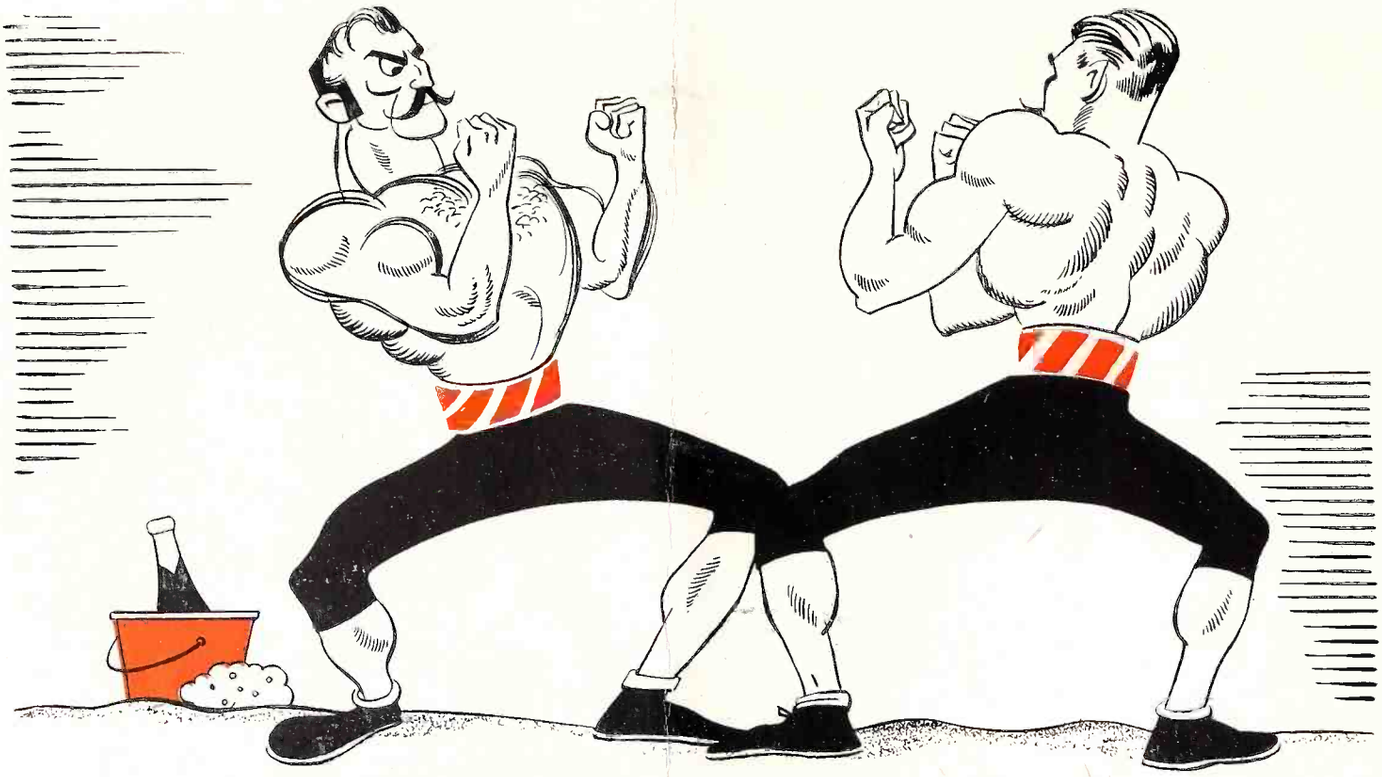
Radio SERVICE DEALER

JULY, 1948

IN THIS ISSUE:

TV Service Outlook
Build This Battery Salesman
Bad Acoustics Cured Electrically
Video Amplifiers

AM-FM-TV-SOUND



Equally Matched

There's no place for a "weight advantage" in the assembly of a vibrator. Unless every part is accurately matched to every other part the performance of the vibrator will be erratic.

Mallory vibrator parts are measured to a minute fraction of an inch and then assembled so that related parts match accurately. The reed matches the reed arms, the reed arms match each other, the weight matches the reed, and the contacts match the assembly. Even the finest scale could not register a significant difference.

The Mallory Replacement Vibrator Guide is free. The Vibrator Data Book is $1.00—from your distributor or by mail.

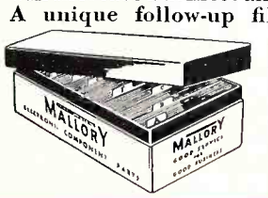
Mallory Vibrators Make the Best Replacements

Careful manufacturing makes Mallory vibrators free of bounce and chatter, dependable in starting, and reliable in operation. More of them are used in original equipment than all other makes combined. That's convincing proof they are the best replacement vibrators for you to stock.

In addition to assured quality, Mallory offers the most complete vibrator line in the business. Mallory standardization permits 12 basic vibrators to meet 90% of your replacement requirements. But a complete line of 52 vibrators is available to meet virtually every vibrator need.

The Mallory "Good Service for Good Business" Plan

will increase business and profits in your shop. A unique follow-up file makes it easy to keep customers.



You tie in with Mallory acceptance to develop new business—ask your distributor about it.

MORE MALLORY VIBRATORS ARE IN USE THAN ALL OTHER MAKES COMBINED

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

EDITORIAL

by S. R. COWAN

TV Service Policies May Be Nixed

At RMA's recent annual Convention, Norman Cooper, Stewart-Warner's service manager, came up with a suggestion which the RMA Service Committee has recommended to its membership; favorable action upon which we most emphatically endorse. The recommendation is: that RMA's standard 90 day warranty be extended to TV receiver sales; also that insurance provisions now offered to TV set purchasers be similarly limited to 90 days.

In other words, as we have urged since the advent of TV sales, the basic job of installing and then servicing TV sets for a 1 year (or longer) period by "exclusive appointees" should be stopped in favor of wide-open free enterprise whereby any and all radio technicians should be allowed to compete for the jobs.

Mr. Cooper stressed a point of great merit, when making his recommendation, that all service dealers and service organizations should act at once to protect their own and the public's equity in TV installation and sales business. Said Mr. Cooper, "The servicing fraternity must promulgate a plan whereby the public can buy, on a pre-fixed fee basis, what can logically be called "Radio Service Insurance."

A full and comprehensive outline of Mr. Cooper's views in this regard will be found in his "Letter to the Editor" which appears on page 6 of this issue.

It will not be easy to determine what scale of fees should be established at the outset, for in cities where there are but one or two TV transmitters the installation problems will be so much less complex than in locales where up to seven stations may ultimately be on the air. But at least, here is a vital subject that all radiomen must work upon at once. We offer but one tentative suggestion for the present, i.e., try to work out your "Service Insurance Plan" on a 3-part basis wherein the basic installation and first 3-months of adjustment-maintenance accounts for Plan 1; while the next 3-month period is covered for any servicing required, under Plan 2; and then have this followed up by Plan 3 to consist of subsequent 3-month duration maintenance period contracts that could be renewed indefinitely, as they expire, at reduced premiums, with the proviso that after the first 90-day period only workmanship and not required replacement parts would be under warranty.

Sound Trucks Permitted

The supreme Court has ruled unconstitutional ordinances that ban the use of mobile sound systems on the basis that such restrictions violate the privilege of free speech. The ruling does not touch upon a municipality's right to require permits (for a fee) authorizing the use of a sound truck; but the decision implied that it is incumbent upon a sound truck operator to use great restraint as to when and where he operates his equipment so it cannot be placed in the category of public nuisance.

Member of the Audit Bureau of Circulations

radio service dealer

VOL. 9 NO. 7

SANFORD R. COWAN, *Editor & Publisher*

SAMUEL L. MARSHALL, *Technical Editor*

JULY, 1948

Editorial 2

Field Findings, by S. R. Cowan 4
A resume of Industry happenings here, there and everywhere.

Letter to the Editor 6
Suggesting how independent Service Dealers may get into TV service business.

Book Reviews 11

TV Service Outlook, by S. Young White 13
Showing how the art will eventually become specialized in 3 categories.

Build This Battery Salesman, by Rufus P. Turner 15
Constructional details of an instrument customers will appreciate.

Bad Acoustics Cured Electrically, by Cuyler A. Tuthill 16
How to modify existing sound installations.

Video Amplifiers, by Samuel L. Marshall 18
Practical applications of video amplifiers.

Circuit Court 20
Ranger Model 118; Silvertone Models 7086 and 7103; Pilot Model T-601 "Pilotuner."

Shop Notes 21
RCA model 66BX, tube replacement advice; Grantline models 605-6 Series A, dial light replacement; Stewart-Warner model 9003-B, audio Oscillation; Hum in Sets using Peanut Tubes; G-E models 41-2-3, increased sensitivity; Crosley models 88 TA-TC, field strength meter; RCA models QU 56C-M, instability; Admiral model 7C73 (chassis 9A1), I-F slug information.

Radio Trade Show New Products Literature Review, Part 2 22
Resume of literature describing new products that is available.

New Products 23

SANFORD L. CAHN
National Advertising Sales Manager

HARRY N. REIZES
Advertising Manager

BRANCH: J. C. GALLOWAY, 816 W. 5th St., Los Angeles 13, Calif., Mutual 8335

Jean M. Wheeler
Circulation Manager

David Saltman
Adv. Production Manager

RADIO SERVICE DEALER (title registered U. S. Pat. Off.) is published monthly at 28 Renne Ave., Pittsfield, Mass. by the Cowan Publishing Corp. Executive & Editorial Offices, 342 Madison Avenue, New York City 17, New York. Subscription rates: —United States, U. S. Possessions and Canada, $2.00 for 1 year, $3.00 for 2 years; elsewhere $3.00 per year. Single copies: 25c Printed in U. S. A. Entered as Second Class Matter at the Post Office at Pittsfield, Mass., under the Act of March 3, 1879. All subscribers should allow at least three weeks for change of address.

VOL. XVII (17)

Should be over your bench NOW!

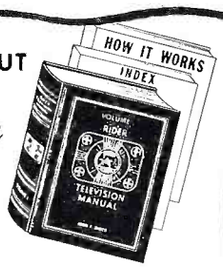
Factory-facts on FM as well as AM radio receivers and allied equipment of 115 manufacturers. Record changers and wire recorders.

Rider-Exclusive "clarified-schematics", break-down every multiband job into individual diagrams of circuits as they exist with each turn of wave band or equipment switch.

The separate "How It Works" book and the Index comes with the Manual at no extra cost. Explains the theory of new radio circuits and elaborates on the mechanical innovations of the sets covered by the Manual.

1648 PAGES, PLUS "HOW IT WORKS" BOOK AND INDEX $15.00

VOL. 1 JUST OUT



RIDER *Television* MANUAL

OVER 1400 PAGES (but the equivalent of 2000 pages)

PLUS, 2 Separate Books, "HOW IT WORKS" and INDEX . . . Complete $15.00

Circuit descriptions, adjustment of various trimmers, traps, transformers, etc., voltage and resistance readings, alignment instructions, parts lists, schematics, patterns, chassis views, wave forms. Everything needed on 1946-1947 television receivers (complete and kit) of 34 leading manufacturers.

208 page "How It Works" book covers underlying theory of television. Transmission and reception, frequency standards, antennas, various portions of television receivers.

Television
"HOW IT WORKS"
Available Separately

If television is not yet in your area, it will be soon. Here is theory you want. **$2.70**

VOL. 1 RIDER PA MANUAL

Out in September

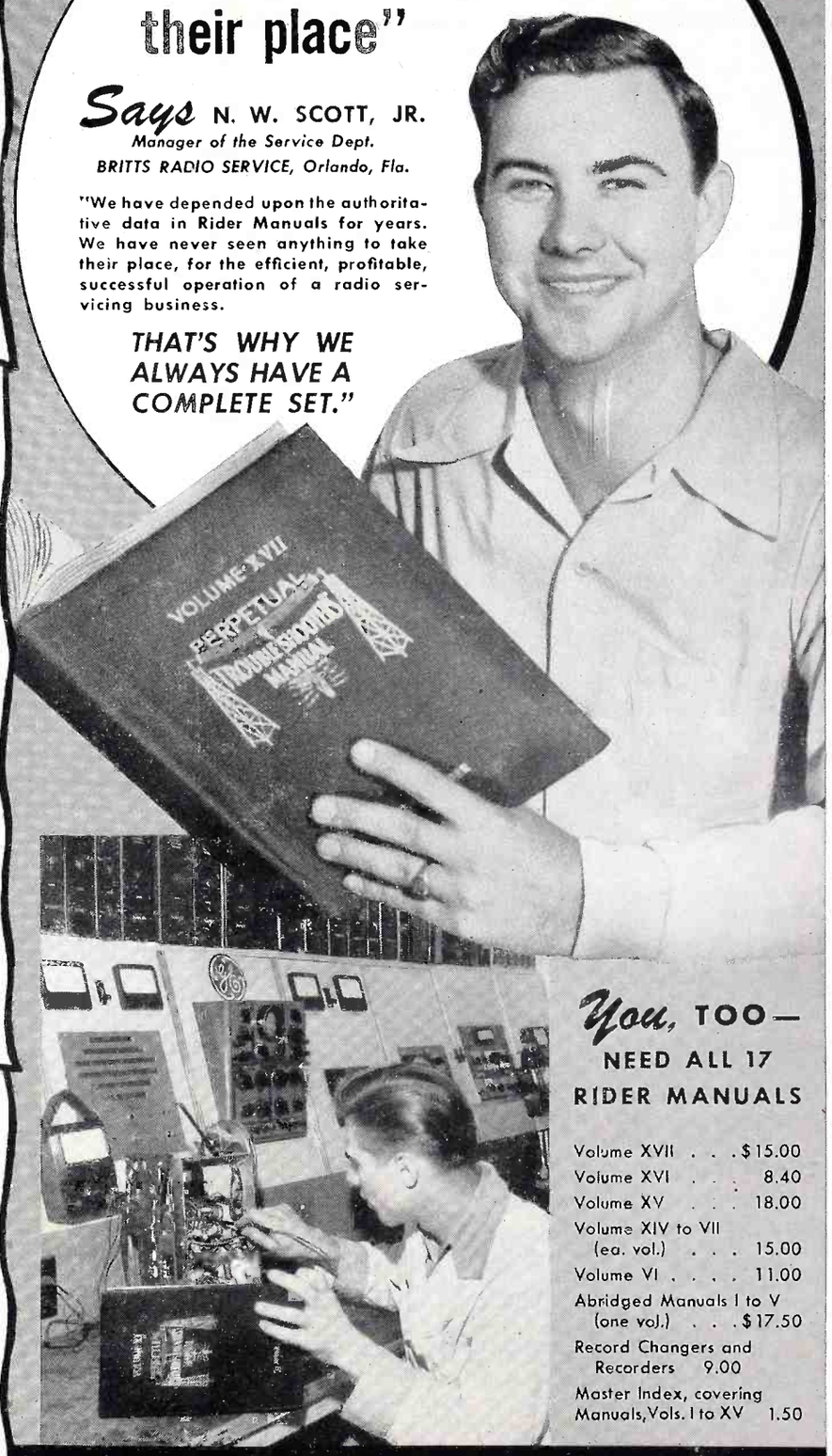
The first industry-wide service manual covering products of all leading manufacturers of PA amplifying systems, manufactured since 1938 to date. Schematics, voltage data, resistance values, capacity values, parts lists, etc. "HOW IT WORKS" explains theory of various designs employed in different types of amplifier systems, the servicing of PA systems, using sine wave and square wave means of checking, methods of rapidly locating faults. Everything you need. **Approx. 2000 Pages. . . $18.00**

"We have never seen anything to take their place"

Says **N. W. SCOTT, JR.**
Manager of the Service Dept.
BRITTS RADIO SERVICE, Orlando, Fla.

"We have depended upon the authoritative data in Rider Manuals for years. We have never seen anything to take their place, for the efficient, profitable, successful operation of a radio servicing business.

THAT'S WHY WE ALWAYS HAVE A COMPLETE SET."



You, TOO— NEED ALL 17 RIDER MANUALS

Volume XVII . . .	$15.00
Volume XVI . . .	8.40
Volume XV . . .	18.00
Volume XIV to VII (ea. vol.) . . .	15.00
Volume VI	11.00
Abridged Manuals I to V (one vol.) . . .	$17.50
Record Changers and Recorders	9.00
Master Index, covering Manuals, Vols. I to XV	1.50

RIDER MANUALS *Mean* SUCCESSFUL SERVICING

JOHN F. RIDER PUBLISHER, Inc., 404 Fourth Avenue, New York 16 Export Agent: Rocke International Corp., 13 E. 40th St., N.Y.C. Cable ARLAB

NOTE: The Mallory Radio Service Encyclopedia, 6th Edition, makes reference to only one source of Radio Receiver Schematics—Rider Manuals.

FIELD FINDINGS

A resume of Industry happenings here, there and everywhere

by S. R. Cowan

THE response to my May editorial, in which I said that I was planning a Fall tour for the purpose of delivering technical lectures to groups of radio service dealers and technicians, is most gratifying. Here is the tentative speaking-date schedule now contemplated:

Cleveland, Ohio	Sept. 2nd
Milwaukee, Wisc.	" 8th
Evansville, Ind.	" 10th
Minneapolis, Minn.	" 13th
St. Paul, Minn.	" 14th
Omaha, Nebra.	" 15th
Salt Lake City, Utah	" 17th
San Francisco, Cal.	" 22nd
Los Angeles, Cal.	" 25th
San Diego, Cal.	" 27th
Burbank, Cal.	" 28th
Long Beach, Cal.	" 29th

The night of Sept. 16th is still open as at this time it is not certain whether I will be at Denver, Col. or Kansas City, Mo., and arrangements for speaking in Chicago on Sept. 9th are still only in the tentative stage. Complete details as to where the meetings will be held and under which Association's auspices should appear in this column next issue.

Meanwhile, I would be remiss were I to fail to acknowledge and thank the many Jobbers, Dealer and Servicemen's Association who, without exception, have so wholeheartedly cooperated with me in arranging the schedule of speaking engagements. I also thank the many radio manufacturing firms who are cooperating by assigning engineers to speak on the various programs so that each one will be quite diversified, informative and well-balanced.

The TV Problem Clarifies

Where ever TV sets have been sold in large numbers, and that means in every city having TV outlets, the public has been delighted with the performance of sets they bought but at the same time dissatisfaction is rife because the installation firms have, as a whole, made a mess of matters. Some TV buyers have had sets in their homes upwards of seven weeks awaiting a temporary or permanent installation. Were TV installations not restricted to so-called "factory-trained agencies" this condition would not exist. However, my editorial on this subject (see page 3) indicates how the matter is well on its way to clarification.

For over eighteen months I have battled alone trying to convince TV set makers to put TV installation-service work on a free enterprise basis. I have contended that there is no mystery to TV and FM problems if any technician assiduously studies the subject and reads "RSD" regularly. Now, to bear out this contention, a contemporary publication (which caters primarily to radio retailers) in its June issue naively admits that the most experienced TV installation and service companies concede that each and every case requires "Trial and Error" treatment.

Service Associations

From all parts of the country come reports that groups of technicians who have organized to improve their own living as well as professional standards are finding the effort extremely worthwhile. New York City's ARSNY, although less than eight months old, already has built up a membership exceeding 550, and during the past month has been favored by technical talks by such authorities as John F. Rider, famous Manual Publisher and Al Saunders who prepared Howard Sams' TV course. In fact, ARSNY presented Rider with a plaque in recognition of his 20 year's of service on behalf of the servicing profession when he sponsored a meeting of over 1200 technicians. ARSNY, like other well-established associations, is getting free spot-announcements on several N. Y. radio stations and the public is avidly responsive by favoring ARSNY members with its service work. To date the Grievance Committee of ARSNY has found it necessary in only one instance to prosecute a serviceman who would not voluntarily render proper and equitable service to a customer. The bug-a-boo that radio servicemen are not honest is quickly being dissipated by Association activities everywhere.

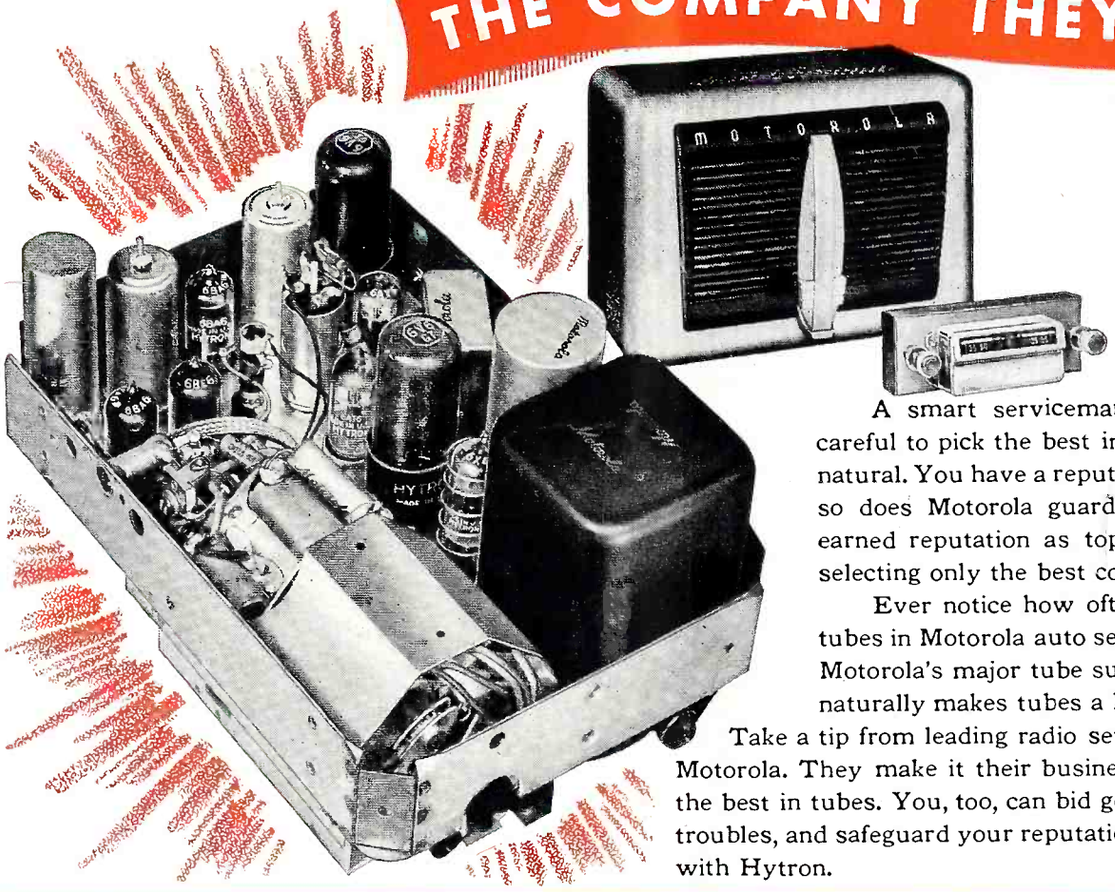
Set Sales Are Down, Servicing Up

In all major marketing centers dealers report a sharp drop in the sale of radio receivers and electrical appliances. Medium and low price video sets are selling well but AM table and console set sales are off. In fact, many secondary brand receivers are such a glut on the market that they can't be disposed of at any price. Public address equipment sales are holding up well, for during election years there is generally a P-A boom. Mobile units are in particularly great demand. Many service dealers are selling and renting P-A systems for campaign purposes, and in conjunction with the basic P-A equipment are finding it easy to sell a wire or tape recorder so that the operator can make a reference recording of the proceedings.

Radio service work has not tapered off to any extent, and in fact, seems to be heading towards a new high level in many communities. The large volume of work available is offset, however, by the fact that many service dealers and technicians are not charging a high enough per-hour rate scale for their

John F. Rider, publisher, receiving plaque from Max Liebowitz, President of Associated Radio Servicemen of New York in recognition of his 20 years of service on behalf of the servicing profession.

TUBES ARE KNOWN BY THE COMPANY THEY KEEP



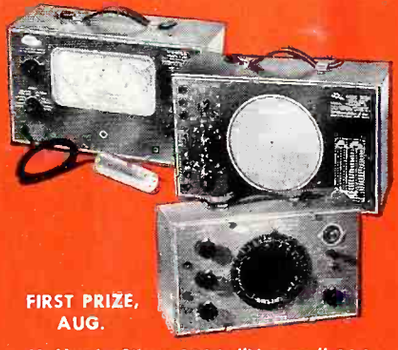
A smart serviceman, you are mighty careful to pick the best in tubes. That's only natural. You have a reputation to protect. Just so does Motorola guard jealously its well-earned reputation as tops in auto radio by selecting only the best components.

Ever notice how often you find Hytron tubes in Motorola auto sets? To rate as one of Motorola's major tube suppliers, Hytron just naturally makes tubes a lot better than good. Take a tip from leading radio set manufacturers like Motorola. They make it their business to know and use the best in tubes. You, too, can bid goodbye to your tube troubles, and safeguard your reputation by "going steady" with Hytron.

SERVICEMEN—Win These Monthly Prizes!

FIRST PRIZE, JULY

Hickok 156A Indicating Traceometer.



FIRST PRIZE, AUG.

McMurdo Silver 900A "Vomax," 904 C/R Tester, and 905A "Sparx."

FIRST PRIZE, SEPT.

Jackson 641 Universal Signal Generator.

FIRST PRIZE, OCT.

Weston 769 H-F Electronic Analyzer.

Want one of these deluxe first prizes? Perhaps a $200 U. S. Savings Bond grand prize? Or one of four $50 and four $25 U. S. Savings Bond second and third prizes? Try your hand at any or all of Hytron's monthly contests exclusively for radio servicemen. It's easy. Here's how. Get entry blank with complete details from your Hytron jobber, or write us. Describe your proposal for a simple, economical shop tool like the Hytron Tube Tapper or Miniature Pin Straighteners. Mail entry to Hytron Contest Editor. Then hold your breath. The finger of the judges may point at you.

SPECIALISTS IN RADIO RECEIVING TUBES SINCE 1921

HYTRON

RADIO AND ELECTRONICS CORP.

MAIN OFFICE: SALEM, MASSACHUSETTS

NEW 9-PIN
Miniature Pin Straightener

Only 49¢ at Hytron jobbers

labor. Their mistaken notion that the public will not pay a reasonably high fee to servicemen causes many technicians to quote prices that are too low, and consequently, in such cases, the servicer takes a loss. The only advice one can give is this: make a genuine study of your costs and required earnings, and then charge fees accordingly. We have assigned a group of cost-accounting experts to work on this subject and hope to be able to publish their recommendations in an early issue.

FCC License Advisable

A Mr. Edwin Crelli of Johnstown, Pa. is typical of the many "RSD" subscribers who have written recently to complain that radio technicians are underpaid. He states that "shoemakers earn from $5 to $6 an hour whereas radiomen seem to be satisfied with much less." I personally don't agree that servicemen "are satisfied" to earn less, but, as stated above, feel they don't know how to go about pricing their services so they earn more.

The question of holding an FCC license enters the picture and can effect a technician's earning capacity. Throughout the country police and fire departments, trucking and taxi firms, industrial and educational organizations are utilizing radio-communications and TV gear to an ever greater extent. With the advent of Citizens Radio, undoubtedly the average radio technician will find himself more and more involved in servicing and maintaining transceiver apparatus, and to do so properly, such technicians should hold at least a Class 2 FCC ticket. In time it might be mandatory.

Just as most cities require that electricians be licensed, so must I advocate that all radio technicians take the required study course to qualify for and obtain their FCC operator's license. Holding such a qualification would enhance the technician's position, give him prestige, and permit the charging of a higher rate scale for services rendered. In addition, broadcast, FM and TV stations around the country are short of technical man-power which slack most radio technicians could take up, at least on a part-time basis, if they prepared themselves accordingly.

Letter to the Editor

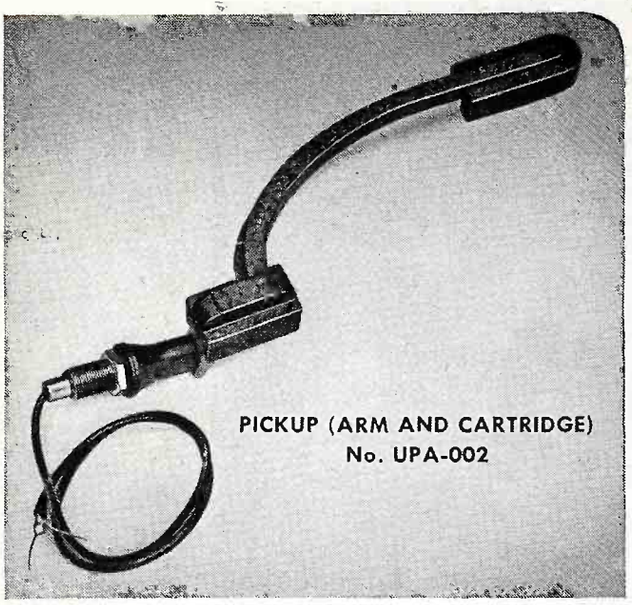
Mr. S. R. Cowan, Publisher
Radio Service Dealer Magazine
New York 17, New York

Dear Mr. Cowan:

"I read with interest the pre-publication draft of the television service policy editorial which you contemplate running in the July issue of *Radio Service Dealer*.

"This editorial is well written and nicely presented. There are, however,

NEW UNITS!
NEW MARKETS!
NEW SALES!
for the



PICKUP (ARM AND CARTRIDGE)
No. UPA-002

VARIABLE RELUCTANCE CARTRIDGE

THESE three new General Electric units open up greater and greater sales possibilities for the Variable Reluctance Cartridge.

Tailored for this fast-moving unit, they fit a ready-made market. Installation problems are simplified, labor is reduced to a minimum, and performance is improved.

Order today—get sales rolling.

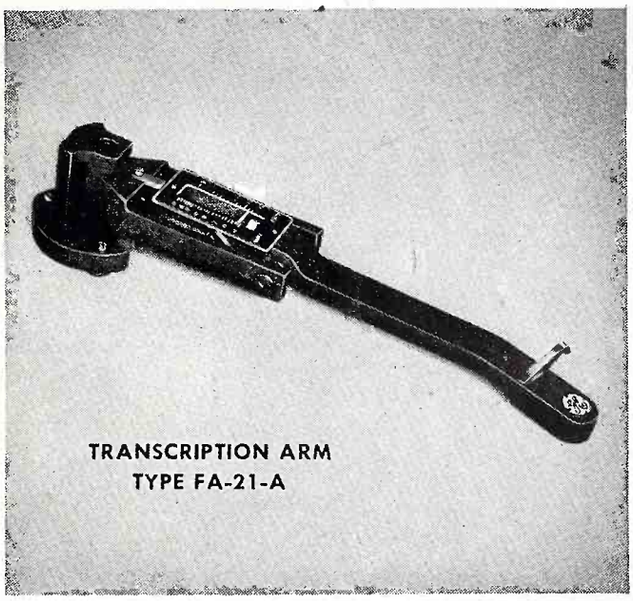
PICKUP (ARM AND CARTRIDGE) . . . No. UPA-002

For 10 and 12 inch records

This inexpensive Pickup has an immediate appeal for the serviceman, high fidelity enthusiast and experimenters—in fact, everyone who owns a record player.

This arm can be used with any record player without automatic changer and provides excellent response with absence of undesirable resonance.

A mounting template is supplied with each Tone Arm.



TRANSCRIPTION ARM
TYPE FA-21-A

TRANSCRIPTION ARM . . . TYPE FA-21-A

For Professional Use

Broadcasters, sound laboratories, recording studios and wired music services will welcome this unit to simplify turntable problems.

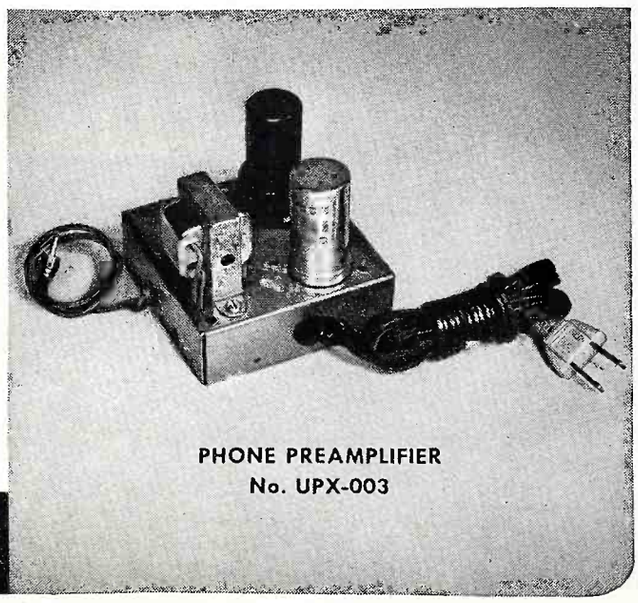
It's easy on the operators—easy to spot in correct groove—no instability worries.

PHONO PREAMPLIFIER . . . No. UPX-003—with RECTIFIER

(For 117 volts, 60 cycle)

This self-contained preamplifier solves a tricky, laborious, installation problem for the busy serviceman. Installations can be made quickly, easily, profitably. The unit is ready to operate when attached to the set—just plug it into the nearest available outlet.

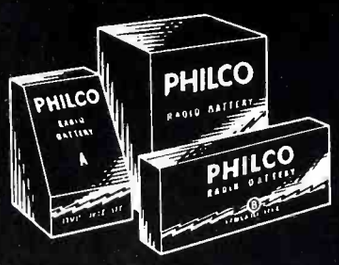
For complete information on these three units write: *General Electric Company, Electronics Park, Syracuse, New York.*



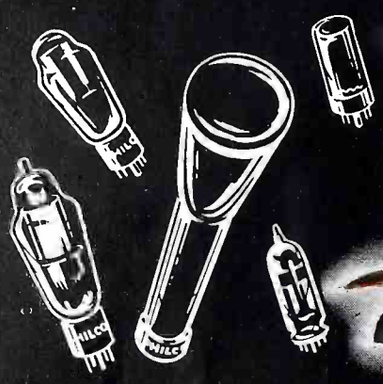
PHONE PREAMPLIFIER
No. UPX-003

169-G7

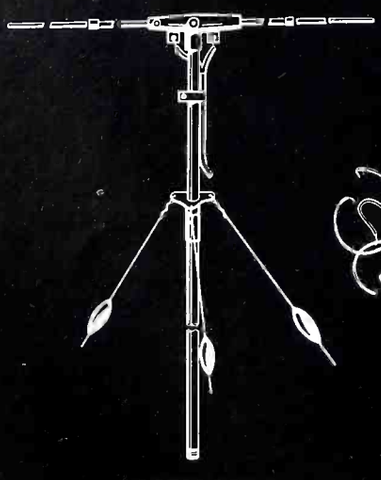
GENERAL ELECTRIC



BATTERIES



TUBES



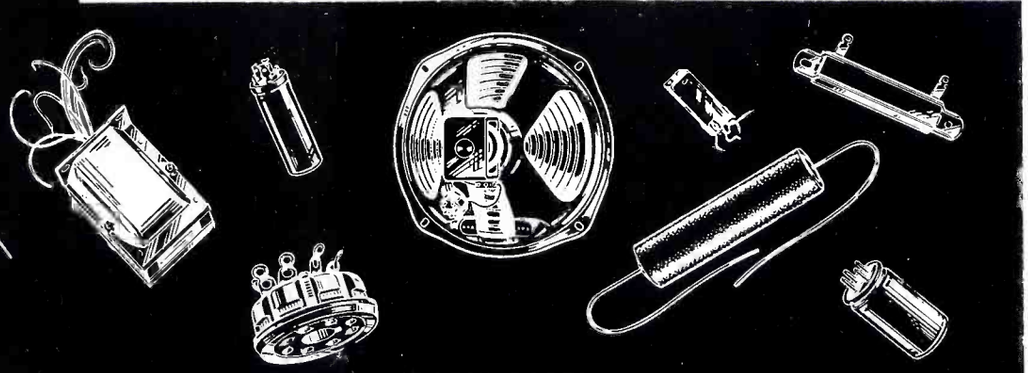
ACCESSORIES

22 MILLION PHILCO RADIOS!

... Yes, by far, here is your greatest market for Tubes, Batteries, Parts and Accessory Products!

Cash in on America's preference for Philco. Sell genuine Philco accessories and replacement parts. They are preferred by Philco owners ... are known and accepted by *all* radio owners for dependable quality and long life.

The complete Philco line of tubes, batteries, parts and accessories—engineered for all radio makes and models—enables you to concentrate on this ONE PREFERRED BRAND, avoid duplicate stocks and overlapping lines, speed turnover, make more money. Get complete facts from your Philco Distributor.



RADIO PARTS


8224
8223
8222
8205
8209
8204
8216
8225
8235
TRANSMISSION LINE CABLES
Every Type for Every Service
Sold Exclusively Through Recognized Wholesale Distributors
8210
8226
8227
8229
8228
Belden
Radio WIRE

one or two points which you may want to reconsider before putting it on the press. Reference is made to Paragraph 3 in which it was pointed out that service organizations should act at once to protect their own and the public's equity in the TV installation and sales business. Actually I was primarily concerned with the action on the part of the independent service organization in protecting his own equity in the installation and service business as that equity was being compressed as the result of manufacturers' use of so-called exclusive appointees in the past 12 to 18 months. There would not in any event be public equity in this activity and you may deem it desirable to revise the standpoint.

"The reason for the suggestion that the service fraternity promulgate their own plan of "radio service insurance" may not be evident to the reader of the editorial. In my opinion this is a very vital point that will convince the set manufacturer that the independent service man is willing to offer his services to the public on a more tangible pricing basis than has been the case heretofore.

"As you undoubtedly personally appreciate, radio service insurance can only be offered by an organization that is run efficiently and in accordance with sound business practices. Radio service insurance can be the means of eliminating certain malpractices that have from time to time caused the public to look with question upon the integrity of the profession that should be very highly regarded in view of the technical skill that is required.

"I suggest you emphasize that the offer of radio service insurance plans by members of the independent servicing fraternity is a very urgent 'must' if they are to reverse the trend of the manufacturer's use of 'exclusive appointees.' The public has gotten to like the idea of the insurance plan now being offered by the set manufacturer and if a return to the RMA standard 90 day warranty is to be accomplished, the servicing fraternity must immediately offer an optional insurance plan of their own so that the purchaser of a television receiver could obtain service protection for a period of a year. The absence of this option could create a sales problem for the set manufacturer who wishes to dispense with the exclusive appointee arrangement.

"Last but not least is the manner in which these radio service insurance plans are to be promulgated. The only logical basis for pricing the plan is in direct proportion to the complexity of the equipment which can be best determined by a numerical count of its stages. For example, the more simply constructed television receiver utilizing the inter-carrier method of extracting sound intelligence would have considerably fewer stages than the conventional type separate sound picture channel job. One would be obviously less complex than the other and hence the insurance fee should differ proportionally. Thus, service insurance could be offered at one rate for a 20 stage receiver and another for a 24 stage and in addition the rate might be based on a 3, 6 or 9 month period. My personal preference is for the 3 month package.

"I hope your editorial attracts wide-

spread attention amongst radio service men and that they become cognizant of the fact that 'this is the time for decision' if they are to retain their competitive position against the manufacturer's type service plans and use of exclusive appointees that have been in use since the post war production of television got under way."

Truly yours,
Stewart-Warner Corp.
N. J. Cooper, Service Manager
Radio Division

BOOK REVIEWS

How it Works (Supplement to Rider Television Manual Vol. I) Published by John F. Rider, Publisher, Inc., 404 Fourth Avenue, N. Y. 16, N. Y. 203 pages 8½ x 11 inches. Price $2.70.

The purpose of this book is to develop in the radio technician a familiarity with television theory and circuits—which when augmented by outside practice should enable an experienced radioman to become a good television technician.

The various chapters of this book were assigned to different members of the Rider staff. This has in no way detracted from the continuity of the book, and has rather enhanced its value because of the "new approach," and the vigorous manner in which each chapter is presented. Contained within its covers we find the contents arranged in conventional fashion, starting with a chapter on general aspects of television, and ending with one on alignment and servicing.

The subject matter covered is fairly complete. References to current TV receivers ties in with theoretical explanations as well as practical applications. The net result is a valuable addition to the all too meager number of books on TV that are available at the present.

Essentials of Radio by Morris Slurzberg and William Osterheld. Published 1948 by McGraw-Hill Book Company, Inc., 330 W. 42nd St., N. Y. 18, N. Y. 710 pages + 75-page appendix + 19-page index + XII pages. Profusely illustrated. Price $5.00.

An ambitious text covering the essential elements of radio in most of its applications. The level of presentation corresponds to the knowledge that should be acquired by a well-grounded radio technician whose academic background includes a high school education. High school math should enable anyone to follow with ease the derivations and problems presented.

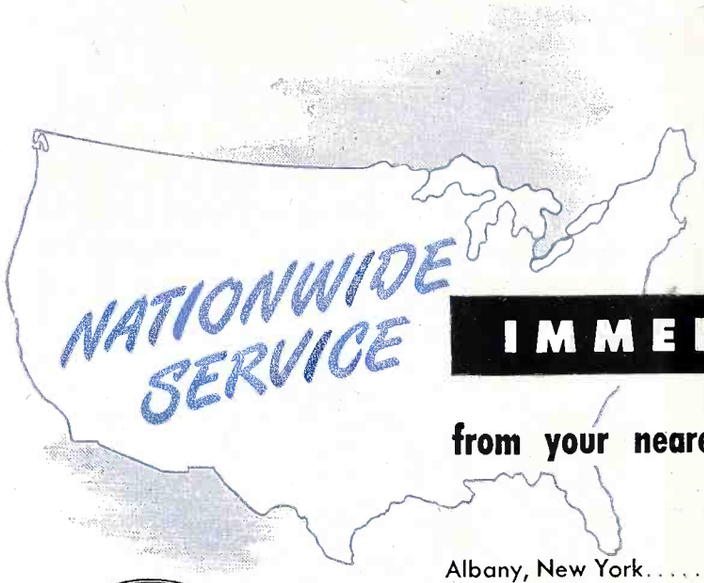
It is the reviewer's opinion that this text is destined to universal adoption by

(*Continued on page 25*)

CROSLEY *Twice Tested*

★ RADIO PARTS

for general replacement



IMMEDIATE DELIVERY!

from your nearest CROSLEY Distributor, listed below

LOOK FOR this emblem on the outside of every package of parts you buy. It's your guarantee of quality parts *inside.*

FREE COMPLETE CROSLEY SERVICE PARTS CATALOG

Contains full descriptions and specifications of thousands of Crosley Twice-Tested radio (and refrigerator) parts and accessories for general replacement and repair. Jam-packed with money saving, time saving, business building values. Order your free copy NOW. Fill in the handy coupon today and mail to your nearest Crosley Distributor.

CROSLEY
Division AVCO Manufacturing Corporation
Cincinnati 25, Ohio

RUSH FREE COPY OF BIG NEW CROSLEY TWICE-TESTED PARTS CATALOG TO:

NAME.....

ADDRESS.....

CITY.....ZONE.....

STATE..... RA-0356

Albany, New York.....Roskin Bros.
Amarillo, Texas
Domestic Appliance Dist.
Atlanta, Georgia..Georgia Appliance
Baltimore, Maryland Legum Distributing
Birmingham, Ala. Alabama Service Co.
Boston, Mass.....Wahn Distributors
Buffalo, N. Y.....Western Mdse. Distrs.
Bristol, Tenn.-Va. Interstate Hardware Co.
Carrier Mills, Ill....O'Keefe Distributing
Charlotte, N. C..Carolinas Auto Supply
Chicago, Illinois...Harry Alter & Bros.
Cincinnati, Ohio...Modern Distributing
Clarksburg, W. Va....Utility Co., Inc.
Cleveland, Ohio..Frankelite Company
Columbus, Ohio Miami Valley Dist. Co.
Dallas, Texas...Lone Star Wholesalers
Davenport, Iowa...Sieg Home Supply
Dayton, Ohio.....Miami Valley Dist.
Denver, Colo..Graybar Electric Co., Inc.
Des Moines, Iowa...H. E. Sorenson Co.
Detroit, Mich.....Peninsular Dist. Co.
El Paso, Texas....Vaughan Appliance
Fargo, N. D.....Meyers-Taube Co.
Ft. Smith, Arkansas Eads Bros. Furniture
Ft. Wayne, Indiana..R. M. Kaough Co.
Ft. Worth, Texas. United Appliance Co.
Grand Rapids, Mich.
Independent Distributors, Inc.
Great Falls, Mont...Gt. Falls Paper Co.
Harlan, Ky.....Kentucky Mine Supply
Harrisburg, Pa....Jules Alexandre, Inc.
Hastings, Nebraska....Dutton-Lainson
Hazleton, Pa.....Lehigh Valley Dist.
Houston, Texas
Reader's Wholesale Distributors
Huntington, W.Va. Huntington Wh'e Furn.
Indianapolis, Ind....Capital Paper Co.
Jackson, Miss....Southern Wholesalers
Jacksonville, Fla. Graybar Elec. Co., Inc.
Kansas City, Mo.....Superior Distr. Co.
Little Rock, Ark.....Wright Service Co.
Los Angeles, Calif.....J. N. Ceazan Co.
Louisville, Ky.....Cooper-Louisville
Manitowoc, Wis..J. J. Stangel Hdwe. Co.
Memphis, Tenn.....National Rose Co.
Miami, Fla....Graybar Electric Co., Inc.
Milwaukee, Wis.....Greusel Distr. Co.
Nashville, Tenn.....Nashville Chair Co.
Newark, N. J.....Apollo Service, Inc.
New Haven, Co...H. M. Tower Corp.
New Orleans, La.
Woodward, Wight & Co.
New York, N. Y....Crosley Distr. Corp.
Omaha, Nebr. Electric Fixture & Supply
Orlando, Fla....Graybar Elec. Co., Inc.
Peoria, Illinois....Johnston-Moody Co.
Philadelphia, Pa...Judson C. Burns, Inc.
Phoenix, Arizona Appliance Distributors
Pittsburgh, Pa. Pittsburgh Products Co.
Portland, Maine Graybar Elec. Co., Inc.
Portland, Ore...Fields Sales Company
Providence, R. I. Graybar Elec. Co., Inc.
Quincy, Illinois....Tenk Hardware Co.
Reno, Nev...Heat. & Air Cond. Supply
Richmond, Virginia..Louis O. Bowman
Roanoke, Va.....Richardson-Wayland
Rochester, N. Y....O'Donnell-Dunigan
Saginaw, Mich.....J. Fischer & Sons
Salt Lake City, Utah Western Supply Co.
San Antonio, Texas .Alamo Distributing
San Francisco, Calif..California Electric
Savannah, Georgia.....Frank Corp.
Seattle, Wash...Commercial Appliance
Shreveport, La.....Electric Supply Co.
Sioux Falls, S. D....Power City Radio
South Bend, Ind...The Ridge Company
Spokane, Wash...Standard Sales Co.
Springfield, Ill..Central Ill. Wholesalers
Springfield, Mass.....Tarbell-Watters
Springfield, Mo.....Rogers & Baldwin
Sterling, Illinois...Hardware Products
St. Louis, Missouri....ARA Distributing
St. Paul, Minn..Motor Power Equip. Co.
Syracuse, N. Y...O'Donnell Distributors
Tampa, Fla.....Graybar Elec. Co., Inc.
Toledo, Ohio
Walding-Kinnan & Marvin Co.
Tulsa, Oklahoma Tom P. McDermott, Inc.
Tucson, Arizona .Appliance Distributors
Washington, D. C. American Wholesalers
Watertown, S. D.....Lyle Meyers
Wichita, Kansas .Steve Wise Company
Youngstown, Ohio....Dorrance Supply

TV SERVICE OUTLOOK

BY S. YOUNG WHITE*

This article is an attempt to survey the future of TV servicing and has been written from the design engineer's point of view. If the conclusions arrived at are correct, TV servicing will offer a larger, more profitable field than radio service before the advent of TV. It will also be divided, most probably, into three fields, —these being 1) routine maintenance, 2) special servicing, 3) installation work.

BASICALLY, a TV set is a cathode ray oscilloscope of a specialized form. Most radio technicians use a scope; and the dozen or so controls on the front panel are all in daily use if the scope is employed very much. As a matter of routine we are constantly re-focusing and re-centering the spot appearing on the screen. In a TV receiver many of these controls have screwdriver type shafts which are generally located so that the user cannot easily have access to them. The components that are used in a TV receiver are no better than in a standard scope, and steady deterioration of the picture detail may be expected. This generally begins about six weeks after the receiver has been installed, and the controls adjusted.

The detail in a picture is proportional to the number of scanning lines employed. After seemingly endless conferences and tests TV engineers have determined that the American public would not accept a picture of less than 400 to 500 lines. However, in a seven inch scope tube the spot cannot be focused small enough to give you more than an equivalent 230 line detail even under ideal conditions. Notwithstanding, the public seems to have accepted this detail, but only as it appears on a 7 inch tube. With this comparatively crude detail quite a bit of inaccuracy as regards exact voltage adjustment can occur without being objectionable or noticeable.

In a large tube, under ideal conditions, about 430 lines can be obtained. However, it takes only a little amount of tube component drift to bring this number down to the 230 lines of the seven inch tube. All current receivers will need constant and regular servicing of a routine nature on this score alone.

The technician engaged in routine servicing will be called upon to locate such faults as burnt out tubes, low emission and microphonic tubes, breakdowns in the power supply, etc. This type of service requires the use of rather simple instruments. He will also be called upon to recognize when the scope tube is near the end of its life, has lost emission, or contains gas. Also, we shall still have our percentage of customers who will not know that junior or the maid had pulled the power cord out of the wall socket; and since we are now TV servicemen, not just radiomen, it should be worth a nominal fee to put it back. There will be plenty of work for our routine service technician since it will be years before men can be trained to the degree of skill where all the answers in a difficult TV servicing problem are at their fingertips. We can make the simple analogy to ordinary servicing by observing that almost any radio serviceman has a signal generator which any radio lab would have been very anxious to own in 1930, but we are very far from possessing a portable TV signal generator of comparative usefulness in tracing faults in a TV receiver, if one is ever developed at all.

The Antenna Problem

The antenna problem is very interesting, both from the theoretical and practical points of view. So many factors are involved that antenna installation is going to be an art rather than straightforward engineering, and we will have to develop some crackerjack antenna experts for this purpose. Let us try to put some order in the present chaos in discussing this problem, one which probably will never be completely solved.

There are three natural zones of reception as shown in *Fig. 1*. These are:

Zone 1, located in the center of a ring of stations.

Zone 2, located immediately outside this ring, say up to two miles from the nearest station.

Zone 3, located so far out that the ring merges into a single source point. It is assumed that the ring will be surrounded by many high buildings.

Receiver adjustments are easiest in Zone 3. Here, in most cases, all stations are received from the same direction so that proper orientation of the antenna is a straightforward procedure. No signal has too high a voltage value, however, if direct line of sight reception is obtained the signal strength will be adequate for good receiver operation. We might expect some interference (to be discussed later) due to weak signals. Or if near an airfield some traveling ghosts will be received which we cannot do anything about. This zone by far encompasses the largest area geographically.

Zone 2 offers greater difficulties of reception. There are large angles between stations so that we must begin to compromise.

In any TV installation we have two

*About the Author

"RADIO SERVICE DEALER" takes great pleasure in presenting this unusual article, written by a man who has been a research specialist in radio for 30 years; is credited with about 230 patents, (mostly on electronics) here and abroad; has contributed to the art many well-known advances including:

A—The Loftin White direct-coupled stabilized amplifier which is now in wide use as a series type voltage regulator.

B—The oscillator used in most radio receivers where the padding condenser is used as a coupling condenser to give uniform output through the band.

C—Was the pioneer in applying AFC commercially.

D—Developed the scanning type receiver that hunts for and locks on a signal, (widely used in Radar for aligning the receiver with the magnetron output frequency).

E—Developed highly stable tunable receivers for UHF having crystal stability.

F—Invented conical scanning used in fire-control Radar and guided missiles.

Mr. White's most recent articles on Ultrasonics, published in "AUDIO ENGINEERING," have created world-wide favorable comment.

Editor

objectives. The first is to obtain a signal of adequate strength, and the second is freedom from interference. It takes about 500 microvolts at the input of a TV receiver to obtain satisfactory operation, and that is a lot of signal. We also wish to eliminate ghosts, that is signals arriving over two or more paths, thereby causing multiple images.

The theoretically perfect antenna must meet certain requirements. It must be highly directional, and therefore consist of many sections if we wish to distinguish between the desired signal and its ghosts. Remember also that the strongest signal may be one that is reflected from an adjacent building rather than one that is being received directly. The best arrays by far are those which are tuned sharply in each element. In the ideal antenna, as we use our selector switch or tuner in the receiver to pick a desired channel, our antenna should lengthen or shorten all its elements automatically to give us maximum performance on that channel. It must then turn towards the direction from which the signal is arriving at its greatest intensity.

In many cases we have reflected detail from the roof chimney, the wall of the next building, and even from the roof itself if the transmitted signal is being received from a direction above the antenna. These reflections may combine with the direct path signal to result in a standing wave pattern at the antenna, resulting in a field intensity variation amounting to as much as 20 DB, plus or minus. For this reason our rotating array must be adjustable through at least a quarter wavelength in the direction of the arriving signal to insure being located at a high intensity spot and not a null point.

Of course the theoretical antenna can hardly be realized practically. However, the antenna considerations just outlined must be taken into account when we install the antenna. In many cases we shall be forced to effect a compromise inasmuch as the standing wave pattern will be different for each station, and if you inadvertently locate on a null you may find a condition where one station is blanked out completely. These nulls become worse as the frequency of the incoming stations is increased.

Zone 1 conditions in the midst of a ring of stations is going to prove really difficult as far as reception and reflections are concerned. This will be especially true if a roof only a few stories high is located in the middle of a number of buildings which are much higher. Reception in such cases will depend largely on reflections with increased instances of marked nulls.

The answer to this problem will be found some time in the future, and will consist of having all transmitter antennas located on a single high building.

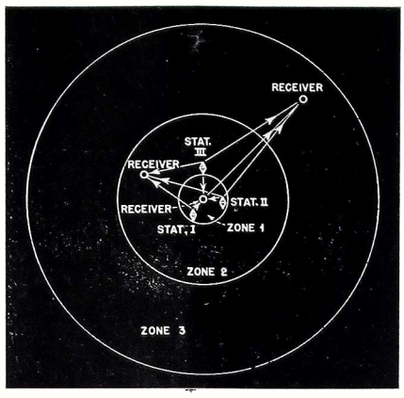


Fig. 1—Effect of receiver location on angle of reception of a number of stations located in a ring.

In New York City it might be the Empire State Building. There would still be standing wave trouble, but almost no ghosts because if a receiver is located so that the best signal is a reflected signal, (for instance from the Chrysler Building) all frequencies would be reflected equally from this point.

Here is a simple fact to keep in mind if you have bright ideas on new antenna design: The signal we receive is a function of the field strength in microvolts per meter, not microvolts per wavelength. It is therefore preferable that the antenna be permitted to be energized from the largest length possible. Do not think of very concentrated and short arrays unless the directional pattern more than makes up for the loss in actual length.

Special Servicing

Since you will have to do your service work without a signal generator capable of putting out a perfect raster on the screen of the receiver, some very complicated problems will arise. The question of correcting excessive keystoning is an example. While each station sets up certain standards they adhere to while on the air, no one can be sure that they do not keystone at any given instant. The cause may be in the camera, the station monitor, or the user's receiver. Also, the keystoning in the receiver may add to or tend to cancel that in the camera at the moment. Since this effect is one which the public seems to be little concerned about at present, and since the customer may like his chorus girls plump at the edge of the screen, it does not pose a serious problem at the moment.

The inability to handle low-keyed scenes, for instance, movie action taking place at night is perhaps more serious because many movies depend on such lighting for dramatic effect. As the camera designers lick this problem a year or so from now it may be possible to build better video response systems into existing sets at some considerable service charge.

The amount of false detail given the picture by a false white space following each black mass is likewise a matter of taste. Some people like it very much because of its three dimensional effect. If they do give it to them.

This kind of servicing requires a rather high order of skill.

Problems of Interference

Here we have a real problem, one which perhaps will never be completely solved. It will require the utmost effort both in general and in special installations. Here are three reasons:

1. In a perfect receiver with no spurious response and with sharp cutoff on a six megacycle bandwidth, any signal within this bandwidth will obviously be accepted. Official tests show that the human eye will respond to patterns produced from interfering signals which are 40 db down from the picture signal.

2. Modern receivers have many spurious frequencies to which they respond, especially at the intermediate frequencies. Furthermore, the cutoff curve is not very definite so that outside interference is very probable.

3. The transmitted power per kc is very low, which is an inherent and important consideration in TV.

Let us consider AM broadcasting power. The art is built on a station with considerable power (50 kw) putting

(Continued on page 27)

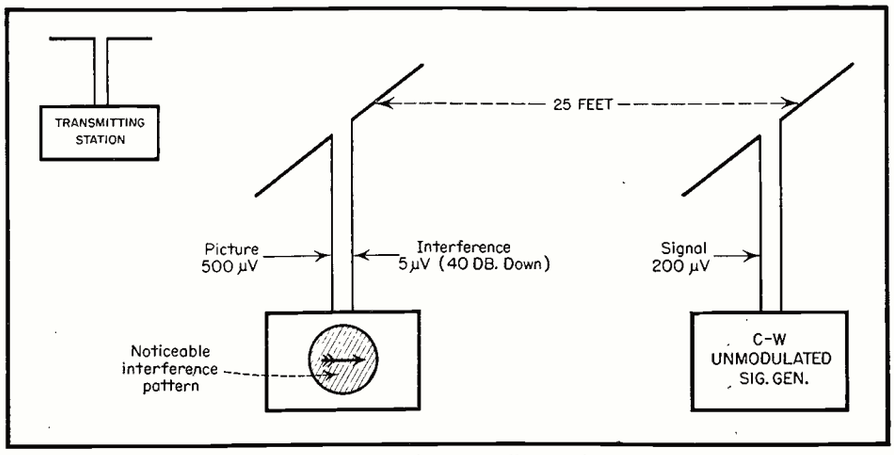


Fig. 2—Setup for measuring interference effects of radiating TV receiver.

Build this

BATTERY SALESMAN

BY RUFUS P. TURNER

Constructional details of a specialized instrument which indicates battery condition in simple terms that any customer can understand.

ANY tests or measurements required in the sale of radio merchandise should be so simple and self-explanatory as to be understood readily by non-technical customers. This will go a long way toward promoting customer confidence, since most customers intuitively distrust meter readings which they do not already understand. While technical units of measurement, even those as simple as the volt and ampere, may be ever so commonplace to the radio service dealer, they tend to arouse a fear of deception in the layman's mind even after they are explained. In this connection, the "GOOD-BAD" scales on modern tube testers have very effectively dispelled most of the suspicion caused by the more vague-reading earlier testers.

Radio service dealer establishments now do considerable business in batteries. Frequent A and B battery replacements are required in portable radio sets and in hearing aids. Official opening of the citizens communication band undoubtedly will boost this business still more. When making a replacement battery sale, it is good policy to show the customer the condition of the old batteries. This involves a voltage test, usually made with a conventional voltmeter or on the voltage scale of a combination tube tester. Both of these instruments generally have several scales and therefore are confusing to the non-technical customer.

The battery tester described in this article has been designed with the foregoing facts in mind. It has a single scale which reads, not in electrical units, but directly in *percentage of rated battery voltage*—figures which are easy to comprehend. Thus; if a reading of 65% is obtained when checking a 45-volt battery, the battery is only 65% good, or is down to 29¼ volts. Similarly, a reading of 50% for a 1½-volt dry cell shows the cell to be only half good (down to ¾ volt). The customer easily understands everyday percentage values and needs little or no selling to convince him that a quarter-good, half-good, or two-thirds-good battery needs replacement.

Fig. 1—Front view of battery salesman described in this article.

Operating Principle

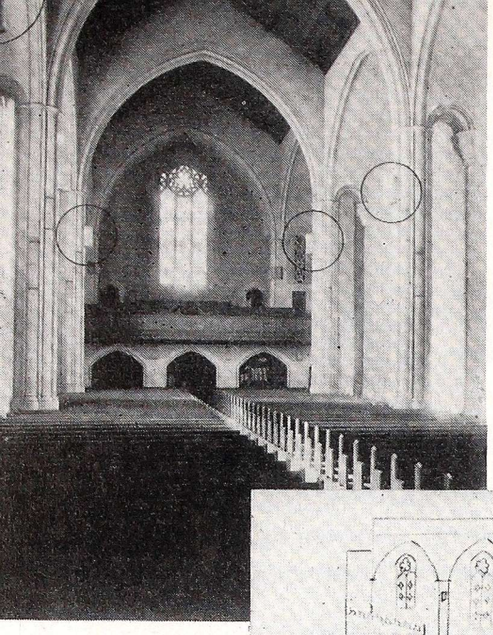
Essentially, the "battery salesman" is a multirange d-c voltmeter with separate full-scale deflections corresponding to each of the seventeen radio, flashlight, and hearing aid battery voltages between 1½ and 103½ volts. The single scale of the indicating meter is graduated linearly in percentages and reads 100% at full scale.

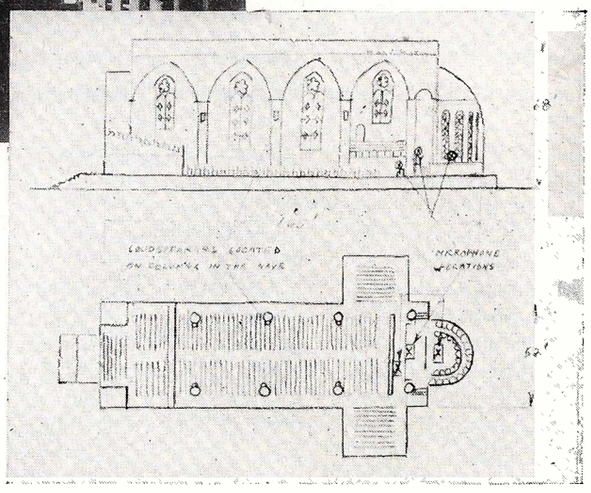
The range switch of the instrument (See BATTERY VALUES name plate in *Fig. 1*) cuts in separate multipliers for the following battery voltages: 1½, 3, 4½, 6, 7½, 9, 22½, 30, 45, 60, 51½, 63, 67½, 75, 88½, 90, and 103½. The only adjustment required when testing a battery is to set this range switch to the rated battery voltage value. The battery condition then is read directly from the meter scale. No further settings nor adjustments are required. There are no rheostats or zero-sets to give the customer the impression that the meter response is being manipulated by the operator.

Construction

Mechanical and electrical construction of the battery tester is shown in the accompanying photograph and circuit schematic.

(Continued on page 30)





g. 1—(Above), view Church's interior after ew speakers were in-alled. (Below), the reliminary sketch owing where to place speakers.

Illustrations, courtesy Western Electric Co.

BAD ACOUSTICS

Many existing sound installations would be vastly improved if modified. Without doubt there are modification jobs like the one described here in your vicinity.

by CUYLER A. TUTHILL

THE five million dollar, fifteen hundred seat, inspiring stone cathedral completed in Winston Salem, N. C., in 1931, pride of the state and its Centenary Methodist congregation, is a beauty to behold from without or within. Yet, its internally generated natural acoustics proved so unfavorable a large portion of its worshippers had great difficulty in understanding their minister.

Its long parallel highly arched walls and narrow width emphasized in *Fig. 1.*, indicate at a glance how havoc was wrought with the parson's orations. Several attempts to alleviate the annoyance proved of little success. Then the proper remedy was found.

Engineers quickly ascertained that power amplification would only make matters worse, as did the minister when he shouted trying to overcome the obnoxion. The problem was strictly one of reverberation. The ever-willing characteristic tones of the edifice were energized to a maximum by the deplorable acoustics adjacent to the pulpit. It was situated mid-way between the two trancepts (*Fig. 1*) almost directly in the focal point of a cylindrical dome-topped choir section.

Skillful listening tests made reverberation tests unnecessary. A speaker moving to the side of the nave became more intelligible immediately. Low frequencies were obviously rolling around wildly. Highs were dissipated by the all-too-thin wall treatment which left much to be desired in the line of uniform frequency absorption. Vowel sounds were echoed while consonants, so needed for intelligibility, were completely washed out.

Since the church's dimensions are 165 ft. long, 52 ft. wide and 68 ft. high, a full congregation contributed only minutely toward reduction of reverberation time. A large ratio of cubic volume decimated each worshipper.

When the engineers who saved this job from the doldrums admit that, excepting costly major structural changes for acoustic benefit, the exact solution was not evident from previous years of experience, we may well pause to respect their integrity. Correction had to be accomplished electrically. Otherwise vast acoustic re-build would demand temporary closing of the cathedral with much embarrassment to the original architect plus great inconvenience and cost to the congregation.

Solution

Basically the correction engineers turned for their text to Huygen's Principle—a plane wave of sound (wherein all points in a horizontal plane are in equal phase at a given instant) is projected directly upon the listeners before reflection can set in. During the war these same engineers successfully leaned upon this principle while correcting the bad acoustics of enclosed hanger decks aboard carriers.

How to set up such a corrective without marring the lofty interior beauty and sanctity was the $64 question. First a rough battery of experimental or working speakers were suspended overhead to aid in analysis. The dire need for increased ratio of direct versus reverberant sound reaching the listener was easily accomplished. Ten speakers were jury-rigged 15 ft. overhead in the nave 15 ft. apart in two rows down across the center of the two main banks of pews for testing.

Next the frequency characteristic of the main sound system was equalized to accentuate the consonants and restore the balance needed for good listenability. Care was taken to hold top emphasis below unnatural hissing. Good results were obtained but, of course, the overhead eye-sore had to be eliminated to achieve discreet concealment of the speakers. The architect's zeal had glorified the vertical 68 ft. expanse of towering pillars and massive arches.

A reasonably good looking hexagonal chandelier or gondola type of clustered housings was tried, but, although it might be well acceptable for other churches, in this case it offended the eye and didn't satisfy the engineers. Compromise with theory often proves virtuous and these men were broad-minded. If they backed off their speaker array to a 30 ft. overhead clearance with spacings 30 ft. apart, they could adjust projection angles for adequate coverage, and, most important, secure safe mounts to the six huge pillars supporting the roof arches across the nave.

Highly satisfactory listening tests throughout the pews decided in favor of this last installation. Only a trained

CURED ELECTRICALLY

ear detected the slight over-balance of reverberant against direct propagation. Intelligibility was obtained throughout and further doctoring could polish things up. Some variation in sound level over the floor area was found indicating some departure from true plane wave propagation. However good hearing was available in all pew seats, and, since parishioners stay put during services, this was of little concern.

A practical working spot light was then pointed at the lecturne to attract attention to the minister. It emphasized the illusion that all sound emanated from that source.

Once a solid mount to the pillars was available the next step was to design a means of concealing the speakers. A hollow blister grill plan was created which carried out the cylindrical lines of the fluted pillars (See *Fig. 2*). This elongated housing, replete with moulding, achieved symmetrical balance of mass and vertical line. The speaker box of plywood was triple-sided with rolled sheets of 1/16" aluminum welded at inverse seams and screwed to the frame. The speaker baffle is above the bottom grill and set at 15 degree angle toward the center aisle. Grey rayon cloth, appearing as limestone, covers the sound grill and bottom aperture. Flat base grey paint is applied to the housing. This is covered with a brownish shading stain which causes the finish to match the aging sandstone blocks. Mortar lines are merly light grey stripes. The finished product becomes a part of the limestone pillar. Many worshippers are unable to locate the speakers.

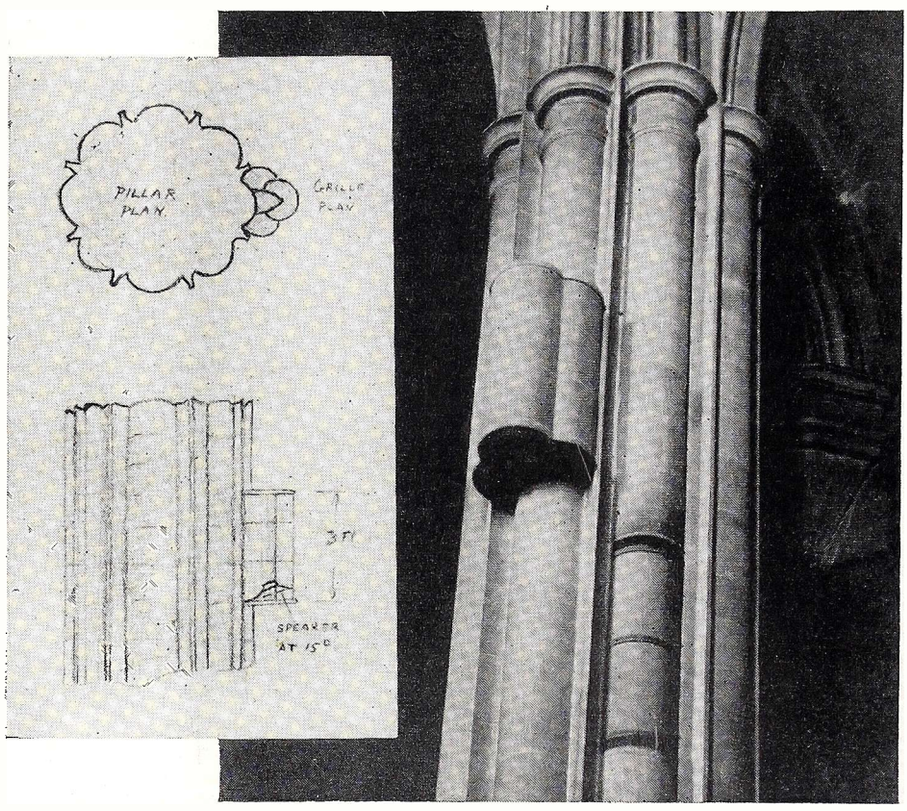


Fig. 2—(Inset), sketch to show how the speaker housing was to be designed to match architecture. (Right), the finished housing.

Technical Data

Three Western Electric 633A saltshaker microphones cover the entire pickup arrangement. One is mounted before the lecturne, one faces the choir centrally, while the third covers the communion bench between the lecturne and the front pews (*Fig. 1*). Baffles of the 8-B type were applied to the microphones to accentuate consonants. The saltshaker was chosen over more directional types since its gain was adequate for the close pickup avoiding any mixture of reverberant with direct sound. Then too, the rising characteristic of the 633A called for no electrical equalization.

The overall frequency response finally arrived at was almost a straight line rising characteristic of 5 db per octave from 100 to 5000 cycles. This was obtained without equalization by employing the above baffled-microphone in conjunction with thirty watt 12" loudspeakers in 1 & ½ cu. ft. boxes. These speakers project high fidelity with more than ample power.

Two amplifiers of the 124-C type were used, each with the grids of the second stage bridged together. They each have 12 watts output with very low hum content. Their first stages are 116-Bs having remote bias control. Each amplifier drives its own speaker group of three speakers down the side of the church. Four mixing inputs are available since each accommodates two 116-B preamplifiers.

A unique remote control box was located in a former "dead spot" in a rear pew. In this box a meter reads the bias voltage set by the control knob. A select-switch picks the channel for bias reading without interfering with mixing. This allows the operator to check the volume settings and gives an indication of correct operation, yet is much simpler than a VU meter bridged across the output. A control panel at the amplifier location allows setting of each channel gain just below the sing point for full gain setting at the remote control. This remote can be operated by relatively inexperienced people without fear of accidents. As a final precaution against equipment causing disturbance or failing during worship, a shorting switch is provided which kills the entire system.

The final results have been enthusiastically received by the congregation. Every pew is provided with clear natural sound without any straining to understand. The choir has been enriched to twice its former value and the projection of soloists now takes on color. Congregation singing had been scant and bashful because of their inability to fill the huge cathedral plus their isolation from the choir. The intimacy between choir and congregation gained through the sound system has greatly relieved this discomfort.

Truly this is a triumph in Audio Engineering. This story also indicates a vast field of potential business awaiting sound re-enforcement engineers in thousands of houses of worship and business establishments. Have you prospects near you? Why not contact them?

VIDEO AMPLIFIERS

BY SAMUEL L. MARSHALL

Practical applications of video amplifiers.

THE video amplifier in a TV receiver performs a task analogous to that of the audio amplifier in an ordinary receiver. It amplifies the rectified video detector output to a voltage high enough to properly operate the picture tube. Voltages of this nature run between 25 and 75. Detector output voltages for full picture signal strength vary between 1 and 2 volts.

For correct operation of the picture tube a positive picture phase signal must be applied to the grid of the picture tube. If the output of the detector has a negative picture phase it is the job of the video amplifier to reverse this phase 180° making the picture phase positive. On the other hand, if the picture phase at the detector output is positive the net phase reversal effected by the amplifier should be 0° or 360°, thereby keeping it positive.

This can be done in a number of ways. It is only important to remember the following basic rules pertaining to phase relations in resistance-coupled amplifiers to be able to follow the phase changes in these amplifiers.

1. The signal phase at the plate of a vacuum tube is 180° out of phase with that at the grid of the same tube.

2. The signal phase at the output of a coupling condenser (grid side) is the same as that at the input (plate side).

3. The signal phase at the cathode terminal of a cathode-follower type of amplifier is the same as that at the grid of the same tube, which means that no phase change takes place in a cathode-follower circuit.

Video Amplifier Classifications

Video amplifiers may be divided into two main groups. The first is the conventional system employed in most TV receivers and is shown in its proper position relative to the complete receiver, in the block diagram of *Fig. 1a*. Here the demodulated video signal, containing the video picture frequencies and the synch pulses, is amplified and fed into both the picture tube channel and the synch channel.

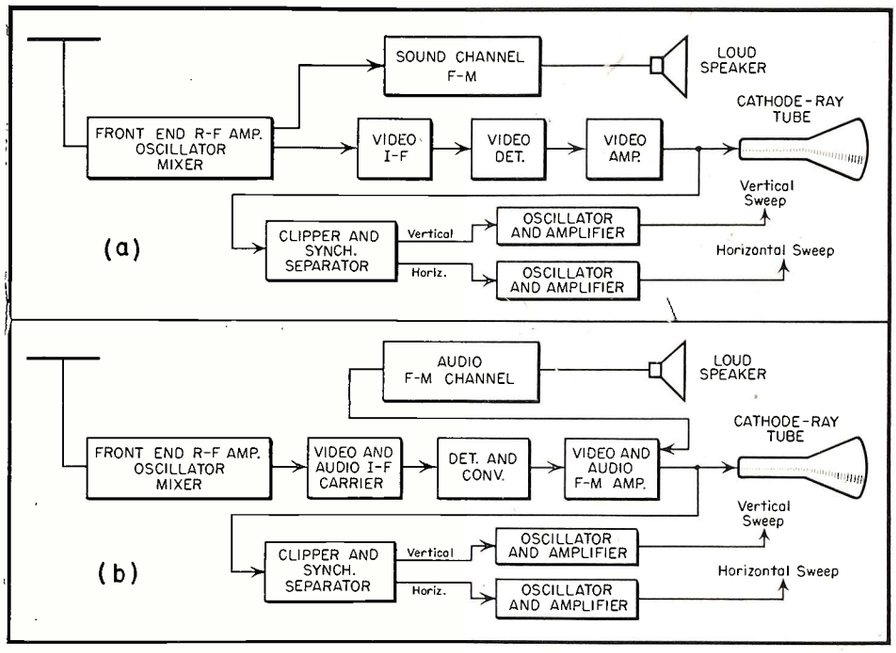


Fig. 1—Conventional TV receiver block diagram (above); Intercarrier block diagram (below).

The second type of video amplifier is employed in the *Intercarrier System* in which FM audio as well as demodulated video frequencies are amplified and sent on to their respective circuits.* It is evident that the requirements of the video amplifier in the Intercarrier System are more stringent than those in the conventional type of video amplifier because of the wider frequency range that must be passed. Two types of signals are present in the video stages of an Intercarrier System. The first is the varying video picture frequency and synch pulse combination contained in the demodulated envelope of the video carrier. The second is an FM signal with a center frequency of 4.5 mc produced by the mixing of the video and audio carriers in the second detector.

At present, there are a few receivers employing Intercarrier video amplifiers. However, a great deal of development work is going on along these lines which gives promise of wider acceptance of this system in the immediate future.

Video Amplifier Characteristics

A basic knowledge of fundamental resistance-coupled amplifier operation is necessary in order to understand more fully the problems met with in video amplifiers. This knowledge is

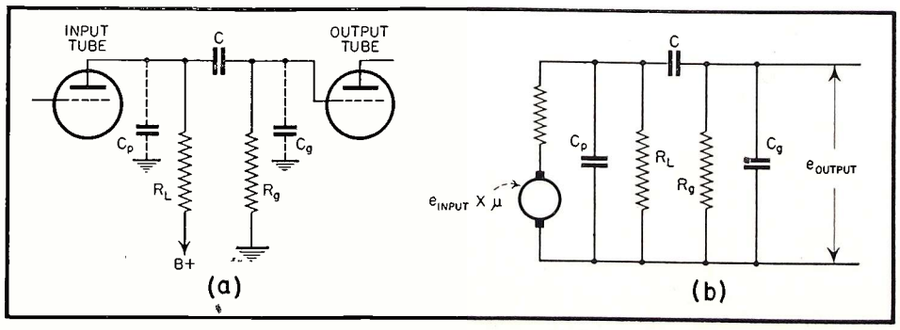


Fig. 2—Resistance-coupled amplifier circuit (left); Equivalent circuit (right).

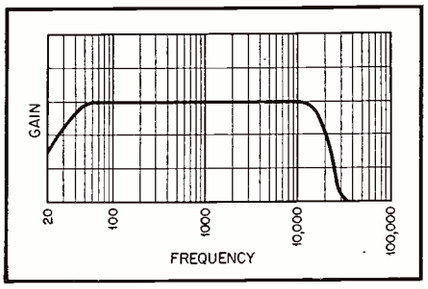


Fig. 3—Typical audio frequency response chart.

more easily acquired from a study of the amplifier and its equivalent circuit as shown in *Figs. 2a* and *2b*.

Examination of these illustrations reveals that the plate circuit of the input is shunted by the plate to ground capacity, c_p, and the grid circuit of the output tube by the total input capacity, c_g. At the higher audio frequencies these shunt capacities have a short-circulating effect on the signal thereby resulting in amplitude distortion.

At the lower audio frequencies the reactances of these capacities are very high and do not affect the operation of the amplifier. However, coupling condenser, C, which is in series with the grid load resistor, R_g, cuts down the voltage available across R_g with the result that amplitude distortion also takes place at the lower audio frequencies.

A typical audio response curve in a resistance-coupled amplifier is illustrated in *Fig. 3*. Notice how the response drops off at the extreme lower and higher ends of the curve. At the middle frequencies the reactances of c_p and c_g are high enough to be negligible. Equally negligible at these frequencies is the voltage drop across C. For these reasons no amplitude distortion is present in the middle frequencies.

The discussion up to this point pertains to amplifiers with a frequency range of from 10 to 15,000 cycles per second. Video amplifiers, on the other hand, must have band pass characteristics from 30 cycles per second to 4.5 mc. Intercarrier Systems require even higher band pass characteristics.

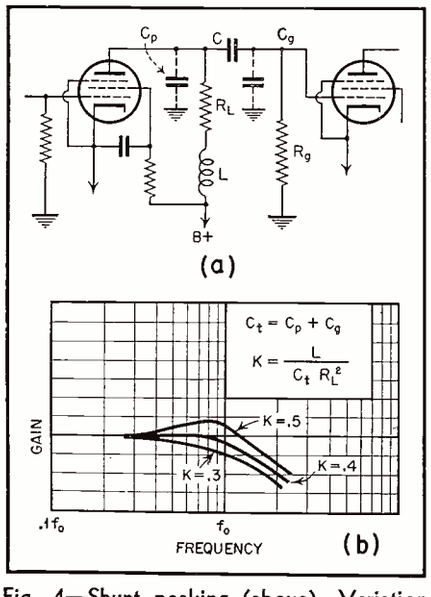


Fig. 4—Shunt peaking (above); Variation of shunt peaking effect with K (below).

Tubes With High Figure of Merit

Reference to the equivalent circuit of *Fig. 2b* will reveal that as we decrease R_L the short-circuiting effect of c_p becomes less pronounced. However, lower values of plate load resistance result in a lower stage gain. In order to obtain greater stage gain with reduced plate load resistors it becomes necessary to use tubes with high values of transconductance.

Proceeding now to the effect of the total grid to ground capacity, c_g, it should be borne in mind that this capacity is comprised of the sum of the wiring capacity of the circuit and the input capacitance of the tube. With certain exceptions, it is preferable to use pentodes of triodes as video amplifiers because of the fact that in triodes the plate to grid capacitance multiplied by the tube gain is reflected back and becomes part of the total input capacitance of the tube.

Special types of pentodes with low values of input capacitance and high values of transconductance have been developed. These tubes permit amplification of a higher range of frequencies than would otherwise be possible. High transconductance and low input capacitance, which are desirable qualities in a tube to be used in high frequency applications, can be described by a single term: *Figure of Merit*

Figure of Merit $= g_m/c$ input

Tubes of this type which are used in modern television receivers are the 6AC7, 6AG5, 6AU6, etc.

Shunt Peaking

Improvement of high frequency response by means of tubes with high Figure of Merits is not quite enough to obtain the wide bandpass required in TV video amplifiers. Further response extension is obtained by high frequency compensation circuits of various types. These will now be explained.

One type of circuit, called *Shunt Peaking*, illustrated in *Fig. 4a*, makes use of an inductance, L, which is connected in the plate load circuit of the input tube. This inductance is in series with R_L and the total effect of c_p and c_g which is equal to C_t. At frequencies near the resonant frequency of L and C_t the gain at the higher frequencies of a compensated amplifier remains fairly constant.

The manner in which the resonant peak depends on the ratio $L/C_tR_L = K$ This is illustrated in *Fig. 4b*.

It would seem that what actually takes place is that the capacitance, C_t,

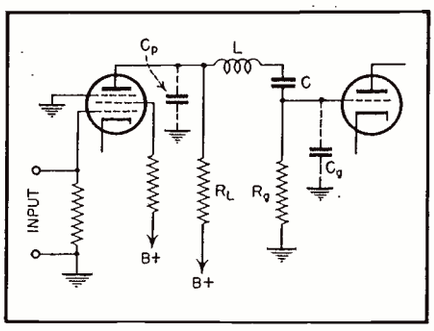


Fig. 5—Series peaking.

is made part of a resonant circuit, so that the resonant voltage drop produced across it aids the gain at the high frequencies instead of short circuiting them.

Values of circuit constants that result in effective shunt peaking are as follows:

$$R_L = 1/2\pi f C_t$$
$$L = R_L/4\pi f$$

where: f is the highest video frequency at which flat response is desired. This value of f is not the resonant frequency of C_t and L, the value of this resonant frequency, f_o being 1.41f.

In practice, somewhat lower values of R_L and L are used in order to compensate for phase distortion. This will be treated in greater detail later on.

Series Peaking

A second method of improving high frequency response in video amplifiers is indicated in the circuit shown in *Fig. 5*. It will be observed that in this circuit c_p and c_g are separated from each other by the inductance L. The value of L is chosen so that $1.41f = 1/2\pi\sqrt{Lc_p}$. In this equation, f is the highest video frequency at which a flat response is desired.

In practice c_g is made to have about twice the capacity of c_p. If it is desired to obtain the value of L directly from the equation just given:

$$L = 1/8\pi^2 f^2 c_p$$

Close examination of *Fig. 5* will reveal that the voltage drop of the signal across the parallel circuit of R_L and c_p is fed across the series circuit comprising L and c_g. The resonant effect in the circuit produced by the presence of L maintains the output constant at the higher video frequencies.

(*Continued on page 26*)

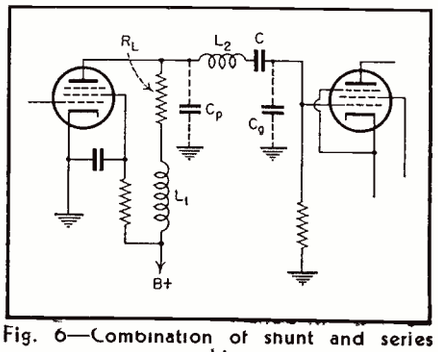


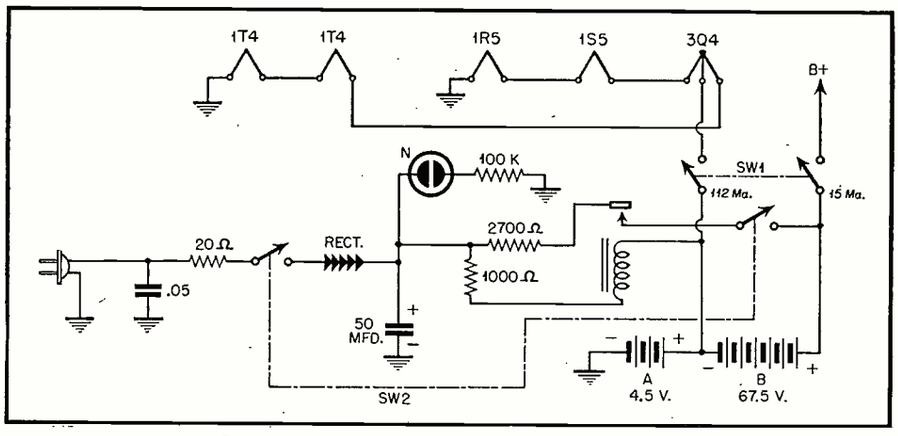
Fig. 6—Combination of shunt and series peaking.

CIRCUIT COURT

Ranger Model 118

This five tube portable set operates from built-in battery or power line supply. A dry-disc rectifier is used for line operation and provision is included for charging the batteries as the set is played. An indicator is included to show when power is applied.

The partial schematic illustrates the details to be discussed. The tube filaments are wired in series-parallel so that each branch of the circuit totals 4.5 volts. The A battery is of this potential. A 67½ volt B unit is used. For battery use these power sources are connected by the throwing of switch *1*.



Partial schematic of Ranger Model 118 receiver.

There are two portions of the line power switch marked *2*. One of these closes the a-c circuit to the rectifier, via the 20-ohm protective resistor. A single 50 μf filter condenser appears at the output of the rectifier, as does the neon indicator. A 100K-ohm resistor in series with the neon lamp limits the current and establishes the breakdown potential.

Two branches are taken by the d-c output of the rectifier to the rest of the set. One circuit includes the 1000-ohm resistor and the relay coil. These components drop the voltage to 4.5 when the set is operating and supply somewhat more to charge the A battery when the set is off.

The relay closes if the set is in use and supplies B voltage through the 2700-ohm resistor and relay contacts. A 30 μf condenser, not shown, completes the filter circuit.

Silvertone Models 7086 and 7103

Considerable interest has been aroused by the introduction of these combination radio, disc and wire-recording instruments. A block diagram is shown illustrating the most interesting of the several features.

The sets are seven tube units and employ a-c/d-c type construction in the chassis proper. Several combinations of operations are possible. Recording may be done from radio, mike or from disc to wire. The phono turntable of the disc playing assembly acts as a reel for the wire as it is recorded.

As a radio the circuit is simple and conventional. A 12SA7 convertor provides 455 kc to the 12SK7 i-f stage. Detection and audio amplification take place in the 12SQ7 stage, and the output tube is a 50L6. Switching is provided to connect the output of the 50L6 to either the speaker or the wire recording head.

For the reproduction of conventional phonograph records, the output of a crystal pick-up is connected to the input of the triode portion of the 12SQ7 stage. It will be evident that no great problem is involved in recording on wire at this time.

The output of the wire being lower than a disc record, use is made of an additional stage of audio amplification during this function. The same tube, a 12SJ7, brings the output of a crystal mike up to the level needed for recording on wire. At all times it is used, the output of the 12SJ7 feeds the grid of the 12SQ7 triode section.

It is necessary to establish a fixed condition of the molecules of the wire, magnetically speaking, before recording takes place, and to provide a strong field for erasing un-wanted recordings. This function is performed by a supersonic oscillator which in the case at hand uses a 50L6 tube.

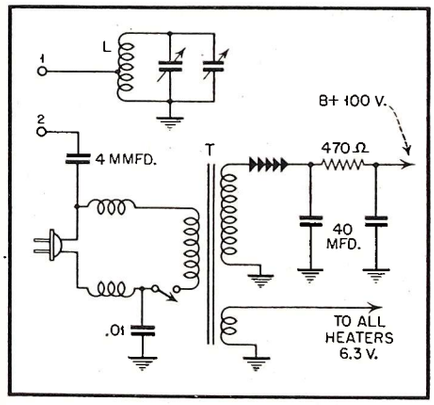
D-C power for all the tubes is derived from a conventional half-wave rectifier circuit using a 35Z5 tube.

Pilot Model T-601 "Pilotuner"

This interesting 5 tube FM tuner has gained wide popularity for it's excellent performance and nominal price. Among the unusual features of the circuit are the rectifier in the power supply and the provision for operation without an external antenna.

The partial schematic shown illustrates both of the details to be discussed. Even though the instrument is suitable for use on a.c. only, the high voltage source is no greater than the line potential. This provision possibly indicates alternate use as an a-c/d-c device with a minimum of modification.

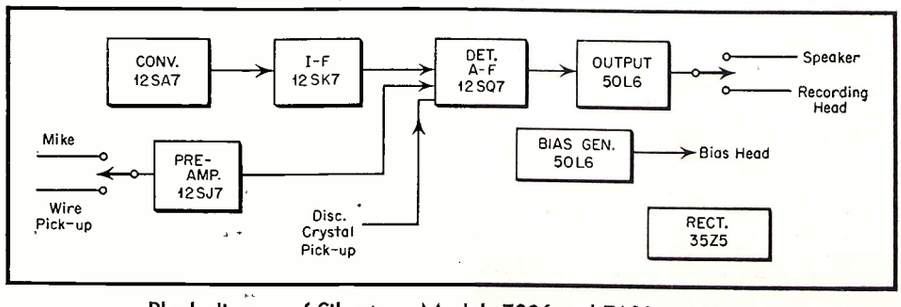
The power transformer has two secondaries; one delivering 6.3 volts for heater supply to the miniature tubes, the other makes 100 volts available at the output of the filter for the d-c



Partial schematic of Pilot Model T-601 "Pilotuner."

elements. The rectifier is a half-wave dry-disc type, and the filter convential

(*Continued on page 26*)



Block diagram of Silvertone Models 7086 and 7103 receivers.

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".

R.C.A. Model 66BX. Caution in Tube Replacement

R.C.A. Victor offers this information for use with the above receiver. Before replacing any tube, place the power cord in position for battery operation and turn the set on. In adition, if batteries are not connected, short circuit pins *No. 6* (black) and *No. 7* (red) of the battery plug. This prevents possible burnout of tubes due to discharge of *C31* which becomes charged to a high voltage on a-c operation if

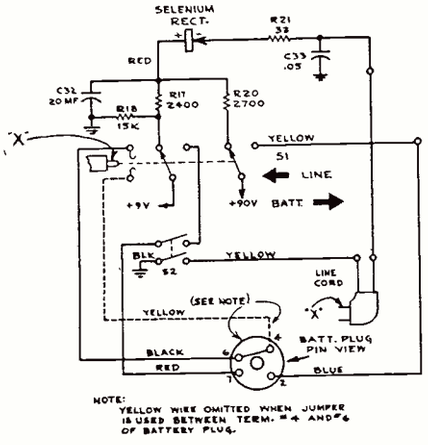


Figure 1

filament circuit is not complete. Late production has a resistor 15,000 ohms, (some may be 10,000 ohms) connected between the low voltage side of *R17* and the common insulated negative wiring. See *Fig. 1.*

Grantline Models 605, 606 Series A. Dial Light Replacement

If the dial lamp burns out the set should not be operated until a new lamp has been installed. Failure to heed this caution may result in a burned-out 35Z5GT tube.

Stewart-Warner Model 9003-B Audio Oscillation

The audio system of this receiver utilizes a two-stage type of inverse feed-back arrangement and should it ever be necessary to replace the speaker or output transformer it is important to maintain a definite phase relationship in the feedback circuit. If the connections to the output transformer are reversed, or if the feedback connection is made to the wrong side of the output transformer secondary, the system will become regenerative instead of degenerative. Under these conditions audio oscillation may result. If that occurs, oscillation may be prevented by reversing the connections to the primary of the output transformer.

Hum in Sets Using Peanut Tubes

In several new sets that use the peanut tube lineup with a 35Z5 there is a hum sounding like a leaky filter condenser. This is usually NOT the trouble as I find that by placing a shield around the rectifier tube the hum disappears.

Submitted by Ronald Brown, Lonaconing, Md.

General Electric Model 41, 42, 43 Increased Sensitivity

To increase the sensitivity at certain points on the broadcast and shortwave bands, a 470 μf capacitor, *C111* has been added between terminals 3 and 5 on the 1st i-f transformer. On early production sets without this capacitor the following should be done: (1) This capacitor should be added between terminals 9 and 10 of wafer No. 6 on the bandswitch; (2) The orange, green, and black leads from terminal 5, 3, and 8 of the 1st i-f transformer to bandswitch should be grouped together and pressed to chassis; (3) *C108*, a .02 μf by-pass capacitor, ground end, should be removed and grounded under the mounting lug of the 1st i-f plate coil.

Crosley Models 88TA, 88TC Field Strength Meter

One of the alignment operations in these receivers involves adjusting an FM oscillator radiation adjustment trimmer for a null reading in order to effect proper operation of the FM band. This is done with the aid of a Field Strength Meter, the circuit of which is shown in *Fig. 2.* This meter consists of a d-c 100 microampere (full scale) meter, shunted by a 1000 $\mu\mu$f mica by-pass condenser; a geranium crystal rectifier connected in series with the meter, and a five foot, 75 ohm twisted

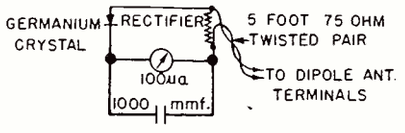


Figure 2

pair of leads. Shunt the meter end of the leads with a 75 ohm carbon resistor. The open end of the leads are connected to the FM dipole antenna terminals. Connect the condenser directly across the meter terminals, and the crystal directly to one terminal of the meter. Keep connecting leads as short as possible.

This instrument will be found extremely useful in checking the extent of re-radiation present in television receivers. This re-radiation is transferred from the oscillator to the antenna terminals by devious links, and is a source of considerable annoyance to other television receivers in the neighborhood.

R.C.A. QU 56C, QU56M—Instability

Development of appreciable r-f impedance in the electrolytic filter capacitor creates common coupling and may

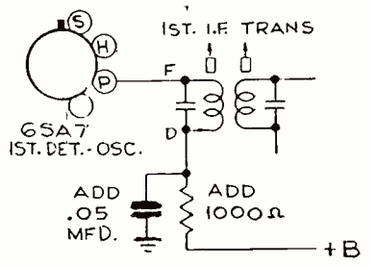


Figure 3

cause i-f oscillation. To eliminate this possibility, R.C.A. recommends an r-c filter connected in the B+ lead of the first detector plate circuit, as shown in *Fig. 5.*

Admiral Chassis 9A1 Model 7C73 I. F. Slug Information

To avoid splitting the slotted head of the powdered iron core tuning slug in the i-f transformers, use a screwdriver with a blade $\frac{1}{8}$ inch wide for i-f alignment.

Under normal operating conditions, mis-alignment of slug-tuned circuits with age is slight. Therefore, re-alignment of the i-f transformers should be accomplished by only a slight adjustment of the slugs. Do not turn a slug in an extreme amount or it will fall into the center of the coil form. Always try to adjust by first turning the slug out. Should an i-f slug be turned in too far and fall into the center of the coil form, it will be necessary to remove the other tuning slug on the opposite side of the i-f can. Then, using a thin rod and screwdriver, "jockey the dislocated slug until it re-engages the threads in the coil form." Since this is a difficult operation, care should be exercised as outlined above and this difficulty will be avoided.

If the iron core slug should become stripped, or if the slotted head should become rounded or cracked, it may be removed by removing the opposite slug and forcing the defective slug out with a thin screw driver.

SHOW REVIEW

Literature describing new products announced at Trade Show will be sent free if you write mentioning "RSD".

American Phenolic Corp., 1830 S. 54th Ave., Chicago 50, Ill., exhibited new lines of radio components, cables and connectors, plastic rods, sheets and tubes which are fuly illustrated in catalog 73. Also featured were the new series of FM and TV dipoles, transmission lines and stand-off insulators. Literature on the new dipoles may be ready by the time this item appears in print. Write for it.

Amperite Corp., 561 Broadway, New York 12, N. Y. presented a new line of "blastproof" ribbon microphones available in various types and models to meet professional requirements. Featured was the PG (pressure gradient) dynamic mike, lapel and "Kontak" mikes. A cable type input transformer and boom-type mike stand were shown, as were a full line of ballast tubes, voltage regulators, thermostatic delay relays and mike accessories. Bulletins are available. An interesting instruction sheet on the Kontact mike and its applications is called bulletin 4-47 10M TP.

Clarostat Mfg. Co., Inc., 130 Clinton St., Brooklyn, N. Y. New types of volume and tone controls, fixed and variable w-w resistors and ballasts. Catalog 48 on controls and resistors; 7th Edition of Control Replacement Service Manual. Both available free.

Hallicrafters Co., 4401 W. 5th Ave., Chicago 24, Ill. Featured new TV models with push-button control and communications receivers. Also demonstrated new types of projected-view TV models, and wall-mounting types which are not yet commercially available. Literature on TV model T-54 and "ham" equipment is available on request.

Bell Sound Systems, Marion Rd., Columbus 7, Ohio introduced complete new line of inter-com and sound systems which are described in bulletins 4849-1, 4708, Catalog 4849 gives all specifications and prices and includes sound accessories, Write.

Webster-Chicago, 5610 Bloomingdale Ave., Chicago 39,—featured the new model wire-recorder, the standard portable types, recorder accessories, amplifiers and recording-level indicators. Request literature Forms 781, 803-P and 804.

Sprague Prods. Co., N. Adams, Mass. Specifically designed capacitors, type ELS, for selenium rectifier circuits. Complete new line is shown in catalog M-419. In addition, there was shown, conventional types of capacitors and especially designed sizes; the new DeLuxe "Tel-Ohmike" universal capacitance and resistance analyzer with built-in d-c volt-milliammeter. The latter components are described in catalog 40.

Drake Electric Works, Inc., 3656 Lincoln Ave., Chicago 13, Ill., was represented with a line of soldering irons and soldering iron accessories—catalog 1948.

Shurite Meters, 15 Hamilton St., New Haven 8, Conn., displayed a new line of panel meters for the measurement of current, voltage and resistance. Catalog sheets may be obtained on request.

Hickock Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio, featured their new television alignment generator Model 610, and television kilovoltmeter Model 465, in addition to their regular line of dynamic mutual conductance tube testers, FM sweep generators, etc. Specs on the TV alignment generator may be obtained by requesting Form No. 610-3-48. Other catalogs may also be obtained by writing to the mfgr.

Industrial Condenser Corp., 3243 N. California Ave., Chicago 18, Ill., displayed their new line of high voltage, tubular TV capacitors. These units are the latest addition to the Industrial line of paper, and electrolytic capacitors. Write for bulletin 1095.

Supreme, Inc., Greenwood, Miss., demonstrated their new "600" tube, battery and set tester, with a full-view 7 inch meter. For a catalog of their complete new line of test equipment write direct to the manufacturer.

Electric Soldering Iron Co., Inc., 3448 West Elm St., Deep River Conn., showed their new, green label, orange label, and red label lines of "Esico" electric soldering irons. Write for catalog.

The Workshop Associates, Inc., 66 Needham St., Newton Highlands 61, Mass., displayed their new line of TV-FM, and amateur broad-band antennas. Included in this exhibit were antenna accessories such as masts, rotators, insulators, and other similar devices. Catalogs may be obtained on request.

E. F. Johnson Co., Waseca, Minn. displayed a complete new line of condensers, inductors, sockets, cabinet racks, a rotary beam antenna, pilot light assemblies, plugs and jacks. Catalog 970B describes these units while the new line of tiny variable condensers is covered by bulletin 8C, for which you should write.

Quam-Nichols Co., Cottage Grove & 33rd Pl., Chicago, Ill. featured a new line of replacement speakers, called "Adjust-A-Cones" and "U-Shaped" coil pots. Also shown was a new line of output transformers. Catalog 64, which is available, covers the items.

Chicago Trans. Corp., 3501 Addison St., Chicago 8, Ill. introduced a brand new line of transformers and reactors called the "Compound-Sealed" type having wire leads out of base, "Semi-Sealed" with solder lugs on terminal board, and "Solder Sealed" with pin type terminals. Included in the new line are audio components for high fidelity work. Complete details and specifications are given in the catalog available on request.

National Co., Malden, Mass. displayed a complete new receiver line, a TV model, and components for TV and "ham" applications. Literature is available by writing National direct.

Electronic Laboratories, Inc., Indianapolis, Ind., featured their new line of converters for mobile, portable, radio, and appliance applications. Included also was their converter that can be used with 32 volt farm or marine power plants. Write for catalogs AD-89, AD-90, and AD-91.

Crescent Industries, Inc., 3430 Milwaukee Ave., Chicago 41, Ill., displayed new types of Alnico V. P.M. and electro magnetic loud speakers for replacement and sound reinforcement applications. Ask for catalog WDSL-1. Also shown was their new C 1000 Series combination wire-recorder record-player mechanism. This unit is described in Catalog WDSL-3 while the older series of wire-recorders having automatic shut-offs are covered by catalog WDSL-2.

Waldom Electronics, Inc., 911 N. Larrabee St., Chicago, Ill. displayed a complete line of replacement speaker cones and universal field coils. Catalog 49 is an excellent replacement guide and reference for this purpose. A copy will be sent. Write Waldom.

Federal Telephone & Radio Corp., 900 Passaic Ave., East Newark, N. J., was represented with their complete line of selenium rectifiers. Applications of these devices are illustrated in a series of pamphlets called, "Application News." An interesting application of selenium rectifiers in TV receivers is treated by George Eannarino in an article entitled, "Selenium Rectifiers and TV Receivers." —Form F-346. These publications may be obtained without charge by writing to the manufacturer direct.

Vaco Products, 317 E. Ontario St., Chicago 11, Ill., displayed a complete new line of radio tools. Of great interest is their reversible blade screw driver which becomes either a regular type screw driver or a Phillips Type screw driver by the simple process of pulling out the blade and using the type desired. Catalogs may be obtained on request.

Cornish Wire Co. Inc., 15 Park Row, N. Y. 17, N. Y., displayed their line of aerial wire, lead-in wire, antenna accessories, P-A wires and cables, intercommunication cables, radio hook-up wire, etc. Ask for catalog 56.

Ungar Electric Tool Co. Inc., Los Angeles, Calif., showed their new line of pencil soldering iron and tellerium tips. The latter are of the screw-in type and are available in many forms.

V-M Corporation, Benton Harbor, Mich., exhibited their new stream-lined automatic record changers, regular and intermix. Write company direct for catalog sheets.

Audak Company, 500 Fifth Ave., N. Y. 18, N. Y., exhibited their new line of high quality "Tuned-Ribbon" reproducers for records up to 12 inches and 18 inches, and for both lateral and vertical recordings. Shown also was their high fidelity line of cutters. Catalog is available by writing the manufacturer.

Alpha Metals Inc., Brooklyn, N. Y., featured their "Tri-Core" solder products as well as their other lines of anodes, extruded metal shapes, preforms, fluxes, and shredded metal and laminated fluxes. Write for catalog.

The Garrard display included a new mixer-changer, a 2-speed transcription motor, and the new RC 70 record changer. Carrying cases, wood bases and cabinets designed to house these changers were also a part of the display. For catalog 48 and other literature describing these units, write Garrard Sales Corp., 315 Broadway, New York 7, N. Y.

Recoton Corp., 251 Fourth Ave., N. Y. 10, N. Y., showed their new nylon "phono-needle." Ask for form 4812 describing this product.

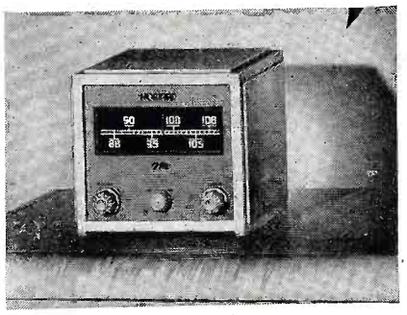
(Continued on page 26)

All literature referred to will be sent gratis if you say you read about it in "RSD".

NEW PRODUCTS

Howard FM Converter

Howard's model 482 has 7 tubes, including rectifier and converts standard radios to receive FM on the 88 to 108 mc bands. It is claimed to have less than 5 microvolts sensitivity. A high fidelity audio booster stage and volume control matches the audio



level of any AM set, providing a convenient volume adjustment on the converter. The dial is slide-rule type.

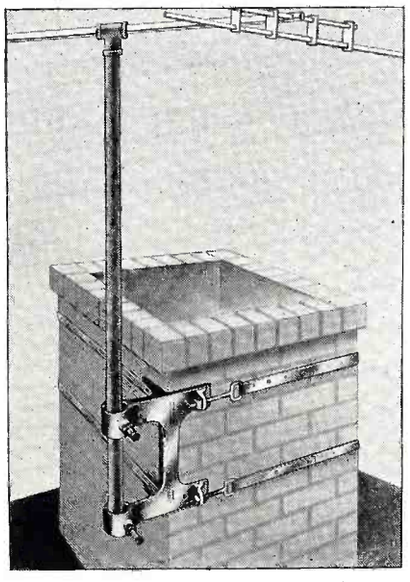
The cabinet matches most surroundings, is available in mahogany and blonde finish, and has a mounting bracket so it may be installed inside of a console record compartment. Further details available from Howard Radio Co., 1735 Belmont Ave., Chicago

New TV Antenna Mount

South River Metal Products Company announces ready for immediate delivery the Chimney Mount Antenna Base—designed to cut installation time and costs and to permit the erection of many antennas on or about a building.

The unit can be installed with just a pair of pliers and s rew driver.

It mounts on any chimney, pole or similarly-shaped extension by means



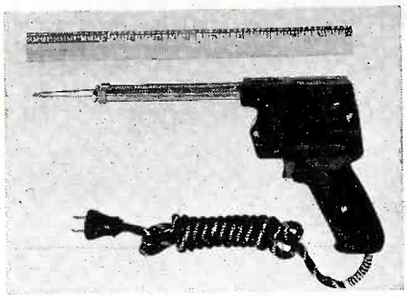
of the straps. It can also be screwed to any corner of a building or to the end of a 2 x 4. The mast holder will accommodate any size tube from ½" to 1/3" O. D. or any size pipe from ¼" to 1" I. P. S. Several mounts can be strapped to the same chimney by simply arranging the antennas at different heights.

Two 12-foot lengths of .023" by ¾" galvanized steel bands, furnished with the mount, are enough to encompass the largest size chimney.

For additional information, write South River Metal Products Company, South River, N. J.

"Longer Reach" Soldering Guns

Two "longer reach" soldering guns 8" and 12" units are announced by Weller Mfg. Co., Easton, Pa. These two new models provide easy access to spots otherwise difficult to reach.



Dual heat at 100 and 135 watts is provided on both new models They operate on 115 volts at 60 cycles. All Weller Soldering Guns include fast five second heating, built-in transformer, long life Flexitip, prefocused spotlight and trigger switch.

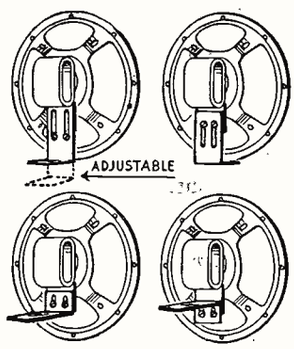
(*Continued on page 24*)

NEW PRODUCTS

(from page 23)

Wright Adjustable Mounting Speakers

Wright Inc., 2233 University Ave., St. Paul, Minn., announces a new loudspeaker adjustable mounting bracket. By stocking only three



different size speakers, 4½, 5, and 6 inch sizes, with these brackets they can be used in repairing practically any type of table model or console radio.

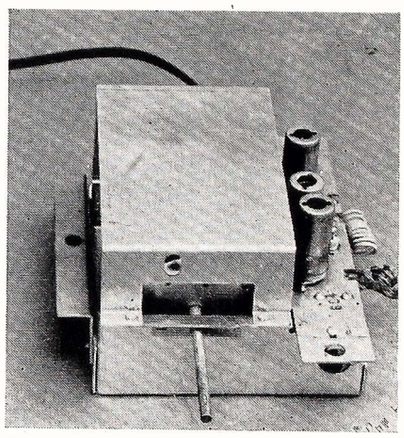
New a-c To d-c Power Convertor

The New RPS Power Conversion Units, answer the radio man's need for an easy, inexpensive means of converting d-c War Surplus Equipment into a-c use.

A basic schematic is furnished with each power conversion unit.

They are available with transformers to match in nine popular models with d-c output—ranging from 14 Volts—2 Amps, 4.5 Amps, 10 Amps, 40 Amps, and 28 Volts—1.8 Amps, 5 Amps, 10 Amps, 20 Amps, and 40 Amps.

Special RPS Units to meet any requirement in voltage and amperage rating are available on special order at no extra cost. Write Radio Products Sales, Inc., 1501 South Hill Street, Los Angeles 15, California. A free copy of "How to Convert a-c to d-c" will be sent upon request. Address all correspondence to Seymour Friedman, Department C-35.



CORRECTION

It has been called to our attention that Fig. 1, page 17, June "RSD" captioned as the "Sarkes-Tarzian Front-end used in Television Assembly Co's. Standard Model" is in reality an R.C.A. front-end. Illustrated above is the Sarkes-Tarzian unit.

BOOK REVIEWS

(*from page 11*)

schools and institutions in which technical radio training is given. The methods of approach, the general get-up, the careful presentation of the various teaching points, the applications, the testing devices, all point to a well-prepared and well-planned series of lessons that begins with introductory concepts of radio and ends with methods of testing radio receivers. This text can well serve as a stepping stone to those technicians who wish to up-grade themselves to higher technical levels.

Television Course by Albert C. W. Saunders. Published 1948, periodically, by Howard W. Sams & Co., Inc., 2924 E. Washington St., Indianapolis 7, Indiana.

A TV course made available in installments which are provided free with each new set of "Photofact" folders. The first unit, covering electrostatically deflected cathode ray tubes is a fine lesson on beam formation and control. Illustrations are excellent. Each installment contains just enough material to make it easily digestible.

Television & FM Receiver Servicing by Milton S. Kiver. Published 1948 by D. Van Nostrand Company, Inc., 250 Fourth Ave., N. Y. C. 203 pages + 4-page appendix + 4-page index + IV pages. Well illustrated. Price $2.95.

A practical approach to TV antenna problems, installations, receiver test equipment, operation, and servicing. The author discusses various types of antennas and practical construction problems. In the chapter on *receiver installation* he analyses the general operations and adjustments to be made in typical installations. In the chapter on *test equipment* he discusses the basic requirements of effective testing and the instruments needed to perform these operations. In *receiver operation* practical applications and analogies are made between theoretical knowledge and current receiver circuits. In *servicing* he draws on the general experiences of the trade in discussing the problems that arise and the methods of solution. A complete and parallel treatment on FM is also included.

Basic Mathematics for Radio by George F. Maedel. Published 1948 by Prentice Hall, Inc., 70 Fifth Ave., N.Y.C. 334 pages + 4-page index + VII pages. Price $4.75.

A text book on the applications to radio of elementary mathematics including basic arithmetic, geometry, algebra, trigonometry, logarithms, and complex numbers. A good math review, however, there ought to be more applications to radio.

VIDEO AMPLIFIERS

(*from page 19*)

The coupling condenser, C, has a capacity high enough to produce little effect on the resonant frequency. This circuit has an advantage over the previous one described in that the total capacity C_t is split up by L, thereby resulting in a greater gain per stage.

Combination Peaking

Most receivers make use of a combination of both shunt and series peaking as shown in *Fig. 6*. Results obtained are excellent. Values of circuit component relationships are given below. These already include additional phase corrections which will be ex-

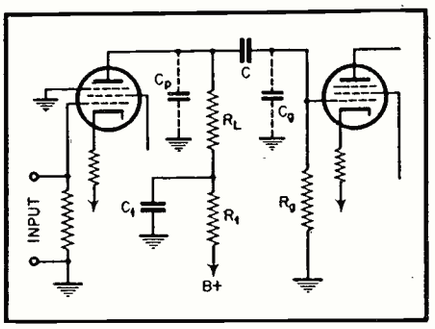


Fig. 7. Low frequency compensation

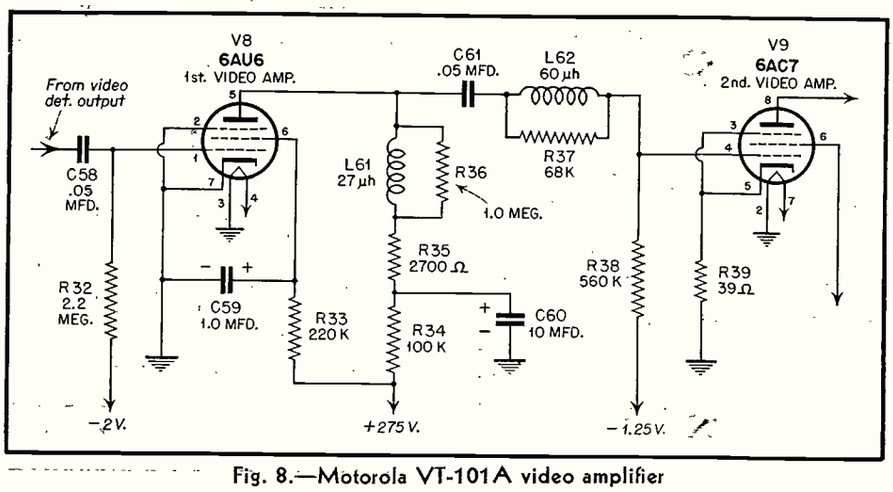


Fig. 8.—Motorola VT-101A video amplifier

plained subsequently.

$L_1 = 0.12C_tR^2$

$L_2 = 0.52C_tR^2$

$R_L = 1.8/2\pi fC_t$

Low Frequency Compensation

It was previously pointed out that at the low frequency end of the audio response curve loss in gain is due to the high reactance offered by coupling capacitor C at these frequencies. Increasing the value of this capacitance extends the linearity of low frequency response somewhat but introduces other serious difficulties. These difficulties are increased leakage capacitance between the high side of the circuit and ground, an increased leakage path between B+ and the grid of the output tube, and an increased value of time constant in the grid circuit of this tube which could result in audio oscillation. Comparable video deteriorating effects take place in video amplifiers employing this practice.

By means of a low-frequency compensation circuit of the type shown in *Fig. 7* it is possible to obtain a linear response characteristic far below the minimum low frequency requirement which is frame frequency (30 cycles). In general, C_1 presents a higher impedance to low frequencies than to high, so that the effective loading of the circuit is higher at the low frequencies than it is at the high. This results in a higher gain at the low frequencies than at the high.

Additional beneficial effects are obtained by virtue of the filtering action of the additional RC circuit in the plate load circuit. This reduces possible hum and feedback thereby rendering the circuit more stable. The basic circuit component requirements for low-frequency compensation are:

$$R_LC_1 = R_gC$$

where R_1, the decoupling resistor is greater than 10 times the reactance of C_1 at the lowest frequency to be passed.

A typical commercial video amplifier employing shunt and series peaking as well as low frequency compensation is shown in *Fig. 8* which is the video section of the Motorola receiver, Model VT 101.

(To be continued)

CIRCUIT COURT

(from page 20)

in nature, employing a 470-ohm resistor and two 40 μf capacitors.

It will be noted that there are r-f chokes in each side of the a-c line. Reception of local FM stations is made possible by the simple expedient of running a 4 μμf capacitor from the line side of one of the chokes to a terminal on the antenna strip. By connecting the condenser to an adjacent terminal which is a tap on the grid coil of the 6BA6 tuned r-f stage, signals appearing on the power line will be received. Reversal of the plug may improve results.

SHOW REVIEW

(from page 22)

National Union Radio Corp., Orange, N. J., displayed their complete new line of vacuum tubes, ballasts, and capacitors. Write for electron tube data sheets on their new tubes; form No. C-C0148 for data on their "NU" capacitors; and their excellent "Uniballast" service manual.

Stromberg-Carlson Mfg. Co., Rochester, N. Y., featured their new line of inter-communication systems. For further information write direct.

The Rauland Corp., 4245 N. Knox Ave., Chicago 41, Ill., displayed their new broad-band FM-TV antennas, also their model MT 500 mast base. Write to the factory for catalog sheets.

The Aerovox Corporation, New Bedford, Mass., featured their new line of "Duranite" capacitors designed to withstand severe humidity and heat, rough handling, and extreme vibration. Write factory for catalog.

Tricraft Products Company, 1535 N. Ashland Ave., Chicago 22, Ill., displayed their all-wave outdoor TV-FM antennas. Also undercarpet FM-TV antennas. Write for their excellent manual and descriptive catalogs.

Gee-Lar Products Co., 3322 W. Montrose Ave., Chicago, Ill., offered a complete line of knobs of all shapes and materials for home and auto radios. Additional items displayed were improved terminal strips, sockets, speakers, microphone mixers, indoor FM-TV antennas, and rubber cabinet—bumpers. Catalog may be obtained by writing the manufacturer direct.

Rad-El-Co Mfg. Co., 6300 Euclid Ave., Cleveland, Ohio, displayed their new auto, and FM-TV antennas. Included also were antenna accessories and hardware. Catalog available on request.

Jackson Industries, Chicago 16, Ill. displayed many types of portable amplifier cases, phonograph cases, record cabinets and speaker housings. A catalog is available free.

Philmore Mfg. Co., Inc., New York 3, N. Y. exhibited two new types of TV and FM kits. The TV model kit is available with 10″ and 12″ flat-faced CRTs. Video and sound channels come completely wired and aligned. Descriptive literature is available.

Technical Appliance Corp., Sherburne, N. Y., manufacturers of "Taco" antenna equipment displayed their new all-wave noise reducing antenna systems, antenna and set transformers, master antenna systems, TV and FM antennas, and antenna accessories. Write for catalog No. 29 and form 11-11-47.

Telex, Telex Park, Minneapolis, Minn. showed their new radio pillar speaker. Catalog sheet is available on request.

Bliley Electric Co., Union Station Building, Erie, Pa., exhibited the new line of crystals of all types and frequencies. Their featured item was a packaged VHF crystal controlled oscillator. Also

shown was their variable frequency, crystal controlled oscillators. For full descriptive literature, write for bulletin 36.

Guardian Elec. Mfg. Co., 1625 W. Walnut St., Chicago 12, Ill. had on display a complete line of relays featuring the new co-axial C-300 Relay which is ideal for all antenna-switching applications. It's a hot TV and "ham" item. This and other relays shown, including the Series 200, which has an interchangeable coil and contact switch assembly, are completely described along with application data in the new catalog which will be sent free.

David Bogen Co., Inc., 633 Broadway, New York 12, N. Y., featured a new P-A line including a centralized system for schools and institutions as described in catalog SB107. Inter-coms, paging systems and specialty equipment is covered in catalogs C9-475, C-5-47P and C2-48P while accessories are covered in catalog P3-48A. All may be had by writing the manufacturer direct.

Carbonneau Industries, Inc., 21 Ionia Ave., N. W., Grand Rapids 2, Mich. introduced a new line of replacement loudspeakers ranging in size from 3½" to 12". Their new "Jet-Line" of Alnico V models in 8" and 10" size were stressed. Literature will be sent upon request.

Mark Simpson Mfg. Co., Inc., 32-28 Forty-Ninth St., L. I. C. 3, N. Y. displayed their "Masco" PA Products. Included is an "All Master" underwriters approved inter-communicating system. Catalog 47C. Also shown was their mobile P.A. line, their regular complement of P.A. units, and a hi-fidelity group of amplifiers and record-changer devices. Catalog 148. These catalogs may be obtained by writing the mfgr.

The Turner Company, Cedar Rapids, Iowa, U. S. A. demonstrated their crystal and dynamic microphones, microphone accessories, matching transformers, magnetic contact pickups and mike stands. Ask for bulletin 747 describing these products. Their new wire recorder heads were a feature of their display. Bulletin TWR-10 describes these units.

Pyramid Elec. Co., 155 Oxford St., Patterson, N. J. showed the new "Twist-Mount" electrolytic and "Tynee-Dry" line of replacement capacitors as described in catalog J-5 which is available on request.

Snyder — Antenna — Gineers, Philadelphi 40, Pa., exhibited their various types of auto and home antennas, and mike stands. Catalog sheets may be obtained by writing the mfgr. direct.

TV SERVICE OUTLOOK

(*from page 14*)

out its energy on a bandwidth of about 10 kc. This represents 5,000 watts per kc of bandwidth.

Almost all TV at present is based on 5 kw of power spread over approximately 5 megacycles. This corresponds to only 1 watt per kc.

There are two types of interference. The first is "mush" such as that produced by an electric razor. This interference spreads itself over a considerable bandwidth and has a low wattage per kc. The other type is c.w. such as produced by radiating receivers operated by "hams." The c-w type of interference merely has to overcome a transmitter power of 1 watt per kc in

order to punch a nice hole into the TV signal with only a few microvolts of radiated energy, provided it is close enough to the receiving antenna. We can therefore appreciate the reciprocal troubles of the TV owner and the poor ham who puts out 1 watt of double frequency from his ten meter rig thereby raising a commotion in TV receivers for a mile around.

A logical question that arises is, "What power do we need to bring TV up to the level of an AM 50 kw station?" Following one line of reasoning the bandwidth of the AM station is about 10 kc, and that of the TV station, about 5,000 kc, or 500 times as much. For overcoming random noise the ratio of powers varies as the square root of the bandwidth ratio. This works out to be 22 to 1, so that in order to equal the effectiveness of an AM station we would need 22 times 50 kw or 1,100 kw. This TV signal would be only 66 times the present one in microvolts per meter, and still would contain only 220 watts per kc in order to overcome c-w interference. We do not have to consider the case of 5 kw per kc as this would require 25,000 kw, and would hardly be feasible, even in the immediate future.

Actually the writer feels that in metropolitan districts all stations will soon be at least 50 kw, giving us 3 times the present signal strength; which we badly need. In a few years 500 kw may be standard for a major station.

Types of Interference

Ignition radiations come in on present TV sets from distances as far as 50 feet and sometimes more. This is mostly an i-f response. FM also produces i-f interference. When the "reflection" is good we can expect interference from single and double "skip" on TV frequencies, especially on the lower channels. This will be a serious problem during certain short intervals of the year. However, little can be done about it. Hams will probably take special steps to avoid trouble during the hours that video is being broadcast.

Other causes of interference are sparking motors. A mysterious blur occurring around 7 P.M. or thereabouts can probably be traced to someone in the neighborhood removing his 5 o'clock shadow. However, the one big trouble that looms ahead for us is the interference caused by the radiating receiver.

Interference of this nature originates either in the horizontal oscillator or in the high voltage power supply. A typical projection receiver might employ a 10 or 20 watt oscillator for this purpose, and the radiations occurring at about 25 kc can produce some pretty horrible effects in a neighboring TV receiver.

Radiations from these sources can be directly sent through the power line, or

can be indirectly picked up and re-radiated by the lead-in and the antenna. This type of interference can affect both FM and AM receivers producing a very annoying whistle. The high voltage supply has poor voltage regulation and can result in a sliding whistle over a certain period of time as the receiver warms up.

TV receivers can interfere with other TV receivers tuned to different channels by virtue of the energy set up in the oscillator section and re-radiated back into the antenna. This type of interference is of considerable annoyance and will show up with greater force as more receivers are placed in operation and as the channels are filled up.

Interference Between Receivers

Some tests were made to check the severity of interference between receivers radiating into each other. Two parallel dipole antennas, spaced 25 feet apart were used. A signal of 500 microvolts was used for the desired signal measured at the 300 ohm input terminals of a receiver. A signal generator was then attached to the other antenna, and it was determined that a signal in the test receiver of 5 microvolts gave an undesirable pattern (40 db down). The emf across the radiating antenna was 200 microvolts.

All present commercial receivers develop considerable radiating energy corresponding to values up to 500,000 microvolts and an interference coverage up to a half mile. Some home-made kits that were tested radiated up to 3 volts, which could blanket an area of one mile in diameter.

The frequency of this interference is that of the oscillator in the receiver. Most receivers run the oscillator on the high frequency side. For this reason much of this interference will fall in the FM bands. However, certain channels will be affected to an extent which in some cases will make them practically unusable.

What is being done about this? Nothing. It would take too much design, and is something that cannot be readily demonstrated on a sales floor, so that it is being ignored. But when the other channels come on the air the serviceman and the dealer are going to be on the spot. This is going to be particularly bad in areas where stations can be received from two cities.

As a rule cheaper sets radiate more readily because of the inferior components they contain. This affects their selectivity and makes them more subject to interference.

New Equipment to be Installed as Accessories

There is need for a real good line filter in order to prevent TV radiations originating in the receiver from getting

into the line. A device of this nature will warrant being a standard item to carry on all calls.

Where two receivers in the suburbs are radiating into each other, some isolating preamplifier would make a saleable item. This must be well designed. A preamplifier with some gain will be of help also where signals are weak. This condition could occur in apartment houses where no outside antenna may be installed, or out in the country where reception is weak. These preamps should consist of two wide-band jobs rather than a single job which covers the entire band from the lowest TV frequency to the highest. The double-band job will eliminate much of the interference that originates in the channel between the two TV bands. If well designed these preamps might well prove expensive, however, they will be worth it.

The Serviceman's Future

It could not be brighter. The troubles which are a source of annoyance to the set owner will afford a golden opportunity for the serviceman to render real service where it will be needed. Study all you can, and acquire suitable test instruments, because you are going to need both. Finally, after completing a job charge well for you will be worth it.

BUILD THIS BATTERY SALESMAN

(*from page 15*)

The case of the author's instrument is a 7" x 7" x 2" metal chassis. A smaller foundation unit can be employed by an individual builder. For example, one of the molded plastic meter cases, available in the surplus market, might be used. A small wooden box is also satisfactory.

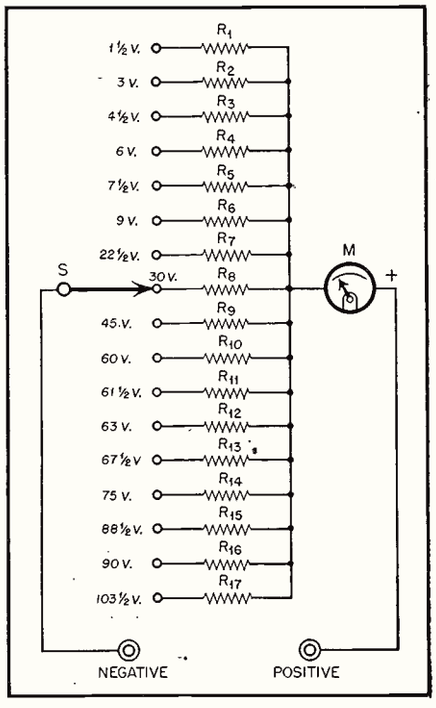
For economy, the meter, M (See *Fig. 2*), is a 0-1 d-c milliammeter (internal resistance approximately 100 ohms). A special 0-100% scale may be prepared and mounted in place of the regular meter scale, as shown in *Fig. 1*. Or the original 0-1 milliampere scale may be retained and conveniently read as 0-100 per cent. A more sensitive d-c microammeter can be used in place of the milliammeter if such an instrument is the only one available. But a sensitive microammeter is not required and it would not increase the practical value of the tester. The resistors specified in *Fig. 2* have been calculated for a 0-1 d-c milliammeter and, of course, would not have these same values if a microammeter were employed.

The special range switch, *S*, is a single-pole, 17-contact *non-shorting* rotary selector switch (Mallory type 32117-J). The plate for this switch (See *Fig. 1*) is made by lettering on

stiff white Bristol board with black India ink. After completing the plate, it is covered with a similar-sized plate of transparent celluloid or thin plexiglass to prevent soiling.

The multiplier resistors (R_1 to R_{17}) are ½-watt carbon units. If a high degree of accuracy is desired, precision instrument-type (wire-wound) resistors may be employed. However, regular carbon resistors will be entirely satisfactory in this instrument, provided they are selected carefully to have exact specified resistance values.

Resistors R_1 to R_6 will be seen, from the parts list in *Fig. 2*, to be slightly under (that is, 100 ohms less than) calculated values vor the 1-milliampere



Below are Resistor Values
Figure 2.

M—0-1 d-c milliammeter
R_1—1400 ohms ½ watt
R_2—2900 ohms ½ watt
R_3—4400 ohms ½ watt
R_4—5900 ohms ½ watt
R_5—7400 ohms ½ watt
R_6—8900 ohms ½ watt
R_7—22,500 ohms ½ watt
R_8—30,000 ohms ½ watt
R_9—45,000 ohms ½ watt
R_{10}—60,000 ohms ½ watt
R_{11}—61,500 ohms ½ watt
R_{12}—63,000 ohms ½ watt
R_{13}—67,500 ohms ½ watt
R_{14}—75,000 ohms ½ watt
R_{15}—88,500 ohms ½ watt
R_{16}—90,000 ohms ½ watt
R_{17}—103,500 ohms ½ watt
S—Single - pole, 17 - contact non - shorting rotary selector switch—Mallory 32117-J.

meter. This is because the internal resistance of the meter must be subtracted from the total multiplier resistance in the case of the 1½-, 3-, 4½-, 6-, 7½-, and 9-volt ranges. For all other ranges, the resistance values are exactly as calculated.

The values specified for some of the

resistors will be detected as not being stock resistances. These may be secured easily, however, by series-connecting resistors to equal the total required resistance value. For example, R_2 must be 2900 ohms, and this is not a stock resistance value. The 2900 ohms may be obtained by series-connecting one 2500-and one 400-ohm resistor.

A small, panel-mounting meter is employed in the author's instrument (See *Fig. 1*). But an individual builder may prefer a large-sized meter, similar to those used in some store-type tube testers and jumbo multimeters, to increase across-the-counter visibility.

Battery Rejection Limits

A natural question which arises in connection with battery testing with this "salesman" is "When should a battery be rejected as bad?" Among radio service dealers, there is a small difference of opinion in this matter. However, the consensus is that both A and B batteries should be discarded when their voltages have fallen to 75 per cent of rated values.

Merits

Our own experience with the battery tester indicates that it is a top-flight salesman and a real confidence builder. The simple, straightforward manner in which it is used puts the customer immediately at ease. Several servicemen who have been given an opportunity to use the instrument over protracted periods have praised its speed and utility and have liked it well enough to use it, instead of the conventional voltmeter, in their own routine shop testing, as well as in customer demonstrations.

Ad Index

Air-King Prods. Co., Inc.	Cover 3
Amperite Co., Inc.	27
Belden Mfg. Co.	9
Burgess Battery Co.	31
Cal-Perry Corp.	27
Clippard Instru. Lab., Inc.	32
Commercial Radio	32
Crosley Div., Avco Mfg. Corp.	12
Delehanty Institute	32
Duotone Company	31
Eastern Technical School	32
General Elec. Co. (Components).	7
General Elec. Co. (Tube Div.).	1
Hytron Radio & Electronics Corp.	5
James Vibrapower Co.	24
LaPointe Plascomold Corp.	24
Littelfuse, Inc.	29
Mallory, P R. & Co., Inc.	Cover 2
Mueller Electric Co.	31
Ohmite Mfg. Co.	30
Permoflux Corp.	26
Philco Corp., Accessory Div.	8
Racon Electric Co., Inc.	6, 30
R C A (Tube Div.).	Cover 4
Rider, John F. Publisher, Inc.	3
Sams, Howard W. & Co., Inc.	25
South River Metal Prods. Co.	28
Star Expansion Bolt Co., Inc.	32
Transvision, Inc.	11
Utah Radio Products	23
Vision Research Corp.	30
Webster-Chicago Corp.	10
Weller Mfg. Co.	28
Workshop Associates, Inc., The	29

$1.00 to $5.00 PAID for "SHOP NOTES"

Write up any "kinks" or "tricks-of-the-trade" in radio servicing that you have discovered. We will pay from $1 to $5 for such previously unpublished "SHOP NOTES" found acceptable. Send your data to "Shop Notes Editor," RADIO SERVICE DEALER, 342 Madison Ave., New York 17, N. Y. Unused manuscripts cannot be returned unless accompanied by stamped and addressed return envelope.

Prepare for a profitable Outdoor Season

AIR KING

Pockette

PORTABLE

For profits that bloom in the spring ...Here's the newest from AIR KING

The "Pockette" portable. So tiny it fits in the palm of your hand . . . so excitingly new and different that you'll agree it's made-to-order for the present competitive market. Yet the "Pockette" portable maintains the same rigid engineering specifications you have found invaluable in all AIR KING radios, radio combinations and wire recorders.

Features designed for selling!

Loop antenna in cover...4 miniature tubes...uses 1 standard flashlight battery and 1 standard 45-volt "B" battery...vinylite carrying strap...polystyrene case...snap-lock cover...sturdy metal grill to withstand outdoor elements. Batteries easily changed! When the lid's open, "Pockette" is "on"...close it, and "Pockette" is "off." Net weight: 1 lb., 11 oz. Measurements: 3"x5¾"x3⅜".

READY FOR IMMEDIATE DELIVERY

Model A-425—Ebony with Nickel trim.....*$19.95
Model A-426—Ivory with Gold trim.....*$24.95
Model A-427—Maroon with Gold trim.....*$22.95

*Less batteries. Slightly higher in Zone 2.

MODEL A-425

$19.95 Less batteries

Slightly higher in Zone 2.

So tiny it fits in the palm of your hand.

AIR KING PRODUCTS CO., INC., BROOKLYN 32, NEW YORK • Export Address: Air King International, 75 West Street, New York 6, N. Y.

AIR KING RADIO *The Royalty of Radio Since 1920*

Division of HYTRON RADIO & ELECTRONICS CORP.

Push RCA Tubes and Watch Your Business Grow!

RCA brings you the widest range of tubes . . . backs you up with the best in sales aids.

Cover the field with RCA tubes

AM, FM, or TV . . . practically every make and model receiver you're called upon to service can be completely re-equipped with *standard available* RCA tubes.

In power and special tubes, too . . . for broadcast, amateur, communications, and industrial equipment . . . RCA has a comprehensive line for every application.

Having the tubes your customers need . . . and the brand they prefer . . . means more business for you—from more sources!

Your RCA Distributor carries extensive stocks of RCA tubes to back you up . . . and the greatest line of sales promotion material to help you sell them. So—see him today for full details on how you can profit by pushing RCA tubes.

THE FOUNTAINHEAD OF MODERN TUBE DEVELOPMENT IS RCA

TUBE DEPARTMENT

RADIO CORPORATION of AMERICA

HARRISON, N. J.