

Tube TRF tuner

DECEMBER

1947

35¢

RADIO NEWS

AGING RACK FOR RADIO TUBES



ALIAS WIS
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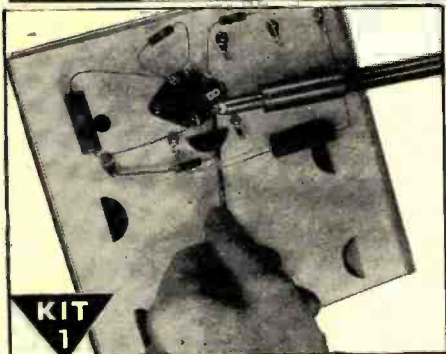
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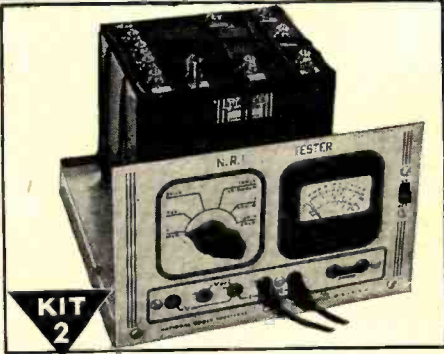
I BROKE INTO RADIO BY PRACTICING IN SPARE TIME WITH THE BIG KITS FROM N.R.I.

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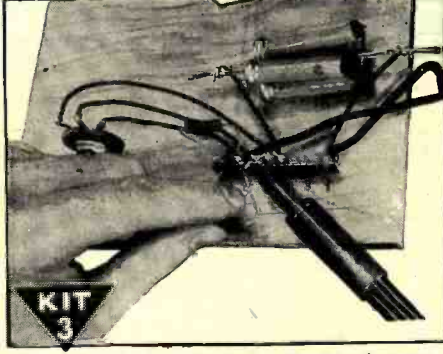
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N.R.I. sends you Soldering Equipment and Radio parts; shows you how to do Radio soldering; how to mount and connect Radio parts; gives you practical experience.



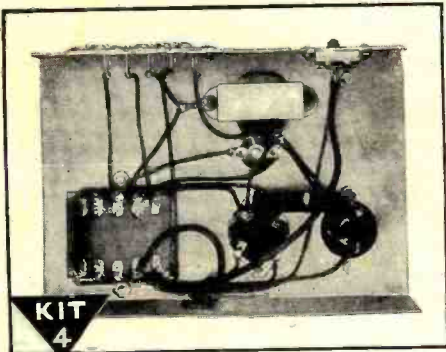
KIT 2

Early in the course you build this Tester with parts N.R.I. sends. It soon helps you fix neighborhood Radios and earn EXTRA money in spare time.



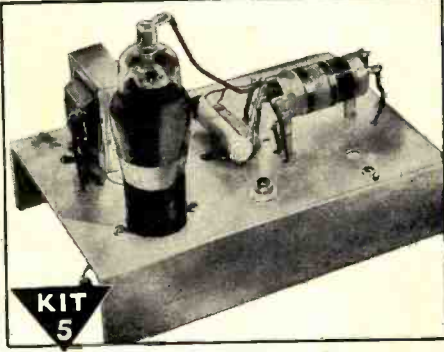
KIT 3

You get parts to build Radio Circuits; then test them; see how they work, learn how to design special circuits; how to locate and repair circuit defects.



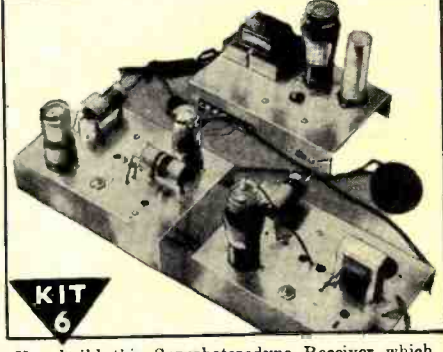
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COVER PHOTO: Tube aging rack at Hytron's Newburyport plant. An incandescent lamp, acting as a current limiting resistor, is in series with each tube element. This final seasoning and degassification operation results in the processing of more uniform radio tubes. (Photo by Steinhart)

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FOR THE SERVICEMAN-DEALER

Publicity Means Sales.....	Philip Lesly	43
Television Installation (Part 4).....	W. W. Waye	52
10.7 mc. I.F. Transformers.....	J. C. Michalowicz	55
New AM-FM Signal Generator.....	Guy Dexter	58
Practical Radio Course.....	Alfred A. Ghirardi	68
Don't Be a Dagwood.....		100

FOR THE AMATEUR

Beginners' Traffic Transmitter.....	A. E. Hayes, Jr., W3LVY	46
Build Your Own Automatic Key.....	G. W. Gunkel, W6NMS	51
Miniature Ten Meter Phone Transmitter.....	Donald R. Rhodes, W6UUY/8	60
A Compact E.C.O. Controlled Transmitter.....	Harry R. Hyder, W2LIW	62

OF GENERAL INTEREST

Television Tubes by the Thousands.....	Frank E. Butler	39
Electronic Photoflash Unit.....	W. G. Many	44
The Recording and Reproduction of Sound (Part 10).....	Oliver Read	48
An Experiment in Voice Controlled Relays.....	Leon A. Wortman	56
Hands That See.....		66

DEPARTMENTS

For the Record.....	The Editor	8	What's New in Radio.....	86
Spot Radio News.....	Fred Hamlin	18	Technical Books.....	164
Within the Industry.....		28	Manufacturer's Literature.....	166
Short-Wave.....	K. R. Boord	65	New Receivers.....	180
RN Circuit Page.....		82	Letters from Our Readers.....	184



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RADIO NEWS

"THE hottest ham performance ever at this price . . ." That's the verdict of amateurs who have had a chance to try Hallicrafters new Model SX-43.

This new member of the Hallicrafters line offers continuous coverage from 540 kilocycles to 55 megacycles and has an additional band from 88 to 108 megacycles. AM reception is provided on all bands, except band 6, CW on the four lower bands and FM on frequencies above 44 megacycles. In the band of 44 to 55 Mc., wide band FM or narrow band AM just right for narrow band FM reception is provided.

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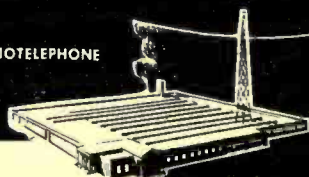
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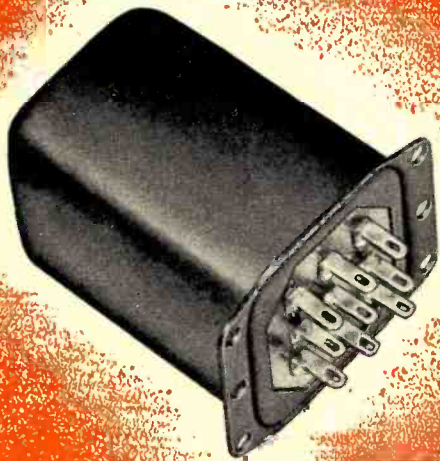
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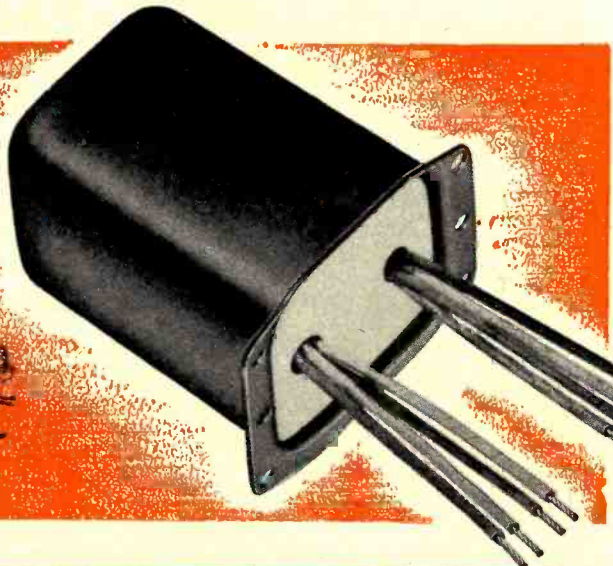


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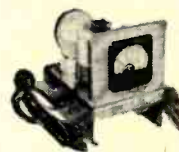
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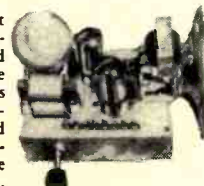
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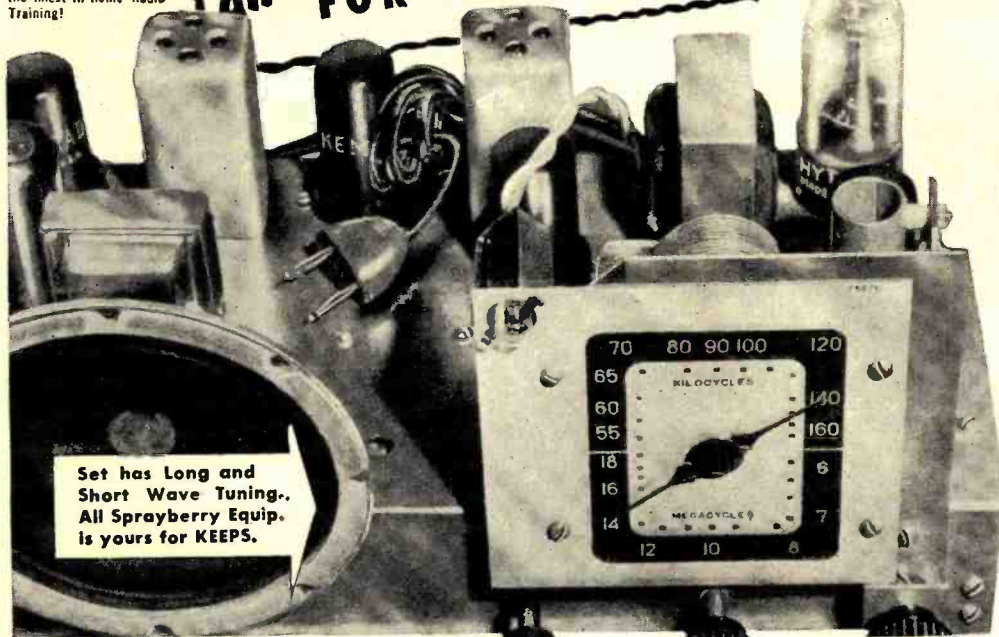
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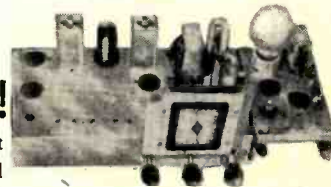


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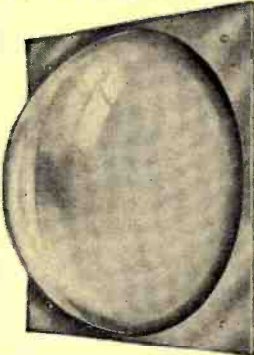
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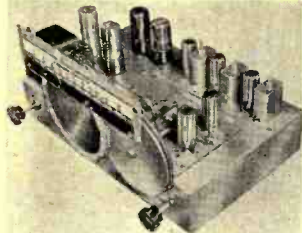
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For the RECORD.

BY THE EDITOR

IT SEEMS that every once in a while some newspaper or national magazine is sold a bill of goods on something which will radically affect the techniques employed in modern radio and electronic equipment servicing.

The latest is the "cure-all" receiver described and illustrated in the September 8th issue of *LIFE Magazine*. The article bears the title "Repair-It-Yourself Radio." The main reason for publishing the article seems to be the following: "It will also be watched with dismay by those radio repairmen who have relied on the customer's ignorance of electronics to foist huge repair bills on him."

The above seems to imply that many radio repairmen are, and have been, charging excessive prices for their work and that the average service technician is being driven around by a chauffeur as he collects exorbitant fees for his "know how." After reading the article, Mr. Set Owner thinks that at long last there is a streamlined solution to his radio repair problems. All he has to do is to take this new receiver to his local serviceman, reach for a spare replacement stage, plug it in with ease and come away with the deep satisfaction that comes with a newly discovered knowledge of having outsmarted a long established technician.

So much for the picture as it is painted. What about the reality involved? First of all Mr. Radio Serviceman is too busy to stand around while Mr. Joe Doakes goes about the task of substituting components until he finds one that will once again give him good performance. During this juggling process Mr. Technician must keep his eye on the customer in order that he does not tear the pins off the connectors or otherwise damage new parts for which he has invested a considerable sum. Suppose that the customer does finally hit the jackpot in finding a workable combination. That brings us to the matter of correct alignment of circuits. Is the customer going to do that? As he gloats in his success at being able to get the set operating, he will of course muster up a lot of courage and accordingly request the use of the technician's equipment (under proper instructions, of course,) for free.

As the clock ticks on, Mr. Technician mentally adds up the comparative time costs involved in servicing a conventional or equivalent receiver. He finds it a fact that not only has the customer wasted his own time, as well as the technician's, but he is still not assured of a satisfactory repair job.

Next comes the possibility, or should we say probability, that one of the

tubes has gone west. If it has, it would be a bit embarrassing to the customer to discover this. Chances are he would blame the serviceman for not "briefing" him when first he came into the shop with his "cure-all." He might even expect that a new tube was part of the package inasmuch as it was associated with the particular unit that he had discovered was on the fritz.

If the "cure-all" customer failed to locate the defective unit, he would be the first to put the blame squarely on the shoulders of the dealer simply because he's the guy that sold him the stuff in the first place and, therefore, it is up to him to keep him as a satisfied customer. We just can't see where the profit on a \$1.85 item can offset the time that might well be involved in re-checking the receiver and advising and explaining the procedures involved to the customer in an attempt to maintain his good will. It doesn't make sense.

The article does not reveal that changing tubes usually requires a bit of realignment on a receiver for proper reception. In fact, the article does little, if anything, to give a realistic viewpoint on the subject. Radio servicing involves a great amount of skill. Without skill it is impossible to correctly maintain a modern radio.

In the case of FM and television sets which are far more difficult to handle than prewar sets, we fail to see where the customer would even be willing to haul such equipment to a repair shop, even though he had an urge to do the repair job himself.

Have you ever seen an owner haul his washing machine down to the dealer so that he could try out various replacement wringers until he found one that would work like the original? Have you ever seen Mrs. Smith bring in a burned out toaster and proceed to try out different heater elements? Have you ever seen an owner of a vacuum cleaner take it down to a repair shop to try out a new motor? Of course not. And isn't it ridiculous to expect an American set owner to do likewise? We personally don't feel that the public at large will accept this "cure-all" service technique for their radios. And how many radiomen would support such nonsense, especially after being tagged as a scoundrel.

We have long been pioneering for improvements in radio servicing techniques and it is not our intention to pull in on the reins of progress in this field. What we do object to is the publication of a so-called "workable" plan that scoops the experts—but is full of loopholes. O. R.

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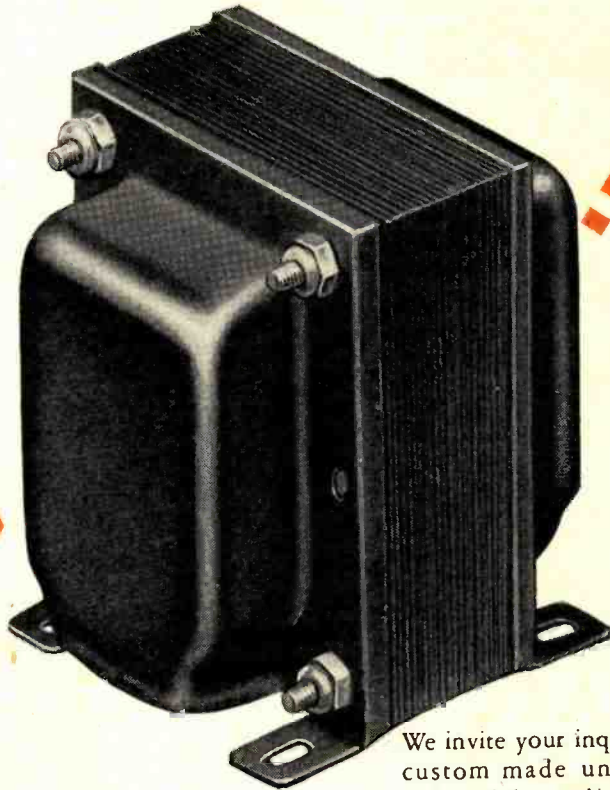
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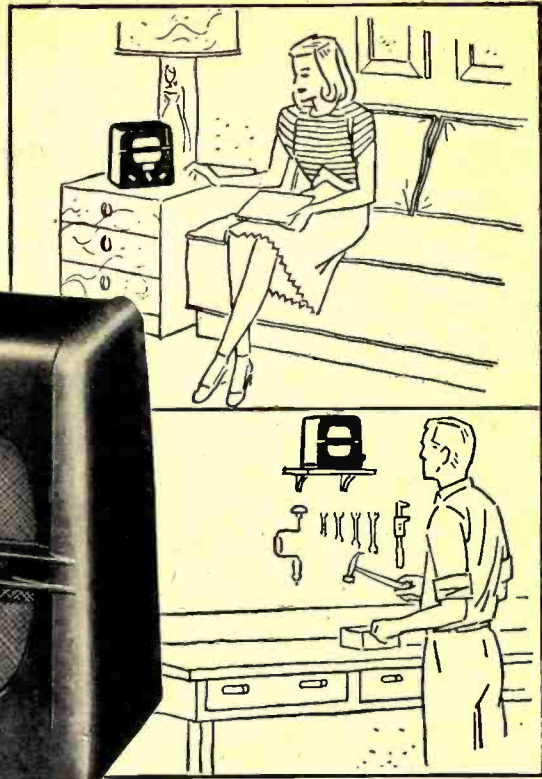
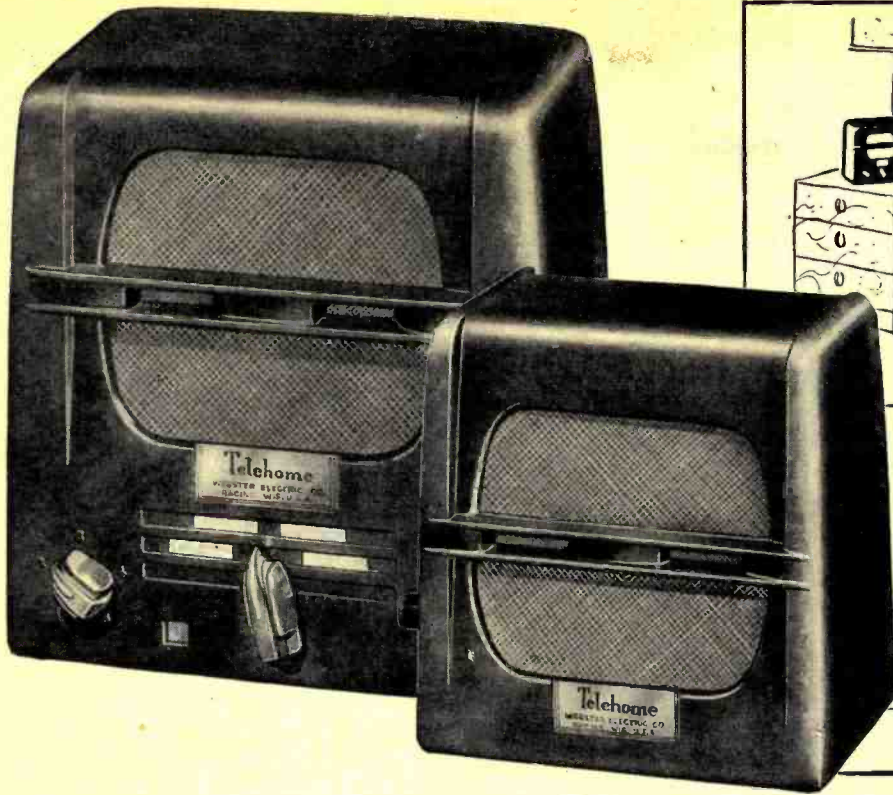
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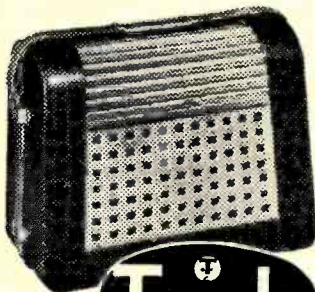


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FEATURES

- Five Tubes—including Rectifier
- Single Band Super-Heterodyne
- Broadcast Band 540 to 1650 K.C.
- Automatic Volume Control
- Super Sensitive Iron Core Transformers
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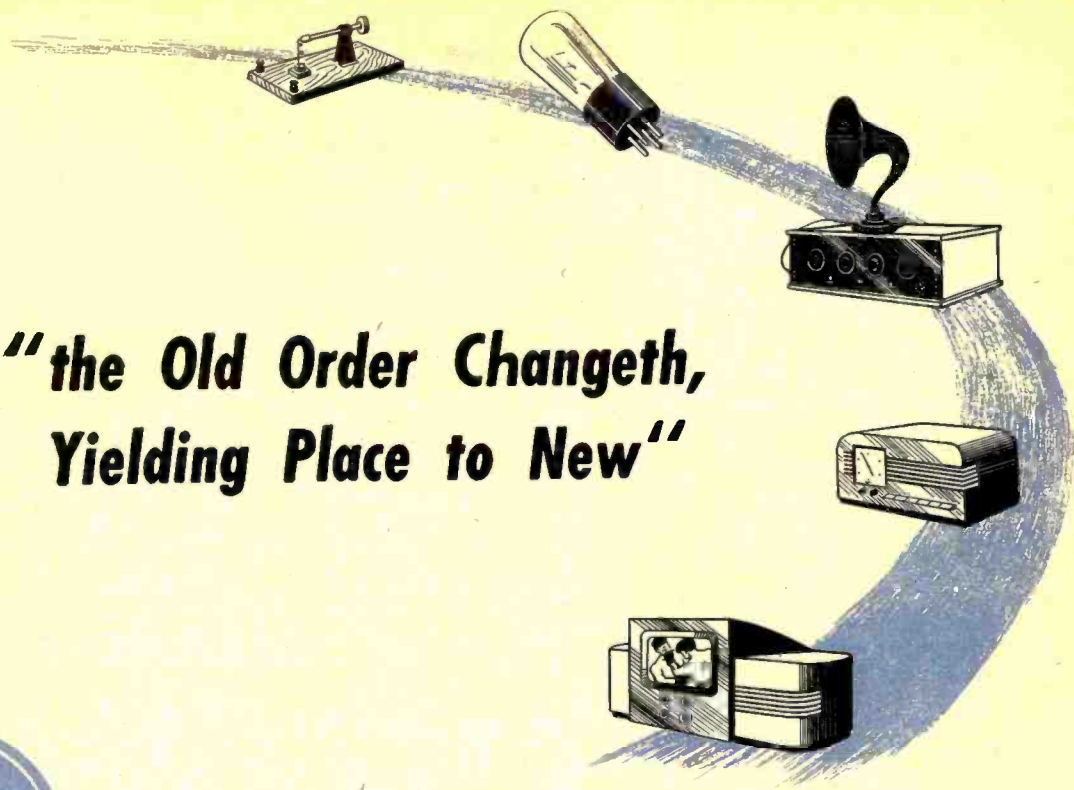
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Spot Radio News

★ Presenting latest information on the Radio Industry.

By FRED HAMLIN

Washington Editor, RADIO NEWS

THE HARD-WON prosperity that came to the radio industry this year promises to continue over into 1948, best authorities in the field seem agreed. With all returns not yet in, '47 will undoubtedly turn out to be the greatest year in the industry's history. The coming year, while fraught with dangers and discouragements, should also hang up a number of new records.

CHIEF AUTHORITY for these statements is one of the best-informed men in radio, Bond Geddes, executive vice-president of the Radio Manufacturers Association, who is not only one to speak with caution, but who also always speaks on the basis of the vast store of statistics at RMA's command. As for this year, says Mr. Geddes, it's bound to hit history-making highs. "Despite the aches and pains always prevalent to a degree in our industry," he said recently, "present indications are that all previous production records will be broken. As the final quarter of the year customarily brings 60 per-cent of our annual sales, we can confidently look forward to a new all-time record in 1947 of about 15 million sets and a probable total dollar volume of close to three quarters of a billion."

BREAKING DOWN the production figures, Mr. Geddes has uncovered some interesting sidelights on radio trends during the current year. Believe it or not, on one type of receiver, production fell off almost to the vanishing point. This was in the manufacture of straight consoles, without phonograph apparatus, which have almost vanished from production and the market. Present production ratios are only eight-tenths of 1 per-cent in number and 5 per-cent in dollar volume, as contrasted with matching ratios in 1941 of 5.16 per-cent and 10.77 per-cent.

OFFSETTING THIS, the percentage of radio-phonograph combination receivers is about double the 1941 ratio, Mr. Geddes estimates. This includes both table and console types. Production ratios to total sets produced of table combination sets is running about 8.7 per-cent. Console combinations are up to about 10.2 per-cent of total volume. Table sets were only 4.61 per-

cent in 1941, console combinations only 5.08. The present dollar value ratio of table combination sets is 12.5 per-cent, compared to 5.51 in 1941. Console dollar value is 28 per-cent. In 1941 it was only 20.75. In production of straight table models, without phonographs, the present unit percentage is still high at 53.5 per-cent of the total volume. Auto radios are now running about 14.5 per-cent, portables 12.2 per-cent. Indications at last count were that receiving tube production would run as high as the last year peak of 205 million. Mebbe higher.

LOOKING TO 1948, Mr. Geddes sees the usual quota of "aches and pains"—and another banner year. The "temporary indigestion due to over-production of table models," which was a headache during part of 1947, has now practically disappeared. Production has become more balanced and many of the troubles owing to obtaining wood for cabinets are gone. FM should make giant strides forward, since "1947 was only the starting point of FM." But Mr. Geddes adds a word of caution: "In my opinion, AM receivers will continue for many years to be the bread and butter of the industry, with FM and television sales as dessert." As for television, total sales for receivers in 1947 will reach some 100,000 and "with increasing commercial sponsorship by local as well as prominent national interests, television should be raised to new heights in 1948." The RMA spokesman is not pessimistic about the fact that less than one-tenth of 1 per-cent of American radio homes now have television receivers, 15 to 20 per-cent of current sales going to public places. He believes that these sales to group-consumer spots will result in stimulated home consumer demand.

BUT 1948 isn't going to be a bed of roses, and competition is going to be tough. In contrast with the industry prior to the war, when it was comparatively stable, now it is still changing over from the war years and is over-crowded. "For instance," Mr. Geddes reports, "in 1941 there were 55 receiver manufacturers. On the rolls today, both active and passive, there are 155, although many of these who



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SPOT RADIO NEWS

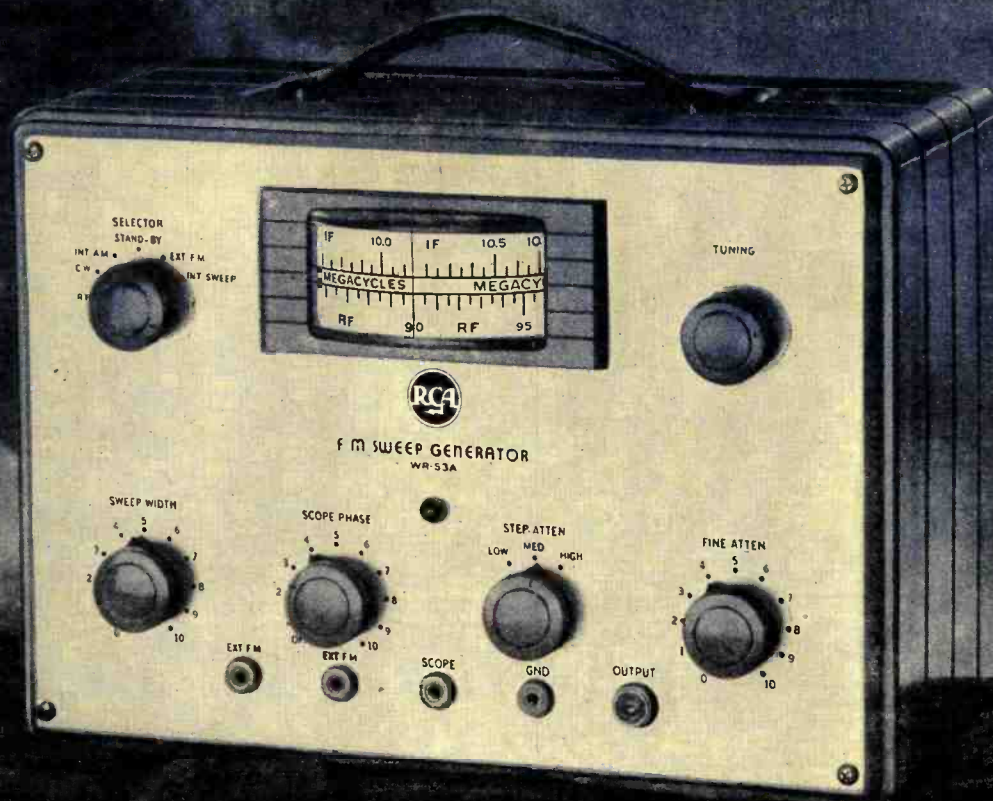
received OPA price permits and patent licenses never made a set. The ranks of manufacturers, however, include many newcomers, a few of whom are climbing up the ladder." It follows that '48 will "unquestionably be a period of extreme competition, in the American fashion" and "already there are indications of some casualties ahead." But despite this, Mr. Geddes is, on the whole, very optimistic. Summing up: "Prospects for 1948 can be regarded as sure to receive the impetus of a continued high level of general business activity, with high national and individual income, and with the assurance of wide and new markets through FM, television, and other electronic appliances."

AS WAS PREDICTED here last month, a new treaty regulating world radio operations, was signed at the Atlantic City convention in due order by the 78 nations concerned. And to give you an idea of how tough the summer-long job was, the final set of regulations, each of which had to be debated almost a word at a time during the meetings, filled 391 pages of fine print. It covered all phases of international radio communications, including operating practices, technical standards, and safety and distress signals. As an example of the work that went into this masterpiece of world amity, consider the toil of only one of its committees, concerned with frequency allocation. The group held no less than eight meetings beginning May 15 and continuing through the summer. They came up with agreements that were approved without change by the entire assembly of diplomats. And not once during their eighty sessions did any of them use invectives or throw a punch.

THE SPIRIT OF THE SESSION was made official toward the end by Leon C. Boussard, editor of "The Morning Electron," mimeographed newspaper for delegates at Atlantic City, and outstanding in its crusade to keep goodwill alive during the meetings. "I have been sitting here for five solid months," declared Mr. Boussard, "and it is a great experience to acknowledge the common sense and goodwill of the specialists and experts who here assembled. They have proved themselves real peacemongers. Never in the whole field of telecommunications have so many owed so much to so few. It was obvious—at least in Atlantic City—that there is always a solution or a compromise proposal at hand to solve the most difficult problems." Mr. Boussard recommended that "when the delegates are scattered and estranged all over this distraught world, they be requested to give five minutes thought every week to the pleasant memory of the time when they used to collaborate with other human beings who were separated by nationality, creed, (Continued on page 186)

RADIO NEWS

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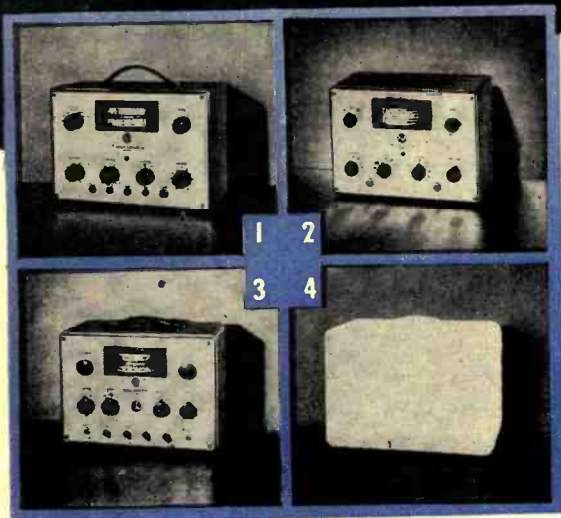
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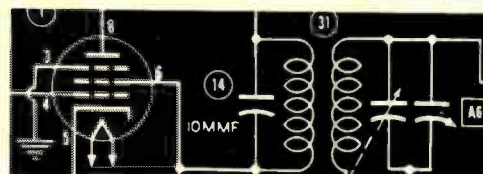
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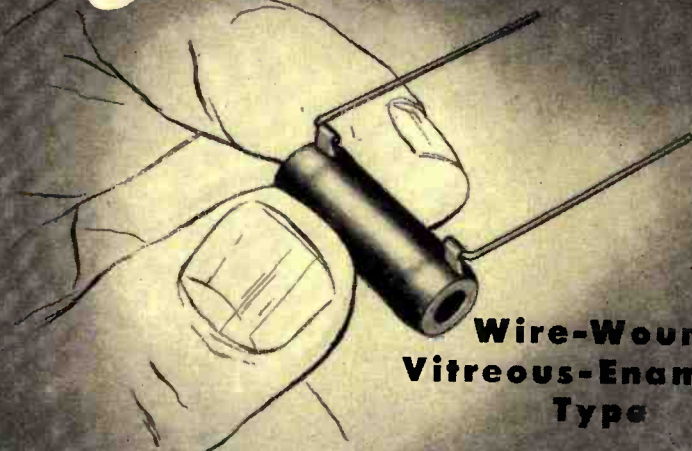
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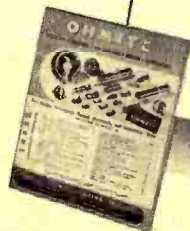
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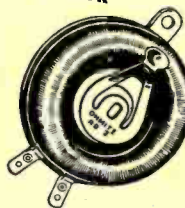
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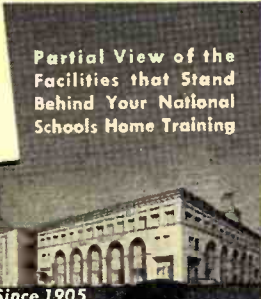
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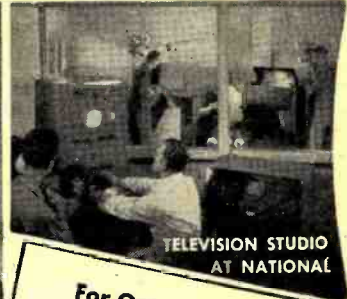
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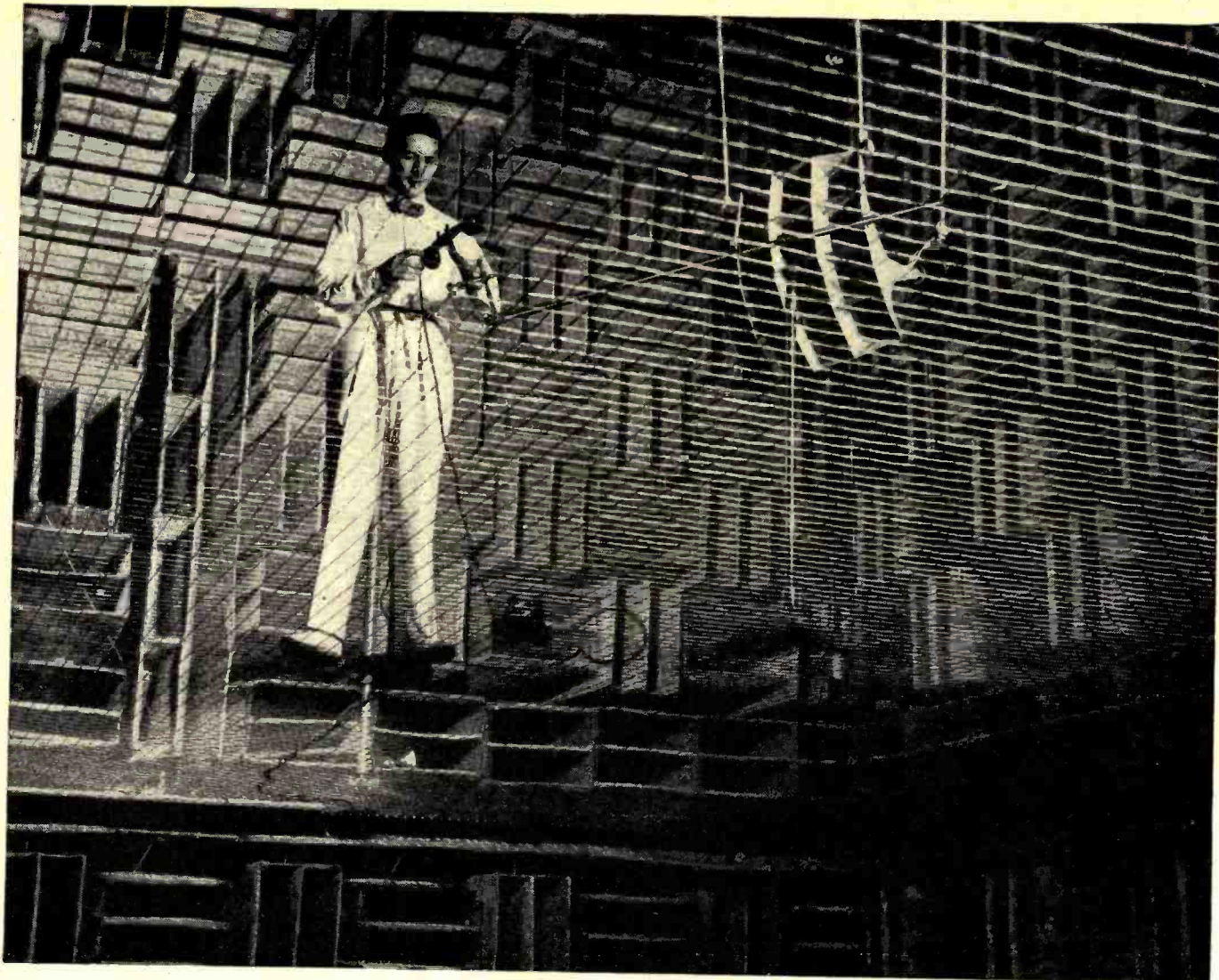
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RADIO NEWS

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In Canada: Atlas Radio Corp., Ltd., 560 King St., N. W., Toronto, Ont.
 Export Dept.: 25 Warren St., New York 7, N. Y.

Within the
INDUSTRY

F. M. SLOAN has been appointed manager of the *Westinghouse Home Radio Division* at Sunbury, Pa., succeeding Harold B. Donley who has resigned.

Mr. Sloan, formerly assistant general manager of *Westinghouse Radio Stations, Inc.*, has been associated with *Westinghouse* radio activities for more than 15 years in technical and administrative positions. In addition to laying the ground work for the nationwide service organization of the Division which he now manages, Mr. Sloan served during the latter part of the war as manager of the Field Engineering Service Department for the *Industrial Electronics Division* at Baltimore.

THOMAS E. STEWART, JR. is the new chief of the Applied Electronics Branch of the U.S. Army Engineer Research and Development Laboratories at Fort Belvoir, Va.



He succeeds Major E. G. Radcliff, who has been assigned to Purdue University to obtain his Master's degree in electrical engineering.

Mr. Stewart, who has been employed by the Army since 1942, was recently presented the Exceptional Civilian Service Award for his development of metallic, non-metallic, and underwater mine detectors, a radio explosives detonator, and a barrage balloon flight analyzer.

Prior to his association with the Army, Mr. Stewart was employed by the *Sylvania Industrial Corporation* of Fredericksburg, Va. He is an associate member of the IRE and a graduate of Pratt Institute.

RODOLFO M. SORIA has joined the *American Phenolic Corporation* of Chicago as Project Engineer in charge of special development work on antennas and radio frequency transmission lines.

Mr. Soria obtained his Bachelor and Master degrees in communication engineering from the Massachusetts Institute of Technology. He was formerly an instructor in electrical engineering at the Illinois Institute of Technology where he received his doctorate in June of this year.

HAYDON MANUFACTURING COMPANY, producers of timing motors and apparatus, have recently moved all operations of the company into new quarters in Torrington, Conn.

The completion of a three-story addition to the plant has allowed the

company to consolidate operations from the Forestville plant under a single roof.

DAVID H. ROSS of San Francisco has been named northern California representative for *Bud Radio, Inc.*, of Cleveland, Ohio.



Long associated with the radio industry, Mr. Ross became the youngest amateur radio operator in the 7th radio district in 1926. He is a graduate of the University of Washington where he received his B.S. in Industrial Engineering. He has been associated with *Globe Wireless, Ltd.*, and *Dalmo Victor, Inc.*, in various capacities.

The company also announced that H. J. Nelson of Denver will serve as a representative for the company's products in the Colorado, Wyoming, Montana, eastern Idaho, Utah, New Mexico and South Dakota territory. He served four years in the Army as an Engineering Officer with the Signal Corps.

PETER N. TSOKRES has been named chief engineer for the *Colonial Television Corp.* of New York.

In his new position, Mr. Tsokres will supervise the engineering of the company's line of bar and home receivers. He succeeds Robert Saron who recently joined the staff of the UNO.

E. H. DREIFKE has recently been promoted to the post of assistant manager of the Radio Division of *Stewart-Warner Corporation* of Chicago.

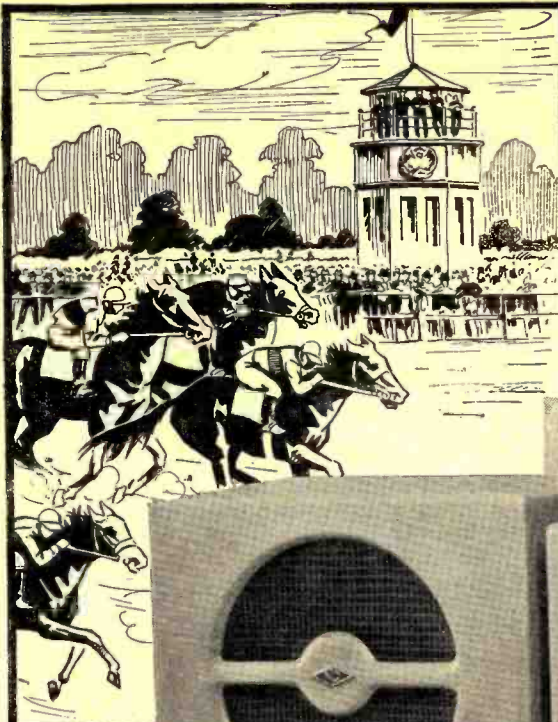


Mr. Dreifke has been associated with the company for 12 years and joined the radio division in January of this year. From 1944 through 1946 he was on special assignment in charge of the firm's war contract settlements.

He was formerly employed by *Grigsby-Grunow Co.* and the *Temple Corp.*

EMPIRIA CORPORATION has recently been incorporated as a New York corporation serving in collaboration with their London colleagues, *Empiria Products Limited.*

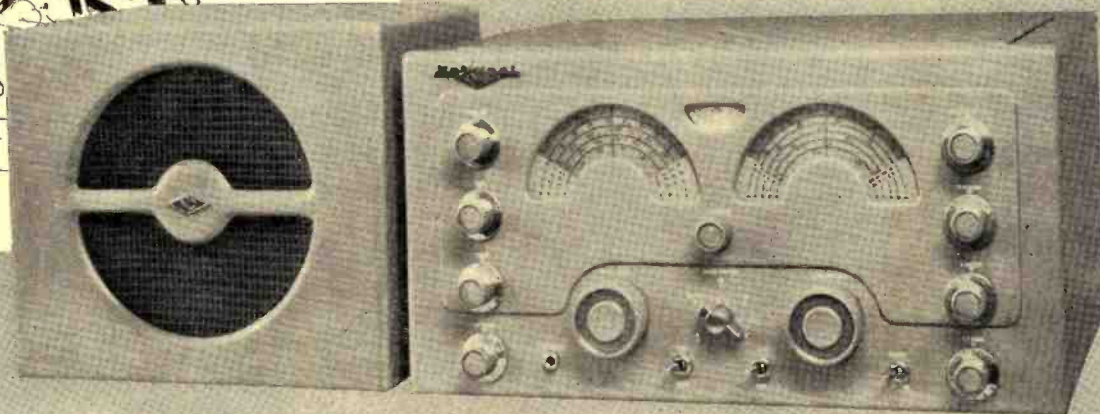
This new concern which will maintain offices at 149 Broadway, New York, will specialize in the exporting



ANOTHER NATIONAL

FIRST

THE NC-183



FEATURES:

- Frequency coverage from 0.54 to 31 Mc Plus 6 meter band. Band-switching on all frequencies.
- Adjustable sensitivity control for S-meter operation on either c.w. or phone.
- Automatic adjustable threshold double-diode noise limiter.
- 115 volts 50/60 cycle AC operation. Easily adapted to 230 volts.
- Amateur Net (Complete with 10" speaker)\$269.00

For the first time, a ham receiver incorporating all the latest innovations demanded by amateurs is now available at a reasonable price.

The NC-183, latest in National's great new line of communications receivers, is a band-switching set covering frequencies from 0.54 to 31 MC plus the 6 meter band. Two r.f. amplifier stages provide remarkable image rejection and the latest crystal filter aids in maintaining the highest degree of selectivity.

In addition, a stabilized voltage regulated circuit makes the NC-183 a truly top-flight performer on the highest frequencies. A push-pull audio output stage with separate 10" speaker affords excellent fidelity of output.

These, plus many other features, combine to make the NC-183 a really "hot" receiver. It will certainly become a strong favorite with those stations that specialize in digging DX out of the background.

See and hear the NC-183 at your nearest National distributor this week.

**National
Company, Inc.**
Dept. No. 15
Malden, Mass.
U. S. A.

MAKERS OF LIFETIME RADIO EQUIPMENT



LCETI

Laboratory Caliber Electronic Test Instruments

Make YOUR SHOP a
modern, profitable

SERVICE LABORATORY

Two things — and only two things — spell success or failure in radio servicing today. One is knowledge and skill. The second is instruments. McMURDO SILVER brings you the *Laboratory Caliber Electronic Test Instruments* which turn your shop into a modern service laboratory. Simple instructions make them easy to use. They are proved by thousands upon thousands of users. Compare value and prices and LCETI will be your selection, too.

MODEL 906 FM/AM SIGNAL GENERATOR: The basic need for AM, FM, and television servicing. 8 ranges calibrated $\pm 1\%$ accurate, 90 kc. thru 210 mc. 0-100% variable 400 AM; 0-500 kc. variable FM sweep built-in. Metered microvolts; variable 0-1 volt Strays lower than \$500 laboratory generators. Only \$99.50 net.

"VOMAX" UNIVERSAL V.T.V.M.: The overwhelming choice of experts. 51 ranges, d.c., a.c., a.f., i.f., r.f., current, db., and resistance. Visual signal tracing to 500 mc. New 5" pencil-thin flexible r.f. probe. Only \$59.85 net.

MODEL 904 CONDENSER/RESISTANCE TESTER: Measures accurately $\frac{1}{4}$ mmfd. thru 1,000 mfd.; $\frac{1}{4}$ thru 1,000 megohms. Internal 0-500 V. variable d.c. polarizing voltage. Measures condensers with rated d.c. volts applied. Only \$49.90 net.

MODEL 905 "SPARX" SIGNAL TRACER: Time-saving visual and audible signal tracing; also tests phono pickups, microphones, speakers, PA amplifiers. Is your shop test-speaker, too. 20~ thru 200 mc.; PM speaker; mains-insulated transformer power supply. Only \$39.90 net.

SEND FOR COMPLETE CATALOG. See these and Silver communication transmitters, receivers, "Micromatch," Xtal-controlled VFO, pretuned frequency multiplier at your jobber.

OVER 36 YEARS OF RADIO ENGINEERING ACHIEVEMENT

McMurdo Silver Co., Inc.

EXECUTIVE OFFICES: 1240 MAIN ST., HARTFORD 3, CONN.
FACTORY OFFICE: 1249 MAIN ST., HARTFORD 3, CONN.

of electrical, engineering electronic, and radio equipment as well as component parts and accessories.

Like the parent company, the New York concern will handle exports principally to India, the Middle East, and South Africa.

* * *

DAVE R. CHENAULT, formerly assistant advertising manager of *Sparks-Withington Company*, has been promoted to the post of sales promotion and advertising manager for the Radio and Appliance Division of the company.



Mr. Chenault was in sales work before joining the U. S. Air Force in 1943. He joined the *Sparton* organization soon after being discharged from the service and has been active in the preparation and execution of many of the company's sales promotions since that time.

* * *

E. E. FERREY has been upped to the post of Director of Public Relations for the *Farnsworth Television & Radio Corporation*.

Mr. Ferrey has served as assistant director of the Public Relations Division since joining the company in August of 1946. In his new post he succeeds Paul J. Boxell who has joined *Hill and Knowlton*, Public Relations Counsel, New York.

The new Public Relations Director was formerly news editor of Radio Station WHAS in Louisville and served as correspondent for the United Press and as extension lecturer in journalism for Indiana University.

* * *

GRENVILLE R. HOLDEN, vice-president of *Sylvania Electric Products, Inc.*, has been elected to the Board of Directors of *Electronic Tubes Ltd.* of London, a British radio tube manufacturing affiliate of *Sylvania*.



Mr. Holden was named a vice-president of *Sylvania* in April of this year after joining the company in 1943 as secretary to the Management Committee. In 1946 he was promoted to the post of Assistant to the President.

He is a graduate of Harvard University where he also served as an Economics instructor. He was formerly associated with *Eastman Kodak Co.* and during the war served the government in various capacities.

* * *

OWEN NANGLE has been appointed a district sales manager for *Zenith Radio Corporation* serving the lower Michigan and most of Indiana territories.

Mr. Nangle succeeds William H. Boyne who has been promoted to the post of general manager of the *Zenith* (Continued on page 146)



For true to life recording there has never been anything better than Presto Green Label Discs.



RECORDING CORPORATION • 242 WEST 55TH STREET • NEW YORK 19, N. Y.

Walter P. Downs, Ltd., in Canada

World's Largest Manufacturer of Instantaneous Sound Recording Equipment & Discs



***Your 'Plant' is your technical ability**
Keep it up-to-date. It's a key to success!

Every manufacturing plant must maintain a program of modernization. Equipment, methods, building—all must be kept up-to-date to meet the swift-moving demands of today and tomorrow. For the same reason it is important that you invest in your own "plant" modernization program.

• If you are wise, you will match strides with radio developments. You must improve your technical knowledge not only to hold the job you now occupy, but to qualify for the better job you want. CREI offers you a proved program of technical self-improvement for home study in your spare time. Courses are constantly revised and kept up-to-date. CREI shows you the way to good pay and security by providing the "tools" you need to build a secure foundation for your "plant".

You can "go all the way with CREI"—from introductory basic principles to advanced training, on to specialized engineering subjects. No matter what your needs—no matter what your experience—there's a CREI course for you. These courses offer you more today than ever before—and are still at pre-inflation prices! How can you afford not to invest in "plant modernization" at this low cost?

Right now is the time to decide what the next five years will mean to your future. It costs you nothing but your time to read the facts in our 24-page booklet and to see and read the sample lesson. You can't afford not to investigate. Mail the coupon now!

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DEPT. RN-12 16TH AND PARK ROAD, N. W., WASHINGTON 10, D. C.

Branch Offices: New York (7): 170 Broadway • San Francisco (2): 760 Market St.

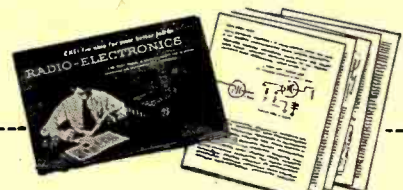
SAMPLE LESSON
FREE

Now, see for yourself! Read one of these interesting lessons from the CREI course. You will see, in advance, how practical it is to improve your ability the CREI way.

From Practical Radio-Electronics Course:
"ELECTRON PHYSICS AND ELECTRON THEORY"—Discusses modern theories of the composition of matter, including atomic energy, and their relation to present-day radio-electronics.

From Practical Television Course:
"PICK-UP TUBES—ICONSOCPE AND IMAGE DISSECTOR TUBES"—Discusses fundamental pick-up tubes of the television camera. It precedes the study of the Orthicon—and the Image Orthicon.

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24-PG. BOOKLET & SAMPLE LESSON



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Mail me ONE FREE sample lesson and your 24-page booklet, "CREI Training for Your Better Job in Radio Electronics". I am attaching a brief resume of my radio experience, education and present position.

Check One PRACTICAL RADIO-ELECTRONICS
 Course: PRACTICAL TELEVISION

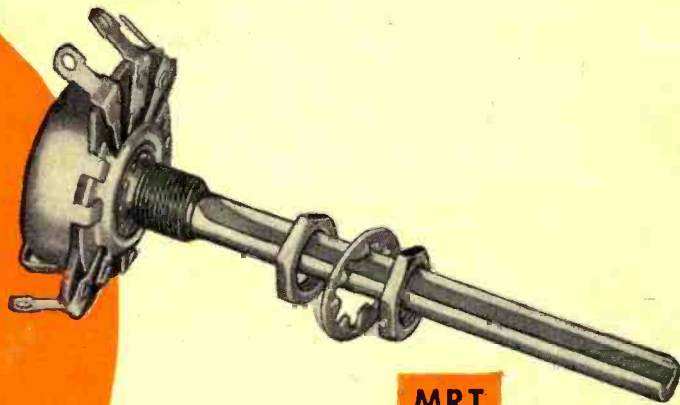
NAME

STREET

CITY..... ZONE..... STATE.....

I am entitled to training under the "G. I." Bill.

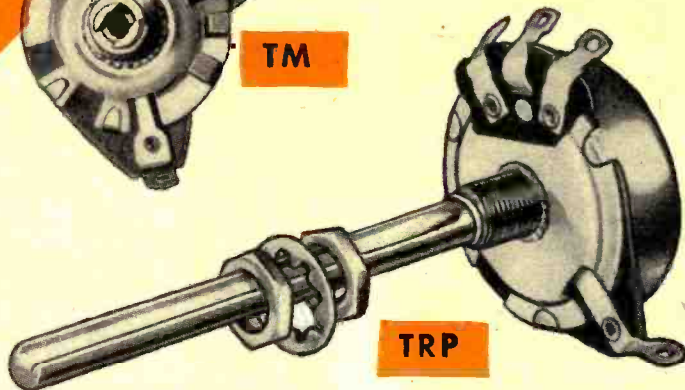
More Tapped Control Values For Your "Every Need"



MRT



TM



TRP

MALLORY provides every needed resistance value in its single tapped replacement controls—31 combinations of overall and tap resistances in all.

Mallory MRT Controls are available in most of the popular values, and feature an easy-to-cut channel shaft that fits all types of knobs. Mallory TMs are made in an even wider range of resistance values than the MRTs, and are used in conjunction with 30 non-wobbling, non-loosening Plug-In Shafts. They have practically universal application because they provide "special" shafts of nearly every required type.

Where shaft lengths of 3 inches or less are required, Mallory TRPs (fixed shafts)

replace large originals using set screw or spring type knobs. See your Mallory distributor.

Insist on MALLORY—the Complete Control Line

Mallory offers 33 Tapered Wire-Wound Controls . . . 31 Values in Single Tapped Controls . . . 10 Values in Double Tapped Controls . . . 12 Clutch Type Controls . . . 10 Universal Dual Controls . . . and 92 Popular Special Controls.

The MALLORY "Good Service for Good Business" Plan includes ideas that will help your business grow.

Ask Your Distributor about it.

P. R. MALLORY & CO. Inc.
MALLORY

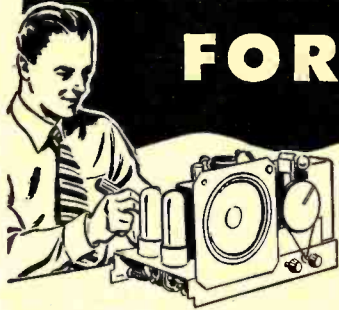
VIBRATORS . . . VIBRAPACKS* . . . CAPACITORS . . . VOLUME CONTROLS . . . SWITCHES . . . RESISTORS . . . FILTERS . . . RECTIFIERS . . . POWER SUPPLIES.

*Reg. U. S. Pat. Off.

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HOW'D YOU LIKE TO GET these famous Ghirardi Training Course Books FOR CHRISTMAS?



Friends or relatives are probably wondering what to give YOU this Christmas. Then why not drop a hint that nothing would please you more than Ghirardi Radio-Electronic training course books? They'll appreciate the suggestion—and you'll appreciate the books every day of your life. What finer gift could you ever hope to receive than these giant training books that make it easy as A-B-C to learn basic Radio-Electronics and to trouble-shoot and repair all kinds of radio and electronic equipment? And why not give these big books for Christmas to your own friends who are interested in radio?

BEGINNERS! LEARN BASIC RADIO-ELECTRONICS . . . as fast as you can read!



The most widely used radio training book in the world

Only \$5 for the entire course.

LEARN FAST!
LEARN RIGHT!

No matter what phase of Radio or Electronic work you'd like to specialize in, you'll need the basic training that Ghirardi's 3½-lb., 972-page **Radio Physics Course** book gives. More people have gotten their start from this giant book than any other book or course! On a survey among hundreds of radio service experts, engineers, instructors, etc., 9 out of 10 said that Ghirardi's **Radio Physics Course** is the finest, easiest-to-understand Radio-Electronic Training Course on the market. And you buy it for only \$5 for the complete course—on a money-back guarantee basis!

36 COURSES IN ONE!

Radio Physics Course is especially written for home study without an instructor. Nothing is omitted or condensed. Starting with a thorough, easily-understood foundation course in Basic Electricity, the book takes you step by step through the entire field of basic Radio-Electronics. Actually, **Radio Physics Course** gives you the scope of 36 complete courses in one big book. If broken into sections and sold as a series of lessons, you'd regard it as a bargain at \$50 or more. But you get it all at once! You learn as fast as you can read. Subjects that seem highly complicated in other courses are made crystal-clear both in text and by over 508 clear pictures and diagrams. Mail coupon today. Remember, you don't actually risk a cent. Our 5-Day Money-Back Guarantee Is Your Absolute Protection.

LEARN TO REPAIR RADIOS THIS FAST, EASY WAY!

You don't have to be an expert to make ordinary repairs in 4 radios out of 5! You don't need a lot of high-priced test equipment! Every receiver has its "weak" spots that give trouble first. Ghirardi has compiled case histories of these common troubles into a big 744-page **Radio Troubleshooter's Handbook**. When you want to repair a set, just look up its make and model number. 4 times out of 5 the book tells you what the trouble is—and exactly how to fix it with a few simple tools. It's a service short cut that really works. The book pays for itself in time saved the first time you use it. Smart servicemen use it on every job. Helps you repair cheap sets profitably because you don't need to waste a lot of time on them. Ideal for training new helpers.



Let this "AUTO-MATIC TEACHER" show you exactly how to repair OVER 4800 RADIO MODELS

Fix radios without costly test equipment!

DO TWO JOBS . . . IN THE TIME NORMALLY REQUIRED FOR ONE!

Radio Troubleshooter's Handbook tells you what to do and exactly how to do it in repairing practically every radio model in use today. And that is just the beginning. It also contains the most complete, genuinely helpful Tube Chart you've ever seen. Dozens of pages contain I-F alignment peaks for 20,000 superhets and data on I-F Transformer troubles. Hundreds of additional pages contain tables, graphs, charts and service information to help you repair any radio ever made easier, and **twice as fast!** You get the complete, 744-page, manua-size book for only \$5. See money-saving offer below!

GET COMPLETE PROFESSIONAL RADIO SERVICE TRAINING . . .

At Home Without an Instructor



Makes the hard jobs easy to do!

Trains you scientifically for all phases of Radio-Electronic Service

Ghirardi's famous 1300-page **Modern Radio Servicing** is a complete, 1-volume course in **PROFESSIONAL** service methods of the kind that open doors to big-money opportunities which only scientifically trained men can grasp. It shows how to avoid guesswork by analyzing radio and other electronic circuits by professional methods. Explains how all basic types of radio test instruments work. Tells when, why, where and exactly how to use them. Shows how to troubleshoot both circuits and complete equipment; how to make repairs and replacements; how to analyze components—even how to run a successful radio service business of your own.

COMPLETE DATA ON TROUBLE-SHOOTING, INSTRUMENTS AND REPAIR

Modern Radio Servicing is invaluable as a "refresher" course for men already in the radio service business—and it's worth its weight in gold to service beginners! Everything is explained so clearly it can easily be understood at home without an instructor. 706 clear illustrations and 720 Self-Test Review Questions speed up learning. Only \$5 for the big 4-lb. book—on our 5-Day Money-Back Guarantee. See money-saving offer in coupon.

MONEY-SAVING SPECIAL OFFER

Let Ghirardi's **Radio Troubleshooter's Handbook** save you time and money on common service jobs. Let his **Modern Radio Servicing** train you for professional service work of all kinds! Get **BOTH** big books for only \$9.50 (\$10.50 foreign). See Money-Saving Offer in coupon

5-DAY MONEY-BACK GUARANTEE

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232 Madison Ave., New York 16, N. Y.

Enclosed find \$_____ for which send me the Ghirardi Book(s) indicated below, or send C.O.D. (no foreign C.O.D.'s) and I will pay postman this amount plus a small postal charge when he delivers my package. If the books are not entirely satisfactory, I'll return them within 5 days and you guarantee to refund my money.

- RADIO PHYSICS COURSE \$5 (\$5.50 foreign)
- MODERN RADIO SERVICING \$5 (\$5.50 foreign)
- RADIO TROUBLESHOOTER'S HANDBOOK \$5 (\$5.50 foreign)
- MONEY-SAVING COMBINATION OFFER! Both **Modern Radio Servicing** and **Radio Troubleshooter's Handbook**, only \$9.50 for the two (\$10.50 foreign).

Name.....

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

Watch these three score!



Winning "Combination"—Model R-1242—combination radio and record player; 110-volt, AC-DC. Sleek, modern design in rolled-top walnut cabinet. Eye-catching grille panel. Built-in loop antenna. Single record player accommodates 10" or 12" records. Four tubes plus rectifier tube. 550-1700 kc. Compact, dependable.



Portable That's "Going Places"—Model R-1409—three-way portable, AC-DC and battery. Smart alligator-grain fabric with plastic front. 550-1700 kc. Self-contained charger increases battery life. Real beauty, exceptional performance.



Tops on Any Table—Model R-1238—table model; 110-volt, AC-DC. Handsomely designed in walnut veneer and silver-gray plastic. Striking lucite-and-chrome carrying handle, convenient and durable. Four tubes plus rectifier tube. 550-1700 kc. Built-in loop antenna. A real value.

They're fast movers
in the great line of **DELCO RADIOS**



DELCO RADIO
A GENERAL MOTORS PRODUCT

Delco radios are distributed nationally by United Motors Service. See your United Motors distributor about the Delco radio line.

THESE three modern-as-tomorrow Delco radios really appeal to American tastes and needs. They're a sure-fire cinch to set sales and profit records for dealers.

Each one of these smart Delco models gives you plenty to talk about in features, appearance, performance and value. Each one carries an assurance of dependability because it is built and backed by General Motors.

You can count on Delco Radio for "the best of all that's new in radio"—and that goes for the complete line of table models, consoles and combinations. Like the original-equipment auto radios built by Delco Radio for America's leading cars, Delco home radios are a great General Motors value.



Dr. Lee de Forest

No longer is Television just a laboratory marvel. It is rapidly spreading over the nation. Practically every radio manufacturer has Television models in production. New stations are being licensed. Television is already *big business*.

Are You Ready?

Who will get those new high paying jobs? Who will step into key positions in a rapidly growing industry? Not inexperienced radio men. Not untrained electricians. But men who know Television and can be relied upon to operate and maintain expensive equipment!

American Television—A Great Training Institution!

American Television has pioneered in Television research. Its directors have made fundamental contributions to the industry. Dr. Lee de Forest, our Director of Research and Training, is known throughout the civilized world as the "Father of Radio" through his invention of the radio tube. U. A. Sanabria, President and founder of American Television, Inc. invented the Interlace Scanning System which is now the standard of all Television. Most recently, a revolutionary new circuit which corrects a common television defect known as "ghost images" has been developed by J. M. Sanabria, head of American Television's Manufacturing Division.

Most Elaborate Training Laboratories

Every modern type of equipment obtainable has been installed for instruction purposes in what we believe to be the most extensive and elaborate Television training facilities in the world. You will find complete operating studios with the new sensitive cameras and their associated equipment. A corps of highly qualified instructors will guide your study.



Start Learning TELEVISION at Home—FREE!

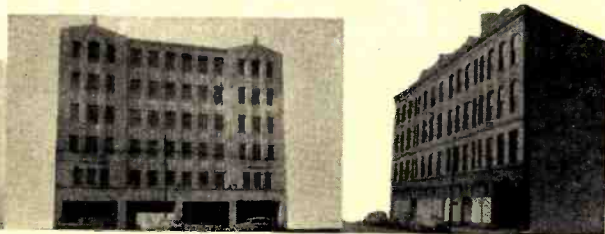
Prepare yourself for the endless opportunities in Television the new "American" way. Now, for the first time, you may discover in advance of entering school, just how your abilities fit into Television. If you qualify under the simple rules, you will be given a complete preliminary home study Television course absolutely free and without obligation.

Your success with the course will not only help you to decide for yourself what phase of Television you like best but will also aid us in qualifying you for residence training.

We prefer that all new resident students take this free course as it provides excellent preparation for residence study. However, there is no obligation on your part to enroll for residence training when you complete the home study course.

We urge you to take advantage of this splendid opportunity at once. Just write your name and address on a penny postcard and say: "I am interested in your free Television Course". Do it today! This offer is necessarily limited.

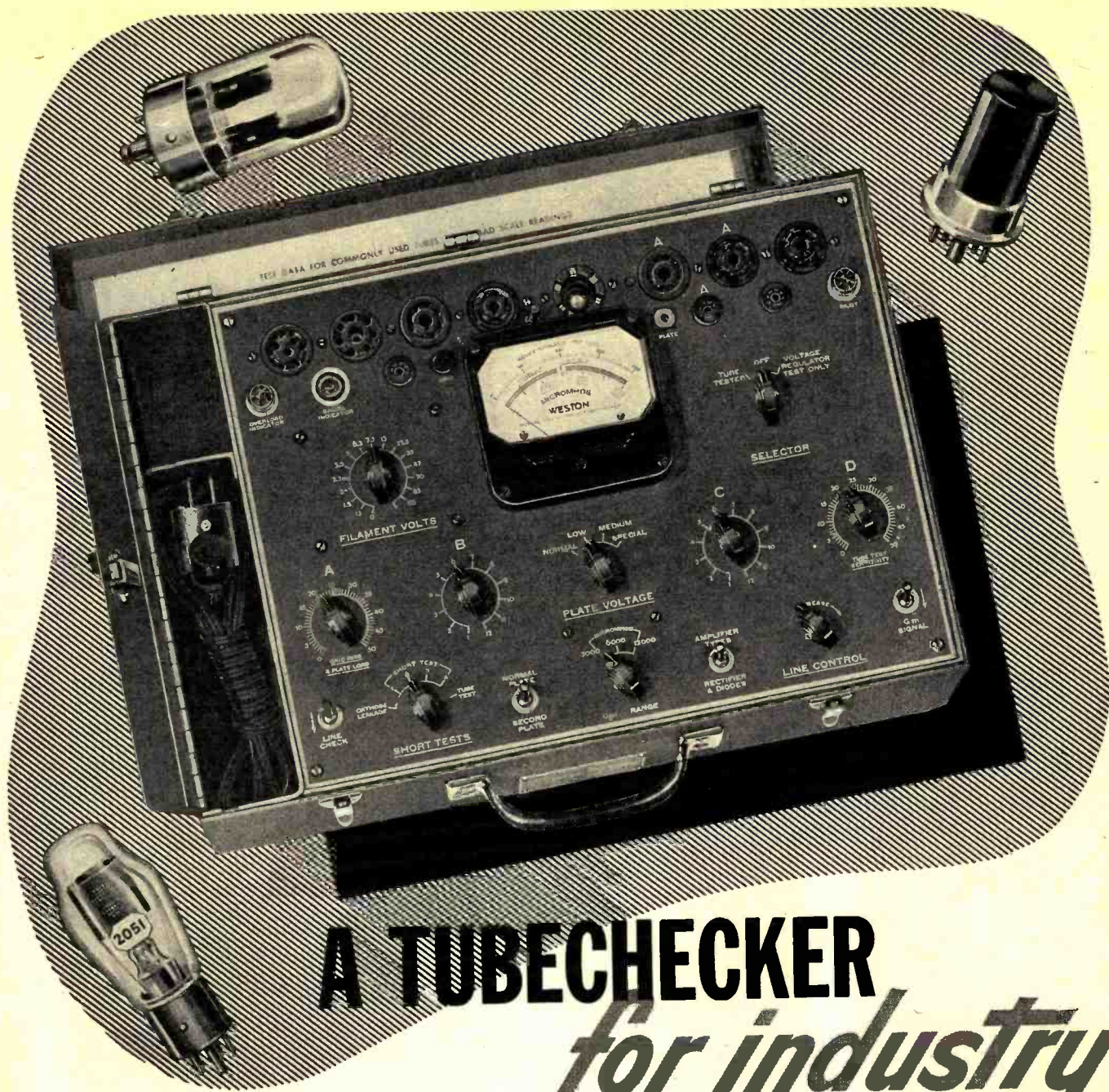
Approved for Veteran Training



American Television, Inc.

5050 BROADWAY

CHICAGO 40, ILLINOIS



A TUBE CHECKER *for industry*

TESTS: Receiving Tubes, Voltage Regulator Tubes, low power Thyratrons

The WESTON Model 798 Mutual Conductance Tubechecker provides, for the first time, adequate tests on voltage regulator tubes, light-duty Thyratrons such as the 884, 885, OA4, 6D4, 2A4, 2050, 2051 in addition to tests on regular receiving tubes. Ranges of 12,000, 6,000, 3,000 micromhos as well as "Good-Bad" indications cover

the tube checking requirements of electronic control and radio circuits. Housed in rugged aluminum case to withstand rough usage in shop or field.

For full details consult your local WESTON representative, or write . . . WESTON Electrical Instrument Corp., 617 Frelinghuysen Ave., Newark 5, N. J.

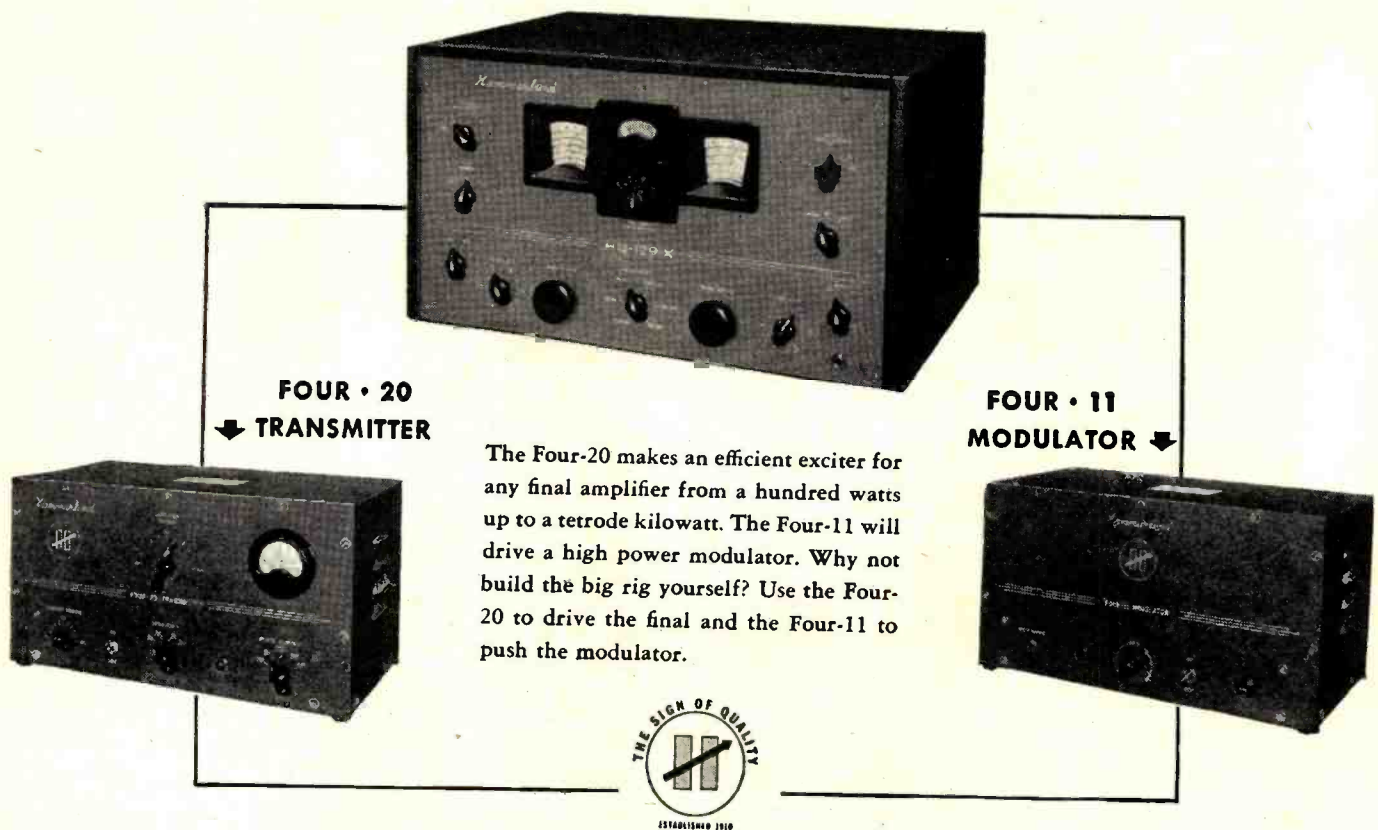
WESTON *Instruments*

ALBANY · ATLANTA · BOSTON · BUFFALO · CHARLOTTE · CHICAGO · CINCINNATI · CLEVELAND · DALLAS · DENVER · DETROIT · JACKSONVILLE · KNOXVILLE · LITTLE ROCK · LOS ANGELES · MERIDEN · MINNEAPOLIS · NEWARK
NEW ORLEANS · NEW YORK · PHILADELPHIA · PHOENIX · PITTSBURGH · ROCHESTER · SAN FRANCISCO · SEATTLE · ST. LOUIS · SYRACUSE · IN CANADA, NORTHERN ELECTRIC CO., LTD., POWERLITE DEVICES, LTD.

HQ-129-X



Full range .54 to 31 mc in six accurately calibrated bands • Band spread with four calibrated ham bands and all-purpose scale • Variable selectivity crystal filter for phone or cw. • Antenna compensator for maximum image rejection and high sensitivity • Voltage regulation. Noise limiter that really kills noise • Adjustable S meter • *Three* IF stages . . . The HQ-129-X has every up-to-the-minute improvement that radio science has so far developed for amateur radio receivers.



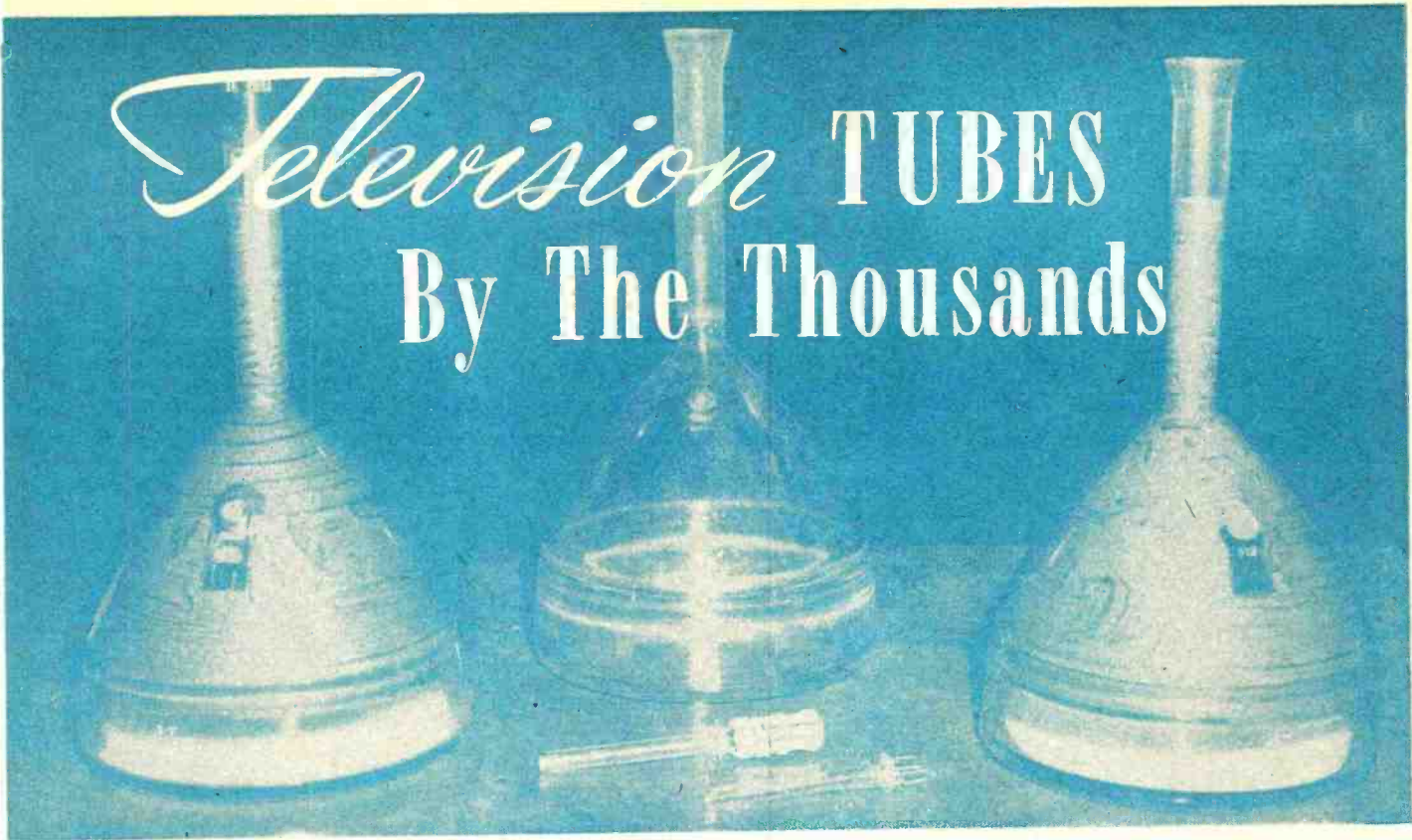
WRITE FOR TECHNICAL BOOKLET

HAMMARLUND

THE HAMMARLUND MFG. CO., INC., 460 W. 34TH ST., NEW YORK 1, N. Y.
MANUFACTURERS OF PRECISION COMMUNICATIONS EQUIPMENT

Television TUBES

By The Thousands



1 Completed 10" kinescope at left. Center unit is bulb blank in which the "button" has been sealed. In front of tube are the stem and completed tube element assembly. Right hand bulb shows fluorescent coating and colloidal graphite lining.

By **FRANK E. BUTLER**

A modern miracle of mass production is typified by the ingenious wedding of automatic machinery, technical skills, and quality-controlled materials.

THE Age of television is at hand and to speed its progress toward perfection, groups of technical experts in widely divergent professions such as electronics, optics, and the glass industries are contributing their share of scientific knowledge and experience to this end.

The technological advance is so rapid, both in monochrome and color television transmission and receiving equipment, that pictures by both systems are now being shown with surprising realism and clarity. Only very little of this advanced development remains in the laboratory stage and this is sufficiently developed to insure its appearance in homes much sooner than most of us had expected.

The rapidity and skill with which this progress has been made by television laboratories and their confidence in the future of television is evidenced by the building of new plants and the designing of special machinery for the manufacture of equipment. Therefore a peep behind the scenes of television activity should prove of unusual interest at this time.

The heart of television is the *iconoscope*—the electronic device capable of detecting the image or scene of ac-

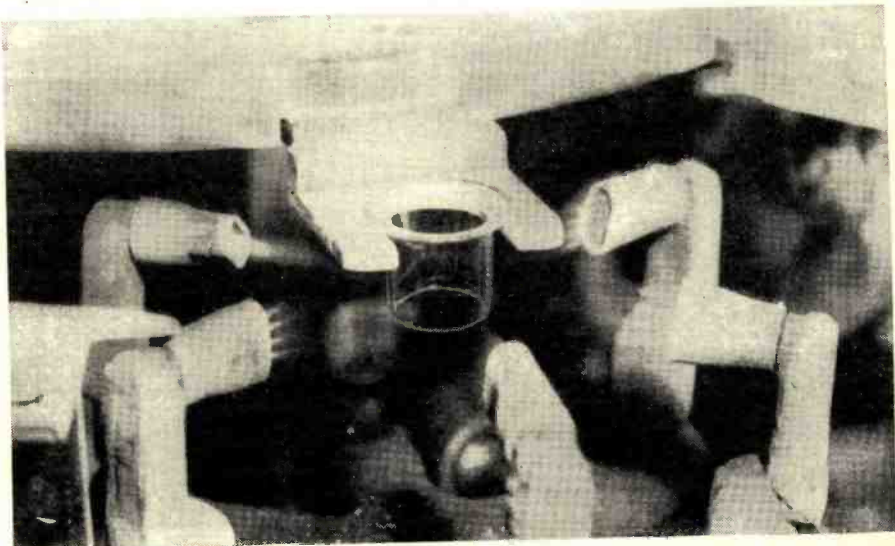
tion that is to be televised through space, then subsequently translating the reflected light into electric impulses.

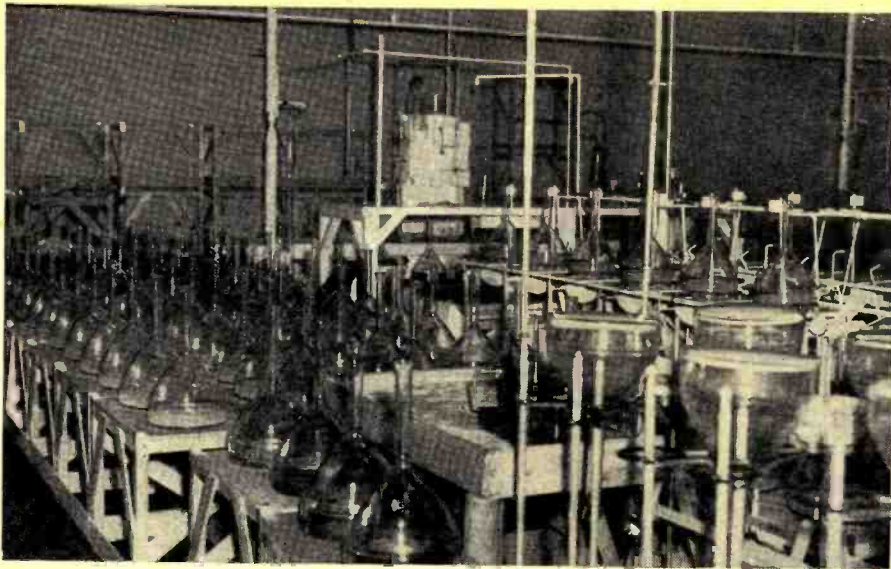
The *kinescope* is a similar electronic tube which reverses the above action whereby the televised impres-

sions are transformed back into light to form a reproduced image or "picture" on the sensitive face of the tube. To create these two companion tubes, which must combine delicateness, ruggedness, and utmost sensitivity, requires the use of nimble fingers, keen eyes, highly developed skills, modern automatic machinery and the best techniques that can be devised by the several different industries involved in the manufacture of tubes.

The factory where these tubes are produced must be fully air condi-

2 Flare machine in which G12 glass tubing is cut off and pre-formed to provide a flat pressed stem for the tube. Glass parts are heated at various stages from 600-900° C.





3 Hundreds of 10-inch kinescope bulbs lined up ready for the application of the fluorescent coating to the inside. Each tube receives a measured amount of solution.

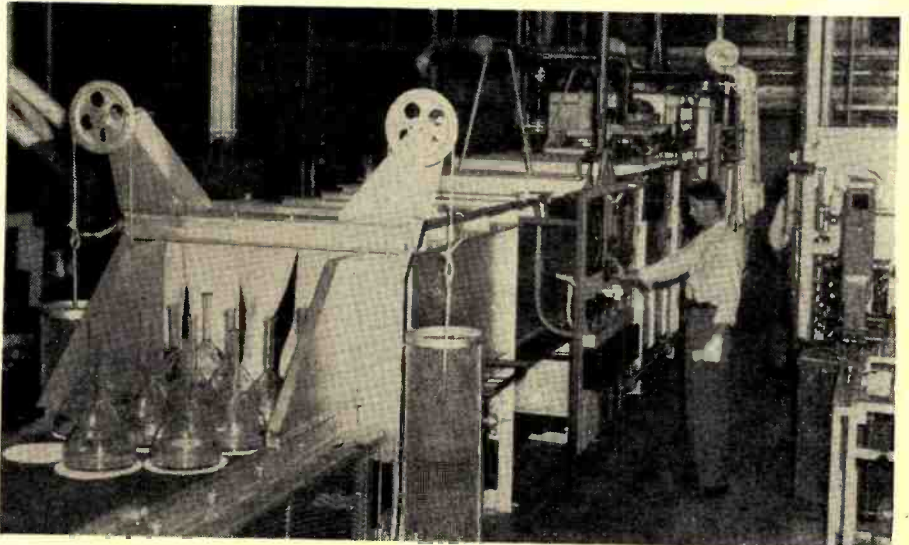


4 Operators prepare the fluorescent solution which is used in the kinescopes to form the picture screen of the video tube. Quality control of the solution is vitally important here.

5 Fluorescent coating, in solution, is carefully poured into a prepared kinescope bulb.



6 Next step is the insertion of the "button" in the side of the bulb by means of a gas-fired torch. Operator softens the glass, punctures a hole, and inserts button.



tioned and the humidity level must be maintained at a predetermined level. In addition, the factory must also be equipped with dust filters in order to eliminate impurities which might affect the sensitive tube elements.

There are two kinds of kinescopes produced—one known as the electronic *direct view* type, and the other as the *projection* type. From the small kinescope which produces exceptionally brilliant images which are subsequently enlarged *optically* for projection on a viewing screen of a 7½ x 10 or 18 x 24 foot theater size, to the largest kinescopes which have a 10 or 12 inch face from which the image is viewed directly (without enlargement), there are many precise and intricate operations which must be performed on both the tube elements and the glass bulb.

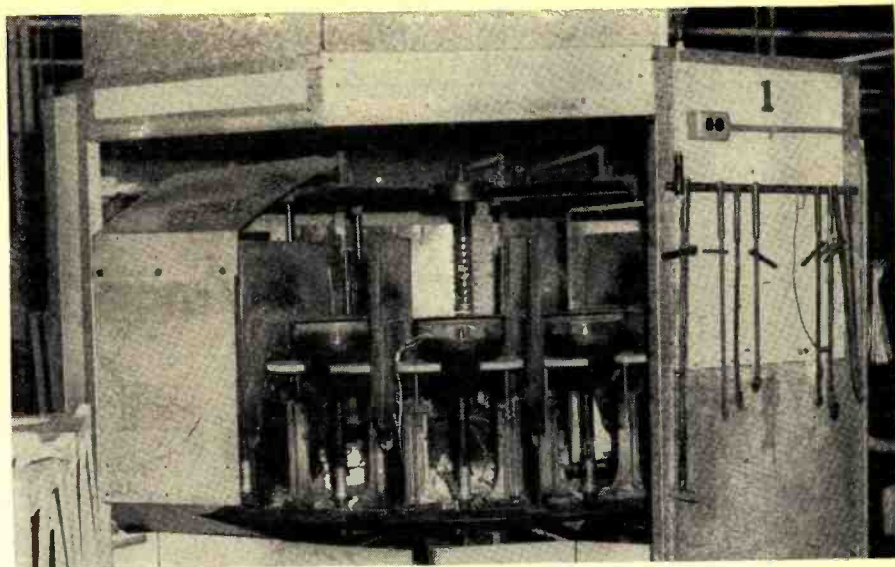
One of the first glass operations in the production of kinescopes or iconoscopes is to make the flare of the stem which holds the elements. This is done on the flare machine shown in Fig. 2. Here gas fuel is used to heat the glass parts as they index around the automatic machine, in various stages, to temperatures ranging from 600° C. to 900° C. After a small section has been cut off and the end flared, the bottom portion is heated by a special gas flame pattern which places the heat exactly where it is wanted at the proper temperature for flat pressing. Heating time is controlled by the speed at which the machine indexes from station to station.

A battery of automatic flare machines is used in making the glass stems in which the tube element supporting the lead-in wires are sealed. Specially designed gas burners, emitting predetermined flame patterns heat the glass tubing to various stages of viscosity in order that it may be flat pressed into a stem. All of the equipment that utilizes heat in any form for processing is effi-

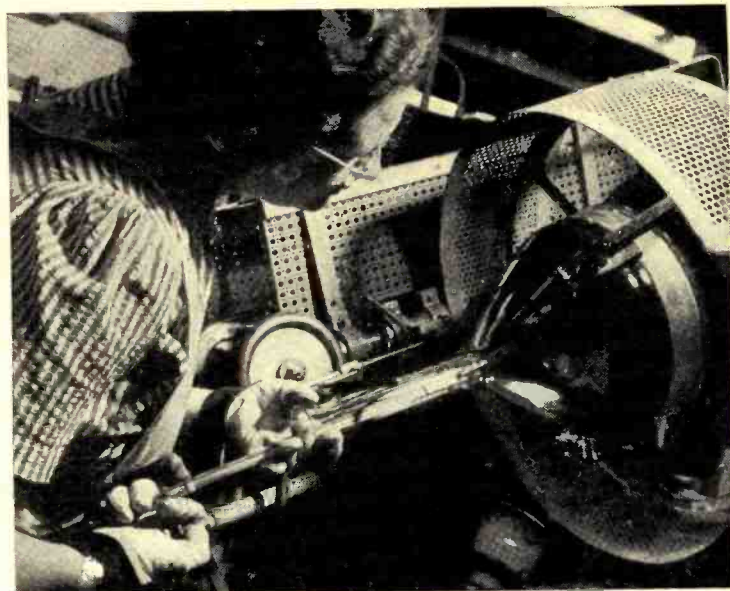
ciently hooded and ventilated to carry off excess heat and the products of combustion.

When this part has been formed, the lead-in wires to the tube elements are inserted and the assembled element units are placed on another automatic gas-fired machine where special flame patterns heat those parts of the stem to just the proper temperature and for just the correct time to effectively seal the wires into the glass stem. Annealing takes place immediately after the part has reached the last position on the machine. The unit is then ready for mounting the tube electrodes, after which it is prepared to be sealed into a bulb-blank, which resembles a large glass funnel with a long stem.

The bulb or kinescope blanks are subjected to many processes and operations; the first being a thorough washing, inside and out, after which they are placed in specially



7 Baking on the colloidal graphite coating requires approximately one and a half hours at 400° C in a gas-fired oven. A specially designed oven is used in this operation.



8 A non-reflecting carbon coating, designed to keep stray electrons from the picture screen, is next applied with a long-handled brush.

9 The operator is shown installing the cathode-ray gun in a modern type image orthicon camera tube which is used for video pickups.

constructed racks in the "settling-room" Fig. 3. This room is constructed on its own foundation and the floor is composed of a heavy concrete slab floating on a layer of cork. There is no physical connection to any other part of the building, thus eliminating any transmission of vibration. A measured quantity of liquid containing a fluorescent substance is then placed in each tube. The preparation of this fluorescent solution requires a high degree of skill and accuracy. The operation is shown in Fig. 4.

Next, the coating, in suspension, is carefully and accurately poured into the kinescope bulb. See Fig. 5. Slowly, the solid, active fluorescent material settles on that part of the tube face on which the electrons react to produce the image. When the settling process is complete, the re-

maining liquid is carefully decanted.

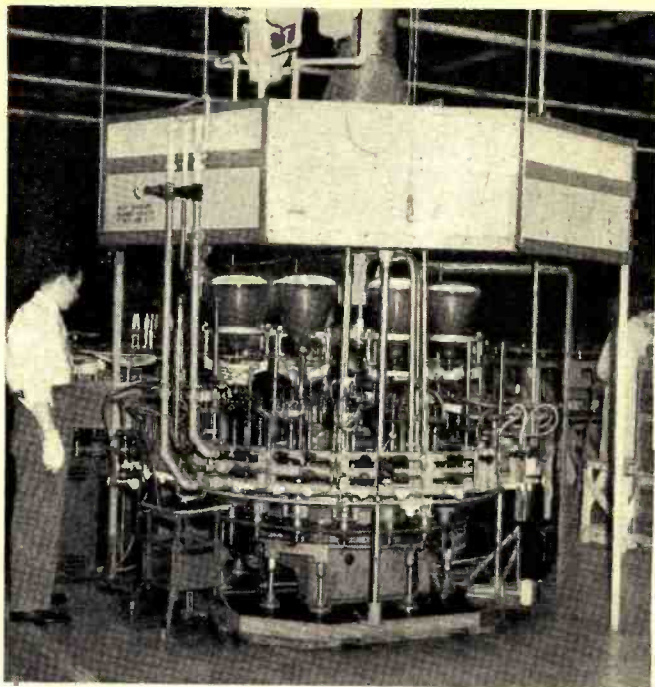
The next step in the manufacture of the tube is the insertion of a "button" in the side of the bulb. This operation, which is illustrated in Fig. 6, is performed by means of a gas-fired torch. The operator softens the glass, punctures a small hole and inserts the "button" or electrical contact which is then hermetically sealed in the tapered section of the bulb. The tube is then annealed at 450° C. by means of a continuous gas-fired radiant tube glasslehr where the cycle of passing through the heated air ranges from four to six hours, depending on the size of the tube.

The inside of the bulb is next coated with a colloidal graphite mixture which serves to carry off the electron charges after they bounce back from the screen. The grounded electrical

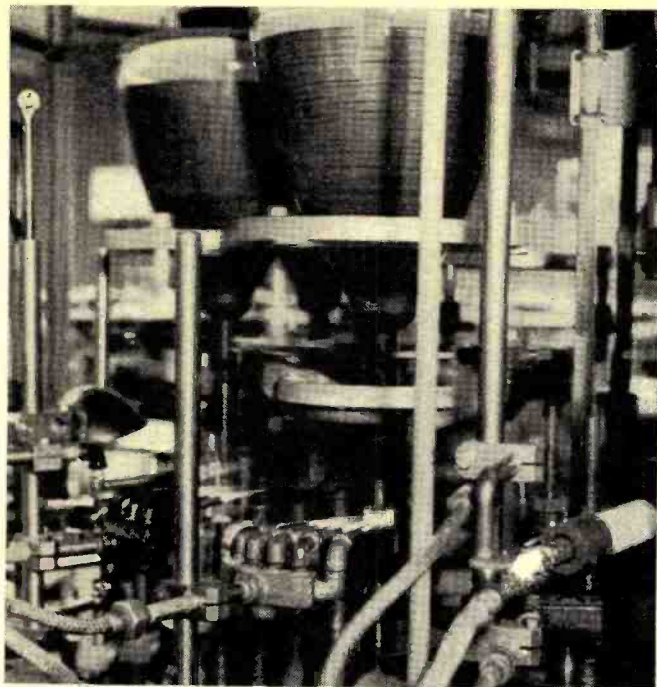
circuit is through the "button" previously described. Next, this inner graphite coating is subjected to a baking cycle which is performed at temperatures of 400° C. for approximately one and a half hours. This operation is shown in Fig. 7.

The operator now applies a coating of non-reflecting carbon to the interior of the tube by means of a long handled brush (See Fig. 8). This coating keeps stray electrons from the picture screen.

Fig. 9 shows the operator adjusting the delicate electrical components that are to be inserted in the tube. At this stage of production, the prepared bulb is ready to be sealed to the glass stem which supports the internal elements, or electron gun. This operation takes place on a completely automatic gas-fired sealing



10 Automatic sealing machine where elements are set in tube, the flare and bulb are sealed and the collet is cut off.



11 Close-up view of operation in which collet is cut off. The gas burner shown at right performs the annealing operation.

machine (Fig. 10) where the elements are set in the tube, the flare and bulb are sealed, and the collet cut off. These operations take place as the tubes index around the machine to their respective stations where varying patterns of gas flames perform the successive operations on the glass. At the final station the excess neck of the bulb, or collet, is cut off when the No. 6 lime glass of which the kinescope blanks are made is heated to 1050° C. by a needle flame which produces a clean, sharp cut.

After sealing, the tube progresses to an exhaust machine where an extremely high vacuum is developed. While on this machine, the glass bulb is heated by radiant heaters to its

softening point to assist the vacuum pump in removing occluded moisture and gases. The electron gun and other internal elements are heated by high frequency induction methods and, at another stage in the process, working voltages are applied to the tube elements themselves.

Fig. 11 shows a close-up view of the six needle gas flames which concentrate on the bulb neck where the collet is cut off as the tube revolves in the flame. The large gas burner, shown at the right of the photograph, performs the annealing operation. When the vacuum process has reached its final position, the tube is "tipped off"—an operation which seals the tube permanently and sev-

ers its connection to the vacuum pump.

After the tube has been evacuated and severed from the exhaust machine, the operator threads the lead-in wires into the socket base of the kinescope. This operation is shown in Fig. 12.

Final tests are then run on the complete kinescopes. The operator (Fig. 14) uses a special chart as a reference standard. Following this testing, the tubes undergo a 500-hour operational test (Fig. 13).

Larger television pictures obtainable in the projection system are the result of an optical development which is an outgrowth of a discovery
(Continued on page 170)

12 Operator threads lead-in wires into socket base of a kinescope after the air has been exhausted from the tube envelope.



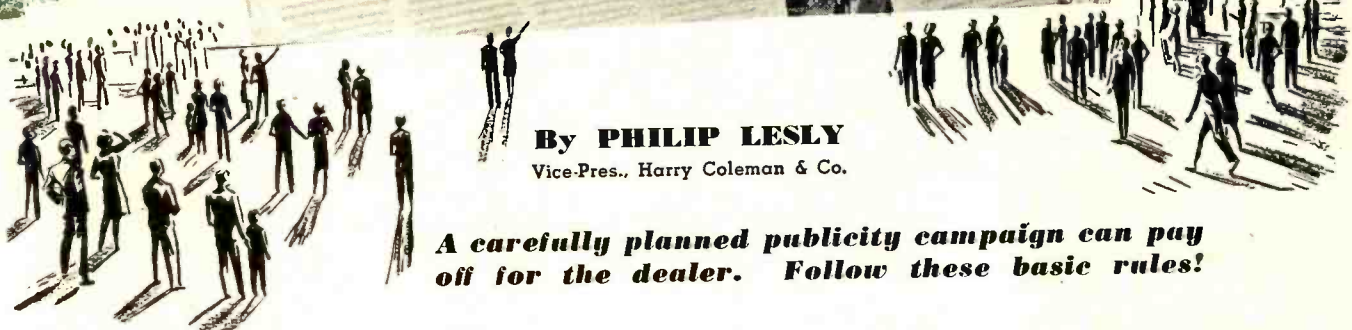
13 Technician checking kinescope picture tubes during a 500-hour continuous performance test run at the home plant.



14 One of the test procedures used in checking the performance of kinescopes used in home television receiving sets.



PUBLICITY MEANS *Sales!*



By **PHILIP LESLY**
Vice-Pres., Harry Coleman & Co.

A carefully planned publicity campaign can pay off for the dealer. Follow these basic rules!

MODERN merchandising involves many factors—getting salable merchandise, proper pricing, attractive store fronts, effective display, good salesmanship, advertising—and the reputation of the dealer. This one point, the most intangible of all, can make all the others ineffective if it is neglected, or can bring surprising returns if it is developed expertly.

Your reputation among your prospective customers depends on two things—the way you do business, and how much the public knows about you and your business. They go together and cannot be separated. If your business methods are basically unsound, no amount of publicity will set them right. If you don't let the public know about you, it will take a long time for your sound policies to pay off in sales.

Almost all dealers today know the basic requirements of a good business reputation:

1. Be fair to all customers. Play no favorites. Set a price on every item and offer that same price to everyone.
2. Be scrupulously honest. Be sure every customer knows exactly what he's paying for and gets a receipt for every purchase.
3. Provide liberal guarantees. Ex-

change merchandise without question if the customer is dissatisfied.

4. Offer as much service as you can afford—pickup and delivery, installations, free check-ups and estimates.

5. Remember the little extra things that please the customer—prompt delivery, etc.

What very few dealers understand is the effectiveness of publicity in letting their prospects know what they have to offer, and in building up the name of the store to the point where it attracts customers.

This familiarity of a name influences everybody's daily purchases of products: *Coca Cola*, *Ivory soap*, *Pepsodent* toothpaste and hundreds of other items. It also frequently determines the choice of store where these items and others are bought. Such places as *Macy's* and *Marshall Field's* sell more of the standard-priced, nationally advertised items than their competitors because their very names attract customers for everything they sell.

You as a dealer have two ways of attracting prospects. One is by offering "X" brand of product, which has been advertised and publicized so that many buyers will seek it out or react favorably when they find it. You, by carrying this brand, automatically gain the benefits of the manufacturer's publicity. The other

way is by making your own store the attraction, so that the prospect will say, "Let's get our radio at Milligan's" and then come to you to see what you have to offer. The ideal combination of the well-publicized product and the well-publicized store is what makes the cash register jingle.

With this in mind, and once you have firmly established the requirements of a good reputation, it will pay to begin a systematic campaign to make your store's name familiar and well-regarded.

Here are the basic principles of a good publicity program for the radio and appliance dealer:

1. Make the familiarizing of your store's name your primary objective. Before you do anything along the publicity line, be sure it will help reach this goal.
2. Simplify the path to the objective. Many of your opportunities for newspaper stories, radio mentions, and word-of-mouth comments will come from your personal activities. These won't help build up your store very much unless your name immediately brings to mind the name of the store. For this reason, it is wise to have your name a part of the store's name; "Milligan's Appliance Center" is better than "Ideal Appliance Center." It

(Continued on page 128)

ELECTRONIC PHOTOFLASH UNIT

By

W. G. MANY

Cornell-Dubilier Electric Corp.

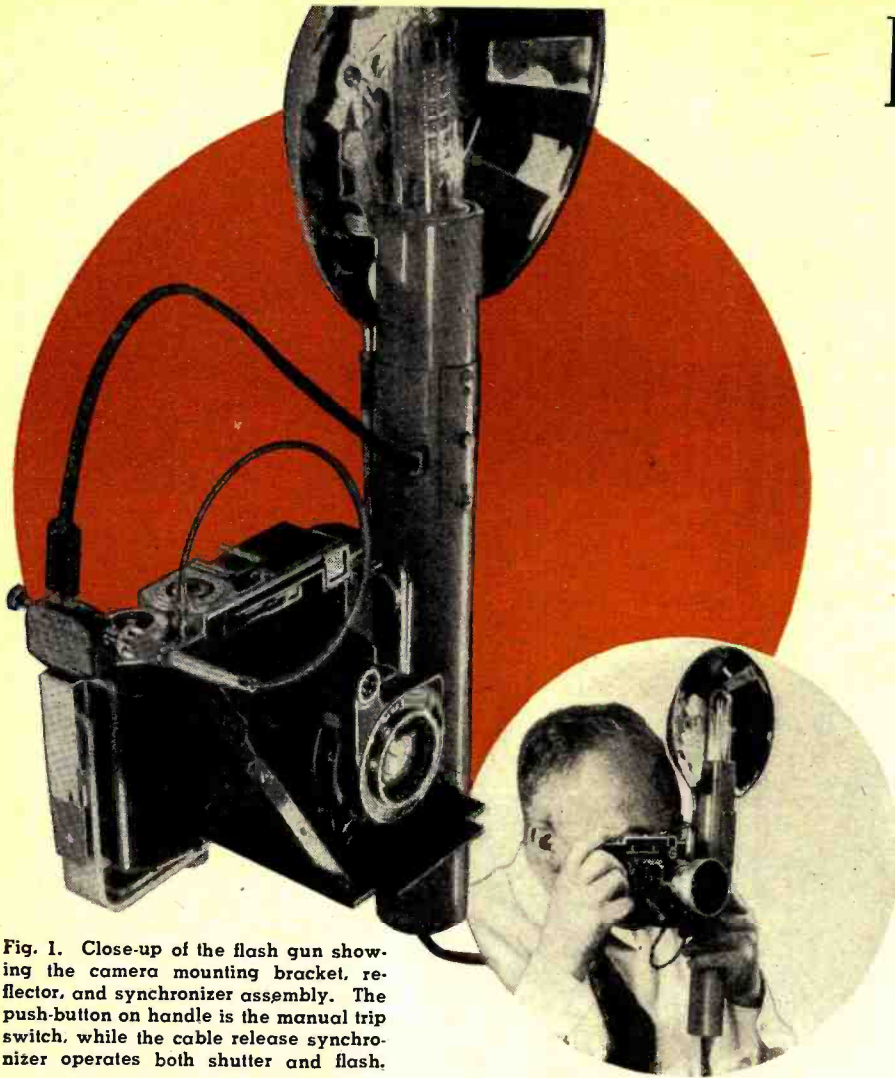
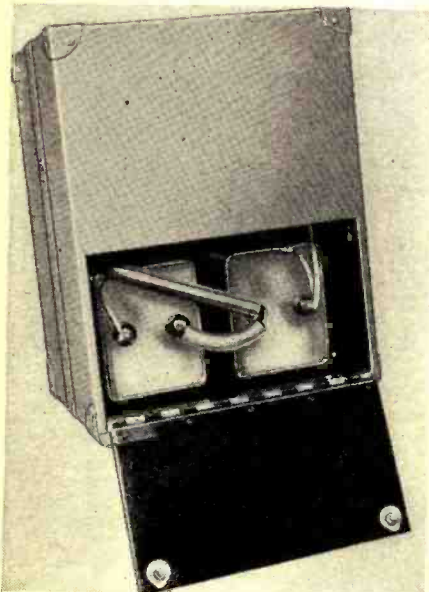


Fig. 1. Close-up of the flash gun showing the camera mounting bracket, reflector, and synchronizer assembly. The push-button on handle is the manual trip switch, while the cable release synchronizer operates both shutter and flash.

Several new types of flash tubes make possible a photoflash suitable for high speed indoor work.

Fig. 2. The two 25 μ fd. storage condensers are mounted in the lower compartment.



THE growing enthusiasm for electronic photoflash units on the part of both radio and photo amateurs and professionals has brought forth many new and interesting circuit and component part developments.

This semi-portable flash unit is designed to be used for any general indoor work and may be constructed of readily available parts. The unit is housed in a professional-looking war surplus cabinet which was originally designed for the SCR-211 frequency meter set.

The circuit is comprised of two principal units, a power supply and two photoflash storage condensers housed in the carrying case, and the triggering circuit and flash bulb which are housed in the flash gun handle. Fig. 5 shows the correct mounting of the simple power supply chassis in the cabinet, while Fig. 2 is a rear view of the unit showing the two condensers mounted in place in the lower section of the case.

The bakelite front panel measures

7 $\frac{1}{4}$ " x 9 $\frac{13}{16}$ " with a sub-base panel attached with brackets to provide mounting facilities for the various controls. The panel carries an a.c. on-off switch, a pilot light for the a.c. line, the 117 volt power line receptacle, a neon pilot light for the high voltage, and a coaxial connector for the lead to the flash gun. In the center of the panel is a heavy duty push-button switch for discharging the condenser bank through the 100 ohm, 100 watt resistor. It is strongly recommended, as a safety factor, that the button be pushed immediately after the power line switch is thrown to the "off" position. A slight snap of the discharge and the neon pilot being extinguished indicates that the condensers are properly discharged.

There is one point that must always be borne in mind in both the construction and operation of this photoflash unit—**DANGER—HIGH VOLTAGE**. Constructors might find it advisable to paint this warning in red letters on both sides of the cabinet as a constant reminder and as a caution to those who might be tempted to inspect the unit while it is in operation.

The over 2000 volts from the UTC Type PFI photoflash transformer is rectified through a 2X2 tube to charge the storage condensers. A tap on the transformer supplies the 2.75 volts a.c. for the rectifier tube filament. These components, along with the 100 ohm safety resistor and the series of six carbon resistors which are used as a power supply bleeder, complete the cased part of the circuit. The two rectangular can type 25 μ fd., 2000 volt condensers are mounted in the lower compartment of the cabinet.

The handle of the flash gun houses a miniature series trigger tube, a model aircraft spark coil, the triggering switch, and the flash tube. A small GE flex switch or micro-switch actuates the gun manually and a socket is paralleled across this switch to provide shutter synchronization.

The new 0A5 trigger tube proved ideal for mounting in the handle of the gun as the system provides little

delay and rapid ionization yet allows the unit to be used with almost any type of external or built-in camera flash control. The size of this tube lends itself nicely to mounting directly in the handle of the flash unit, as can be seen in Fig. 4. The switch on the gun is a manual trip for those who use the "open-flash-shut" method of taking pictures.

The handle of the gun is made from a length of heavy bakelite tubing, 13" long by 1 3/8" i.d. A piece of bakelite tubing, 1 3/8" o.d. and 1/16" thick, was cut in half lengthwise to fit inside of the tube handle. On this half-tube were mounted the seven 1/2 watt molded bakelite insulated carbon resistors, spark coil, tubular paper condensers, miniature socket, and the OA5 trigger tube. Wiring is done with light polystyrene covered stranded copper wire, with care being taken to keep the high voltage leads well separated from ground and other leads. A seven foot length of single conductor and copper braid coaxial cable, with polystyrene insulation capable of withstanding over 2000 volts, is brought out through a hole made at one side of the bakelite disc cover which is used at the bottom of the handle.

The socket for the Sylvania Type R4330 flash tube was made from an Amphenol octal base, voltage-safety socket with the upper molded shell cut off and the unused pins removed. This socket is mounted by means of two small flathead screws, mounted on the half-tube, can now be inserted into the handle. An Amphenol 93-series single conductor coaxial connector is finally connected at the end of the coaxial lead ready to be inserted into the companion connector on the panel of the power supply unit.

In operation, the storage condensers will charge quickly but it is advisable

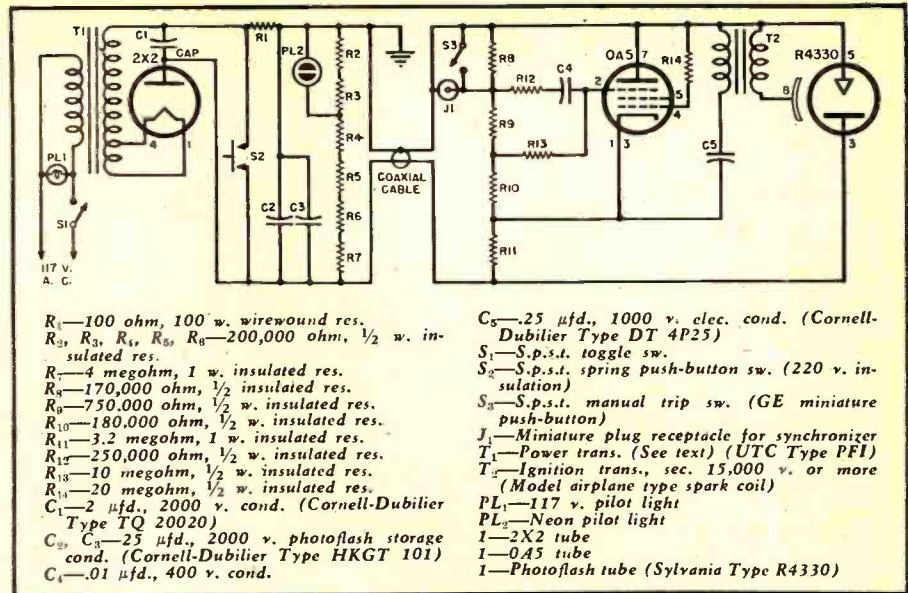


Fig. 3. Wiring diagram of the power supply unit and trigger circuit of photoflash. Power supply assembly is shown at left and gun handle assembly is shown at right.

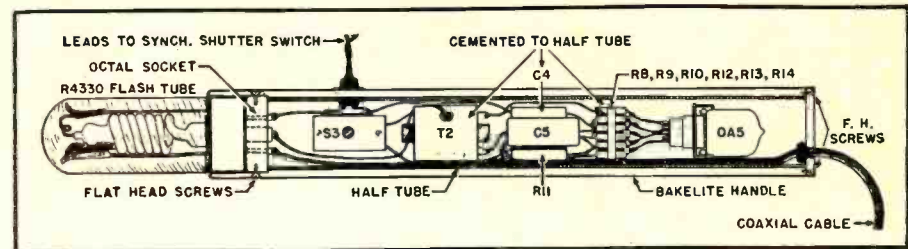


Fig. 4. Sketch showing the flash gun construction and layout of parts in bakelite tube handle. By removing the two screws in the octal socket and connections to the manual trip switch the entire assembly mounted in the half tube can be readily removed for inspection. Care must be taken to have high voltage leads well insulated and separated from ground and spark coil leads to prevent flashovers.

to allow about 15 seconds between flashes to assure time for the condensers to recharge. A weak flash or none at all will result in a poorly exposed negative.

The manufacturer's rated light output of the flash tube is approximately 12,000,000 lumens, and with internal synchronization, may be used at any shutter speed.

Fig. 5. Complete photoflash consisting of power supply in the cabinet and auxiliary triggering circuit in flash gun handle.

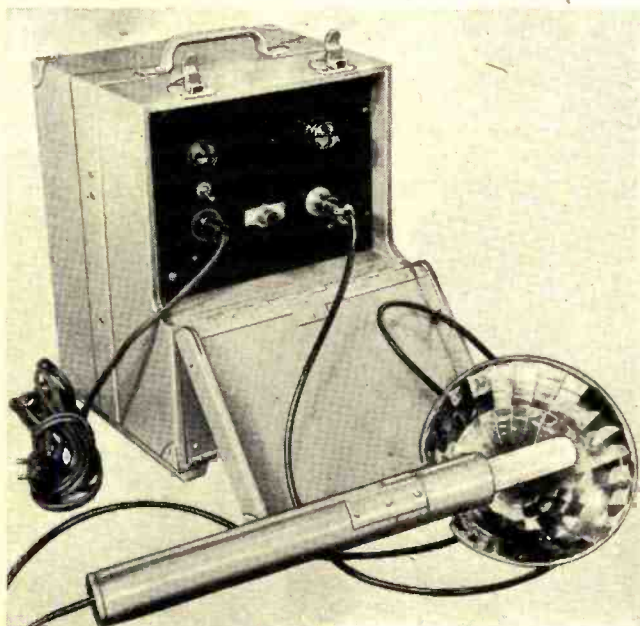
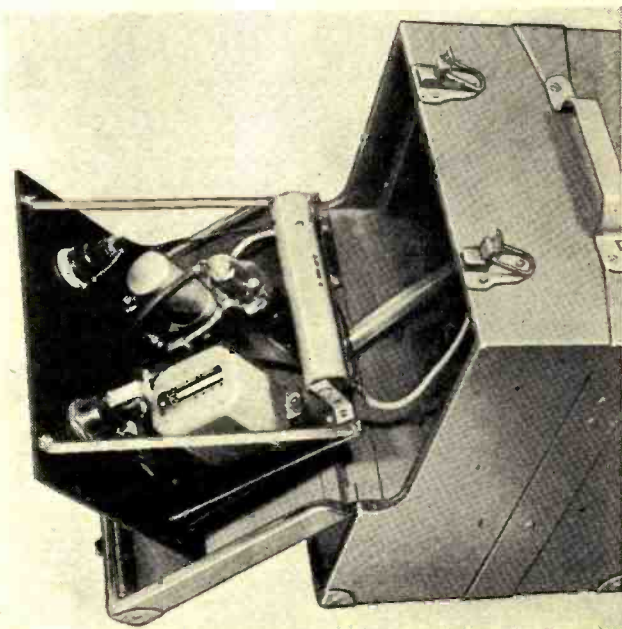
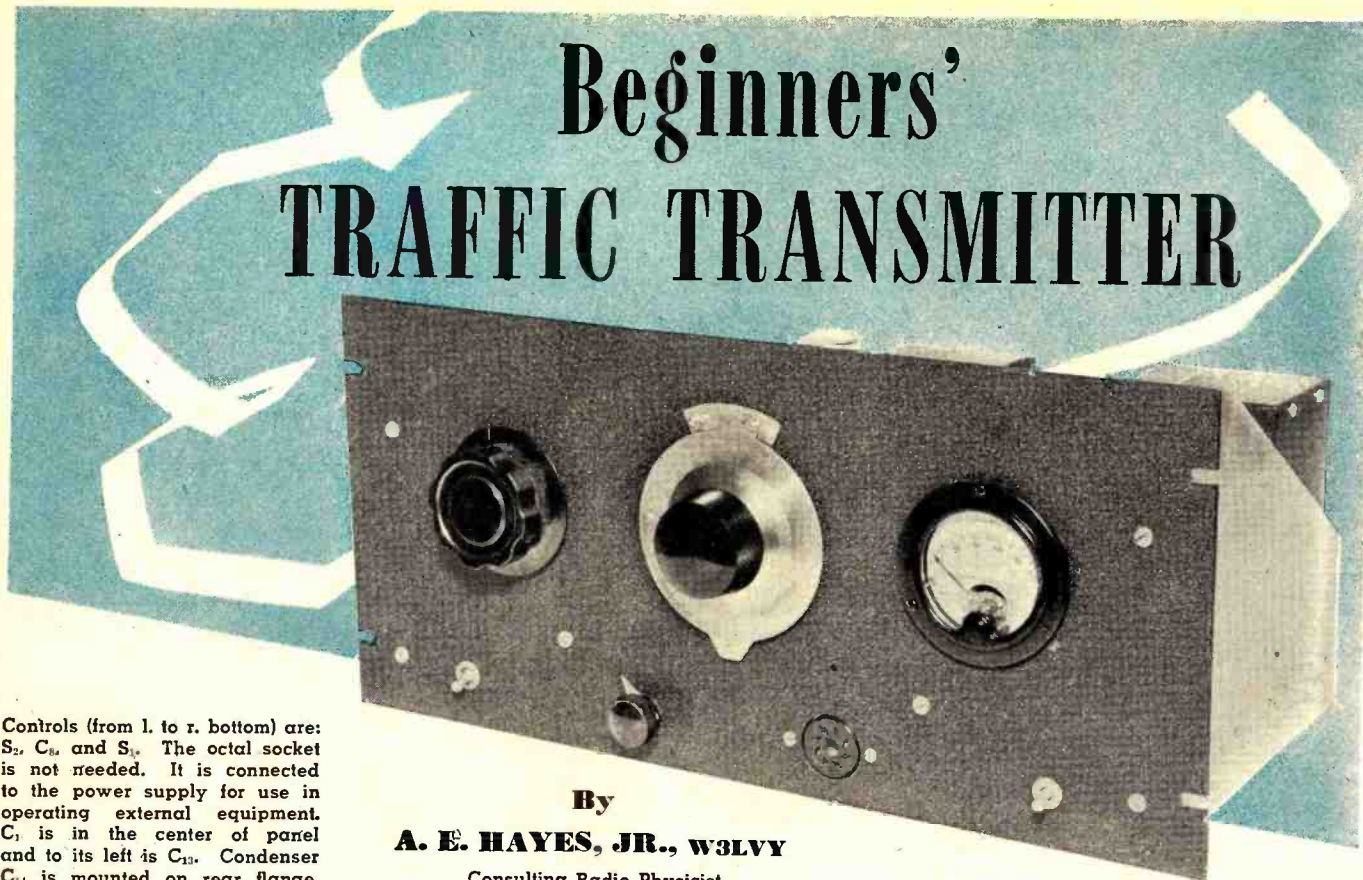


Fig. 6. Power unit with front panel removed to show arrangement of parts. Two leads connect unit to storage condensers.



Beginners' TRAFFIC TRANSMITTER



Controls (from l. to r. bottom) are: S_2 , C_8 , and S_1 . The octal socket is not needed. It is connected to the power supply for use in operating external equipment. C_7 is in the center of panel and to its left is C_{13} . Condenser C_{14} is mounted on rear flange.

By

A. E. HAYES, JR., W3LVY

Consulting Radio Physicist

Covers 80 and 40 meter bands without coil change and incorporates a v.f.o. with cathode keying.

WHEN the newcomer breaks into the traffic handling game he soon finds that his "Beginners' Transmitter" lacks several features which are essential to the traffic man and which are concerned with the oscillator circuit. The average beginner has a crystal controlled transmitter having an output of between twenty-five and fifty watts, and, more often than not, the unit is keyed in the amplifier circuit. Thus, break-in operation is impossible, and it is break-in that has contributed most during the past several years to the speed and efficiency of our major nets.

Keying the crystal oscillator is not much of a problem, as any reasonably good crystal will key quite satisfactorily up to 25 or 30 words per minute providing the principles of good design are incorporated in the circuit. In virtually any of the amateur handbooks there is a variety of crystal oscillators designed for oscillator keying.

Due to the relatively new procedure of operating most of the major traffic nets on a number of frequencies simultaneously, that is, having stations swapping messages on a number of different frequencies above and below the nominal net frequency, the crystal oscillator has become almost a "dead pigeon" due to the expense of procuring the necessary number of crystals.

Another procedure that multiplies this "cost factor" of crystals is the fact that an individual station may often be called upon by the Net Control Station to QSY to the frequency of another net to see if they have any traffic. A good variable frequency oscillator, or v.f.o., is, therefore, almost a necessity.

The above-listed requirements would seem to pose a difficult problem, a v.f.o. that keys well. In most instances the newcomer, examining a possible v.f.o. transmitter diagram, is presented with a circuit including at least an electron-coupled oscillator, one or two "Class A" buffers to isolate the oscillator from the remainder of the circuit, and a driver; all this before the final stage is considered. It is small wonder, then, that the beginner usually sticks to his simple crystal controlled transmitter, and thus is effectively prevented from getting into the traffic game.

It is the object of this article to describe a transmitter having a v.f.o. that is beyond reproach, both from the standpoint of frequency stability, and of "keyability." The transmitter to be described was built by the writer after a careful consideration of the design problems involved, and has been used nightly on one of the largest and fastest nets in the country (The Traffic Outlet), and on the very formal ARRL Trunk Line C. Reports are uniformly

all that any operator could desire.

The following specifications were decided upon, before proceeding, as the framework into which the transmitter must fit:

1. Power input to the final tube of about 50 watts.
2. Unit construction—that is, the entire unit including power supply and antenna tuning network must fit into a single 8¾ inch relay rack cabinet.
3. An antenna tuning network which effectively couples power into an antenna having any length from 25 feet to 500 feet or more.
4. A v.f.o. having no measurable drift after a 15 minute warmup period, and having a keying characteristic with no perceptible "chirp."
5. Eighty meter or forty meter operation without coil changes.

It was decided to first attempt a simple two-stage transmitter, a simple oscillator-amplifier arrangement. Reference to all of the established texts indicated that such an arrangement could not possibly be satisfactory, due to the lack of isolation between the frequency determining circuits and the power circuits, etc., but we proceeded, and evolved the circuit shown in Fig. 1.

In the circuit, the 6V6 oscillator is connected in a conventional electron-coupled Hartley oscillator arrangement, the frequency of which is determined by the tank circuit formed by the paralleled group comprising the condensers C_1 , C_2 , C_3 , and the inductor L_1 . Two things of top impor-

tance must be observed in the construction of the oscillator—the .001 μ f. padding condenser C_3 must be of the type (as for example, *Aerovox* Type 1570-257L) capable of carrying a large radio frequency current and the inductor must be wound of large diameter wire on an extremely rigid, low-loss form. The coil form used in the transmitter illustrated was one of the ribbed ceramic forms available in many of the government surplus units on the market. The entire tank circuit must be wired with heavy wire, preferably silver-plated if such is available, and must be arranged in such a fashion that circuit losses are kept at a minimum. The screen and plate voltages of the oscillator are stabilized between very narrow limits by the regulator tubes V_4 and V_5 . The sliding tap on the resistor R_1 is adjusted so that the current through the regulators is about 30 ma. in the "key up" condition.

The oscillator is coupled through a condenser C_8 to the grid of the 807 amplifier, and the screen of the 807 is tied to the regulated 255 volts across the series-connected regulators. This latter precaution, though unconventional, serves to eliminate the last traces of chirp on the keyed signal. The cathodes of both the 6V6 and the 807 are effectively tied together and connected to ground through the resistor R_2 across which the key is connected through the open-circuit jack J_1 . The use of the resistor R_2 in shunt with the key serves to greatly reduce any key clicks which might be produced by conventional cathode keying arrangements.

The amplifier is connected to the antenna-ground system through a modified pi-section tuning network, and the switch S_2 serves to permit the amplifier to supply power to the antenna in either the 80 or 40 meter bands. It will be found that this output arrangement allows the operator to use an antenna of almost any conceivable length, a feature of importance for those of us who must live in apartments and must be satisfied with a simple wire leading out the window to the nearest tree.

By way of explanation, it must be pointed out that the condenser C_3 is of such large physical size in order to minimize the heating effect due to r.f. losses through it. The less the heating of the components of a v.f.o. tank circuit the better, and in this case it is impossible to detect any rise in temperature over the ambient of any component except the 6V6 after several hours of operation. The constants of the grid tank circuit of the oscillator are selected to provide substantially 100 per-cent bandwidth of the eighty meter c.w. band. The actual calibration curve, as measured, is illustrated in Fig. 2. It will be seen that the calibration is essentially linear except for a slight curvature at the low frequency end of the band. This is to be expected in the type of bandspreading circuit used. The small trimmer C_2 adjusted originally to make the band edges

December, 1947

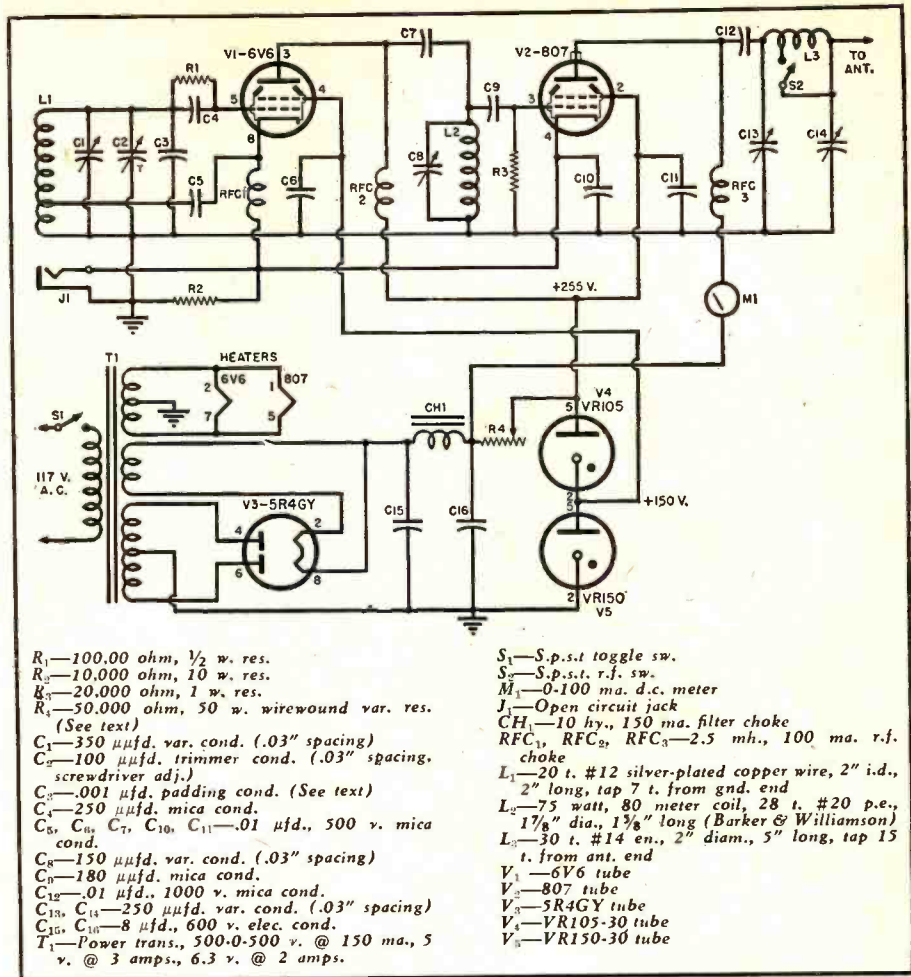


Fig. 1. Circuit diagram—a conventional Hartley oscillator is used.

"center up" on the tuning dial, may be used to correct the calibration providing any long term drift due to tube aging or the like is found. No such effect has been observed by the writer after several hours of operation.

In operation the grid circuit of the oscillator covers the range 1750 to 2000 kc. and the plate tank circuit C_9, L_2 is tuned to the second harmonic

range which is the eighty meter band. The plate circuit of the 807 is tuned to 80 meters when the switch S_2 is in the "open" position, and to the 40 meter band when the switch is closed. The 807 thus functions as a doubler on 40, but it has been found that with the amount of drive available from the oscillator the output on 40 may be
 (Continued on page 171)

Rear view shows placement of various above-chassis components.

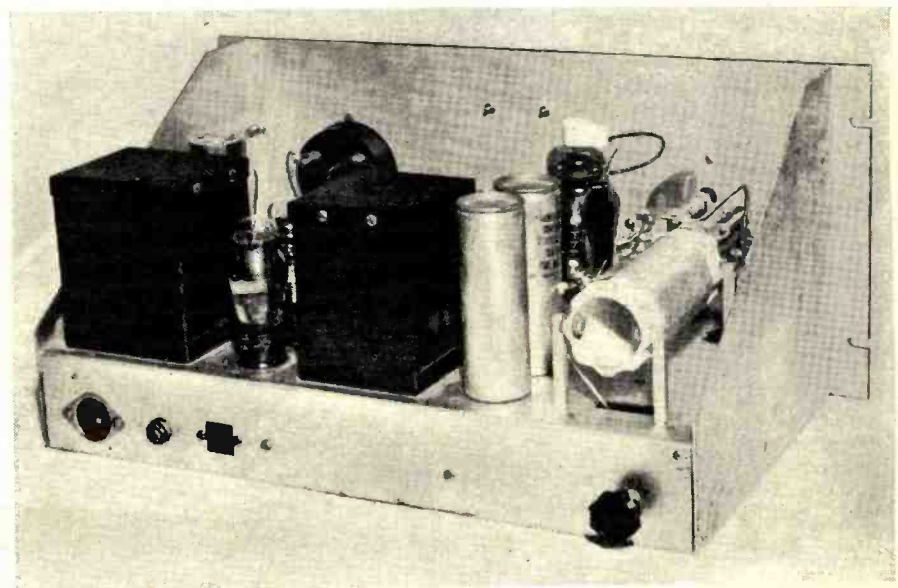
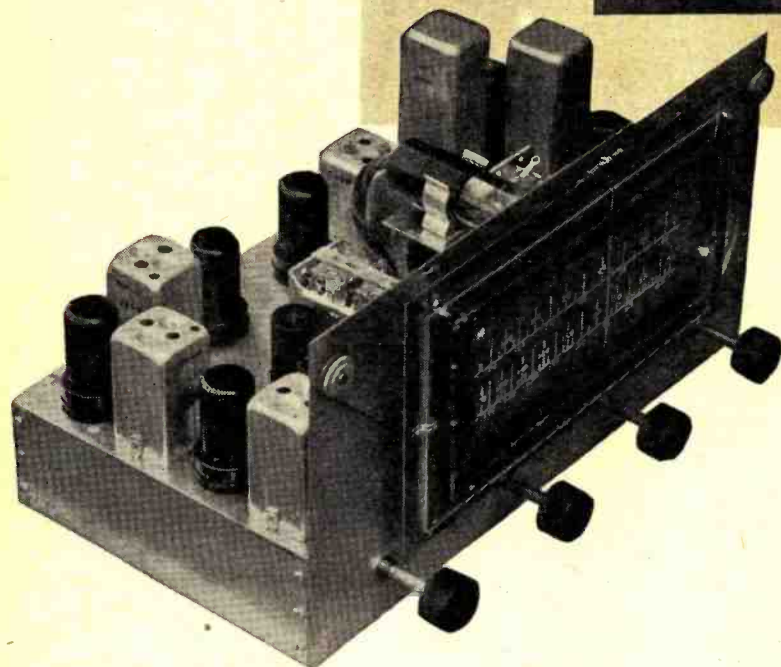


Fig. 1. The Browning RJ-14 (top) and the RJ-12 (bottom) tuners represent two of the many different makes of commercially built, high quality tuners that may be used for recording off-the-air programs.



Part 10. Covering a discussion of two representative tuners, well suited to recording radio programs directly off-the-air.

By OLIVER READ
Editor, RADIO NEWS

The Recording and Reproduction of Sound

ONE of the major requirements for the recordist is a good high quality tuner for picking up signals from local transmitters and, in particular, for purposes of recording high quality music or other entertainment on his discs, etc. The requirements permit latitude in the selection of a tuner as we may begin with a simple two or three tube job employing tuned r.f. circuits, and later procure one of the universal FM-AM tuners, such as the one to be described, when we wish the ultimate in FM-AM reception for recording purposes or public address installations.

Such tuners include the *Browning* RJ-12 and RJ-14, Fig. 1, which are designed for high fidelity reception in the 88-108 mc. FM band as well as the standard AM broadcast band. This tuner is designed for maximum performance when used with a 300-ohm FM antenna. Almost any commercial FM antenna having this impedance should work satisfactorily. It is im-

portant that no part of the antenna system be grounded because of the balanced feed required on FM operation. On AM operation, the entire antenna and feeder act as the antenna. The antenna system should, therefore, be located as high as possible. For those who wish to build their own antenna, a drawing has been provided to furnish the necessary information. See Fig. 3.

Shielded leads from the tuner to the recording amplifier are essential. When making up the cables, the center conductor should be stripped, tinned and inserted in the center sleeve of the male connector and heated until the solder flows, making a good joint. It is well to bring the braid up on the outside shell of the plug and solder all the way around. There are some cases where the shield on the lead between the audio output of the tuner and the amplifier employed may not be a sufficient ground bond between the two. In cases where

there is any hum, not present in the amplifier itself, bonding of the amplifier and tuner with copper braid of No. 16 or larger wire, should be used.

The power requirements for the tuner are 250 volts d.c. at 65 milliamperes and 6.3 volts a.c. or d.c. at 4 amperes. Occasionally the voltages are available from the recording amplifier. If these voltages are not available, a separate power supply should be used. A schematic diagram of such a unit is incorporated in the diagram Fig. 5.

The FM section of the tuner employs the famous Armstrong circuit. In the r.f. portion we find several new miniature type tubes (Fig. 5), a 6BA6 r.f. amplifier, a 6BE6 mixer, and a 6C4 triode oscillator. Following the mixer are two i.f. amplifier stages that operate at a center frequency of 8.25 mc. Excellent gain is realized in the r.f. stage and in its conversion to the intermediate frequency amplifier. In order to obtain the most effective

quieting, two limiters are used in cascade. Assuming that proper limiting is used, then the major source of distortion in FM circuits lies in the non-linearity of the discriminator characteristic. When this curve of frequency versus output voltage is linear over the range of modulation, there can be no distortion in detection. This tuner has an excellent linear characteristic. High frequency pre-emphasis, purposely introduced at the transmitter, must be compensated for in the tuner if we are to obtain a linear output voltage. A suitable high frequency attenuator compensates for the standard degree of pre-emphasis which is inserted at the transmitter.

The superheterodyne circuit employed in the AM section has one r.f. stage and one i.f. stage. It further employs a diode detector to provide audio and a.v.c. voltage. A sensitivity of one microvolt or better over the entire band is made possible by employing recently developed tubes. The bandpass of the i.f. amplifier provides a high selectivity much desired for average interference-free reception. Noise reduction benefits are realized due to this selectivity and yet the quality of reproduction remains excellent.

One of the features of this commercially built tuner is the insertion of a wave trap that is tuned to 450 kc. to provide a low impedance path to ground for any signal that might otherwise cause interference. This is to eliminate local high power, low frequency code stations in particular.

Especially designed recording amplifiers will be described in later chapters. They are well suited for use in conjunction with the *Browning* tuner as well as the simple home-made tuner to be described in the following paragraphs.

T.R.F. Tuner

A high fidelity radio frequency tuner suitable for use with a recording amplifier or public address system may be constructed from parts readily available in the average junk box. The tuner to be described was designed by *E. Bruce Pray, Engineer, Electronics Division, Sylvania Electric Products, Inc.*

In addition to its being useful for recording or in conjunction with large permanent p.a. and paging systems (such as are installed in factories, clubs and parks), the radio tuner may be coupled to all types of portable amplifiers such as small truck amplifiers and record players.

The tuned r.f. circuit is well suited to recording applications because of its inherent low distortion. The latter is obtained at somewhat of a sacrifice of tuning—the tuning ordinarily tending to be broader than in a standard superheterodyne. However, the tuned r.f. section may be engineered to have good selectivity, as well as fidelity. Another outstanding advantage is the fact that the tuned r.f. "front end" picks up less noise interference than

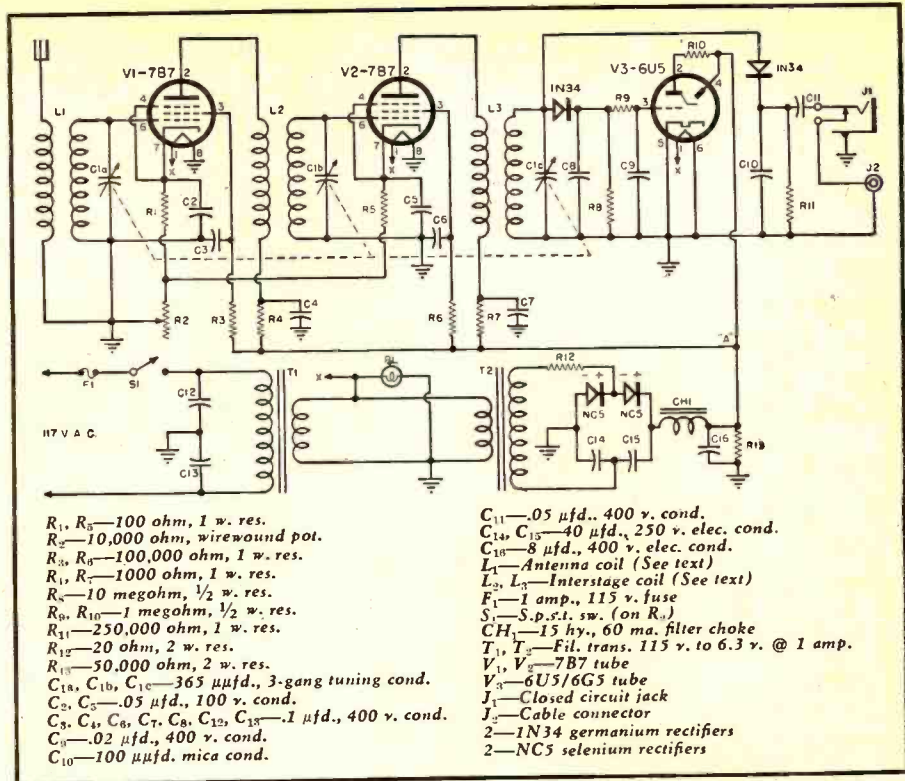


Fig. 2. Schematic diagram of a home-built, three-tube, t.r.f. tuner. The unit covers the AM broadcast band and is suitable for recording purposes.

many of the low-priced sharper tuning superhets.

This tuner has been designed for maximum selectivity rather than maximum amplification, and consists of two transformer-coupled pentode tubes, feeding into a germanium diode rectifier acting as the detector.

It is often of great importance that an r.f. tuner introduce as few additional tubes as possible. Here, we have handled this situation by employing a germanium crystal diode as the detector, and a selenium unit as the separate power supply rectifier. The rectified audio signal is delivered to an output jack located on the rear of the chassis, and to a headphone jack located on the front panel. This arrangement enables the operator to monitor the tuner ahead of the amplifier into which it feeds. This is a convenience, especially during tuning-in periods. The final radio frequency signal is also fed to another germanium

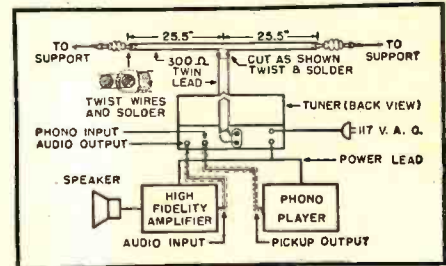


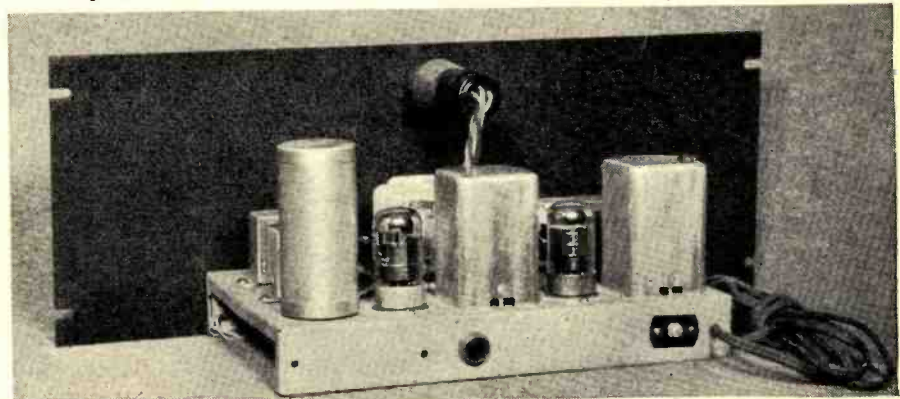
Fig. 3. Diagram shows installation wiring of an FM-AM tuner. Details for antenna construction are also given.

rectifier, the output of which is filtered and fed to the grid of an electron ray indicator tube.

This second crystal unit serves to clear up the eye image, giving a sharper pattern than ordinarily would be obtained.

The power supply operates from a 115 volt, 60 cycle source and consists of two 6.3 volt, 1 ampere filament

Fig. 4. Rear view of t.r.f. tuner. Location of parts should be followed closely.



transformers with their secondaries connected together. The junction of the two secondaries is used to supply the filaments of the amplifiers, while the output of the combination, approximately equal to the line voltage, is fed to two selenium rectifiers connected as a voltage doubler. This back-to-back transformer arrangement per-

mits use of the line voltage without the dangerous ground-return common to a.c.-d.c. line power supplies. At the same time, tube heater voltage is supplied without having to incorporate line-cord resistors. The additional plate voltage supplied by the voltage doubler results in higher output and greater sensitivity

than would be obtained with only 115 volts on the plates of the tubes. The output ripple of the voltage doubler combination is reduced to a minimum by the addition of a 15 henry filter choke and an 8 μ f. condenser. The 50,000-ohm bleeder resistor completes the power supply which will be more hum-free than either a series-flament arrangement or an a.c.-d.c. transformerless supply.

Layout is an extremely important factor. The first decision that must be reached in constructing electronic equipment is that of proper location of parts, and selection of a suitable chassis. This, at first sight, might appear to be wasted effort, but after rebuilding a unit several times, one then fully realizes the importance of proper parts location.

The amplifier employs a 7"x11"x1 1/2" chassis and a standard 7"x19" panel. Above the chassis (Fig. 4) are located the tuning condenser, the two filament transformers, the three shielded r.f. transformers, the two tubes, the filter choke, and the magic eye.

The transformers and choke are mounted together and in such a way that their fields do not interfere with the tuning condenser (C₁). The tubes and coils are arranged across the rear of the chassis, with the antenna coil at the extreme left hand corner, followed by the first r.f. amplifier, the first r.f. coil, the second r.f. amplifier and the second r.f. coil. Locate the magic eye on the front panel directly over the dial.

In mounting the tube sockets (Fig. 6), arrange each one so that its grid contact is nearest to the coil connecting to the preceding stage. The plate contact then automatically will be opposite the coil of the following stage. The antenna and ground binding posts should be located at the rear of the chassis, just under the antenna coil.

Locate the two selenium rectifiers on the front of the chassis by means of two machine screws inserted through the mounting eyelets which are insulated from the discs. Caution should be exercised to avoid grounding the discs of the rectifier. These discs carry the a.c. potential, and a short circuit at this point might damage the filter condensers, the rectifiers, or the transformers. The chassis position of these rectifiers should always be such that they are not mounted adjacent to any heat-dissipating components, such as power tubes, high-wattage resistors, etc.

The two germanium crystals are mounted on a terminal strip which is placed along the left hand edge of the chassis. All grid and plate leads should be as short and direct as possible, and the plate leads kept close to the chassis.

(Continued on page 106)

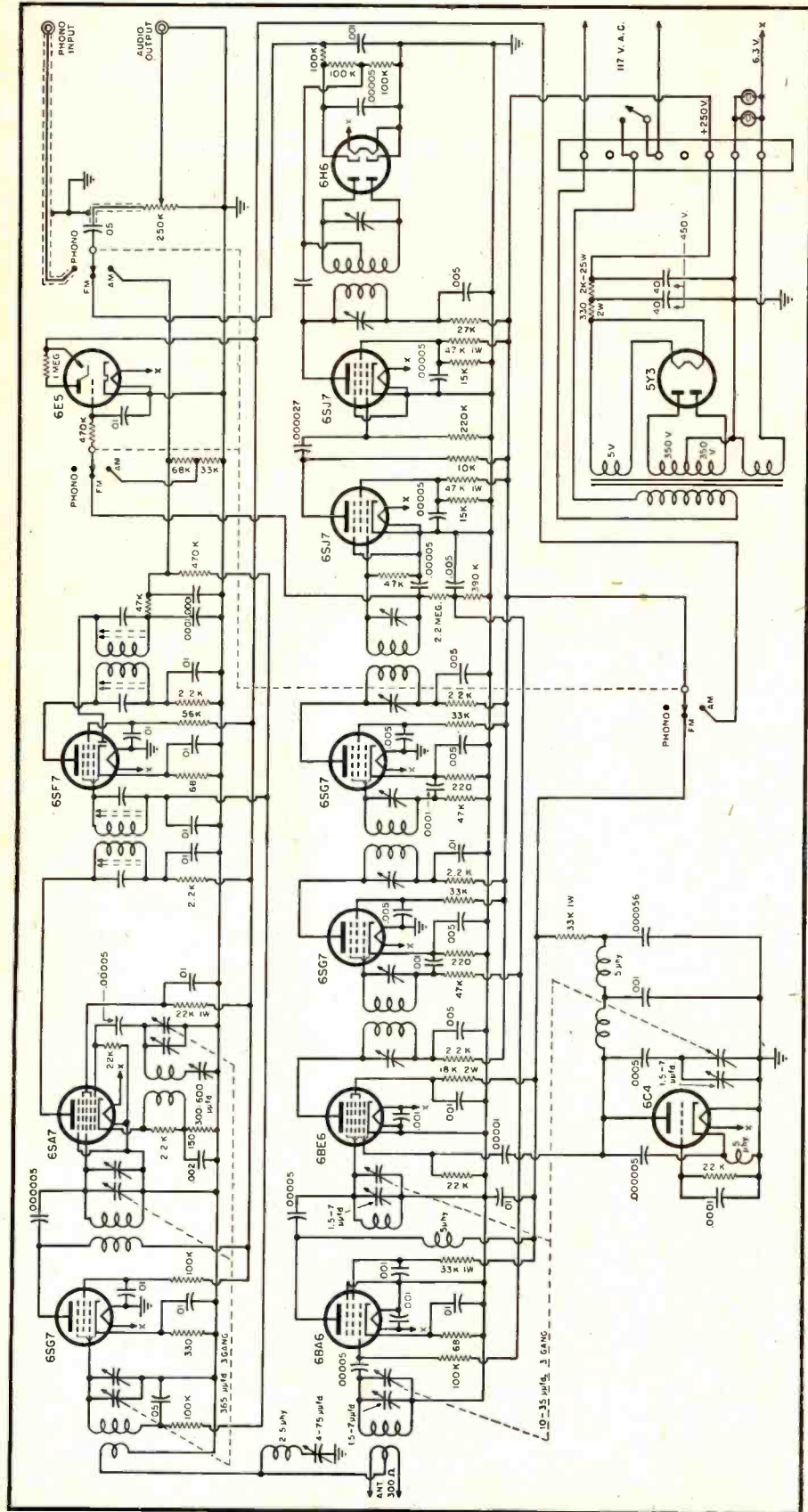


Fig. 5. Complete schematic diagram of Brown- ing Models RJ-12 and RJ-14 FM-AM tuners. The power supply which is incorporated in this schematic diagram is actually built as a separate unit and connected via cables.

Build Your Own AUTOMATIC KEY

Two views of the completed, home built automatic key. Over-all size is 3"x 4"x 5". No external power supply is required. Knob on side of case is speed control, R₁. Note position of the micro-switch.



By

G. W. GUNKEL, W6NMS

Code key that provides automatic dots and dashes is low in cost and extremely simple to construct.

A NUMBER of articles have been published in recent years on the subject of automatic keys. Such a key should meet the following specifications: It should make perfect dots, dashes and spaces; be a single unit of the same size or smaller than a standard mechanical key; it should not be necessary to resort to purchasing a standard key in order to adapt it to an electronic key; the power supply should be included in the unit; it should be ready for instant operation without tube heater lag or consuming power in the standby period; be low cost. The key herein described is the only one, to the author's knowledge, that meets all of the above specifications.

The theory of operation is extremely simple and can best be compared with that of an ordinary buzzer or doorbell. The make and break system is the same; however, a sensitive relay connected as a buzzer is used and condensers switched across it. The time necessary for the condensers to discharge into the relay provides the necessary time lag.

Fig. 1 shows the circuit diagram for automatic dots and manual dashes. Switch X consists of a spring keying arm (a piece of hacksaw blade works well) that pivots between contacts A and B. When the keying arm is in the dot position, touching contact A, the alternating current flows through the selenium cell rectifier (a Federal 100

ma. type) where it emerges as direct current; it then flows from the keying arm X to the top contact of one side of the double-pole, double-throw relay; thence, across the contacts to the relay coil and condenser C₁. The relay closes, opening the top contacts and the condenser C₁ starts to discharge. The relay stays closed until C₁ is completely discharged, at which time, the relay arm springs back and again makes connection with the top contact. This process repeats itself as long as the keying arm is held in the dot position. The time necessary to discharge C₁ and hence the speed of the dots is regulated by R₁, the 10,000 ohm linear taper potentiometer connected across the relay. The spacing between dots can be adequately adjusted by varying the spring tension on the relay armature and the spacing between the relay contacts. These relay adjustments are the same for all speeds and need be

made only once. The two lower contacts on the other pole of the relay are connected to the circuit to be keyed. These contacts are connected when the relay is in the down position.

Manual dashes are made by moving the keying arm against contact B. This throws the direct current directly across the relay. The relay will open and close in conjunction with the movement of the keying arm from neutral position to contact B and return.

Fig. 2 shows the schematic for automatic dots and dashes.
(Continued on page 144)

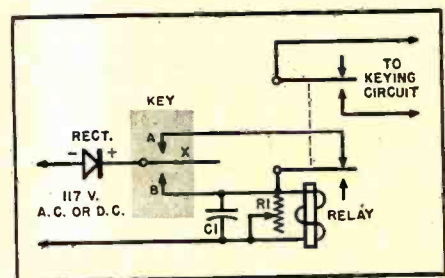
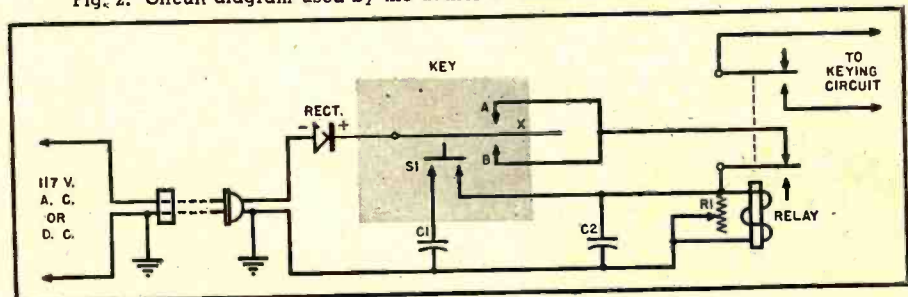


Fig. 1. Circuit that may be used to obtain automatic dots and manual dashes.

Fig. 2. Circuit diagram used by the author to obtain automatic dots and dashes.

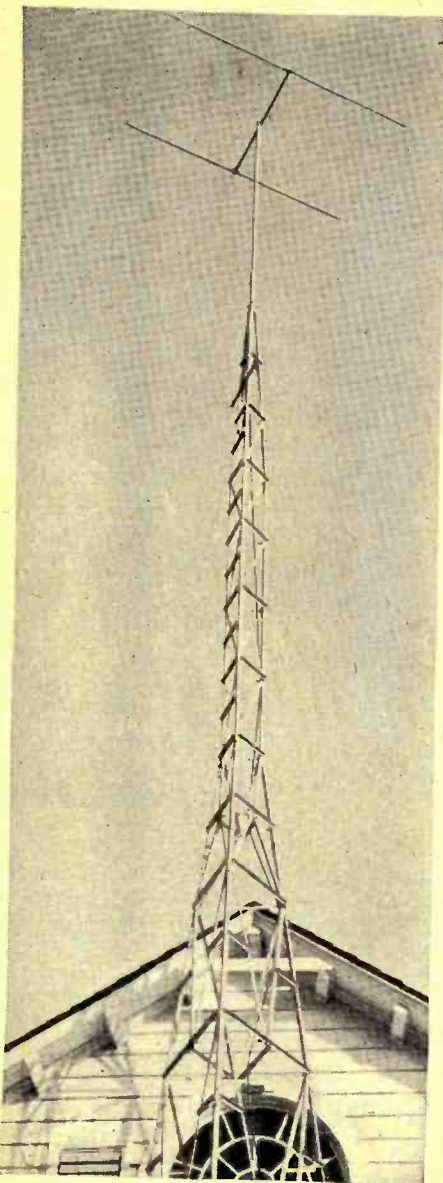
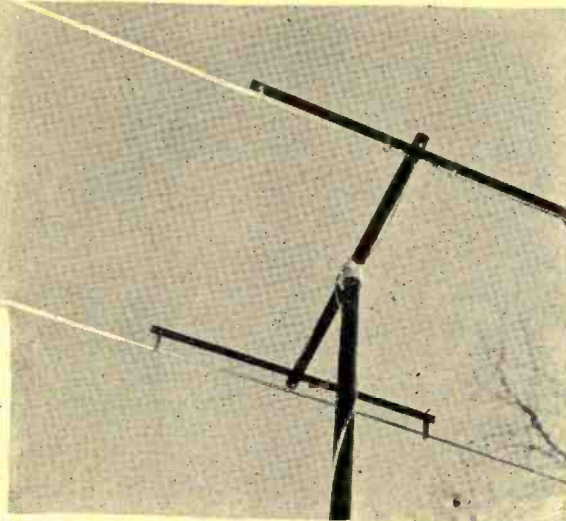


TELEVISION INSTALLATION

By W. W. WAYE

Part 4. City and urban locations usually require specialized techniques and highly directional antennas for ghost-free reception.

Fig. 1. The conventional dipole-and-director antenna is adequate for most installations, but a more highly directional antenna may be required in city or urban locations to overcome ghosts.



A CRITICAL requirement of every modern television set is an efficient installation capable of providing adequate reception—free from ghosts and other interference—on the TV channels desired by the customer. Properly installing a television antenna and lead-in system is no simple matter, however, because every installation is different.

The work is influenced by the type and size of the customer's house or dwelling or business establishment, and by its location with respect to local television transmitters as well as any nearby, large buildings. The work is complicated by any of several installation problems, which invariably are of more serious nature when the location is in the vicinity of urban, industrial, or commercial districts.

For a few urban locations, a single dipole may sometimes provide satisfactory reception. Usually, however, either a director or reflector is used with the dipole for greater directivity. With such a two-element arrangement (Fig. 1), there is very little pickup from the rear, and much sharper directivity with an increase in "gain" or signal strength in the forward direction. These basic antennas, previously discussed, prove entirely adequate for most suburban installations and for many urban installations.

However, in many city or metropolitan locations, it may be difficult—sometimes impossible—to site and orient such antennas for adequate, ghost-free reception, following the *Basic Procedure of Installation* (Table 1). The resulting poor reception, obtained at such locations with the set operating normally, is visible directly

←
Fig. 2. An increase in height of the directional antenna provides better signal reception with less electrical interference.

on the receiver picture tube, and may be analyzed in terms of these symptoms:

1. *Weak pictures* on one or the other, or both, of the *Primary* and *Secondary Channels* preferred by the customer. These pictures are often speckled with a "snowy" effect, and the image may not hold steady on the screen.

2. *Ghost images* of the direct picture signal, or, blurry or diffused reception which does not move or change. The effect is always characteristic of only one channel; it is decidedly different or even non-existent when other channels are received.

These are two common symptoms of a poor antenna installation. They are regularly encountered in urban locations, and are important indications of "what to do next."

In some cases, only a further adjustment or better siting of the existing antenna is required. In many cases, however, a more highly directional antenna is necessary for good reception, according to the degree and nature of the symptom of poor reception.

Importance of Height

With the set using a directional antenna (a dipole-and-director) and operating normally, reception of weak or "snowy" pictures on one or more television channels (Symptom 1) indicates that insufficient signal power is being received by the existing antenna. A building or other large obstruction may be blocking the direct or line-of-sight path between the receiving antenna and the transmitter, or the receiving site may be located a considerable distance from the transmitter. In either case, the best solution to this problem is to increase the height of the receiving antenna.

If a higher location is available, the

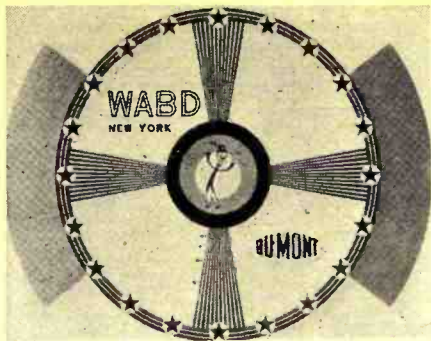


Fig. 3. Normal picture signal of test pattern as received on primary television channel.

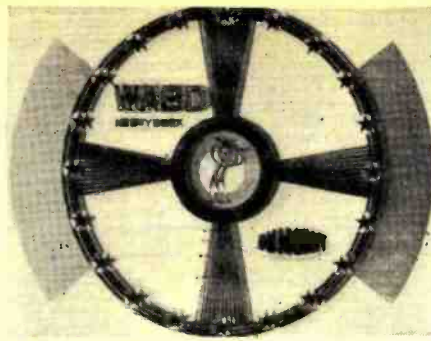


Fig. 4. Hazy effect caused by a ghost image, slightly displaced from the direct image.

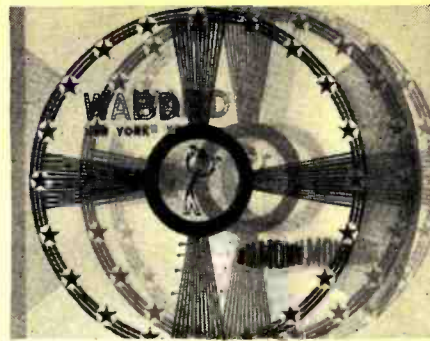


Fig. 5. Multi-image reception caused by several reflected signals appearing at antenna.

antenna should be resited. Even an elevation increase of a few feet may be sufficient for greatly improved signal reception.

However, when it is physically impossible or impractical to find a fixed location of sufficient height, the antenna should be mounted on a suitable mast above the house or building (Fig. 2). Despite the resulting increase in the cost of installation, the customer will usually approve such construction when the reception problem is properly explained.

Suitable towers can be obtained from manufacturers or structural steel companies. Proper guying and other mechanical factors of safety and sturdiness must be considered in erecting such a tower.

Siting and orienting of the antenna at high elevations follow the usual procedures (Table 1). Since long transmission lines are required for such installations, impedance matching between receiver and lead-in and between lead-in and antenna is of extreme importance.

Fig. 6. Photograph shows a typical urban installation where a conventional dipole and reflector antenna is used to provide adequate reception on the two preferred TV channels as selected by the customer.



December, 1947

A good general rule for all television installations is to erect the antenna in the clear and as high as possible.

Increased height is of particular importance when the receiving site is more than 30 miles from a television transmitter, and often may provide adequate reception of signals at particularly remote receiving locations which would not otherwise be possible.

Additional height also provides greater security from ignition and motor "noise" and other types of electrical interference.

Reception of Ghosts

The appearance of multiple images or ghosts (Symptom 2) is an indication of the reception of more than one signal from the same transmitter. Ghost images are caused by reflected signals arriving from various directions different from the direct or line-of-sight path, and their appearance on the television screen is due to the insufficient directivity of the receiving antenna.

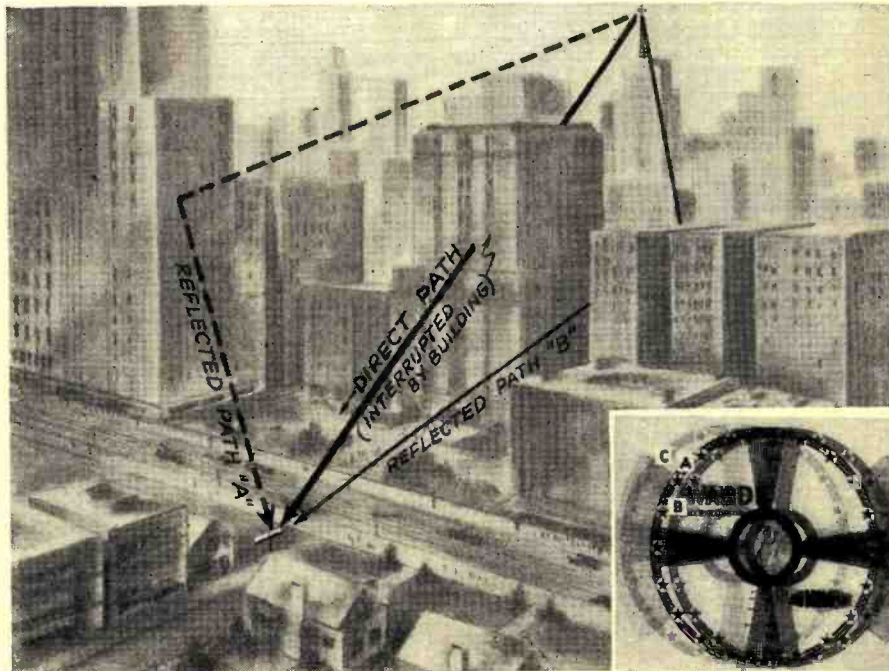
This is one of the most important

problems of television installation. It is a common source of poor reception, encountered in all urban installations, and is a perpetual challenge to the ingenuity and ability of the technician or serviceman.

Picture signals radiated by a transmitter travel outward (in straight lines) in all directions, until the waves reach a resonant antenna, or until they strike a surface or large object and are reflected in various new directions. Since a receiving antenna is usually located as high as possible, within so-called "optical sight" of a transmitter, a direct wave (following a line-of-sight path) is the first signal to reach a receiver tuned to that channel, and this appears on the picture screen as a direct image (Fig. 3). Other radiated picture signals are reflected by various surfaces in such a way that some of these waves also arrive at the receiving antenna—but a few microseconds later than the direct wave.

When a receiving antenna is not properly sited and oriented, or is not

Fig. 7. An urban installation providing reception of three images from single station, with reflected "ghost" via path "A" stronger than direct image or ghost via path "B" (see inset). The dipole is directed toward source of reflected "A" signals for best reception, and addition of director (or reflector) removes two unwanted images from picture screen. Pattern "C" (inset) is obtained from "direct path" signal.



LOCATING THE RECEIVER

Best position must be satisfactory to customer, free from sunlight and electrical interference; with adequate space for viewing screen.

1. Install receiver carefully.
2. Check operation with makeshift dipole.
3. Determine customer's choice of 2 stations, for Primary Channel and Secondary Channel.

PREPARING THE LEAD-IN

Best lead-in for "probing" is "twin-lead ribbon." Match impedances. If set input is marked 300, use lead-in with 300-ohm rating. For 75-ohm input, use 75-ohm lead-in.

1. Cut extra-sufficient length of lead-in to reach from set to any point on roof.
2. If 300-ohm lead-in is used, connect short Matching Section (a 36-inch piece of 150-ohm "twin-lead ribbon") to end of lead-in on roof.

PREPARING THE "PROBE"

Installation "probe" consists of typical commercial dipole, mounted on pole, and connected to set by lead-in. Dipole is portable.

1. Assemble dipole of 2 metal rods. Use over-all dipole length of 78 inches to receive ALL channels. To favor certain channels, use:

Channel	Over-all Dipole Length.
1	108 in.
2	90 in.
3	81 in.
4	73 in.
5	64 in.
6	60 in.

2. Connect lead-in (and Matching Section) to dipole.
3. Run wires and install simple two-way telephone or intercom between roof and set.

SITING THE ANTENNA

Best site is determined experimentally, using two-man coordination system. While man on roof uses "probing" dipole to test various locations, man at set observes merit of locations in terms of signal strength and picture quality, and absence of ghosts and noise interference.

1. Site is selected for best reception of Primary and Secondary Channels, with least effect of ghost images.
2. Attach metal mounting bracket to roof.
3. If ghost interference is not too serious and picture signals are strong, assemble a directional antenna—either a dipole-director or a dipole-reflector antenna with a mounting pole of suitable height—and erect antenna in roof mounting bracket, leaving it free to rotate.
4. If ghost images predominate and/or if desired signals are weak, first "probe" for new site, then attempt much greater height. Assemble any type of highly directive commercial antenna and erect at best site, leaving it free to rotate in roof bracket.

ORIENTING THE ANTENNA

Previous two-man coordination system is used. Antenna is oriented and tuned, based on best results observed by man at receiver.

1. Rotate antenna to best position for ghost-free reception of Primary and Secondary Channels.
2. Tune antenna by adjusting all tunable factors for best signal strength and picture quality WITHOUT ghost reflections. Install in fixed position.
3. If noise interference persists throughout siting—and orienting, substitute (properly matched) coaxial cable for lead-in between antenna and set.
4. Install lead-in permanently, without slack. Recheck operation of set.

Table 1. Basic procedure for all television antenna installations.

sufficiently directional, it accepts these reflected signals and they appear on the television screen as fixed (but usually weak) images, which are identical to the direct image but are displaced horizontally and to the right of the direct image.

The amount of displacement is really an indication of the additional distance the ghost signals traveled to reach the receiving antenna. When this additional distance is short, the displacement on the screen may be so small that the result is a blurry or indistinct merger with the direct signal (Fig. 4). Greater displacements on the screen, however, produce more distinct multiple images (Fig. 5).

In all instances of ghost reception, the first image (to the left on the television screen) is the direct image. It is usually brighter than the "ghost" images, because the reflected signals lose part of their energy (or intensity) during reflection.

These unwanted signals are reflected by large buildings, apartment houses, skyscrapers, factory buildings, steel storage tanks, and other large objects or surfaces, which may be located at any distance and in any direction from either the transmitter or the receiving site. For this reason, ghost interference is particularly troublesome in metropolitan or city locations, where there are many large buildings acting as almost-perfect mirrors of television signals.

However, the procedure of eliminating ghosts is the same for either urban or suburban installations, because the key to the problem lies in the directional characteristics of these reflected signals. Ghost images arrive at the receiving site at different

angles with respect to the direct wave. For this reason, the receiving antenna must be sufficiently directional so that it accepts only the strongest signal from the transmitter—usually, but not always, the direct signal. This requires the introduction of some new techniques, within the scope of the *Basic Procedure of Installation*.

Ghost Elimination

After initial "probing" operations with a single dipole (Table 1) and temporary installation of a directional antenna—either a dipole-and-director or a dipole-and-reflector—it will be found, in most city or urban locations, that some degree of ghost reception is present regardless of the orientation of the directional antenna. This condition is very typical, and indicates that the directional antenna is inadequate in its particular location. A new site must be found, and the purpose of further roof activities is the reception of ghost-free signals.

Although a general procedure can be followed, each installation must be treated individually because of the specific problems posed by each location. Many hours, perhaps a day or two, may sometimes be necessary to find a ghost-free site in crowded metropolitan or industrial districts. For the two-man installation team, patience is an absolute requirement!

The importance of antenna height should first be considered as probably the simplest means of eliminating some ghosts. The usual 4- or 5-foot mast of the directional antenna can be replaced with a mast of much greater height. Or, the higher elevation of an adjacent building may be considered a better site.

Frequently, however, ghost-free reception with a conventional dipole-and-reflector antenna requires a thorough exploration of every conceivable site in the vicinity of the location most desired. This requires further, careful, patient "probing" over extended roof areas, and may even include amateur rigging and steeple-jack work atop some types of large buildings. In many instances a satisfactory site can be located, however, and then the antenna must again be oriented for reception of both Primary and Secondary Channels—and without ghost effects!

In one typical, metropolitan area, long and patient exploration revealed only one roof location that was free of ghosts (Fig. 6), where a conventional director-and-reflector Philco antenna could be used, without the additional expense of erecting a mast and without recourse to a more complicated, highly directional antenna.

Since the displacement of a ghost image (on the television screen) is a ratio measure of the additional distance required for the ghost signal to travel, it is sometimes possible to estimate distances to actual reflecting objects or surfaces by such displacement on the television screen. In this way, certain large buildings, water tanks, or other exposed objects can be identified optically. Knowledge of the location of such objects or surfaces can be used to good advantage in improving an existing antenna so that it is capable of rejecting signals arriving from the direction of such known reflecting surfaces.

As one example, a large, reinforced section of sheet metal or screening can be erected upright near the antenna, on a line with the distant source of reflected signals, so that the antenna is effectively shielded in that direction. The screen must be rigid with low wind resistance, and must be erected no closer than 8 feet from the antenna.

Ghost Utilization

In rare instances, a reflected signal may be desired in preference to the direct signal.

A condition is sometimes encountered in urban locations, where a reflected or ghost image may prove brighter and stronger than the direct signal, and the television antenna is oriented with respect to the source of signal reflections instead of to the transmitter.

In a typical case (Fig. 7), the path of the direct wave is almost entirely blocked by a tall building between the transmitter and receiving antenna. However, two reflected paths "A" and "B" are of significance. The latter wave is reflected by a small building. Wave "A" is reflected by a large, steel-and-concrete building, however, resulting in a reflected signal of considerable power reaching the antenna site. For this reason, the single dipole is turned broadside to the large building, the "source" of the strongest sig-

(Continued on page 124)

10.7 mc. I.F. TRANSFORMERS

By
J. C. MICHALOWICZ

Dept. of Elec. Eng.
Catholic Univ. of America

**Build your own i.f. transformers.
10.7 mc. is now standard for a
new band FM home receiver.**

THE re-allocation of the frequency-modulation broadcasting designation to the 88-108 megacycle band has necessitated the reconstruction of 42-50 megacycle receivers to intercept this new frequency. The most important changeover required is, of course, that of the high-frequency or input section of the receiver, but probably of equal importance, is the renovation of the intermediate frequency amplifier system, in particular, the i.f. transformers.

In choosing a proper intermediate frequency, it must be borne in mind that the image frequency must necessarily fall outside of the high-frequency band. With the old allocation of 42-50 megacycles, a 4.3 megacycle i.f. frequency was employed, its image being produced at 8.6 megacycles, which is well outside of the 8 megacycle band. So also with the new allocation of a 20 megacycle bandwidth (88 to 108 megacycles), an i.f. frequency must be used whose image falls outside of the FM band. Consequently, a frequency of 10.7 megacycles for intermediate frequency amplification has been adopted.

Although commercially-built 10.7 megacycle i.f. transformers of good bandwidth are available, they are fairly expensive. However, with the increasing availability of coil-forms and shield cans, one can construct his

own with satisfactory results. The materials used by the author are shown in Fig. 1. This type (an RCA product) is not absolutely essential; any adaptation of discarded i.f. transformer forms may be employed as long as the coil diameter and spacings as shown in Fig. 3 are followed closely. Also, the metallic shield should be of such a size as to permit at least the width of one coil diameter between the windings and the shield, both at the sides and at the ends of the coils. Inductively-tuned transformers are chosen in preference to capacitively-tuned ones, since they are more stable

and present a more compact finished product.

The winding data is shown in Fig. 3. Both secondary and primary windings consist of 17 turns of No. 28 plain en-

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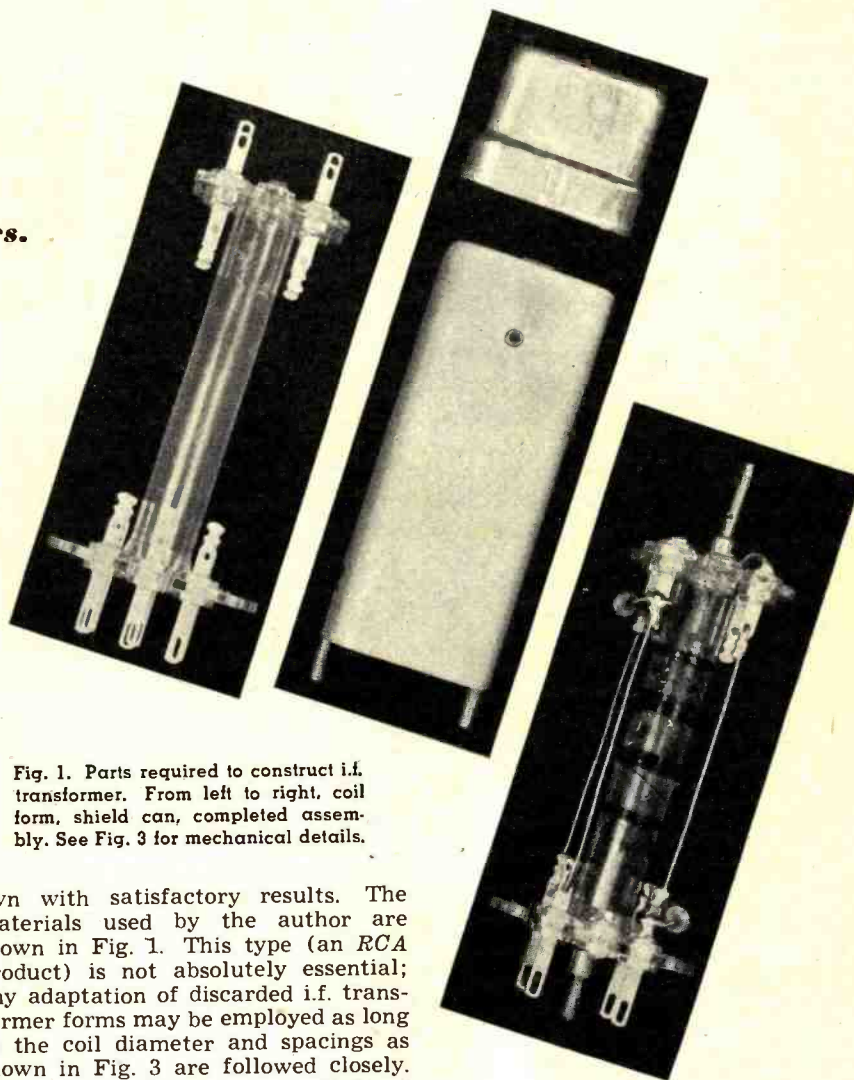
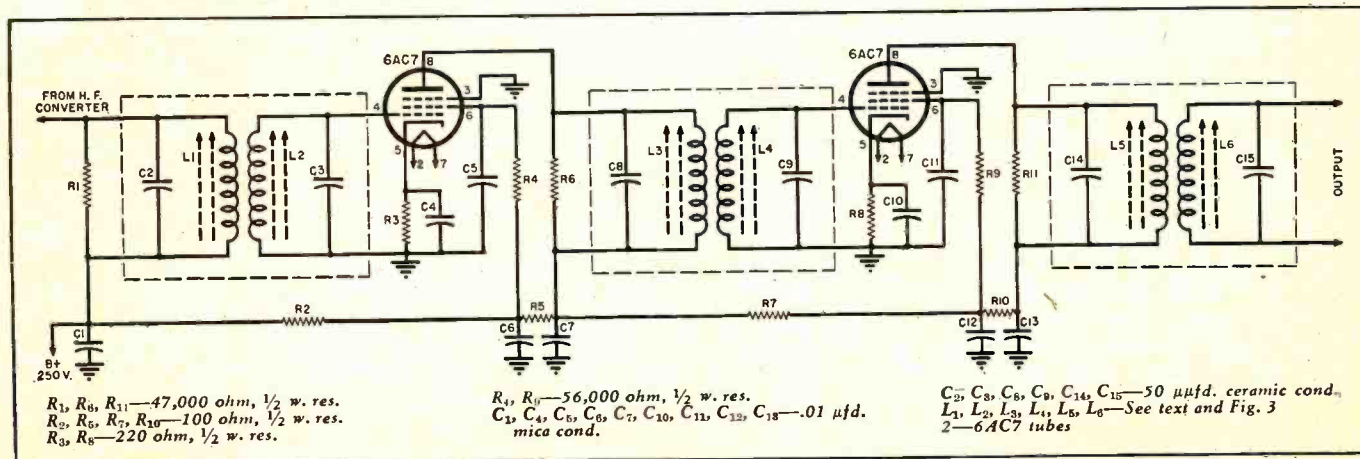
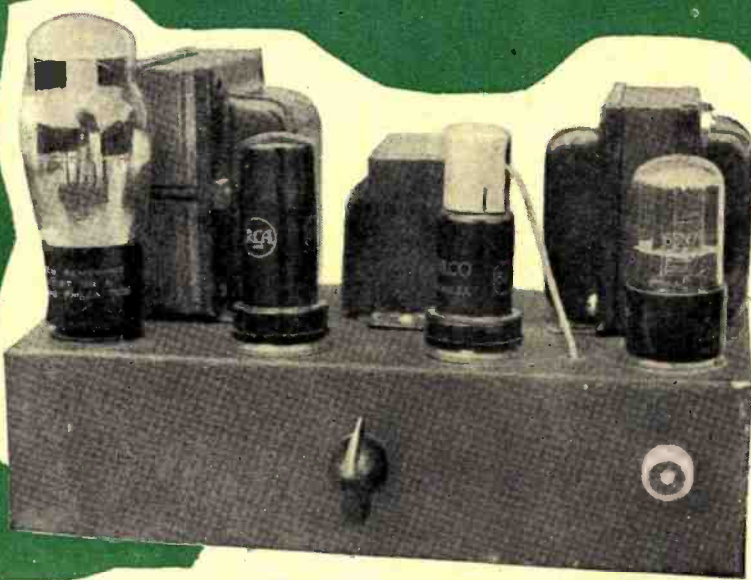


Fig. 1. Parts required to construct i.f. transformer. From left to right, coil form, shield can, completed assembly. See Fig. 3 for mechanical details.

Fig. 2. Schematic diagram of two-stage i.f. amplifier. All transformers are identical in design and construction.



An Experiment in Voice Controlled Relays



Unit designed and built by the author. It is being used to control the operation of a paging system.

By **LEON A. WORTMAN**
Radio Station WSYR

Just "say the word" and this electronic device will control the "on-off" operation of other equipment.

THERE are countless devices that are used to carry voice frequency modulations. Most of these devices, be they intercoms, public address systems, paging systems, radio-telephone transmitters, dictating machines or recording devices, must be operated manually before they will function. If the device can be operated automatically as soon as the voice or other modulating signal is

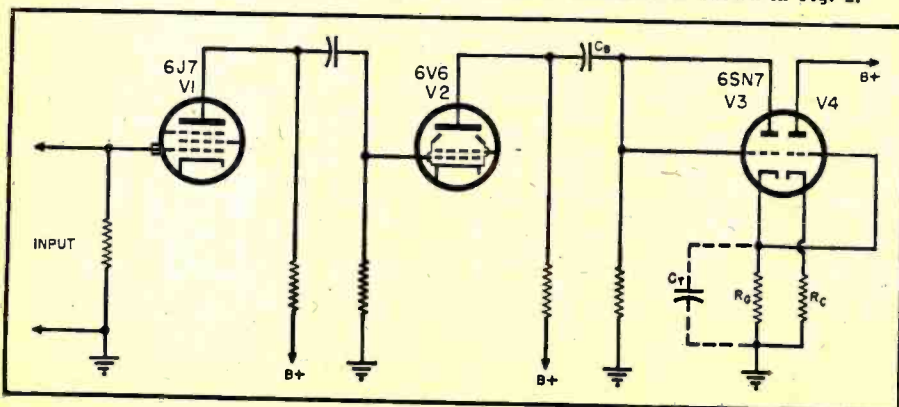
impressed on its input, and if the device can maintain operation during the period of desired modulation, and if the device can automatically stop itself at a predetermined time after the signal has ceased, such a device speaks for itself and no pun is intended. The idea was suggested by a friend who operates a large laboratory. There is a paging system throughout the lab and its associated offices

with the microphone placed at the switchboard for the telephone operator. This was designed to save that poor overworked switchboard operator all the abuse that is heaped on her head for having forgotten to switch the microphone on when she paged "Mister Smith on two three wun!" Or she would forget to turn the microphone off after use and the whole plant became an audience for her personal conversations. The unit to be described, when added to the existing paging amplifier, eliminated the "switch throwing" operation entirely. The amplifier began feeding immediately as she started talking into the microphone and the amplifier stopped when the talk stopped.

Fig. 1 diagrams the basic circuit for the unit that was installed to perform these functions. A signal voltage impressed on the input terminals of the unit is amplified by V_1 and V_2 . C_B , acting as a blocking condenser for the d.c. plate potential of V_2 , permits the amplified signal voltages to be impressed on the anode of V_3 , which is connected as a diode rectifier. V_3 rectifying the signal voltage causes a positive potential to appear across its load, which is R_o in parallel with the grid and cathode of V_4 . The triode, V_4 , is biased almost to cut-off by the voltage drop across R_o as a result of the cathode current flow. As the signal voltage increases from zero, the voltage developed across R_o increases, making the grid less negative with respect to the cathode. As a result, the plate current flow increases instantaneously. It can then be seen that by placing a sensitive type relay in series with R_o , in effect making the relay an integral part of the biasing circuit, and adjusting the bias of V_4 to the point where the relay is in normal position, an audio voltage impressed upon the input terminals of V_1 , will, in a fraction of a second, actuate the relay.

However, the relay will alternately "release and hold" as the voice or other modulation is impressed. It will "chatter" and try to follow every word. Therefore some time delay must be introduced to maintain the relay in a "hold" condition. If a condenser, C_T , is placed across R_o , in Fig. 1, a time delay to the release operation is introduced. C_T is charged instantaneously by the peak rectified voltage output of diode V_3 , and it will maintain a sufficiently high potential on the grid of V_4 , to keep the relay locked in a

Fig. 1. Simplified diagram of relay unit. Complete schematic is shown in Fig. 2.



"hold" position until the charge leaks off through R_o . The "leakage" time can be predetermined.

The combination of R_o and C_T in parallel will preset the "release" time delay of the sensitive relay. Varying either the value of C_T or of R_o will permit a wide variation in time. The time can be made to vary from the inherent mechanical lag of the relay armature up to several seconds or even minutes. Larger time delays are possible but the constants then become quite large electrically and physically, and the charging potentials may become inordinately high. A series of practical experiments showed that a time delay of up to four seconds from start was sufficient for most purposes. Of course it is far more practical to make R_o the variable element while C_T remains at a fixed value. An ordinary potentiometer with smooth action as in the ordinary, well-built gain control (carbon type), connected as R_o with the potentiometer arm going to one end of C_T and the other terminal of C_T going to the grid of V_1 will serve ideally as the fully variable time delay control.

R_o , in practice is a 20,000 ohm wirewound rheostat or potentiometer. Both the controls R_c and R_o are mounted on the back of the chassis, as seen in the photograph. A screwdriver slot adjustment is cut into the shortened shafts. These two controls, once set, seldom need be readjusted unless the type of service changes or possible bias adjustment of R_o may be necessary when V_1 is aging or is replaced.

Fig. 2 diagrams the practical and completed circuit of a typical voice control relay unit. It is the unit shown in the photographs. This unit was used to drive the paging system. The output line is placed in series with the voice controlled relay so that talking closes the audio output line, and when the relay "releases" the audio output line is opened or broken. The output line was connected to the input terminals of a standard public address system which was used for paging. No changes or alterations of any kind are required in the paging unit. The gain controls are adjusted so that close talking is required to operate the relay unit. This is necessary so that extraneous office noises and conversations will not actuate the relay. In order that the operator can be certain she has operated the relay and that she is being heard, a small pilot light is placed within easy view to indicate that the unit is functioning. In order to utilize the set of s.p.d.t. contacts of the standard model sensitive relay, the pilot light going off rather than on indicates "in operation." The switch-board operator did not find it at all confusing. And as she said, "Just as long as something changes when I start talking."

Fig. 3 shows a model that can be used to operate a radio-telephone transmitter, act as a microphone pre-amplifier, be used to key a transmitter carrier, and generally be operated as

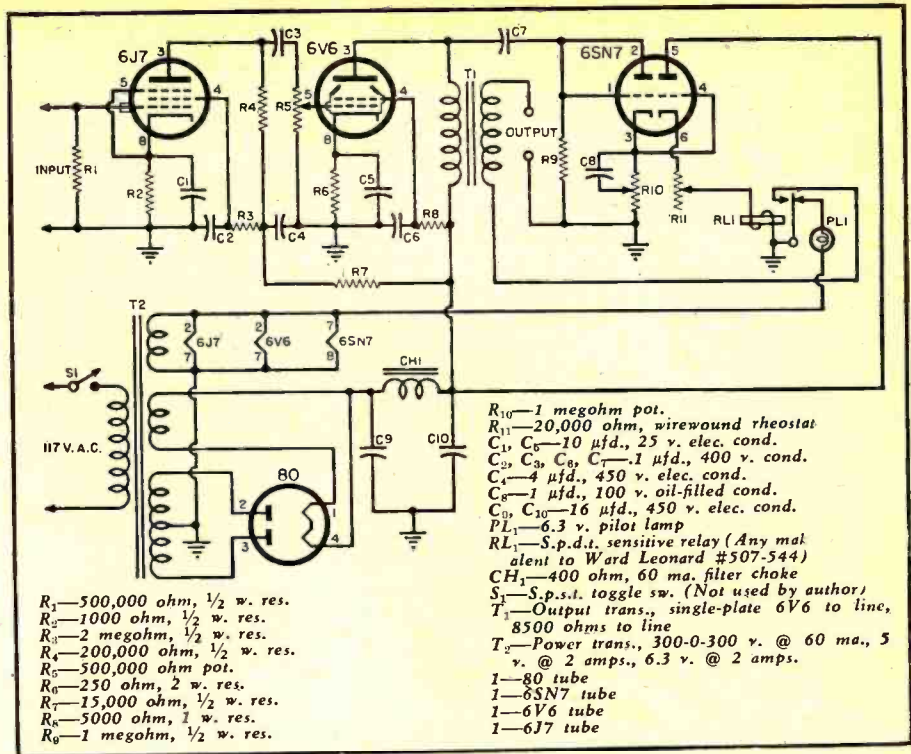


Fig. 2. Schematic diagram of a voice controlled relay unit designed to operate a paging system. Potentiometer R_{10} is time delay adjustment.

a "master control" unit for the transmitter. V_1 is a 6J7, V_2 is a 6V6, V_3 is one section of a 6SN7 connected as a diode with the grid and plate tied together, and V_4 is the second section of

the 6SN7 operated as a triode with the plate going directly to the high voltage "B" supply. With R_{10} set to approximately one second delay time, rapid (Continued on page 161)

Fig. 3. Suggested circuit diagram of a unit that may be used as a "master control" for operating a conventional radio-telephone transmitter.

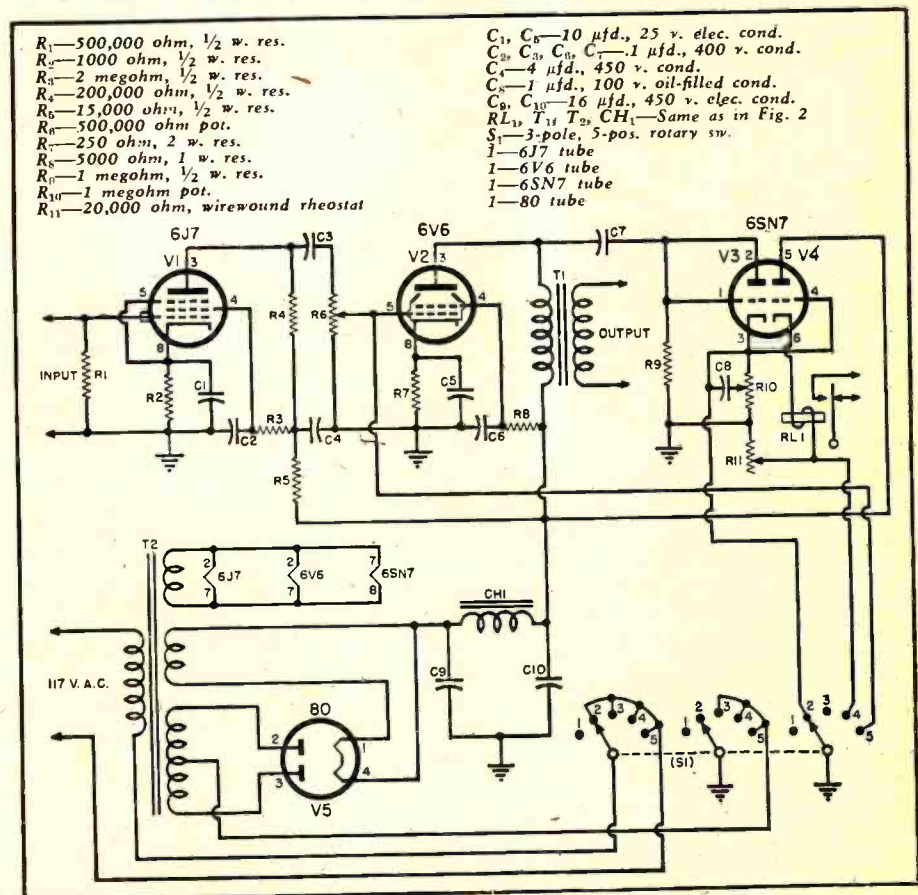




Fig. 1. Panel view of Silver Model 906 signal generator.

By
GUY DEXTER

A relatively low-priced test instrument covering 90 kc. to 210 mc. Features AM, FM, and 400 cycle audio.

New Compact Signal GENERATOR Has Laboratory Features

NO LONGER is a good signal generator a luxury instrument. The increasing complexity of modern radio receivers, together with the need for precise measurements and adjustments, now makes this instrument *essential* in the radio shop, as well as in the technical laboratory. The day of haphazard measurements with leaky test oscillators is past.

A signal generator is a distinct instrument having many imitations but no real counterpart. It is more than just a tunable r.f. signal source. Not every test oscillator can qualify as a signal generator. In addition to delivering accurate radio frequencies, selectable over a wide range, the *modern* signal generator has the following features: (1) Its output attenuator permits smooth adjustment of the signal strength to levels which may be duplicated. (2) At zero setting of the attenuator, no signal is delivered by the instrument except at very high frequencies where *total* reduction of signal strength to zero is impossible in the present state of the art. But even in the latter case, the transmitted signal is of known, negligible value. (3) The actual signal level is accurately indicated in microvolts by means of the attenuator and a self-contained output v.t. voltmeter. (4) In addition to standard 400-cycle modulation with continuously variable modulation percentage, continuously variable-width frequency modulation is also provided, in order that the signal generator may be employed in FM and television receiver measurements and in visual (oscilloscopic) adjustment of AM receivers. (5) Signal leakage (that is, the radiation of r.f. energy over any path except through the controlling attenuator) is zero,

58

except at very high frequencies where stray coupling reactances are very small and shielding less efficient. Even this leakage, however, is small in the laboratory-caliber signal generator.

These important features formerly were obtainable only in laboratory type signal generators costing many hundreds to even thousands of dollars. The high cost of such instruments precluded their wide use in service shops and in small laboratories. The costliness of such instruments can be attributed, at least in part, to the special manufacturing procedures, almost amounting to custom building, which have been required in the past. Using war-learned techniques, one electronic instrument manufacturer has solved the problem of building an efficient signal generator in volume production, thereby reducing the cost of this instrument to a figure within the budgets of service shops and small laboratories.

Features of the Instrument

Frequency Range. The Model 906 Signal Generator is single-dial tuned from 90 kc. to 170 mc. (amplitude modulated) and from 90 kc. to 210 mc. (frequency modulated). Calibration accuracy is ± 1 per-cent. The eight frequency bands are selected by means

of a single control knob. Band changing is accomplished efficiently by means of a coil-changing turret.

In the first seven frequency bands, fundamental frequencies are generated, and these are read directly on the main dial of the instrument. In the eighth band, the r.f. oscillator operates at frequencies equal to one-half the dial values, output being on the second harmonics of the actual oscillator frequencies. This type of operation is desirable in the 57 to 170 mc. range, since the stability of the oscillator is greater when operating between 28.5 and 85 mc. The second harmonic amplitude is substantially equal to that of the fundamental frequency because of the short excitation cycle of the oscillator.

R. F. Oscillators. Two radio-frequency oscillators are employed in the Model 906 Signal Generator. One of these is a variable-frequency unit, expressly for unmodulated and AM output; the other is a fixed frequency oscillator, used in conjunction with the v.f. oscillator for FM output.

The variable-frequency r.f. oscillator is designed around a type 6C4 miniature button-base tube, V_1 . The first models of the signal generator employed one-half of a type 6J6 as the r.f. oscillator; the other half being

RADIO NEWS

used as the 400-cycle AM modulator. Later in-production tests, however, established the superiority of the 6C4 as regards better output, increased frequency stability, and longer life.

The variable-frequency oscillator circuit is seen in the upper left-hand corner of Fig. 2. Variable condenser C_2 is the main tuning unit. C_1 is an individual trimmer paralleling each of the eight turret-mounted coils, L_1 .

In the v.f. oscillator portion of the instrument circuit, RFC_2 is a heater-isolating r.f. choke. This component, together with plate r.f. choke RFC_1 , contributes to the stability and freedom from "strays" of the oscillator.

Each coil is individually air-trimmed by means of a concentric 3-30 $\mu\text{fd.}$ air condenser, C_1 , mounted directly on the coil to which it is connected. Each

coil, L_1 , is wound on a separate ceramic form. These forms are held between two disc-type aluminum heads which form the rotary turret. As the turret is rotated into position for each of the eight frequency bands, the 3-coil contact studs are brought into contact with low-inductance, flat bronze contact springs which lead directly to tuning condenser C_2 and to tube V_1 . This arrangement insures short, direct leads. The turret method gives the convenience of switching, while actually eliminating the selector switch and its attendant losses, and providing the efficiency of plug-in coils.

Each of the coil assemblies are aligned at four to seven points in each frequency range, against precision crystal standards. Both the capaci-

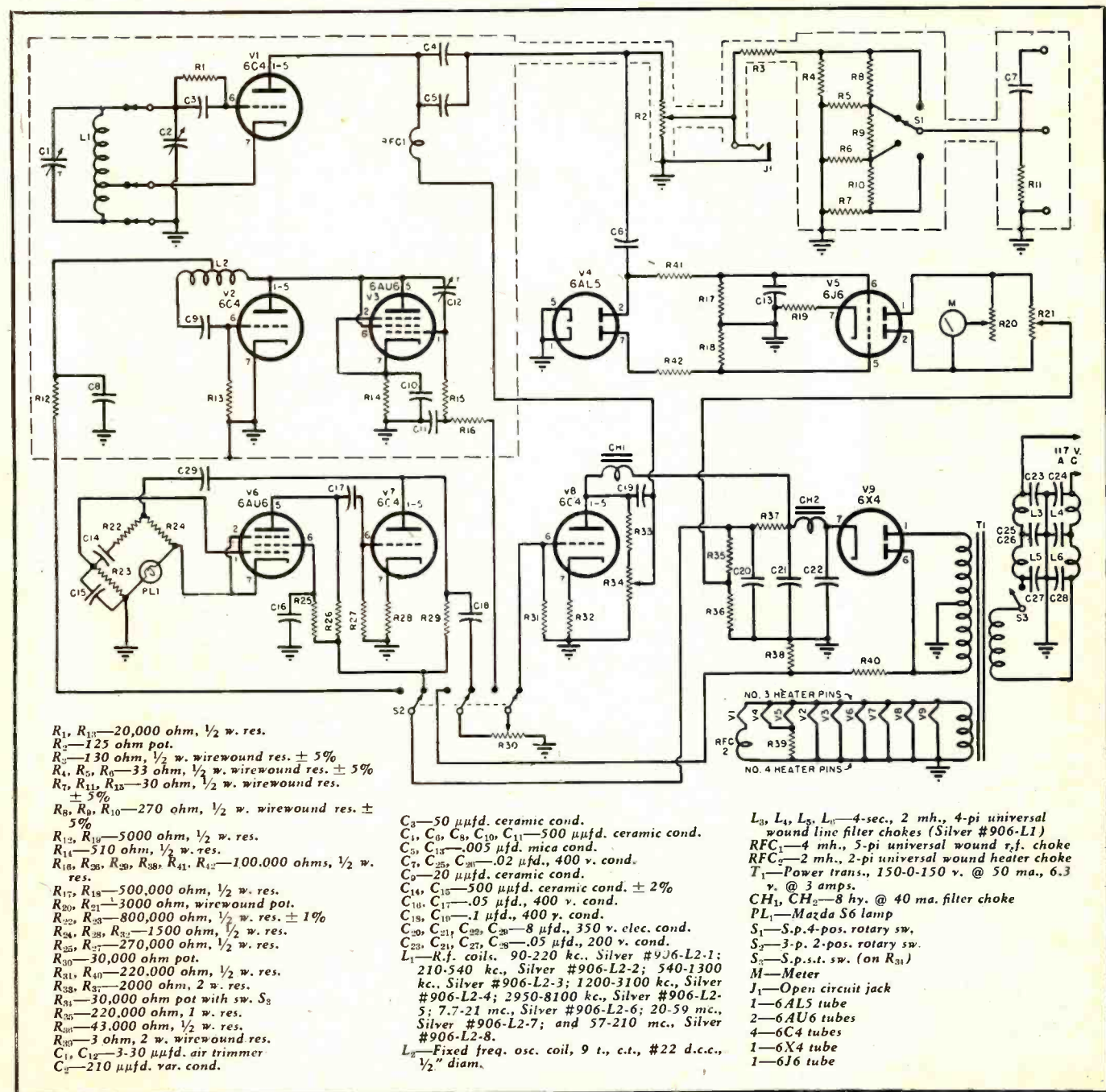
tance of the trimmer C_1 , and the coil inductance are adjusted in this operation. A frequency accuracy of $\pm 1\%$ or better is maintained.

The fixed-frequency oscillator (for FM) operates at 40 megacycles and is designed around the 6C4 tube, V_2 . Operating into this oscillator is a reactance modulator, comprised of the 6AU6 tube, V_3 .

The fixed-frequency oscillator and reactance modulator are placed in operation by means of the "Modulation" switch, S_2 . When this ganged 3-section switch is thrown to its FM position, the 400-cycle AM modulator is silenced and the reactance modulator sweeps the 40 mc. fixed oscillator frequency over a continuously variable width of 0 to 500 kilocycles, depending

(Continued on page 115)

Fig. 2. Schematic diagram of signal generator. A turret-type bandswitching assembly permits 90 kc. to 210 mc. coverage in 8 bands.



Miniature Ten Meter PHONE TRANSMITTER

By DONALD R. RHODES, W6UVY/8

Antenna Lab., Ohio State University

With only 2-watts input to final, this compact, home-built transmitter has worked out to 3000 miles with good results.

IT IS well-known to radio amateurs that the ten meter band has the unique characteristic of providing fairly consistent two-way communication over long distances with low power. It has also been observed that a low power station will often be heard as well as one using high power when conditions are right for communication with a certain part of the world, and when these conditions are not right even the high power station will not be heard. The transmitter described in this article is, to the author's knowledge, the smallest complete phone transmitter ever designed specifically for amateur operation. Very good readability and signal strength have been reported over distances of three thousand miles with an input power to the final amplifier of only two watts.

The entire transmitter, consisting of two stages of r.f. and three stages of a.f., is completely self-contained in a standard 3" x 4" x 5" metal box. This was made possible by the release of miniature type tubes on the surplus market at a price comparable to their standard metal equivalents. It was necessary to select the remaining component parts with great care due to the necessarily limited amount of space available in the box. All of the parts used were standard and are available at any amateur radio store.

A conventional circuit employing a

crystal oscillator, amplifier, and plate modulator, together with two audio stages for crystal microphone input is shown in Fig. 5. The crystal oscillator is the well-known tri-tet, used extensively among amateurs to obtain output on even harmonics of the crystal frequency. With a 40 meter crystal, sufficient output can be obtained on 10 meters (the fourth harmonic of the crystal) to drive the final amplifier. Capacity coupling between the oscillator and final amplifier is employed because of space limitations. The final amplifier is a plate-neutralized triode which is self-biased by means of a grid resistor; link coupling between the amplifier tank coil and the antenna provides a low impedance r.f. output. A 6AK6 pentode modulator operating "Class A," provides enough audio power to Heising modulate the final amplifier. This type of modulator does not require a modulation transformer, since the modulation voltage can be developed across a small a.c.-d.c. filter choke; good power regulation is also obtained since the plate current of a "Class A" amplifier remains constant at all times. For 100% modulation the peak audio voltage must equal the d.c. voltage on the final, which means that the final plate voltage must be less than the modulator plate voltage. It has been found however, that when the d.c. voltages are the same the carrier can be modu-

lated satisfactorily between 80 and 90 per-cent.

The crystal socket is mounted externally so that the transmitter frequency can be quickly changed by merely changing crystals; mounting the crystal in this position also tends to prevent the crystal frequency from changing due to crystal heating. Controls and connectors are shown in the photographs; the oscillator and final amplifier plate tank condensers, microphone jack, audio gain control, and antenna terminals are mounted on the front panel, with the meter switch and connector plugs for power, meter, and "on-off" switch mounted on the back. Screwdriver-adjustment tank condensers are used to prevent accidental change of capacity. Since the meter switch is used only during tuning of the transmitter, it also is screwdriver adjusted. The antenna terminals are National type TPB threaded polystyrene bushings with a center conductor which is molded in. Thus, by putting alligator clips on the transmitter end of the transmission line the antenna can be quickly attached or removed. Power for heaters and plates is supplied through a four-prong male Amphenol miniature connector, with a four-prong female miniature connector for meter and send-receive switch connections mounted next to it. These connectors mount in a plain round hole $\frac{3}{8}$ " in diameter and are held in place by a tempered steel retainer ring. A single-contact Amphenol coaxial plug-in connector is used for microphone input and must be thoroughly grounded to the chassis to prevent stray pickup. Also, the resistor from microphone to ground and the grid lead to the preamplifier audio stage should be as short and isolated as possible.

An old aluminum recording disc was obtained from a local broadcast station and after being cleaned up was cut, formed, and drilled as shown in Fig. 6 to provide a T-shaped skeleton chassis within the box. The chassis is mounted in the box with screws at

Fig. 1. Midget home-built transmitter—compare it for size with the Hallicrafters S-27.

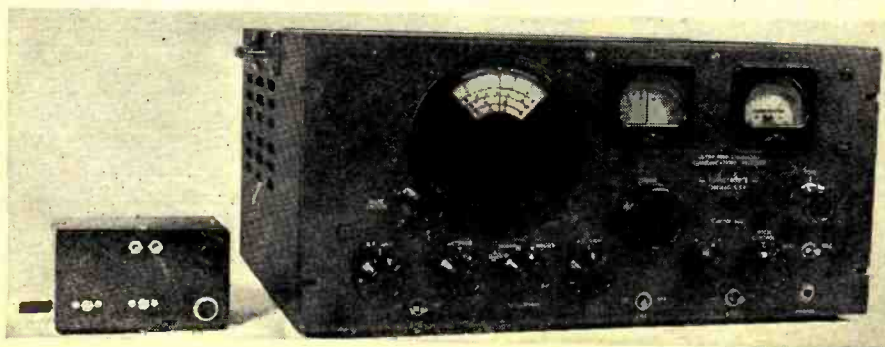




Fig. 2. Front panel view of home-built transmitter. Over-all size is 3" x 4" x 5".

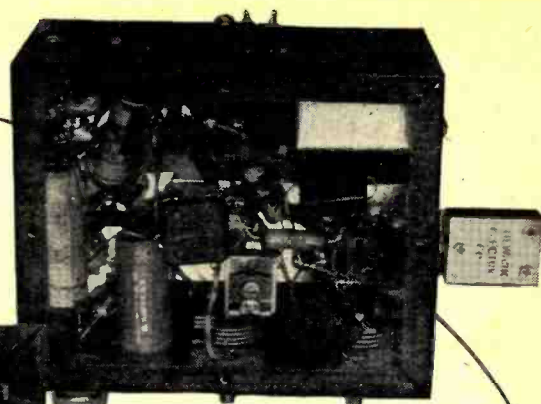


Fig. 4. Under-chassis view. Due to compact size, all parts must be carefully placed and wired.

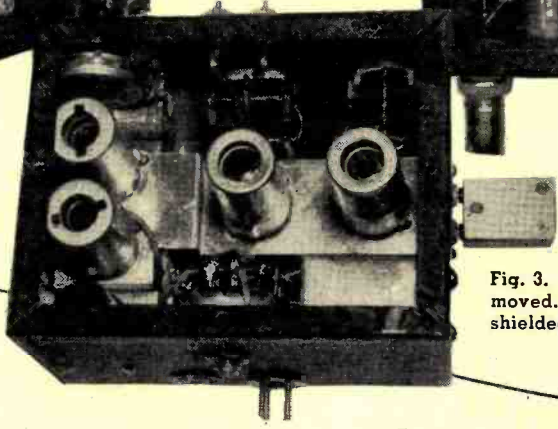


Fig. 3. Top view with cover removed. All tubes must be well shielded to prevent oscillation.

two points of the T and by the audio gain control at the other point. Miniature type tube sockets with shields are available at surplus at a reasonable price, and help considerably in isolating the various stages. The shield on the modulator tube was omitted since it was not needed.

All wires and leads from condensers and resistors connect directly to terminals provided by tube sockets, plugs, switch, etc., which eliminates the need for terminal strips. To obtain a proper size r.f. choke (RFC₁) in the final grid lead it was necessary to remove two pi's from a standard 2.5 mh. r.f. choke and use the remaining two pi's with just enough of the ceramic core to hold them together.

The neutralizing capacity is a small 3-30 μ fd. trimmer condenser. It is screwdriver adjusted and need only be adjusted once for any amplifier tube. Out-of-phase voltage for neutralization is obtained by placing the center of the final tank coil at ground r.f. potential with the amplifier plate at one end of the coil and the neutralizing condenser between the other end and grid. The final tank condenser is a single-section padding condenser which was designed to have the rotor grounded through the mounting stubs. The connection between the rotor and grounded stub can be broken with a small, sharp chisel and then part of the metal strip connecting the two may be removed. However, being a single section condenser there will be an unbalance between the rotor capacity to ground. This unbalance will change the required neutralizing capacity slightly
(Continued on page 134)

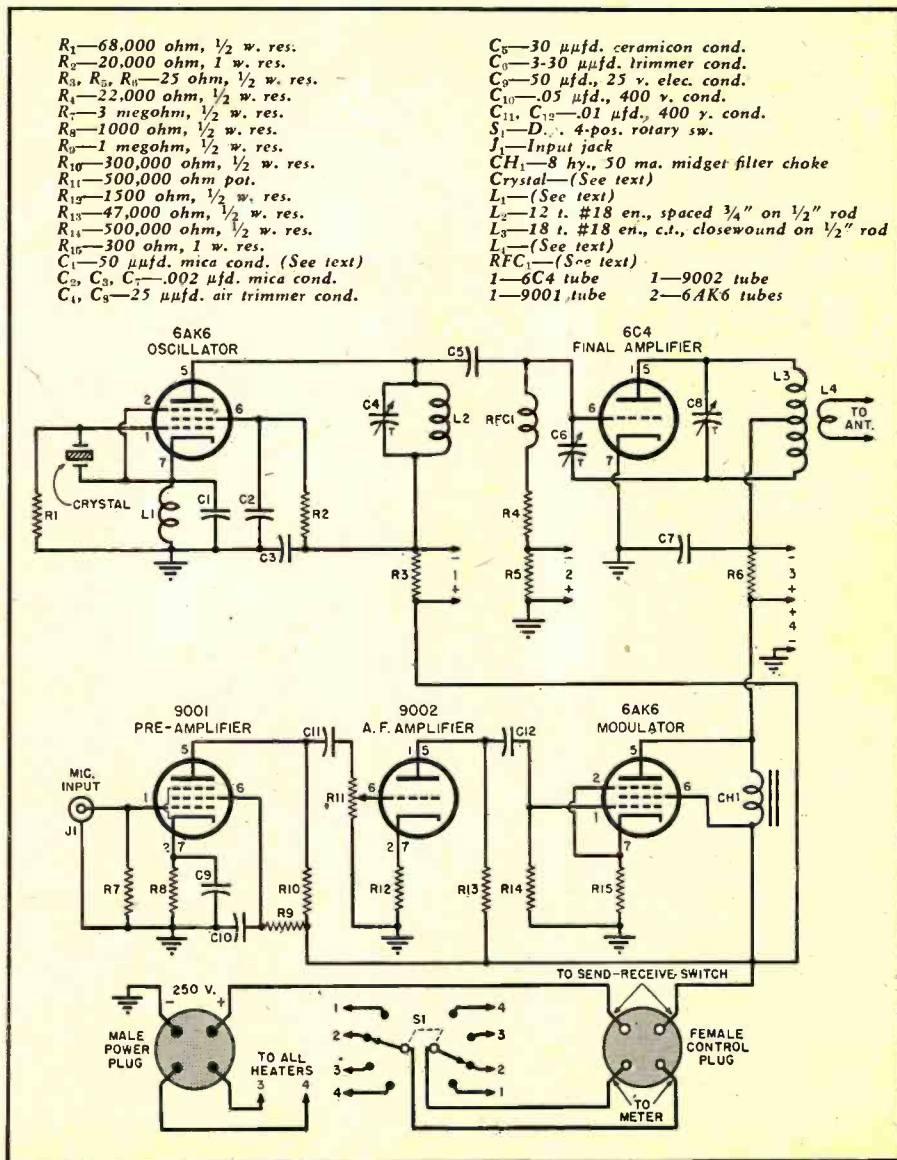


Fig. 5. Complete schematic diagram of 10-meter phone transmitter. Crystal oscillator is the well-known tri-tet circuit.

A Compact E.C.O. Controlled TRANSMITTER

This unit serves as a complete transmitter or as an exciter with either v.f.o. or crystal control.

By

HARRY R. HYDER, W2LIW

MOST amateurs build their v.f.o.'s as a separate unit, to be placed on the operating table alongside the station receiver. The v.f.o. usually feeds a string of doublers in the transmitter proper. The unit itself delivers but a watt or two of power. There is a lot to be said for isolating the v.f.o. from the transmitter as much as possible, but several transmitter manufacturers have demonstrated that it is entirely feasible to make the v.f.o. an integral part of the transmitter. This naturally requires some care in design and construction.

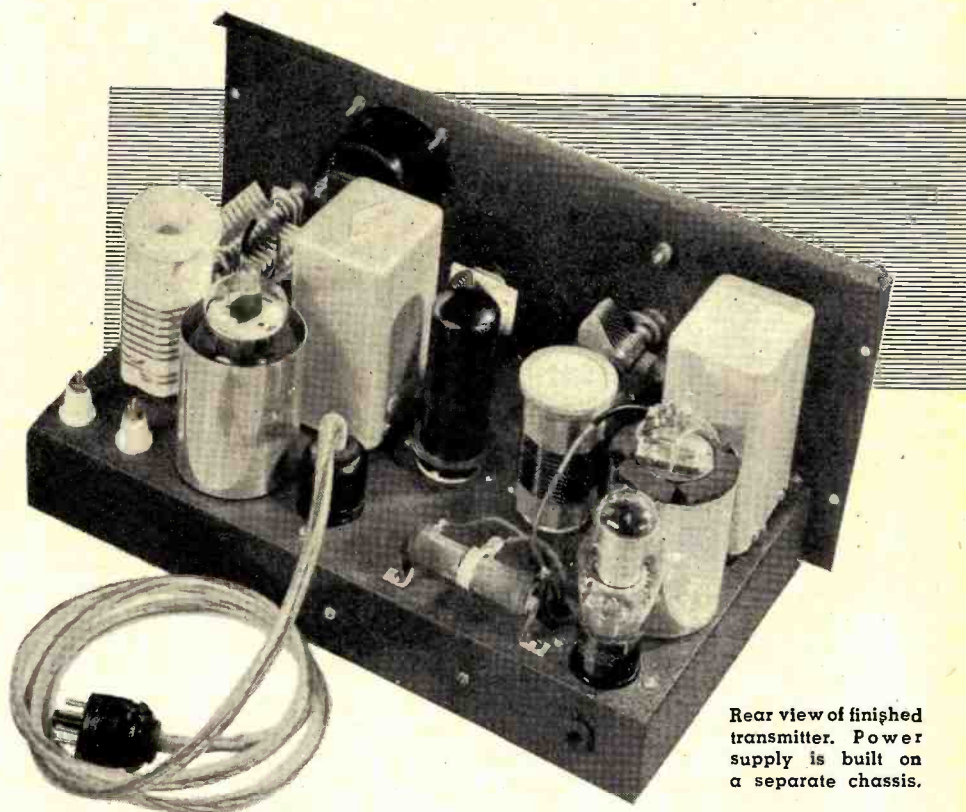
At this station, it was planned to make the v.f.o. as versatile as possible. Compactness was sought so that the unit could serve as a complete portable transmitter. A reasonable amount of power output was desired in order that the unit could serve as a transmitter alone, or, be used to excite a high-power final. It should operate on all bands with a minimum of coils and tuning adjustments. Provision should be included for crystal control on any band. Finally, but most important, it should put out a clean signal of high stability.

All the above requirements are met in the unit pictured above. Its outside dimensions are 7" x 14" x 8". It delivers a measured output of 20 watts on the 28 mc. band and 35 to 40 watts on all other bands (without exceeding CCS ratings!). There are only three tuning controls, changeover to crystal control is automatic, and the quality of the signal is all that could be desired.

Circuit Details

As is evident from the diagram (Fig. 2) an 802 is used as the electron-coupled oscillator, followed by a 6L6 buffer-doubler (which also serves as a crystal oscillator). The final amplifier is an 807.

The 802 was chosen because of its excellent shielding and rugged construction, so important in any self-excited circuit. Care was taken to make the oscillator stable and free of hum modulation. A tank capacity of 500 μ fd. is used, together with a 50 μ fd. "band setter" and a 100 μ fd. tun-



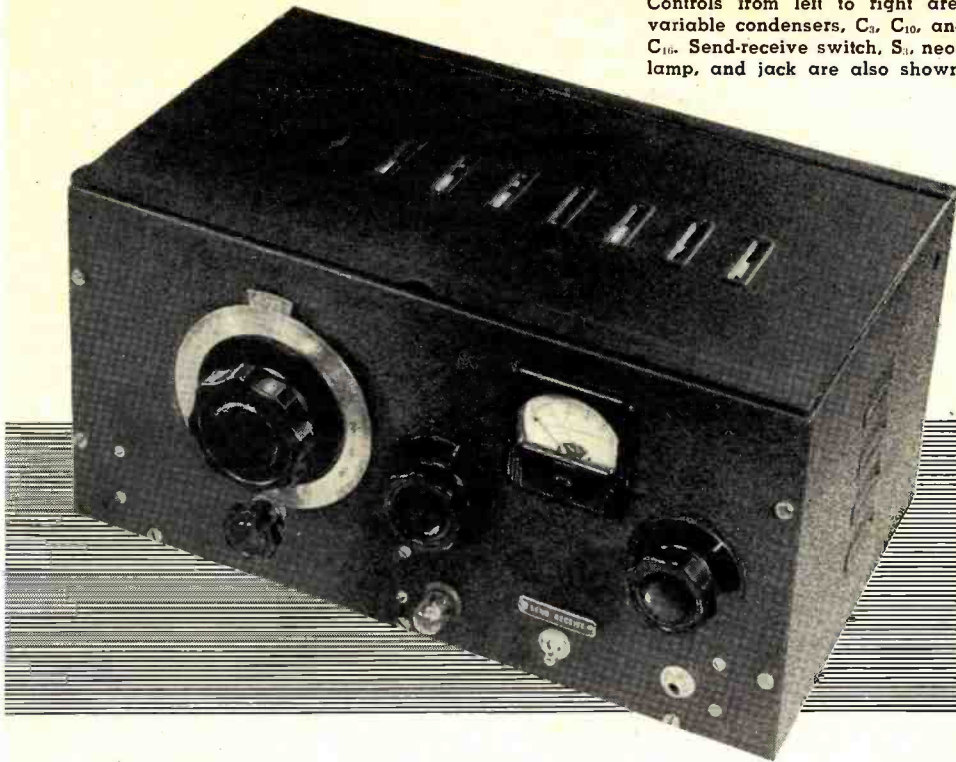
Rear view of finished transmitter. Power supply is built on a separate chassis.

ing condenser. The fundamental frequency range is 3500 to 3650 kc.; output is secured on that portion of the 3.5 mc. band and on all of the 7, 14, and 28 mc. bands. The filament of the 802 is at the same r.f. potential as the cathode. This removes all traces of hum modulation. The screen and suppressor are tied together. A VR-105 voltage regulator controls the screen voltage. The plate circuit of the 802 is rather interesting. On the 3.5 and 7 mc. bands, the plate impedance is a 2.5 mh. r.f. choke, mounted in a blank 5-prong coil form. On the 14 and 28 mc. bands, the plate load is a 7 mc. coil, wound on a similar form. This coil is resonated to about 7200 kc. by a mica trimmer mounted inside the coil form. Once set, the trimmer needs no further adjustment, as the tuning is sufficiently broad to cover the entire band. Enough excitation is supplied to drive the 6L6 as a doubler to 14 mc. These coils also have jumpers across some of the prongs (see Fig. 2) which make the power supply connections to the 802 plate and screen. Thus, when no coil is in the 5-prong oscillator plate coil socket, there are no voltages

(except filament, of course) on the 802. When crystal control is to be used, a crystal is plugged into this 5-prong socket. The 6L6 then operates as a straight-forward crystal oscillator. All of the crystals used were of the pre-war variety, which fit a 5-prong tube socket. For the newer type crystals an adapter may be used, or an octal socket and octal-based coil forms may be adapted.

The 6L6 buffer-doubler-crystal oscillator has sufficient cathode bias to keep the idling plate current within the dissipation rating, therefore, no provision is made for metering this circuit. The plate circuit is resonated with the aid of a $\frac{1}{4}$ watt neon bulb, which is pushed through a rubber grommet on the front panel. A wire is soldered to the center contact of the bulb and wound several times around the 6L6 plate lead, making a good, cheap, resonance indicator. In addition to cathode bias, the 6L6 has a 100,000 ohm grid leak, which increases its harmonic output. The 6L6 plate coils are found on National-XR-2 1" diameter forms, and mounted inside National PB-10-5 plug-in shields.

Controls from left to right are; variable condensers, C₂, C₁₀, and C₁₆. Send-receive switch, S₁, neon lamp, and jack are also shown.



Shielding of these coils is necessary, because of their proximity to the 807 plate circuit.

The 807 is operated as a straight amplifier on the 3.5, 7, and 14 mc. bands, and as a doubler to 28 mc. 47 ohm, 1 watt parasitic suppressors were placed in the grid and screen leads, right at the socket, before the bypass condenser. As a result, the 807 shows no traces of instability at any frequency. Bias for the 807 is obtained partly from a 200 ohm cathode resistor, and partly from a 22,000 ohm grid leak. In addition to supplying bias, the 200 ohm resistor acts as a key-click filter. The 807 screen is fed from a dropping resistor, suitably bypassed for r.f. and audio. A note of warning—the amplifier tank r.f. current flows through both the plate and screen bypass condensers. They should be placed close to the final tank coil socket, have short, heavy leads, and be of the high-voltage mica types. The 807 tank coils are standard items, manufactured by E. F. Johnson Co. Similar coils of other manufacturers may be used, of course. The 3.5 mc. coil has a 25 μ fd. double-spaced trimmer mounted internally, since it was not possible to resonate it with the 50 μ fd. tuning condenser. A 0-150 d.c. millimeter is wired in the plate circuit. It is not a bad idea in this case, to shunt the meter with a condenser, since the r.f. field is rather strong. Output is taken from the coil links, connected to a pair of feed-throughs on the rear of the chassis.

Construction

The unit is built on a 7" x 13" x 2" steel chassis and mounted in a 7" x 14" x 8" hinged-lid cabinet. The chassis must be spaced back from the panel about 1/8" in order to clear the front

lip of the cabinet. All tuning condenser frames are at ground potential, so no insulation problems or shock hazards exist. A good, accurate dial is a "must" in any v.f.o.; this one is 4"

in diameter, has a reduction drive, and a vernier permitting it to be read to one-tenth of a division. The buffer and amplifier tuning controls are fitted with 2" diameter skirted knobs.

Most of the components are mounted underneath the chassis. A ground bus is run from one end of the chassis to the other, and all r.f. grounds and bypass returns are made to this. In addition, even though all tuning condenser rotors are grounded to the chassis, wire leads are brought from their terminals to the ground bus. This idea could well be incorporated in all high frequency gear, since it insures minimum r.f. currents in the chassis proper, thus preventing unwanted coupling between circuits.

The 802 and 807 sockets are sub-mounted 1", to increase the clearance between their plate caps and the cabinet lid. Sleeve shields are used on both the 802 and 807. The 6L6, being metal, requires no shielding. Several small pieces of sponge rubber were jammed into the 802 shield, to prevent vibration of the tube.

The 6.3 volt filament transformer is mounted on the back drop of the chassis. All power leads are brought to a male octal socket. The power cable has a female plug at one end, which plugs into the transmitter, and a male plug at the other, which plugs into the power supply. The cable is made by running insulated wires through transparent plastic sleeving.

Table 1. Winding data for coils required to cover 3.5, 7, 14, and 28 mc. bands.

COILS REQUIRED			
Band	Osc. Plate	Buffer Plate (L ₂)	Amp. Plate (L ₃)
3.5 mc.	A	C	F
7 mc.	A	D	G
14 mc.	B	E	H
28 mc.	B	E	J

If crystal control is desired on any band, an appropriate crystal may be plugged into the oscillator plate coil socket. (For socket wiring see Fig. 1.) This automatically removes plate and screen voltages from the e.c.o. The buffer then operates as a straight crystal oscillator. For 3.5 mc. crystals, use coil C for L₂; for 7 mc. crystals use coil D; for 14 mc. crystals use coil E. The final amplifier may be used either as an amplifier or a doubler, in order to obtain a plurality of crystal frequencies.

COIL WINDING DATA

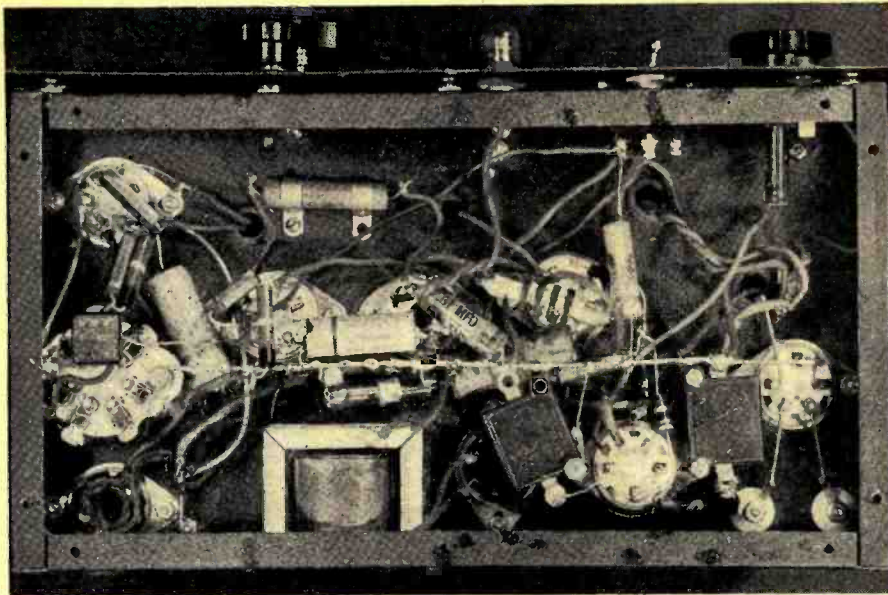
Osc. Grid Coil (L₁)
14 t. No. 22 d.s.c., 1" long, tapped 4 t. from gnd. end. Fil. winding 4 t. interwound at gnd. end. (See diagram below.)

Osc. Plate Coils
Coil A: 2.5 mh. r.f. choke, mounted inside blank 5-prong form. (See inset Fig. 1 for wiring.)
Coil B: 12 t. No. 20 en., 1 1/2" diam., spaced to 1 1/2" length. 25-125 μ fd. mica trimmer mounted inside 5-prong form. (See inset Fig. 1 for wiring.)

Buffer-Doubler Plate Coils (L₂)
Coil C*: 45 t., No. 24 d.c.c., close-wound.
Coil D*: 20 t., No. 20 d.c.c., close-wound.
Coil E*: 12 t., No. 18 d.c.c., spaced to 1".
*Coils wound on 1" diam. forms mounted inside National PB-10-5 plug-in shields.

Final Amp. Plate Coils (L₃)
Coil F**: 3.5 mc., 50 w. plug-in coil. 25 μ fd., double-spaced air trimmer set to full capacity mounted inside. 32 t., No. 16 en., link 6 t. No. 16 en. (See text.)
Coil G**: 7 mc., 16 t., No. 16 en., link 4 t. No. 16 en. (See text.)
Coil H**: 14 mc., 9 t. No. 14 en., link 3 t., No. 14 en. (See text.)
Coil J**: 28 mc., 6 t. No. 12 en., link 2 t. No. 12 en. (See text.)
**Coils wound 1 3/4" diam. forms, 2" winding length. All link coils wound at cold end.

Construction of oscillator grid coil (L₁).



Under chassis view shows location of miscellaneous components.

The power supply requires little comment. It supplies 500 volts at 100 ma. for the amplifier, and 350 volts at

100 ma. for the oscillator and buffer. A common transformer and filter choke are used, with separate recti-

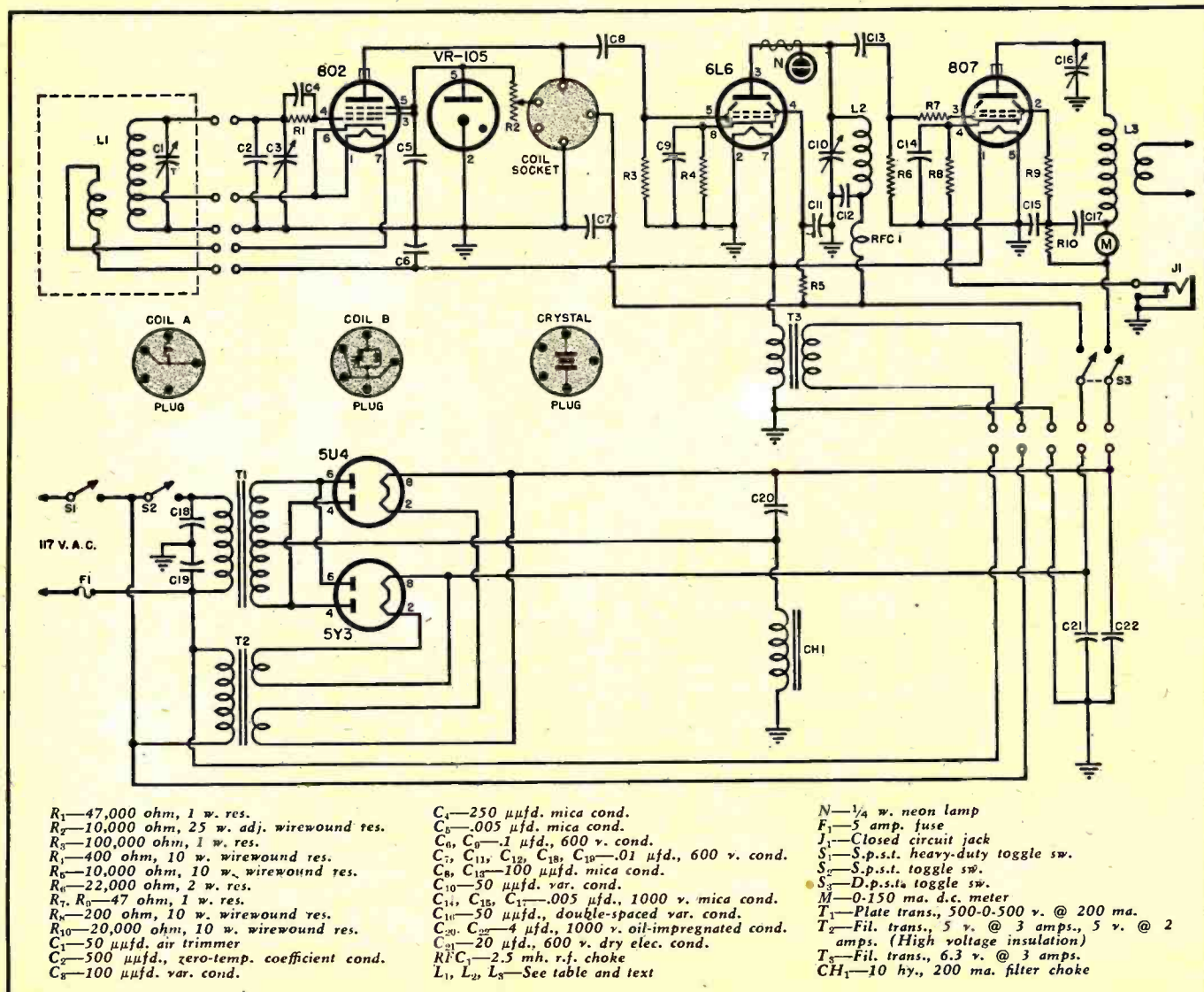
fiers for the two voltages. The choke is in the negative lead. The high-voltage portion of the supply uses a 5U4G, the low voltage a 5Y3GT.

Operation

It is best to get the electron-coupled oscillator operating first. Plug in the oscillator coil, the form-mounted r.f. choke in the plate circuit, and the 802 and VR-105 tubes. Apply filament voltage and allow about 15 minutes for the 802 to reach its normal operating temperature. Then turn on the plate voltage. Adjust the slider on the VR-105 dropping resistor until the tube ignites, as indicated by the familiar blue glow. It would be a good idea to check the current drawn by the VR-105; for best regulation, this should be about 30 ma. Next, set the oscillator tuning condenser to about 90% of full capacity. Tune the receiver or frequency meter to 3500 kc. and adjust the 50 μ fd. trimmer across the oscillator coil until the signal is heard. The high frequency end of the band should then be checked; 3650 kc. should fall at about 10% of full capacity.

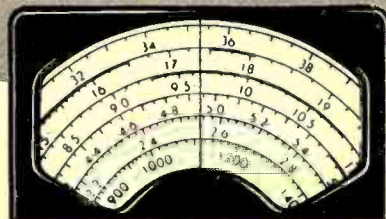
(Continued on page 76)

Fig. 1. Complete schematic diagram for transmitter. Oscillator plate coils, A or B, or crystals plug into coil socket shown.





International SHORT-WAVE



Compiled by **KENNETH R. BOORD**

THIS month we salute a southern *Good Neighbor* of the British West Indies—the new *Radio Trinidad*, VP4RD, Port-of-Spain, Trinidad, B.W.I.

William MacLurg, general manager, Trinidad Broadcasting Company, Ltd., 11B Maraval Road, Port-of-Spain, sent us this data on VP4RD (this call sign will be changed shortly to a "Z" call sign):

The name of *Radio Distribution* has been associated with broadcasting in the Colony of Trinidad for so long that it is perhaps not surprising that some people in that island have been wondering whether *Rediffusion* would be closing down when *Radio Trinidad*, station of the Trinidad Broadcasting Co., Ltd., commenced operations in the Colony. Such is by no means the case.

The Trinidad Broadcasting Co., Ltd., and Radio Distribution (T'dad), Ltd., are two entirely separate and distinct companies, each operating a public service. These services, however, are complementary.

Rediffusion, which operates extensively in Great Britain and the Colonies, does not normally originate programs; the origin of programs is primarily a function of the broadcasting organization, and it is the job of a wired broadcasting service—such as *Rediffusion*—to see that those programs are brought to the listeners' homes with the best possible quality and freedom from interference. The universality of radio broadcasting has resulted in a general state of interference and restriction in quality of reproduction from which wired distribution systems have comparative immunity. This is particularly true in densely populated areas, where electrical and man-made interference are rife, and *Rediffusion* provides listeners with a means of overcoming this type of interference by connecting them to the studio by a direct wire.

In a recent presidential address to the Institution of Electrical Engineers, Sir Noel Ashbridge, M.I.E.E., now Assistant Director General to the British Broadcasting Corporation, stated that wired broadcasting, that is, *Rediffusion*, was the inevitable outcome of the present limitations of ordinary broadcasting. It is for this reason that the two services exist—to provide a high-quality entertain-

ment service in densely populated areas, and broadcasting via *Radio Trinidad* is the natural medium for providing a Colony-wide service.

Each company is managed by a man with considerable experience in his own specialized field. W. A. MacLurg, general manager of the Trinidad Broadcasting Co., Ltd., has been with the BBC for 15 years, and A. Cross, general manager of Radio Distribution (T'dad), Ltd., has been in the service of the Rediffusion Company in the United Kingdom and elsewhere for 17 years. Also on the staff of *Radio Trinidad*, as studio manager, is Gerard V. de Freitas, long associated with ZFY, "The Voice of Guiana," Georgetown, British Guiana.

Thus, there are now in Trinidad two radio companies, with entirely separate but complementary functions, and with a single purpose: *Public Service*.

Radio Trinidad was officially opened on Sunday, August 31, by His Excellency the Governor, Sir John Shaw, K.C.M.B. The program included greetings and musical messages from other radio stations in the Caribbean area; a special Trinidad edition of "Caribbean Carnival" from

the BBC; "This is Trinidad," a picture in words and music of the Colony of Trinidad and Tobago; "Evesong" from the Cathedral of the Holy Trinity, Port-of-Spain, conducted by the Very Reverend Beardmore, O.B.E., Dean of Trinidad; "Music from Trinidad," singers, musicians, bands, and local artists; and other features.

Radio Trinidad began its career as a "new voice in the air" with four main objectives: 1. To give the people of Trinidad and Tobago the sort of radio service they want. 2. To cooperate with Government and other official bodies and with radio services such as the BBC in the spreading of news, knowledge, and information. 3. To provide an effective and efficient radio advertising service for those who take time on the station for this purpose. 4. To provide a radio service of higher technical quality.

Officials of the station pointed out that "These objectives can best and mostly quickly be achieved if you, the people of Trinidad and Tobago, remember that this is *your* radio service and that the station invites and indeed is very anxious to receive suggestions and criticisms . . . *Radio*

(Continued on page 149)

Sample QSL card which is being sent out by "Radio Trinidad," Port-of-Spain.

QSL FROM "RADIO TRINIDAD", BRITISH WEST INDIES

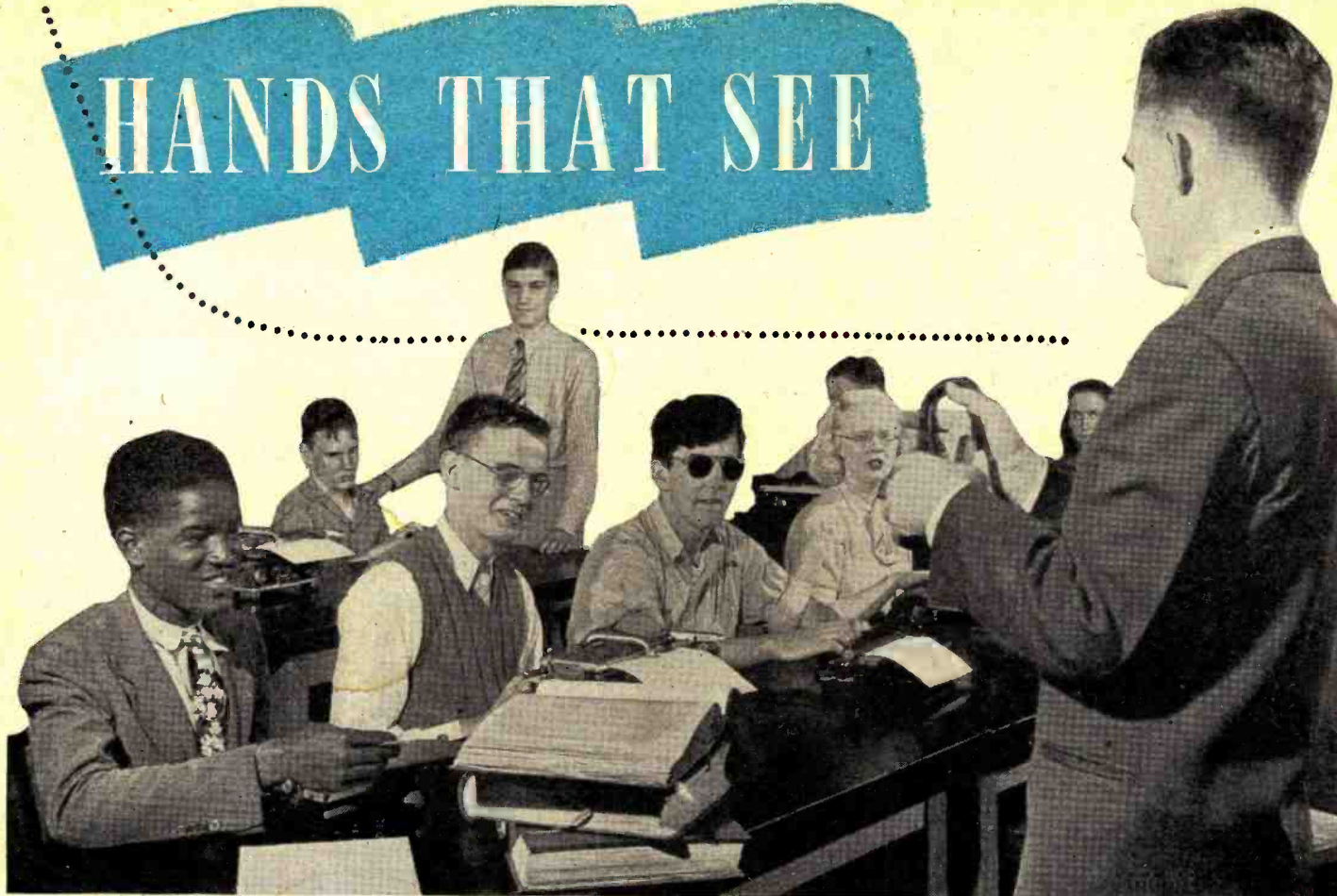
CHANNELS:
31.16 Metres (9,625 kc/s)
231.65 Metres (1,295 kc/s)

Transmission Hours:—

Sundays
7.00 a.m. to 2.00 p.m.
4.00 p.m. to 11.00 p.m.

Week-days
(Monday through Saturday)
7.00 a.m. to 9.00 a.m.
12.00 (Noon) to 2.00 p.m.
4.00 p.m. to 11.00 p.m.

HANDS THAT SEE



The students' first contact with radio is in the Science Room where the instructor is shown teaching them theory of electricity and magnetism. Standard textbooks are used and classroom notes are taken, in Braille, on the machines shown.

N. Y. Institute for the Blind prepares students for their ham license exams.

AN HOUR'S ride from downtown Manhattan, on picturesque Pelham Parkway, is the New York Institute for the Education of the Blind. Founded in 1831, the school has grown with great strides, so that today, through the efforts of a former student, it proudly

boasts of a modern, topnotch radio section. Happily responsible for the rapid growth and establishment of this phase of the school's curriculum is that former student, who is now instructor of the radio department. The sequence of instruction, methods of demonstration, and a myriad of lesser problems had to be overcome, for Robert W. Gunderson had no pattern or example to follow except that of determination to succeed at his task.

Now after 15 years of activity, requiring many evenings and weekends of hard work, students go through



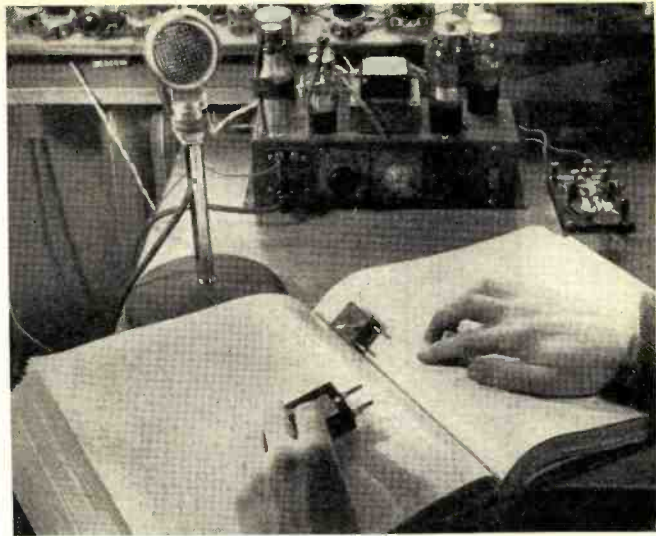
Combination circuit and Braille demonstration board is the means by which the theory is applied to actual practice. This system is analogous to the well-known block diagram in radio.

The next, and natural, step is to learn construction techniques. Here the instructor helps the student learn the proper handling of the soldering iron for wiring a radio chassis.





With theory and construction techniques mastered, the students are instructed in the operation of the school's high fidelity audio network. While the instructor supervises, Vito cleans the cutting table and Al maintains the proper level on unit.



By now every student has been bitten by the urge to become a "ham." In the textbook translated to Braille, our student studies the frequency control of a transmitter by use of a crystal. Note the Braille frequency markings on the crystal.

the radio section of the Institute at the rate of 10 per year. Theory naturally comes first, but instructional technique must necessarily be different. The blind literally "see" with their ears and sensitive fingers, so textbook data and instruction manuals must be set in Braille, from whence it is translated orally by the teacher. Small machines, called Braille Writers, and faintly resembling a typewriter, are often used for classroom note work.

From theory classes, the student studies circuit applications with the demonstration boards designed and built by the instructor, and patterned after the well-known Dynamic Demonstration Board. Using these enlarged, Brailled, block diagrams, the student learns the component parts and their placement in circuits. Actual practice is soon begun, and students begin learning the proper handling of tools and the correct construction techniques. Starting first with simple breadboard receivers or amplifiers, they soon advance to building finished units that look and operate as well as any commercial product.

If the student hasn't been bitten by the "ham" bug from the beginning, he certainly has by now, so concurrent code instruction and practice is interspersed throughout the course. By the time the boys (and an occasional girl) are well up on theory, they also possess a code proficiency high enough, or better, to meet license requirements, and
(Continued on page 179)



Keeping the station log is also done in Braille. The sheets are shellacked to retain the raised dots and then bound into a permanent form. Operator is shown checking time for entry.

A fine example of the excellent workmanship seen at the school is the instructor's pet transmitter. The rig was built entirely by Mr. Gunderson, including drilling of chassis and panels.

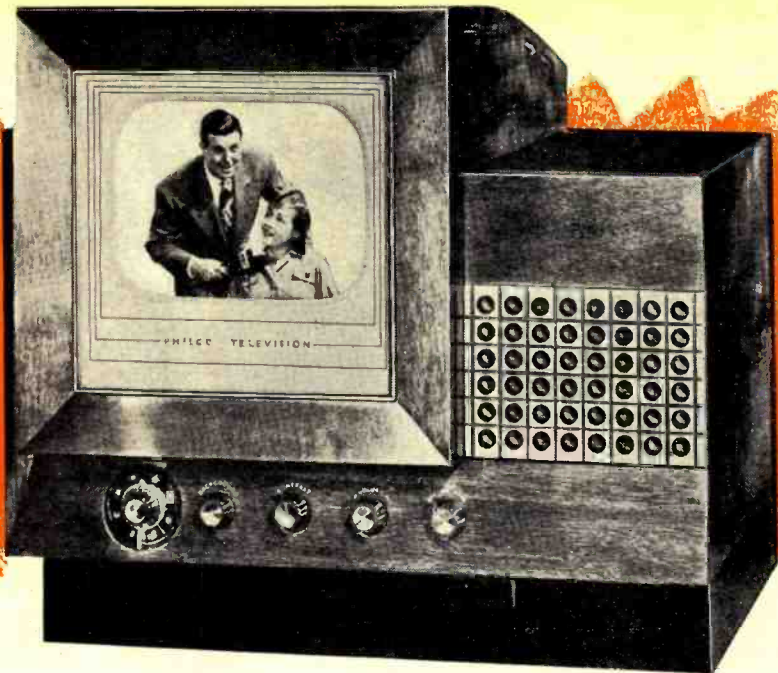
After winning his coveted ham license, this senior student goes on the air with a two-meter portable rig which he built.



December, 1947



Practical RADIO COURSE



The new Philco Model 1000 table receiver which features a ten inch picture tube, automatic level control, and electronic tuning control.

By
ALFRED A. GHIRARDI

IN ORDER to make a nationwide television broadcasting system possible, certain uniform video and audio transmission and reception standards have been set up by the FCC and the RMA for use in the United States. These have been modified several times during the past few years, but it is likely that those recommended most recently will remain in effect for some time to come. The picture can still be improved a great deal without changing these standards by making refinements within the system. Designers of new television broadcasting transmitters, as well as manufacturers of postwar television receivers for black-and-white picture reproduction, are now employing them as their standards of television engineering practice. A knowledge of the composition of television signals, and familiarity with a few of these standards, is necessary for a clear under-

standing of the bandpass acceptance response characteristics required in the sound and video i.f. amplifiers of modern television receivers. It will, therefore, be well to first obtain a clear understanding of the modulation characteristics and bandwidth requirements of the *video* (picture) and the accompanying *audio* (sound) signals.

The Composite Video Signal

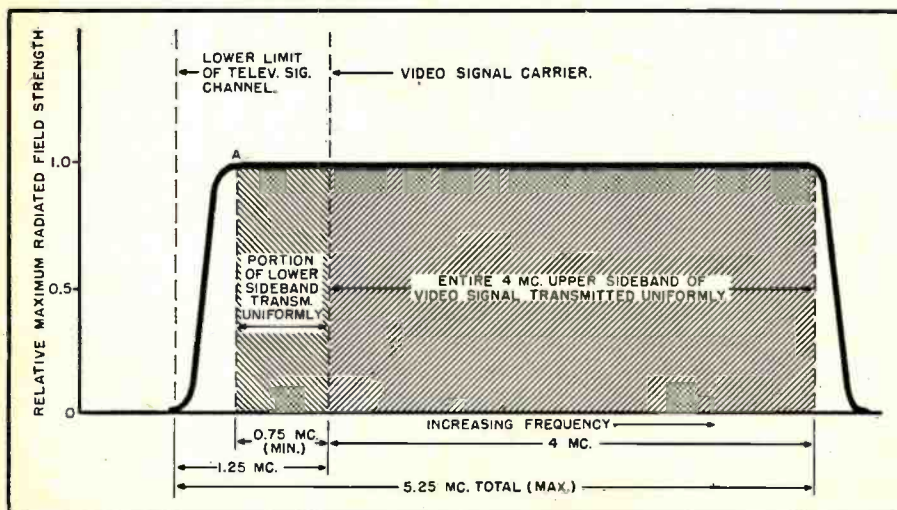
The signal generated by the camera tube in the television broadcast studio is employed to *amplitude-modulate* the video carrier of the television transmitter. The composite video signal is really a combination of the pic-

ture signal and those produced by several associated scanning and synchronizing circuits that are necessary to the system.

For transmission of the present standard 525-line black-and-white type of picture interlaced at 30 frames (60 fields) per second, the composite amplitude-modulated video signal actually involves a range of sideband frequencies extending to approximately 4.5 mc. above, and below, the video carrier frequency employed, in order to convey all the image information ranging from the very large objects in a scene (which result in relatively low modulation frequencies) to the very small details (which result in much higher modulation frequencies). In practice, the range of sideband frequencies transmitted is limited to approximately 4 mc. as this has been found to be adequate.

If conventional full double-sideband AM transmission were employed for the video signal, a frequency channel $2 \times 4 = 8$ mc. wide would be required for it. In order to economize on the radio spectrum necessary to accommodate a sufficient number of television broadcast transmitters in a given service area, the bandwidth required by the composite video signal of each transmitter is greatly reduced below this value by employing for it a modified form of single-sideband transmission known as *vestigial sideband transmission*. It is important that this type of transmission be clearly understood, for it is responsible for the peculiar and unusual shape of the band-

Fig. 1. Ideal video (picture) transmission characteristics.



pass acceptance response characteristic required in the video i.f. amplifier of a television receiver.

Vestigial Sideband Transmission of the Video Signal

The standard ideal video transmission characteristic is illustrated in Fig. 1. As shown, the video carrier frequency is set 1.25 mc. above the low-frequency limit of the transmitting channel assigned to the television station. It will be observed that all the modulation components in the entire upper sideband (up to 4 mc. from the video carrier frequency) are transmitted uniformly. Those in the lower sideband are partially suppressed.¹ Only those lower sideband components of frequencies up to about .75 mc. from the carrier frequency are transmitted uniformly. Those of a frequency between about .75 and 1.25 mc. from the carrier frequency are partially attenuated (as shown by the sharp drop at the left of point A in Fig. 1) by means of suitable filters in the transmitter so that a negligible amount of energy at these frequencies is radiated. Those of a frequency greater than 1.25 mc. from the carrier frequency are entirely suppressed (observe that the transmission characteristic drops to zero value at the 1.25 mc. point). Therefore, since these higher-frequency components of the lower sideband are rejected at the transmitter, *single-sideband* transmission results for the higher video modulation frequencies above about .75 mc. and double sideband transmission takes place only for the lower video modulation frequencies between zero and about .75 mc. This partial suppression of one side-

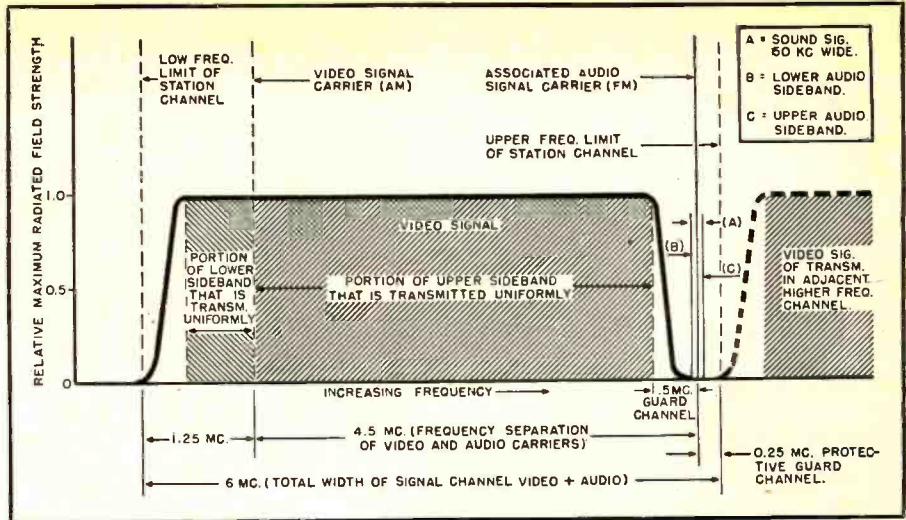


Fig. 2. Video-audio division of channel and relative positions of the video and audio signals (and their transmitted sidebands) in the 6-mc. wide television transmitter channel.

band is known as *vestigial* sideband transmission, and it serves the very useful purpose of making it possible to satisfactorily effect transmission of the desired intelligence without need for employing nearly as wide a frequency channel as would be required if full double-sideband transmission were employed.

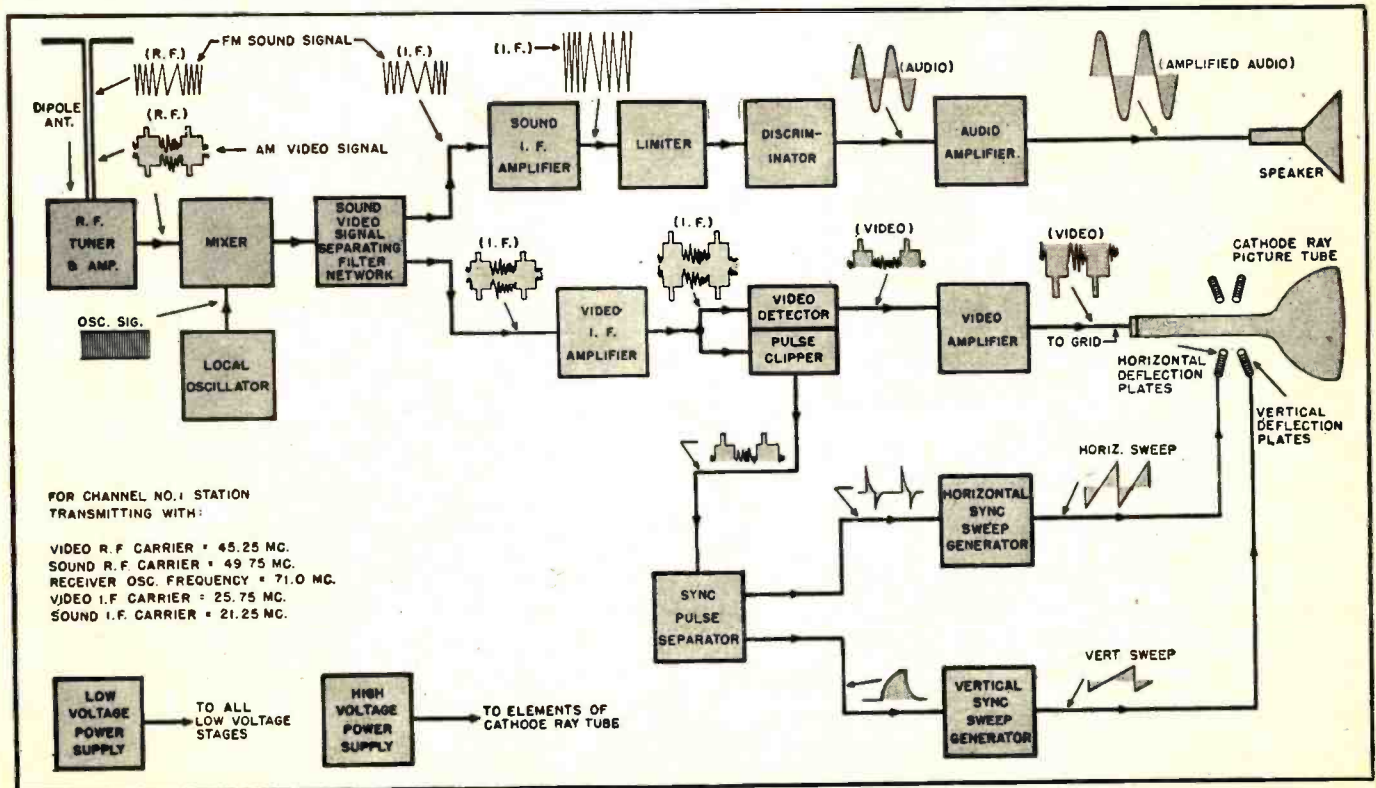
Vestigial sideband transmission can be used in television because the video signal consists of a series of various types of pulses. Since the function of each pulse is to actuate a circuit in the receiver in order to produce a visual action, only one-half of each pulse

cycle is actually necessary. In fact, single sideband transmission (transmission in which one sideband is completely suppressed and only the other is transmitted) would serve satisfactorily for the video signal if it were not for the fact that removal of the entire lower half of the signal would introduce phase shifts that would ruin the picture. Therefore, it is necessary to remove only that part of the lower sideband portion of the signal which will not cause a serious shift in phase. The amount removed in the standard transmission characteristic illustrated in Fig. 1 has been found to fulfill this requirement.

The fact that a part of the lower sideband is transmitted along with the

¹ Because of technical limitations in transmitter filters, it is not practical to suppress the entire lower video sideband. Consequently, a portion of this sideband is transmitted.

Fig. 3. Block diagram illustrating functional operation and the two separate i.f. channels in conventional postwar television receiver.



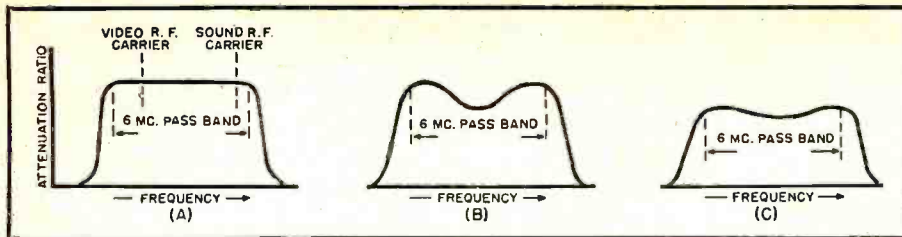


Fig. 4. Three band acceptance characteristics for the r.f. tuning circuits in a TV receiver.

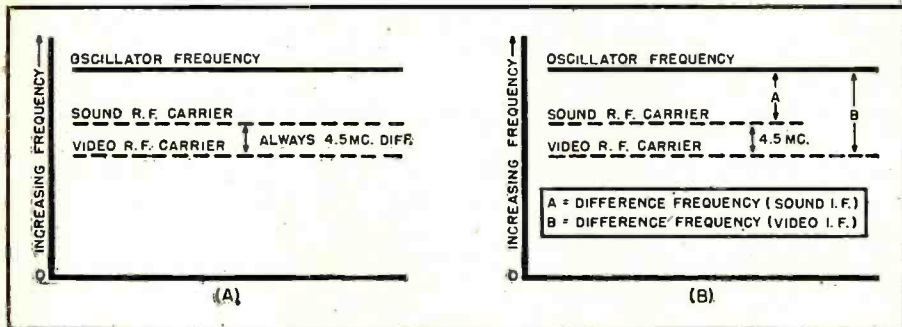


Fig. 5. (A) Relation of local oscillator, sound r.f. carrier and video r.f. carrier frequencies in a television receiver. (B) Relation between the "difference" frequencies produced during frequency conversion, giving rise to the sound i.f. carrier and video i.f. carrier frequencies.

full upper sideband actually results in an over-emphasis of the low modulating frequencies, since the energy of the low frequencies of the partially suppressed lower sideband adds to that of the low frequencies of the upper sideband. To avoid this over-emphasis, the tuned circuits of the video i.f. amplifier in the television receiver must be designed to provide an unusual form of bandpass acceptance characteristic that attenuates the video carrier frequency 50% (see Fig. 7.). This compensates for the over-emphasis of the low modulating frequencies at the transmitter and results in substantially flat response (for the complete system) over the entire video modulation-frequency band.

The Audio Signal

Simultaneously with the viewing of the scene to be televised, a microphone picks up the sound which attends the scene and converts it into equivalent electrical variations which are employed to modulate a separate carrier

employed for transmission of the sound (audio) portion of the television program. *Frequency modulation* is now employed for the sound program, with a swing of ± 25 kc. defined as 100% modulation. A system capability of 50 to 15,000 cycles is used and pre-emphasis having a time constant of 75 microseconds is employed. This practice has been standardized by the FCC for use in America.

Television Transmission Channels

The television frequency channels allocated by the FCC for use by commercial television broadcasting stations in the United States have been revised several times. Present regulations provide for the establishment of thirteen numbered channels each 6 mc. in width. These are located in two bands in the v.h.f. portion of the radio spectrum. Six of the channels lie in the 44 to 88 mc. band. The other seven

² In addition, the frequency band between 480 and 496 mc. has been allocated for use by transmitters engaged in transmission of experimental color television.

lie in the band of higher frequencies between 174 to 216 mc.² The lower and upper frequency limits of each of these 13 channels, together with the Channel Number assigned to each, are tabulated herewith for reference:

CHANNEL NO.	FREQUENCY LIMITS
1	44-50 mc.
2	54-60 mc.
3	60-66 mc.
4	66-72 mc.
5	76-82 mc.
6	82-88 mc.
CHANNEL NO.	FREQUENCY LIMITS
7	174-180 mc.
8	180-186 mc.
9	186-192 mc.
10	192-198 mc.
11	198-204 mc.
12	204-210 mc.
13	210-216 mc.

Accommodating the Video and Audio Signals Within the Television Signal Channel

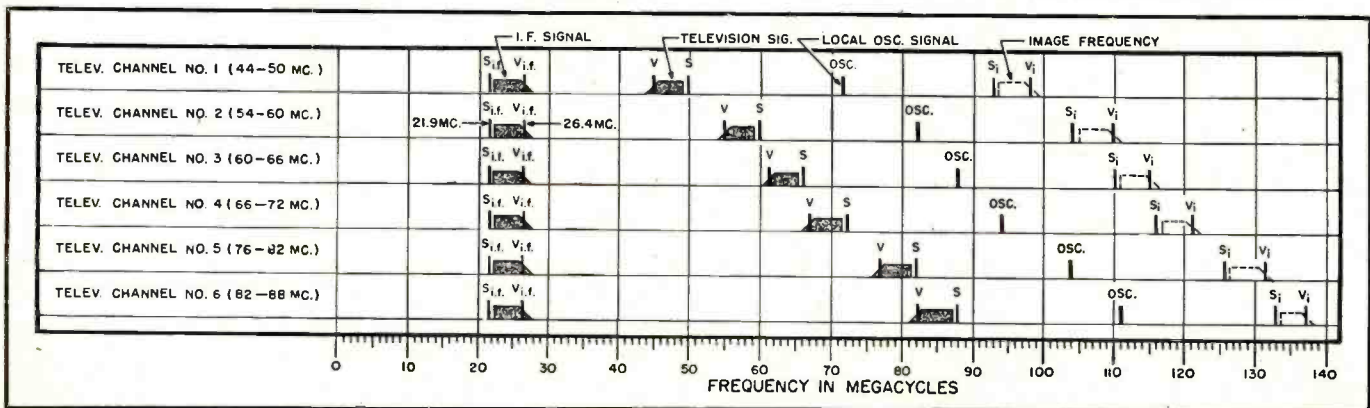
Although several methods have been proposed for transmitting both the video and audio signals on the same carrier, the practice now in vogue in the United States is to transmit the two signals simultaneously but by means of separate carriers differing in frequency by a definite amount. The relative position of these carriers in the 6 mc. wide spectrum of the frequency channel allocated to the television transmitter, and the division of the complete channel into the relative portions devoted to the video and audio signals and their respective transmitted sidebands has been standardized by the FCC and will now be discussed.

Video-Audio Division of a Television Channel

By regulation, the carrier frequency of the video signal is made 1.25 mc. higher than the lower-frequency limit of the station channel. This positions the video carrier near the low-frequency end of the station channel, as shown in Fig. 2.

In order to prevent the sound signal from causing audio interference with the low-frequency sideband of the video signal of the transmitter operating in the next adjacent channel of higher frequency, an adequate separating *guard channel* must be provided between them. This protective guard channel is provided by locating the sound carrier .25 mc. (250 kc.)

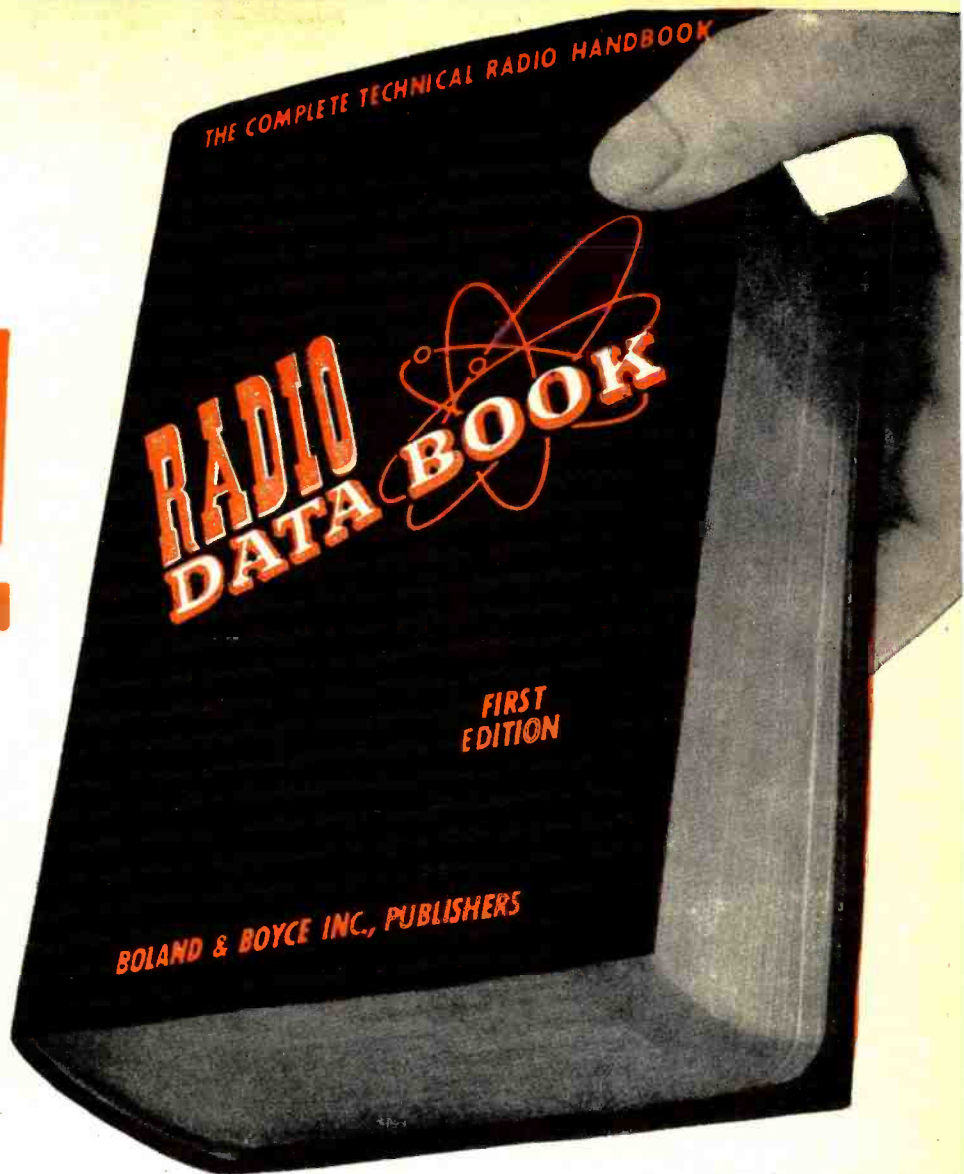
Fig. 6. Chart showing the oscillator frequency (Osc.), video and sound intermediate frequencies ($V_{i.f.}$, $S_{i.f.}$) and video and sound image frequencies (V_i , S_i) for television signals (V, S) in the six television transmission channels from 44 to 88 mc.



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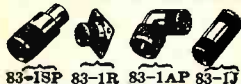
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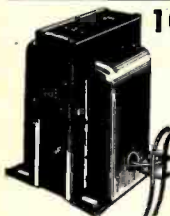
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below the upper frequency limit of the station channel, as shown at the right of Fig. 2.

Since the video signal upper sideband to be transmitted is approximately 4 mc. wide (see Fig. 1), this leaves a guard channel approximately .5 mc. (500 kc.) wide between the upper limit of this sideband and the carrier of the associated sound signal (see Fig. 2) for prevention of audio interference with the associated video signal, and vice versa.³

It is apparent that with the television channel divided up as shown in Fig. 2, the amplitude-modulated video signal with all its sideband frequency components that are to be transmitted, the frequency-modulated audio signal with all its sidebands that are to be transmitted (deviation of ± 25 kc. defined as 100% modulation), and the necessary guard channels for prevention of self and adjacent-channel audio interference with the picture are all nicely confined within the 6-mc. transmission channel limit assigned to each television station. It will be observed that these standards set the frequency separation between the video and audio carriers of any one television transmitter at the definite, fixed value of 4.5 mc. For a very good reason that will be pointed out later in this discussion, the current postwar standards recommend that all television transmitters be operated with the video carrier frequency 4.5 mc. below that of the audio carrier, as illustrated in Fig. 2.

Before leaving this phase of the subject it will be interesting to examine Fig. 2 in order to determine what the use of vestigial sideband transmission for the video signal actually accomplishes in the matter of reducing the width of the transmission channel required for each television broadcast transmitter. If regular, full double-sideband transmission were employed for both the video and the sound signals, a channel $.25 + 4.5 + 4.5 = 9.25$ mc. wide would be required for each television transmitter in operation. By employing vestigial sideband transmission for the video signal, the station channel width is reduced to 6 mc. This represents a reduction of approximately 33 1/3%. This decrease in required station channel width makes it possible to operate that many more television broadcast transmitters in a given locality within the present assigned 44 mc. to 88 mc. television broadcast band.

Basic Elements of a Television Receiver

Television receivers are usually of the superheterodyne type, in order that all the important advantages inherent in this type of receiver may be

³ It is not necessary to make the guard channel between the audio carrier and the video signal of the adjacent-channel transmitter of higher frequency as wide as this because the extreme portion of this transmitted adjacent-channel video signal which the audio channel adjoins is that which is not intended to be used by the television receivers tuned to receive its picture program. Consequently audio interference with it, if it occurs, does no harm. Accordingly, this guard channel is made only 0.25 mc. wide.

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 Like new.

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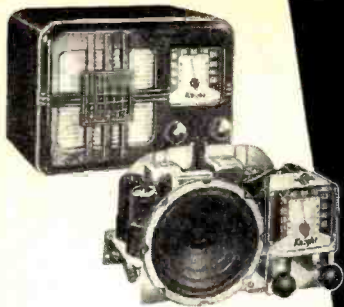
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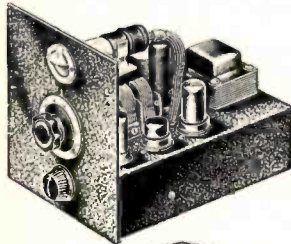
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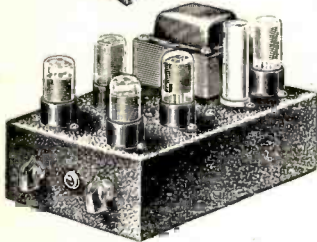
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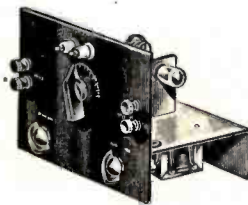


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POPULAR 2-METER TRANSCIVER. It's easy to build this powerful, compact 2-meter transceiver. Fine engineering brings unusually high output efficiency. Supplies current for single button carbon mike. Output transformer for any PM speaker or headphones. Requires 250 v. at 75 ma., and 6.3 v. at .65 amp. for power. Kit complete with all parts: punched and formed cadmium plated chassis, 5 x 9 x 2", clearly marked 6 x 9" steel front panel with black crackle finish, tubes, wire, solder, etc. Includes easy-to-follow instructions. Requires Amateur license to transmit. Kit complete, less mike, speaker and power supply. **83-220. NET, only \$18.25**



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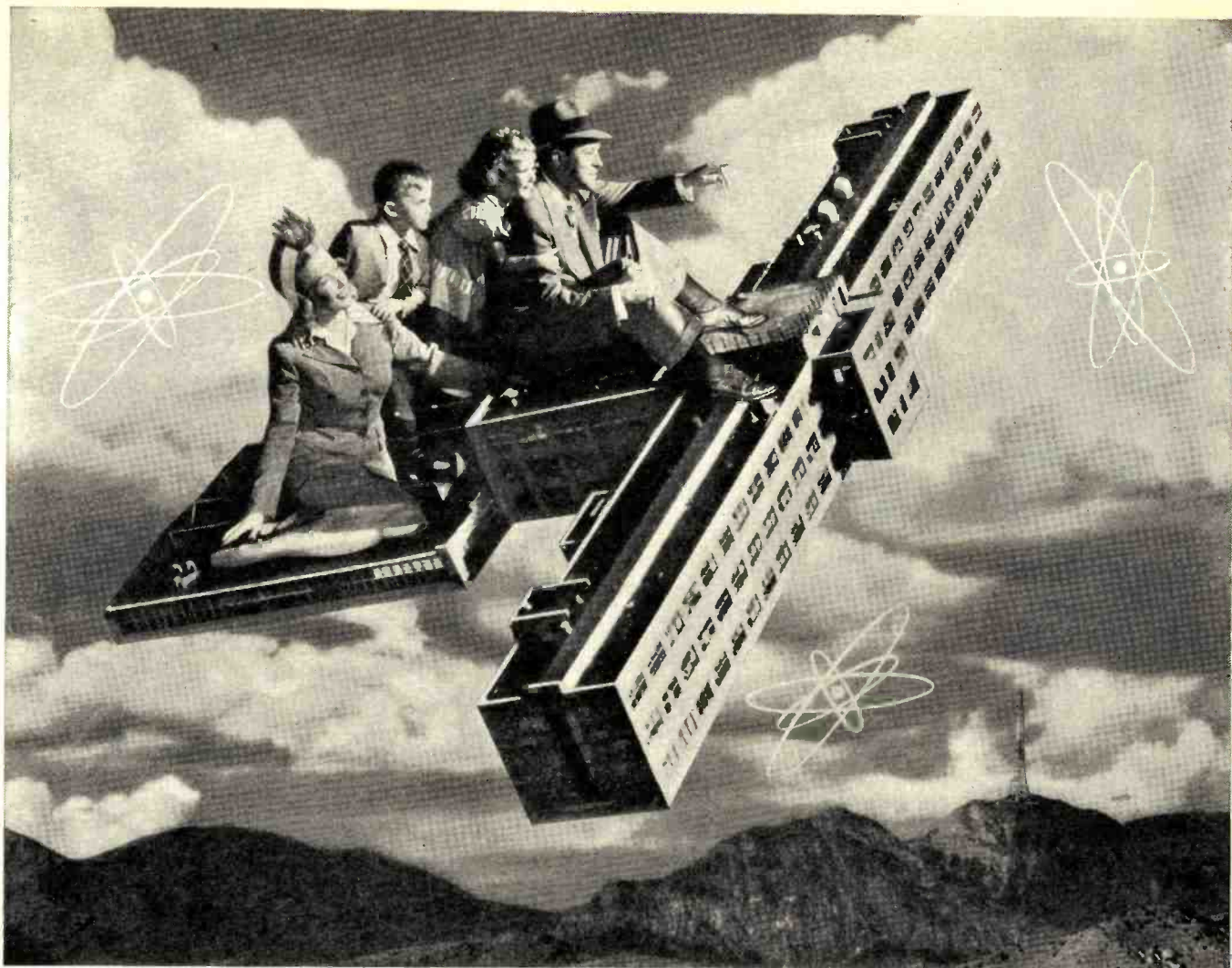
secured. They employ a number of basic functional units arranged in the sequence illustrated in the block diagram of Fig. 3.

Whether or not a tuned r.f. amplifier stage is employed ahead of the mixer as shown in Fig. 3 depends upon the price of the receiver, preferences of the designer, etc. There are several reasons for this. (1) At the very high frequencies (44 to 88 and 174 to 216 mc.) allocated to commercial television broadcasting the usefulness of an r.f. amplifier stage is not as great as it would be in a receiver designed for the very much lower AM broadcast frequencies of 535 to 1605 kc., since the gain and adjacent-channel selectivity contributed by a t.r.f. amplifier stage at these v.h.f. is comparatively small. (2) Image-frequency rejection is not as important a problem in present-day television receivers as it is in receivers designed for other services, because the standard i.f. values recommended for use in both the video and audio i.f. amplifiers throw all possible image frequencies well outside of the television bands and into the frequency channels employed by a comparatively few low-powered transmitters used for other services. (3) Because the television transmitting distances are short, and the signal voltages at the receiving antennas therefore are comparatively high, the gain that would be contributed by an r.f. amplifier stage is not of great importance. For these and several other reasons which need not be gone into here, most television receivers do not employ a separate tuned r.f. amplifier stage but couple the composite television signal received by the dipole receiving antenna to the input circuit of the mixer tube through a tuned r.f. coupling transformer. In such receivers, the tuned r.f. portion referred to is the coupling and tuning circuit between the antenna and the mixer grid.

Since the composite television signal (video plus audio) encompasses a frequency bandwidth of 6 mc. (see Fig. 2) the r.f. and mixer tuning circuits must be designed to have a band acceptance characteristic at least 6 mc. wide⁴ if both the video and sound signals are to be passed. Fig. 4A illustrates such a characteristic (ideal) that accepts all the desired frequencies uniformly, and that sharply attenuates the unwanted signals of adjacent transmitting channels. It is impossible to attain this ideal flat-topped, steep-sided characteristic in practice, so a compromise is necessary. By employing over-coupling be-

(Continued on page 173)

⁴ The smaller table-model television receivers which employ small diameter cathode-ray tubes having picture screen widths of the order of 5 or 7 inches do not require as sharp an image as is necessary when the larger C-R tubes are used. The sharpness of the reproduced image is a function of the bandwidth of the video signal applied to the picture tube. Consequently, since extremely fine picture detail is not necessary in such receivers, it is not necessary to reproduce the higher modulating frequencies of the video signal. Therefore the r.f. tuning circuits can be made more selective by employing a band-acceptance width of only 4 or 5 mc. instead of the full 6 mc. required for receivers that employ the larger C-R tubes.



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Compact E.C.O.

(Continued from page 64)

If the oscillator is operating well, which it should if the coil data has been closely adhered to, the buffer may be tuned. Plug in the 6L6 and either the 3.5 or 7 mc. buffer plate coil. When the circuit is in tune, the neon bulb on the front panel will glow brightly. Next, remove the r.f. choke from the oscillator plate circuit and plug in the other oscillator plate coil and the 14 mc. buffer plate coil. Set the oscillator to 3600 kc. and tune the mica trimmer inside the oscillator plate coil for the brightest glow of the neon lamp. This adjustment will hold for the entire 14 and 28 mc. bands, since a large reserve of excitation is available.

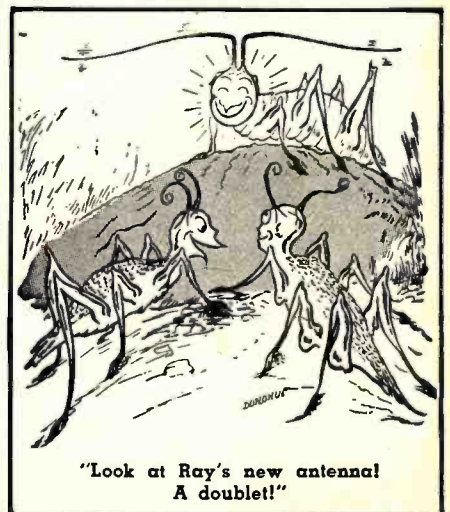
The final amplifier is tuned for minimum plate current in the usual way. The unloaded plate current should be 10 to 20 ma. on the 3.5, 7, and 14 mc. bands, and about 40 ma. at 28 mc. The amplifier can be loaded to 100 ma. without trouble. Refer to the coil table for the proper coils to use for any particular band. The output link is suitable for coupling to a low impedance line, such as would feed a center-fed doublet, or to a separate antenna coupler.

The stability of the oscillator has been checked against a secondary frequency standard, and after a one hour warm-up period, did not drift more than 500 cycles. Jarring the cabinet heavily will "wobble" the frequency slightly, but the unit will always return to its original frequency. The unit was placed on an inexpensive sponge rubber kneeling pad, which fortunately, measured just 8" x 14". This made the v.f.o. insensitive to any but the severest shocks.

The rig was intended to drive a kilowatt amplifier, but the performance and versatility were so acceptable that no further experimentation was felt necessary.

The 807 may be plate and screen modulated very easily. About 25 watts of audio at 5000 ohms is necessary.

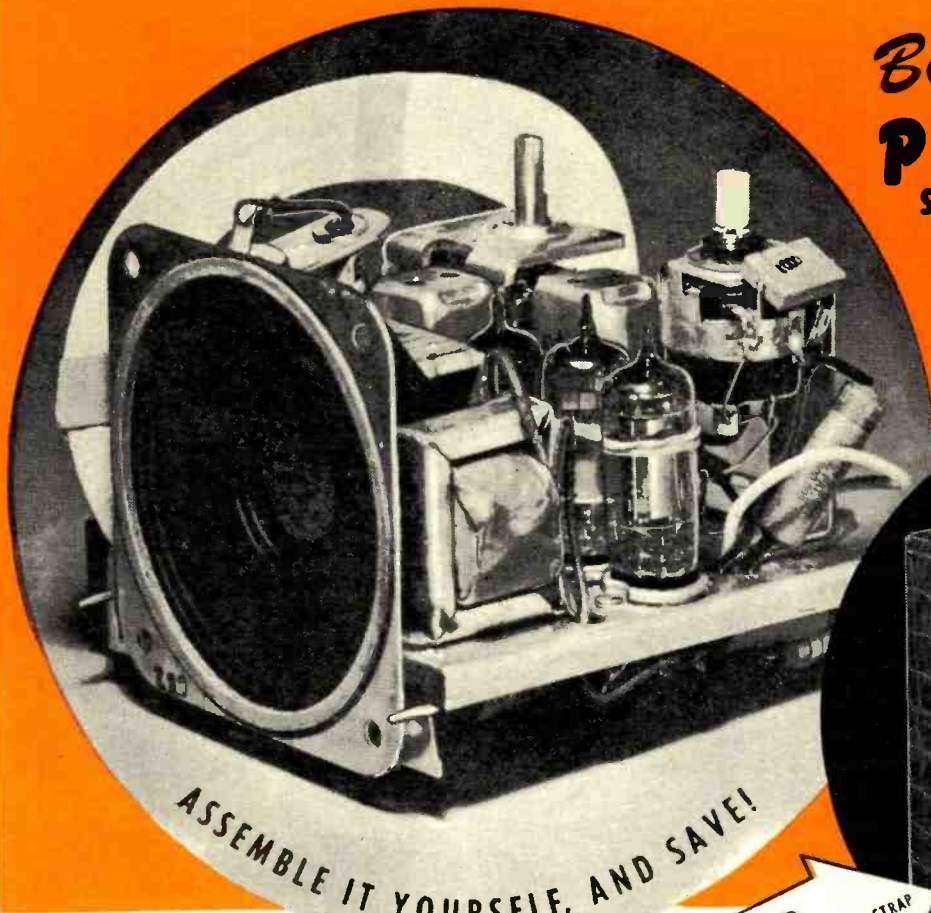
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It has a 3 1/2" ALNICO V PM speaker. Uses standard, easy-to-get, long-lasting batteries—easy to change. It plays with the lid open or closed. Has 4 tubes. Weighs 3 1/2" lbs. (approx.) when complete and operating, case and all!

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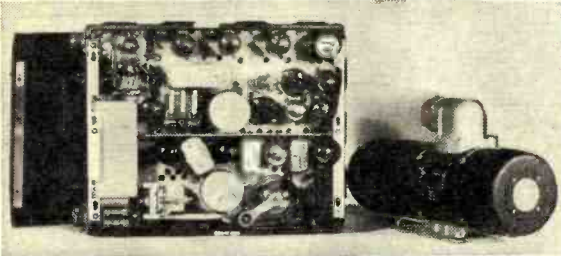
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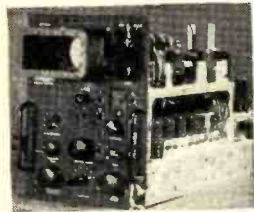
IDEAL FOR 2 METERS PRICED COMPLETE WITH 20 TUBES—AND 12-28 VOLT DYNAMOTOR



FOUR CHANNELS CRYSTAL CONTROLLED. ARC-4 for VHF frequencies 140 to 144 megacycles. There are 7 tubes in the transmitter: 832, two 1614, two 6V6 and two 6L6. The receiver section has 13 tubes: two 6AC7, four 6N7, three 12SJ7, two 12SQ7 and two 12A6. The unit is actually two receivers and one transmitter in one piece. One receiver is for stand-by use. Has built on dynamotor for 12 or 24 volt DC operation. Priced complete with tubes and four crystals and dynamotor. Hams convert this for two meter operation. It's a scoop at this price. Used, but guaranteed to be in good condition.

LORAN R-65 RECEIVER INDICATOR SCOPE 28 TUBES \$2495

HAS G.E. 100 KC. CRYSTAL 3BP1 Scope Tube



R-65 APN-9—Loran Receiver indicator scope. A compact Airborne unit. Priced complete with 28 tubes. 6SK7, 6SN7, 2X2, etc. Has 3 inch scope tube 3BP1. This unit has many possibilities. More parts, coils and controls than you can imagine. Has a 100 KC. General Electric crystal. Pictured with case removed. Size 9x12x16. Weight 35 lbs. These units have been in aircraft but we guarantee them to be in good condition.

Net \$24.95—Two for \$46.95

SELSYN INDICATORS \$2.95



Selsyn Indicators. 5" diameter. Will operate on from 15 to 24 volts 60 cycle AC. Model I-82A can be used as either selsyn transmitter or selsyn receiver. Scoop Price, \$2.95, 2 for \$5.49



SWITCH POT SALVAGE 99¢ 3 for \$2.50



PACKARD BELL PRE-AMP. \$1.99 Housed in a handy aluminum case 5x4x5. Priced complete with tubes 6SL7, 28D7. Has many usable parts. Relay and control PL68 plug and patch cord.

BC-412 SCOPE BRAND NEW FACTORY CARTONED \$4995

BC-412-612 Oscilloscope. Brand new factory cartoned, weight 200 lbs. This unit is the most ideal war surplus scope. Works on 110v 60 cycle AC. Only simple changes (conversion in many radio magazines) necessary to convert to a laboratory test scope. Has twin heavy duty plate supplies and tubes 5BP1 5" scope tube, 6-6L6, 2X2, 5T4, 2-6SJ7, 6SC7, 6H6, etc. Schematic diagram with each unit. This may be the last time we have a scoop in a scope like this. Net \$49.95

Left to Right New Remote Control Head and volume control CW. MCW, sw. for BC-455-B 6 to 9 MC receiver. Scoop Price, \$0.99 BC-631-13 Jack Box. NEW. Has 10M gain control and Jones 6 screw terminal block. Salvage Price, \$0.29



Salvage Scoop BC-732-A Radio Control Box. Toggle switch, volume control and 6 position single pole cam-operated switch; phone jack. Scoop Price, \$0.49 HEAD PHONES. 10,000 ohms. 1mp. Civilian Types. Standard length cord \$1.29 each. VOLUME CONTROL SPECIAL. 1 Meg tapped with switch. 10 for \$4.90.

RECORD CHANGERS

GENERAL INSTRUMENT single post, small size, deluxe model as used on many '47 model \$400 combinations. Shuts off on last record. Scoop price \$17.95.



Maguire two-post with permanent needle. Shuts off on last record. Scoop price \$11.95. OAK deluxe model twin post changer. This is a finely tooled job. Net \$19.95. AERO single post. Has push button off and on and reject switch. A small size changer. Net \$13.95. Individually designed made to fit walnut bases may be had for any of the above changer for \$2.49 extra.

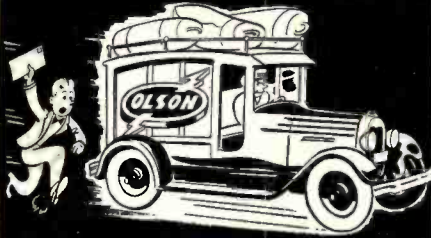
McGEE RADIO COMPANY

WRITE FOR CATALOG

SEND 25% DEPOSIT — BALANCE C. O. D. 1225 McGEE ST., KANSAS CITY, MISSOURI



RADIO WAREHOUSE INC.
73 East Mill St., Akron, Ohio



Better get on our
MAILING LIST!

If you havent sent us
your name and address,
do it now and be
sure of getting
our monthly
**BARGAIN
BULLETIN**
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Deals we offer

**NO CHARGE
IT'S FREE!**

MAIL THIS
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OLSON

RADIO WAREHOUSE INC.
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Sure, put me on your List.
I want to save time and money.

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CITY _____ STATE _____

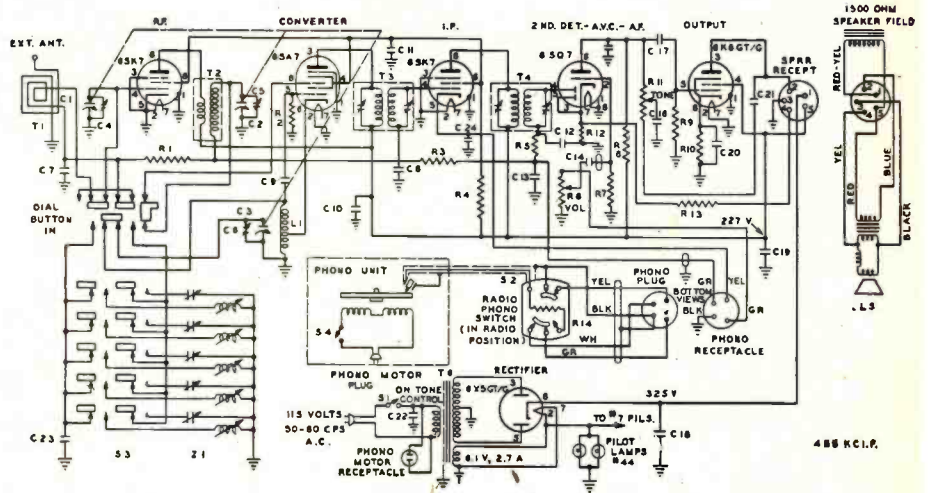


CIRCUIT PAGE

(FOR PARTS LIST SEE PAGE 92)

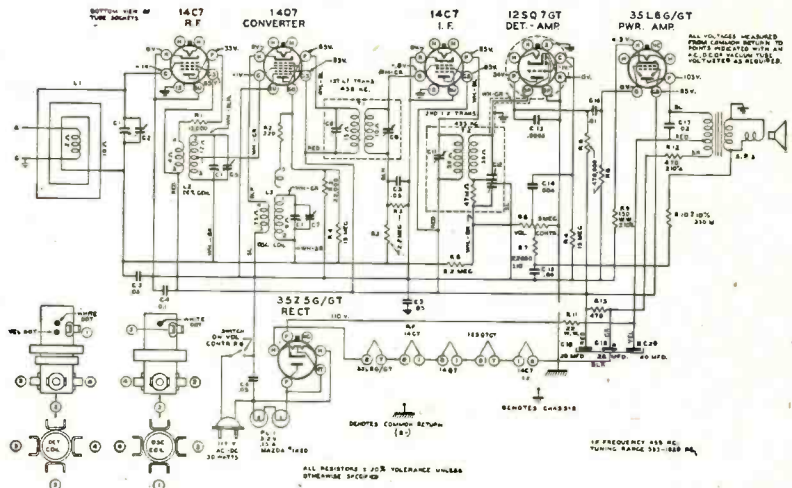
RADIO NEWS, DECEMBER, 1947

HOFFMAN MODEL A500



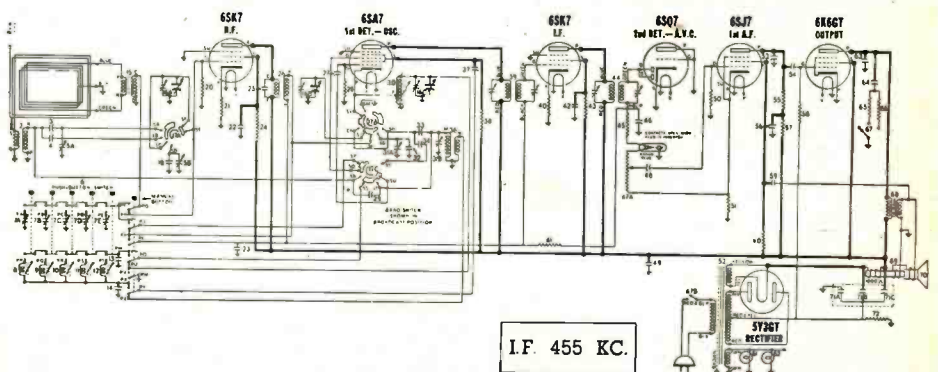
RADIO NEWS, DECEMBER, 1947

ZENITH MODELS 6D014, 6D029



RADIO NEWS, DECEMBER, 1947

STEWART-WARNER MODEL 9003-B



Here, and on following pages, are circuit diagrams and parts lists of many new postwar radio receivers. Radio News will bring to you other circuits as quickly as possible after we receive them from manufacturers.

it's new
it's timely



it's **FREE!**

Lafayette's new Radio Supplement and Gift Guide

HERE ARE SOME TYPICAL LAFAYETTE BARGAINS

Phono and Amplifier Case



Handsome airplane luggage type case, lightweight and sturdy. Will hold phonos built to play 10 or 12 inch records, with space for 6" spkr. and amp. circuit. 13x14" mtg. panel. 19 x 13 3/4 x 7 1/2" overall. 8 lbs.

X19444 Your Cost, Only.....\$6.95
10 for.....\$55.00

TRUTEST 67 1/2 Volt Battery

A powerful miniature "B" battery for portable radios, hearing aids, etc. Can be used in place of similar Burgess, Minimax, RCA, etc. batteries. 2 1/16 x 1 1/8 x 3 1/16". 1 1/2 lbs.



XPS737.....\$1.29

Sensational Tube Values



872A.....\$1.79
G1 8020..... 3.45
Limac 15 E..... 1.95
327 A..... 2.95
VT-127 A..... 2.95
7BP7..... 3.95
954..... .39
TruTest Battery..... 1.29

Lafayette Radio
RADIO WIRE TELEVISION, INC.

100 Sixth Avenue, New York 13, N. Y.
542 E. Fordham Rd. 24 Central Avenue 130 Federal Street
Bronx 58, N. Y. Newark 2, N. J. Boston 10, Mass

MAIL THIS COUPON TODAY

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100 Sixth Ave., N.Y. 13
Rush Free Supplement and Gift Guide No. 885

Enter my order for X19444.....

XPS737.....

Check () M.O. tube(s).....

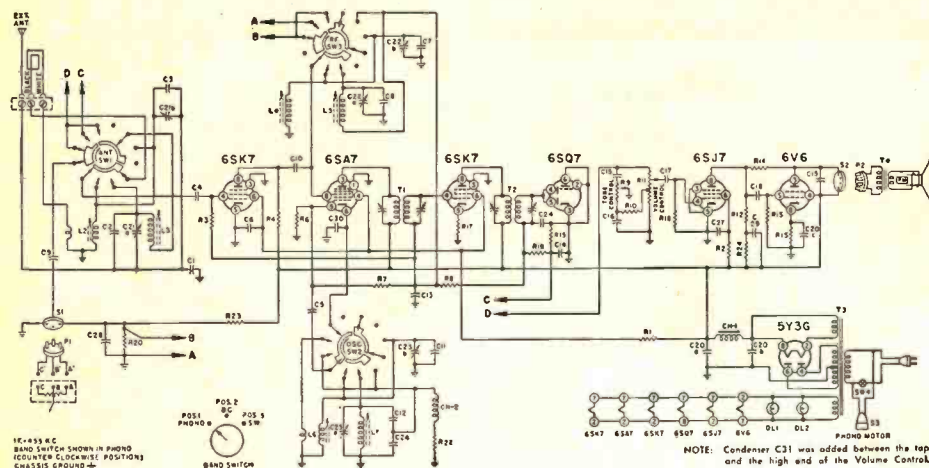
NAME.....

ADDRESS.....

CITY.....ZONE.....STATE.....

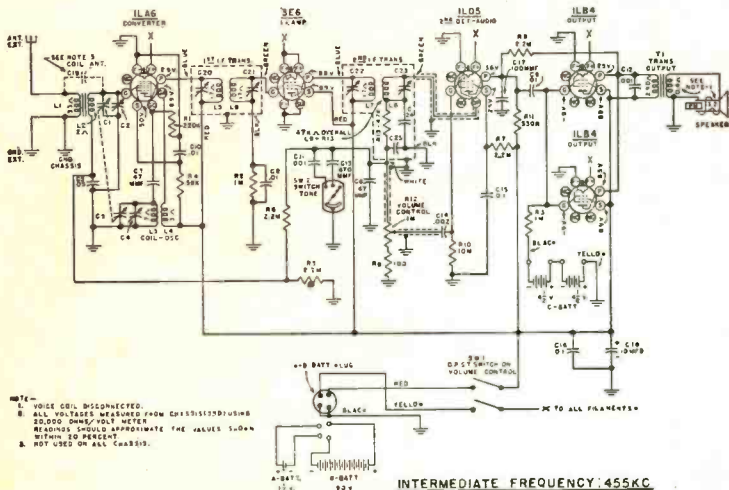
RADIO NEWS, DECEMBER, 1947

ADMIRAL MODEL 7C63, CHASSIS 7C1



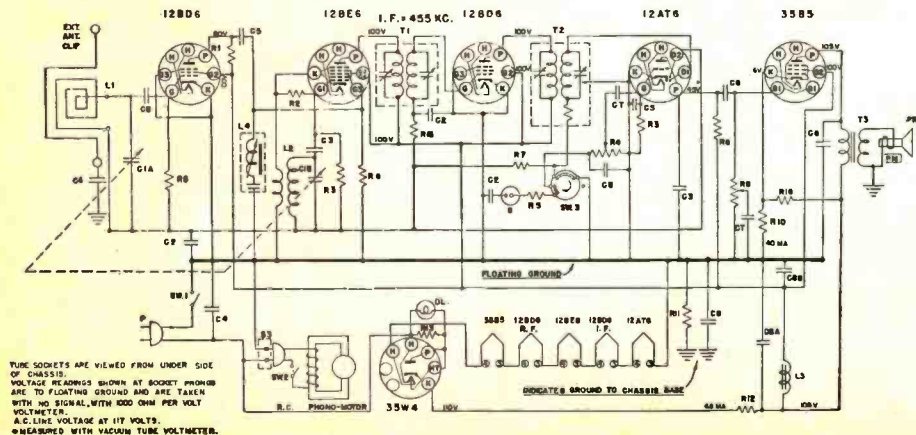
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WESTINGHOUSE MODEL H-133



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ARVIN MODELS 150TC, 151TC



R&M Radio

**MORE FOR YOUR MONEY—
SATISFACTION
GUARANTEED—**

Large, complete stocks—prices at absolute minimum—and
GUARANTEED EQUIPMENT Look at the prices on these war-
surplus items:

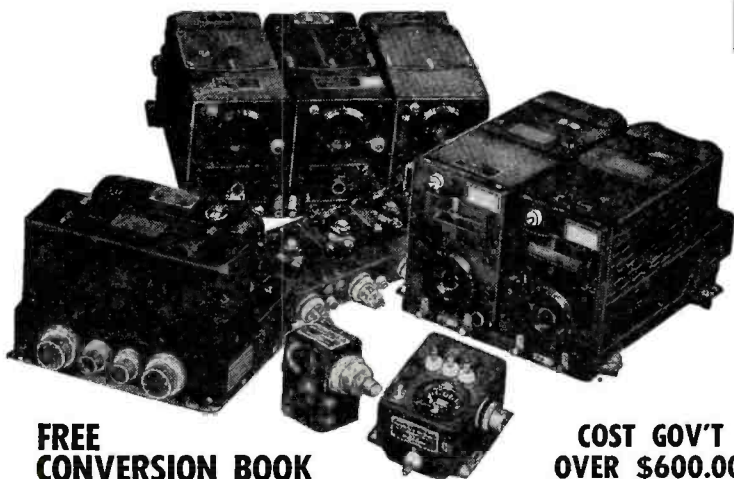
10 Meter Mobile.....\$19.50 2 or 6 Meter Rig.....\$17.50
BC-375E 17.50 ART-13 68.50

IMMEDIATE DELIVERY ON EVERY ITEM

TRANSMITTERS & RECEIVERS FOR

10 Meter Mobile Rig

WAR SURPLUS SCR-274-N COMPLETE ONLY



**FREE
CONVERSION BOOK**

**COST GOV'T
OVER \$600.00**

Conversion Book Supplied Free
gives details for low-cost,
easy conversion to

- 10 METER MOBILE RIG
- 20—40—80 METER BANDS

\$19.50

This sensation of all surplus is not only an ideal 10 Meter Mobile Rig! It's a complete amateur radio station! Here are a few more ways to use the equipment included in this Command Set. The transmitter VFO driver stage gives your BC-375-E higher RF output—as high as 150 watts. Make swell standby receivers with the BC-348 on round-table "rag chews." You get all this equipment: 3 Receivers—190-550 kc, 3-6 and 6-9.1 mc; two transmitters, 4-5.3 mc, 5.3-7 mc; four dynamotors—28 volts DC input; 1 modulator with carbon mike input; two tuning control boxes; one antenna coupling box with r-f ammeter; antenna relay and 5000 volt 50 mmf. WE vacuum condenser (antenna relay can be used with most rigs); and a complete set of tubes for each unit—29 POPULAR TUBES in all. Mechanical cables for remote tuning of receivers supplied for \$1.00 extra.

MOUNTS

SCR-274-N COMMAND SET	
FT-220-A Rack for 3 receivers, with plugs	\$2.50
FT-221-A Shock Mounting for FT-220-A	.75
FT-222-A Mounting for Control Box BC-450	.30
FT-225-A Shock Mounting for modulator BC-456	.60
FT-226-A Rack for 2 transmitters, with plugs	2.25
FT-227-A Shock mounting for FT-226-A	.75
FT-228-A Mounting for Control Box BC-451-A	.20
FT-229-A Shock Mounting for antenna relay BC-442-A	.60
Total \$7.95	

SPECIAL—Complete set of mounts for SCR-274-N with plugs \$5.00

BC-348 RECEIVER

FT-154 Shock Mount with plug PL-Q103	\$2.25
--------------------------------------	--------

SCR-522 TRANSMITTER-RECEIVER

FT-488 Mount for transmitter-receiver	\$1.75
FT-498 Mount for dynamotor	1.25
Set \$3.00	

BC-375-E TRANSMITTER

FT-107 Mount for dynamotor PE-73-C	.75
FT-115-B Individual rubber shock mount for top of trans.	.35
FT-151-A or C Shock Mount for BC-375 Transmitter	2.25
Set \$3.35	

PLUGS: We have plugs available for all the above equipment separately. Just name your plug, each only 75c

INSTRUCTION BOOKS—MANUALS

BC-348	\$1.25	SCR-522	\$1.25
BC-375	1.00	BC-221	1.00
SCR-274-N	1.50	SCR-269-G	1.00



CONTROL BOX BC-451 89c

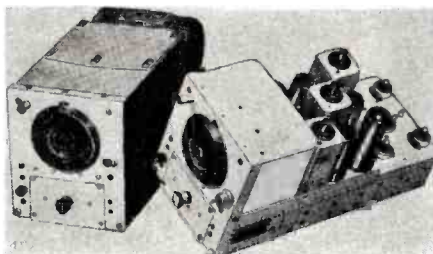
Telegraph key, 2 mike jacks, 4 position selector switch, and numerous other parts.



COLLINS ART-13 TRANSMITTER Complete \$68.50

Rated at over 100 watts, one of the most compact and neatest xmtrs ever built, complete with tubes and plugs; freq. range 2-18 mc. FREE schematic diagram furnished.

Dynamotor DY-17	\$17.50
Remote control for xmtr.	\$3.00
COMPLETE TRANSMITTER	
with accessories	\$89.00



SUPER-HET RECEIVERS

Ideal Stand-By or Companion for Your Shack—

75 meter receiver BC-454	EACH \$5.50
40 meter receiver BC-455	
Easily adapted to 10 meter reception.	
Airway weather stations BC-453 190-550 kc.	

ALL THREE FOR \$14.50

Free Conversion Book with 2 or more sets.

SCOPE TUBE 5CP7 BRAND NEW \$2.98

ANTENNA SWITCHES



19c 29c 75c



BC-375E ARMY AIR FORCES

**\$14.50 FOR
TRANSMITTER ONLY**

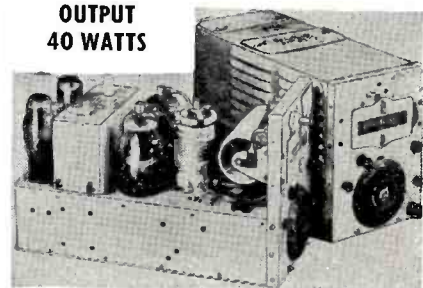
Transmitter complete with tubes, plugs and one tuning unit.

COMPLETE BC-375-E transmitter, with five tuning units, antenna loading unit, dynamotor, plugs, and all tubes, only

\$24.50

FREE Conversion BOOK The complete unit has over \$1,000.00 worth of standard radio parts and cost govt. over \$1,800.00 . . . one of most popular surplus items ever offered at such a low price . . . and **GUARANTEED.**

OUTPUT 40 WATTS



FAMOUS VFO DRIVER

BC-457	75 Meter VFO Driver	\$6.00
BC-458	40 Meter VFO Driver	\$6.00

Transmitters are complete with tubes, schematic diagrams, and data for conversion.

BOTH FOR \$10.00

RADIO NEWS



R & M RADIO CO.

CONVERSION BOOK SHOWS HOW

We've been deluged with requests for schematic diagrams covering various war surplus equipment conversions. This book, complete with diagrams, instructions, and discussion, covers the basic sets—SCR-274-N, BC-375-E, SCR-522, and BC-348. Our engineers have worked out many new ways of eliminating the worries and headaches of conversion.

\$2.00

HEADPHONE ADAPTERS MC-385

From high to low impedance, 4000 ohms to 600 ohms. Contains matching transformer.

30c each, 4 for \$1.00

Headphones

69c

HS-33 with cord and plug, 600 ohms — Used, in A-1 condition.

Carbon Mike T-17

Used, in A-1 condition

\$1.00



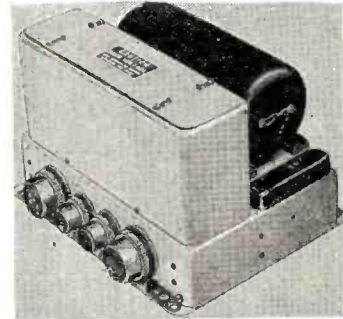
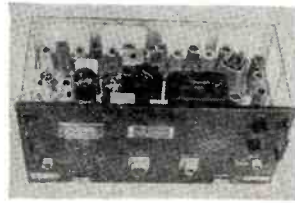
HEADPHONE EXTENSION CORDS 25c

Approx. 72" long, rubber covered, with JK-26 and PL-55 plugs.

TELEVISION SCOOP—BC 788

AC powered, needs only standard 50 mills 60 cycle transformer to replace present 400 cycle transformer; entire set usable as T.V. receiver with minor RF assembly changes. Has 6 I.F. stages, 30 mc, broad band width, 6AG5 tubes; stages mounted straight line; may be cut out intact to fit any set. One of the best 420-450 mc. SuperHet Receivers obtainable today. Schematic diagram furnished.

\$14.50

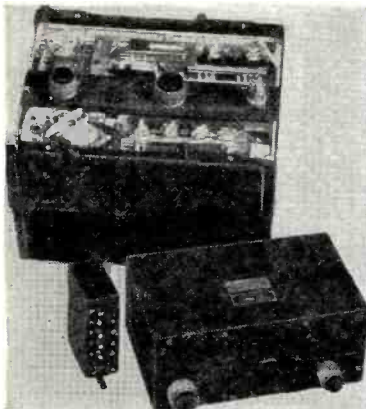


SPEECH AMPLIFIER

Modulator for Transmitter,
High Voltage DC Power Supply

Model unit, BC-456-A or V with dynamotor DM-33-A, plugs and tubes. Approximate weight 17 lbs. Tube line-up, 12J5GT, 1625, VR150 and many other parts that make this an ideal purchase for spare parts alone. Diagram furnished.

\$2.75



2 METER OR 6 METER RIG AAF SCR 522

AAF SCR-522 designed to operate from 100-156 mc. makes ideal 2 meter rig (or 2-way mobile radio). Only two small changes incorporated converts to 6 meter operation. As mobile radio telephone unit the dynamotor can be converted to an engine-driven, self-excited generator or coupled to 1/4 hp. AC motor for ground station power supply.

Transmitter and Receiver complete with tubes **\$17.50**

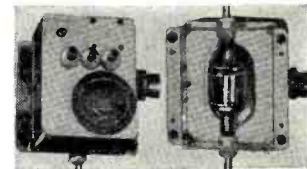
Trans-Rec., tubes, dynamotor, control box, plugs and conversion diagram book—

\$24.50 GUARANTEED

ANTENNA

RELAY

\$2.45

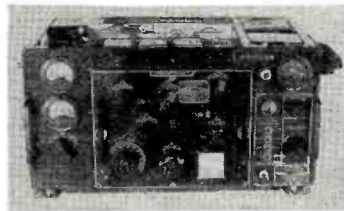


BC-442-A, SWITCHING RELAY, ANTENNA CURRENT INDICATOR with 19.5 millivolt movement, current transformer and thermocouple, 50 MMFD vacuum condenser, fixed, 5000 volt rating, (CAN BE USED WITH ANY RIG).

NAVY TRANSMITTER TYPE GP 7

Rated at over 125 watts, designed to cover from 350 to 9050 kc. with plug-in tuning units; one of the few transmitters on surplus market built of standard parts, making it a very unusual buy. Limited quantities. Transmitter, tubes, and tuning unit—

ONLY \$17.50



TUNING UNITS—FIVE FOR \$10 OR \$2.50 EACH



The following are available:

TU-5B 1500—3000 kc. TU-9B 7700—10,000 kc.
TU-6B 3000—4500 kc. TU-10B
TU-7B 4500—6200 kc. 10,000—12,500 kc.
TU-8B 6200—7700 kc. TU-26B 200—500 kc.

We have several hundred sets of five tuning units to a box, all different.

FOR ONLY \$10.00 PER BOX

If you desire special tuning units, they are **\$2.50 EACH**

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R & M RADIO COMPANY

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SAVE COD CHARGES BY REMITTING IN FULL

or send 25% deposit on all orders. Shipment is from our nearest warehouse—East, Mid-West, or West Coast—thereby saving you time and money.

All orders shipped best way, prices F.O.B.

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Send Conversion Book. \$2 inclosed. Send C.O.D.

Send FREE catalogue on

Xmtr. Kits. Receiver Kits. Tube Bargains.
 I am a licensed amateur. Beginner.

Name

Address

City

Zone..... State

distinguished service
record of the famous
WALDEN-WORCESTER
Socket Wrenches



SINCE Walden-Worcester made the first tool kits to go into the first automobiles, the products of this company have been compiling an enviable service record. Today Walden-Worcester Socket Wrenches are:

- Extra thin walled but 60% stronger
- Used by all major air lines
- First with precision forming
- Favorites for auto assembly
- First to use "Power-Packed" alloy steel
- First with new spring-lock design
- Protected with bright chrome finish



SET WW 21

The highest quality socket wrenches and attachments in all standard drives are also available in complete sets. Write Dept. 26 for further information.



STEVENS-WALDEN, INC.

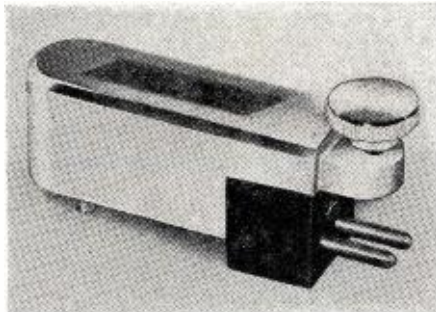
Worcester • Massachusetts

Over Forty Years of Master Toolmaking

What's New in Radio

PICKUP ADAPTER

Technical Products International of New York has recently developed a new "Vibromaster" type M Adapter which adapts the *Western Electric* 5A



arm to accommodate *General Electric* Variable Reluctance or *Pickering* 120M cartridges.

The adapter is interchangeable with 9A heads and provides a correct balance when used with the 5A arm and either the *GE* or *Pickering* cartridges. No soldering is necessary for attachment to cartridge lugs. Output of the cartridges is 10 cm. per second, stylus velocity is 25 millivolts for the *Pickering* and 11 millivolts for the *GE*. Since both of these units are high-impedance, the leads at the rear of the 5A arm should be opened and fed directly to grid or preamplifier.

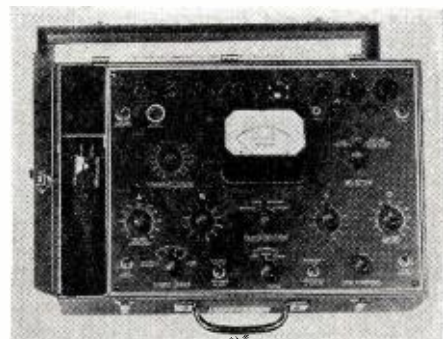
Additional information on this adapter will be furnished upon request to *Technical Products International*, 453 West 57th Street, New York 19, New York.

WESTON TUBE CHECKER

A new proportional mutual conductance tube checker, designated the *Weston* Model 798 Type 5, has been announced by the *Weston Electrical Instrument Corporation* of Newark, New Jersey.

This new instrument tests not only all receiving tubes but will also handle voltage regulator tubes and low power thyratrons as well.

A new differential frequency system, used in this instrument, provides proportional mutual conductance



readings under conditions which closely resemble actual operation. "Good-Bad" readings are also provided. 60-cycle a.c. potentials are used on tube

elements, thereby approaching the zero plate load conditions most desired for mutual conductance tests. A separate internal 5 kc. signal is applied to the control grid, and the resulting plate component of the high frequency signal is measured on a rectifier meter.

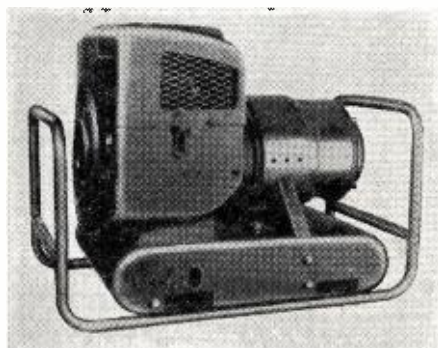
Since the normal plate current of the tube does not pass through the meter circuit, all types of tubes can be tested without overloading, in spite of widely varying characteristics. Three signal voltages of only .75, 1.5 and 3 volts provide mutual conductance ranges of 12,000, 6000, and 3000 micromhos, without overdriving, or tube damage which might result from the use of a higher signal voltage. A hot neon test is provided for checking leakage between tube elements.

Full details on the Model 798 Type 5 may be secured from *Weston Electrical Instrument Corporation*, 617 Frelinghuysen Avenue, Newark 5, New Jersey.

LIGHTWEIGHT ELECTRIC PLANTS

D. W. Onan & Sons, Inc., of Minneapolis, Minnesota, have developed a new line of lightweight electric plants designed for heavy-duty service.

This new CK line of plants is char-



acterized by low cost operation, one kwh. output per quart of gasoline, and air-cooling.

One outstanding model in the line is the 5CK-115M weighing only 272 pounds. This 5000 watt plant employs the new *Onan* "CK" air-cooled, 4-cycle, two-cylinder gasoline engine.

The line is available in 60 or 50 cycle a.c. (2000 and 3000 watts) and d.c. (5000 watts, and 3500 watt battery charger) in stationary or portable types, with either manual or electric starting.

Correspondence concerning this line should be addressed to the Advertising Department, *D. W. Onan & Sons, Inc.*, Minneapolis 5, Minnesota.

PERSONALIZED METERS

Assembly Products, Inc., has just introduced a line of meters which should be of interest to amateurs.

A complete range of milliammeters and voltmeters, both a.c. and d.c., are being offered. These clear plastic meters may be obtained with the owner's

**3rd
Smashing
Month**

**ROCK BOTTOM PRICES!
ON ALL TOP QUALITY ITEMS**

**25 Pounds of Radio
Parts and Assemblies**

We are swamped with tons of samples and odds and ends which cannot be placed in our regular stock. We must dispose of this useful merchandise immediately to give us elbow room. Buy 25 pounds of parts and assemblies at the ridiculously low price of **\$3.00**

Assortment Values

100 brand new assorted paper tubular by-pass condensers **\$3.85**
100 carbon and W.W. resistors —1/2, 1, 2, 5, 10 Watt —brand new stock.... **\$1.95**
105 ft. assorted spaghetti tubing, .35-3 ft. lengths for **\$1.00**

**JUST
ARRIVED!!!**

General Industries phono-motor and turntable!

Model LX or MX (your choice) 78 R.P.M., rim drive, self-starting induction motor, 9 inch turntable. For 115 volt 60 cy. **\$2.95**
A.C.
ASTATIC PHONO PICKUP ARM with crystal cartridge. For 10" or 12" records. Sturdy die-cast construction, brown finish, curved. **\$1.45**
ALNICO P. M. SPEAKERS!
3" ... **\$1.29** 5" ... **\$1.49**
4" ... **1.39** 6" ... **1.59**

TUBES !!

Every tube we sell is guaranteed to be exactly the same as those you ordinarily pay 2 to 3 times as much for. No "off" brands, seconds, or used tubes. Your money back if not satisfied.

1A5	6J5	6SR7	12SK7
1H5	6J6	6V6	12SN7
1LC6	6S8	7E5	12SR7
5U4	6SA7	7N7	30
5Y3	6SD7	12A6	31
2C26	6SG7	12C8	35W4
6AL5	6SH7	12H6	80
6C4	6SK7	12J5	VT-52
6C5	6SN7	12SH7	
6H6	6SQ7	12SJ7	

Your Choice

50c

Your Choice

60c

1A7	6J7	12AT6	25Z6
1G4	6K7	12BA6	35L6
1G5	6X5	12BE6	35Z5
1N5	6Y6	12SF7	50B5
1R5	7F7	12SG7	2051
1S5	7Y4	12SQ7	VR105
1T4	12AH7	14B6	VR150
3Q5			

955—\$0.75
956— .75
9001— .75
9003— .75
9006— .50
2C40— 1.00
2AP1— 1.95

Special Customers Bonus:
Deduct 10% from all tube orders of \$20.00 or over.

**Special Purchases!!
LIMITED SUPPLY ONLY
ALL ITEMS SUBJECT
TO PRIOR SALE
Order Now!**

Brand New Meter Bargains

Sangamo 0-50 DC MA, both sides center, 3" round, ...	\$3.00
Triplet 0-15 RF Amps 3" Round	3.00
Aero Freq. Meter 380-420 cycles per sec.; 125V 3" round	3.00
McClintock 0-5 MA, 3" round.	3.00
McClintock Triple Range; 0-15 DC MA, 0-300 DC-DC MA 3" Square Face	3.00

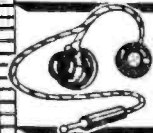
High Speed Drill Sets (#0-45)

45 Straight Shank High Speed Drills Graduated from .0810" to .2280". 45 drills for **\$7.25**

RG 8/U Coaxial Cable, 100 feet for ...	\$2.85
RG 22/U Coaxial Cable, 100 feet for ...	4.85

F.M.—I.F.'s

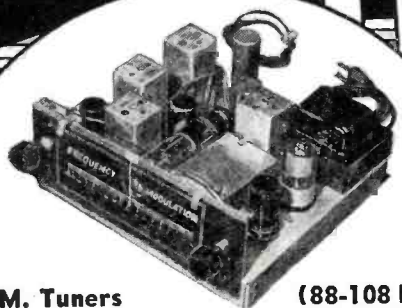
20.7 MC double iron core tuned I.F.'s. Four to a complete set. Use them for F.M. or Video. Can easily be trimmed down to 10 MC with a single ceramic condenser. Set of four matched I.F.'s. **\$3.98**



Xtal Phones
200-600 Ohm s. Unusually sensitive. Less Rubber pads. Used. Guaranteed perfect working order. **50c** ea. 10 for \$4.00

Bakelite

Brown, 1/2 inch sheets—plain, no holes or marks. 36x36—weight 32 lbs.—per sheet **\$9.45**
36x42—wt. 36 lbs. per sheet **\$10.95**

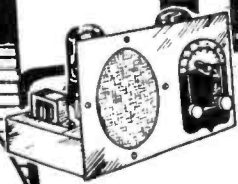


F. M. Tuners (88-108 MC)

Armstrong Circuit, 8 Tubes: 1 R. F., Mixer osc. 2 I. F.'s, 1 Limiter, 1 Disc. Rectifier, Tuning Eye (Not Furnished), 3 Gang Tuning Condensers built in 110V A.C. 300V Power Supply, 300 ohm dipole input. Each unit checked and guaranteed. Completely wired, ready to plug in. Supply Limited.

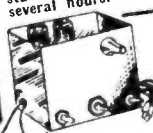
\$24⁹⁵

With 7 Tubes



Broadcast Band TRF KIT \$6⁹⁵

Less cabinet, includes speaker, tubes, wound antenna coil, etc. Most amazing 2 tube circuit on the market, provides 4 tube operation. Has nearly as much sock as ordinary 6 tube superhet. Ideal for the beginner, student or hobbyist. Can be built in several hours.



Short Wave Xmitter Kit (2-30 MC) \$4⁰⁰

Companion to SW Receiver. Also uses 12SN7 and 6SL7 for four Tube Regenerative Circuit. Chassis, 2 Tubes, Resistor, Condensers, Xmitter Key, Hardware, Diagram, etc. Included in this easy to build set. All for \$4.00.

2-in-1 VALUE: ONLY \$4⁰⁰

Learn code the practical way! Learn by building your own kit!
Practice Code Oscillator (Audio)



Kit includes two tubes, sockets, chassis, key, resistors, condensers, wire, hardware, diagram, etc.

Buy Now!

Short Wave Receiver Kit 2-30 MC \$4⁰⁰ Only



STUDENTS, HOBBYISTS, BEGINNERS!
This kit is the hottest experimental deal on the market. Two dual triodes, 12SN7 and 6SL7, give chassis, tubes, 6SL7 and it includes condensers, wire, sockets, resistors, tuned coils, variable slug tuned coils, includes av-coupler, diagram, etc. Includes speaker, condenser, diagram, etc. Includes everything of Hardware. All this and plenty of sock!

All Items listed subject to prior sale!
TERMS: Cash with order, F.O.B. Chicago, Ill. Please remit postage charges.
MANUFACTURERS: Write us your requirements.

IRVING JOSEPH 220 S. Halsted St., Chicago 6, Ill.

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Lower Prices

SAVE UP TO 50%!

- **Phantom Antenna Unit**
 Mounted in round metal can, size 3 in. D. 6 3/4 in. L. Contains air trimmer, jewel lite, 2-20W resistors, amphenol male connector, iron slug tuned coil and 2 metal binding posts. Ideal as dummy ant. on 40M and 20M for low-power rigs. Each **\$0.89**
- **Antenna—Fishpole Type**
 8 sections extends to 128 inches. Phosphor bronze conductor thru center makes positive contact to all sections. (AN-131-A) Each **\$1.09**
- **Antenna—Telescopic Whip**
 AT-59 TRC-7. 27 3/4 inches fully extended. Has standard Amphenol co-ax male connector as a base mounting. Knocked-down size 15 1/4 in. Each **\$0.69**
- **Tuning Units for B.C. 375**
 T.U. 26B and C. **\$1.19**
 T.U. 10B. **1.79**
 Cases for above units. Each **.49**
- **V.H.F. Tuning Assembly**
 Tuning Condenser, acorn tube socket fil. bypass and two fil. R.F. chokes all mounted on Polystyrene subpanel. Drilled and tapped for 6-32 machine screw mounting. Size 1 3/4 in. x 3 1/2 in. Ideal for 2-meter transceiver, etc. Each **\$0.89**
- **Radio Compass Receiver Unit**
 BC-433 G. (less tubes) Part of SCR-269. Has 400 Cycle power supply (115V). Limited Quantity. Each **\$9.95**

✓ CHECK THESE PRICES . . .

- ✓ **Frequency Meters**
 6-inch square industrial type. GE with external Impedor. 58 to 62 cycles and 55 to 65 cycles. (Specify scale desired) Just **\$11.95**
- ✓ **A.C. Ammeters**
 0-5 Full Scale calibrated 0-50 amps. GE and Burlington 3-inch round (less 50-amp shunt) Just **\$2.49**
- ✓ **Insulators**
 Assortment, all-porcelain or isolantite-Ant., Spacer, Stand-off and feed thru. All new and usable. 15 insulators. Only **\$1.00**
- ✓ **Selenium Rectifier**
 Dual unit. 7.1 V.A.C. 115 Cycles input. 1.7 V.D.C. @ 2.4 to 4 amp output. Plansteel. Ideal for converting battery sets to A.C. Only **\$0.69** Each
- ✓ **Head and Chest Sets**
 Consists of one phone and one breast microphone cord and plug. (Used.) Special at **\$0.69** per set.
- ✓ **Bias Meter**
 (1-97A) Used with teletype equipment. Has zero center meter which reads to 115 V.D.C. and 100 M.A. DC Right or Left. Mounted in sturdy steel case, 5" H., 7" L. 4 1/4" D. Contains cond., trans., and other useful parts. Diagram included. Marion Meter. A buy! Only **\$5.45**
- ✓ **I.F.F. Unit V.H.F.**
 Uses 11 tubes in receiver and xmitter. New. With Dynamotor and tubes. Many useful parts and relays. Limited Quantity. Only **\$12.95**

★ ★ ★

VIBROPACK (PE-125 BX)

12V and 24V D.C. input, 475V @ 200 MA. D.C. output. Draws 7.2 amps at 24V and 15.2 amps. at 12V. A heavy-duty unit—built and rated for continuous service. Uses 2-RK 60 rectifiers, tubes incl. Limited Quantity! Shipping Wt. Approximately 80 Lbs. Only **\$12.95**

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- Correct your weak points before taking the actual examination

Prepared by Arthur R. Nilson, Famous Co-author of Nilson and Hornung's RADIO OPERATING QUESTIONS AND ANSWERS
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amateur call letters on the dial. These meters are easily illuminated from the rear by a light bulb located outside the instrument case and behind the panel. Light directed on the rear of



the case is piped through the plastic and diffused softly on the front of the dial scale.

Where front illumination is preferred, the clear plastic front casts no shadows on the dial and permits complete freedom in the choice of types of lighting.

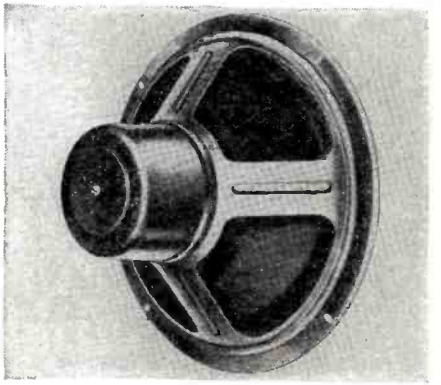
The meters are supplied in the popular 3 3/4" rectangular size.

A circular describing this meter line, is available upon request to *Assembly Products, Inc.*, Chagrin Falls, Ohio.

HI-FI SPEAKERS

A new line of deluxe speakers, especially designed for extended range use in installations requiring efficient sound reproduction have been introduced by *Permoflux Corporation* of Chicago and Glendale.

Ranging in size from 10" to 15", these Hi-fidelity De Luxe speakers come in both permanent magnet and electro-magnet types, with power handling capacity up to 25 watts. The



PM type features a heavy ring magnet and oversize voice coils. With suitable baffling the audio range of these units is approximately 30 to 12,000 c.p.s.

Permoflux Corporation, 4900 West Grand Avenue, Chicago, Illinois, or 236 South Verdugo Road, Glendale 5, California, will supply full details on this new line, upon request.

SAFETY CARRYING CASE

Simpson Electric Company of Chicago has developed a new Roll Top Safety Case for housing the company's
 (Continued on page 120)

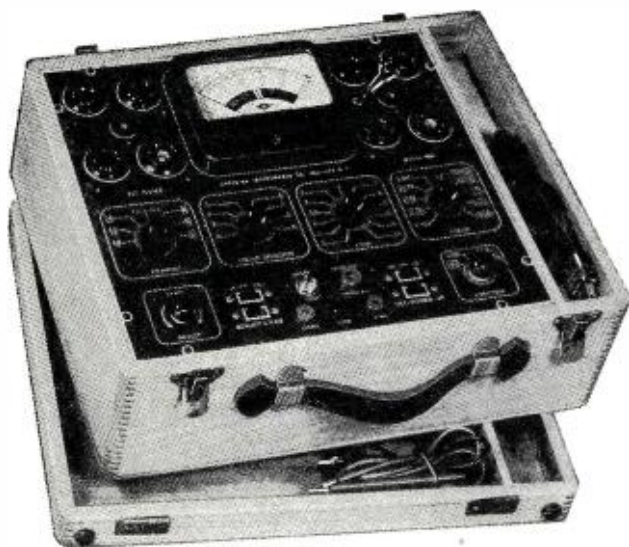
NOW AVAILABLE FOR IMMEDIATE SHIPMENT!

The New Model

777

20,000 OHMS PER VOLT!!

SET TESTER



Specifications:

- Tests all tubes including 4, 5, 6, 7, 7L, Octals, Loctals, Television, Magic Eye, Thyratrons, Single Ended, Floating Filament, Mercury Vapor Rectifiers, New Miniatures, etc. Also Pilot Lights.
- Tests by the well-established emission method for tube quality, directly read on the scale of the meter.
- Tests leakages and shorts of any one element against all elements in all tubes.
- Tests both plates in rectifiers.
- Tests individual sections such as diodes, triodes, pentodes, etc., in multi-purpose tubes.
- New type line voltage adjuster.
- **D. C. VOLTS:** (At 20,000 Ohms Per Volt)
0 to 7.5/15/75/150/750/1,500 Volts
- **A. C. VOLTS:** (At 10,000 Ohms Per Volt)
0 to 15/30/150/300/1,500/3,000 Volts
- **D. C. CURRENT:**
0 to 1.5/15/150 Ma. 0 to 1.5 Amperes
- **RESISTANCE**
0 to 2,000/20,000/200,000 Ohms 0 to 50 Megohms
- **DECIBELS:** (Based on zero decibels equals .006 Watts into a 500-Ohm line.)
-10 to + 18 D.B., + 10 to + 38 D.B., + 30 to + 58 D.B.)

A super-sensitive, complete all purpose testing laboratory, this versatile analyzer will quickly and accurately test all tubes. The extremely high sensitivity of the V.O.M. section (20,000 ohms per volt on D.C. and 10,000 ohms per volt on A.C.) will enable you to:

1. Measure A.V.C. Voltages at the grid return of tubes.
2. Measure plate or grid Voltages in resistance coupled amplifiers.
3. Measure grid driving Voltages in amplifiers and phase inverters.
4. Measure minute leakage Voltages and currents in R.C. amplifiers.
5. Measure diode rectifier Voltages in second detectors.
6. Measure squelch Voltage in noise reduction circuits.
7. Align discriminator in F.M. sets.
8. Analyze automatic frequency control circuits.
9. Align F.M. receivers by measuring the grid voltage in the limiter stage.
10. Measure the Voltage at the grid of picture tubes for proper television alignment.

Model 777 operates on 90-120 Volts 60 cycles A.C. Housed in beautiful hand-rubbed cabinet. Complete with test leads, tubes charts and detailed operating instructions. Size 13" x 12½" x 6".

\$ 59⁹⁵
NET PRICE

20% DEPOSIT REQUIRED ON ALL C.O.D. ORDERS

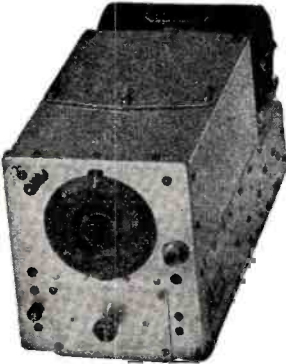
GENERAL ELECTRONIC DISTRIBUTING CO.

DEPT. RN-12 98 PARK PLACE, NEW YORK 7, N. Y.

"ARROW" leads with Better Buys!

ARMY AIRCRAFT RECEIVER Model BC-946-B

Broadcast band from 520 to 1500 Kc; sensitive 6 tube receiver for the broadcast band with calibrated dial. Has one RF and two IF stages with iron core coils and air trimmers. "Perfect" for car radio, home radio, portable or P.A. tuner. BRAND NEW complete with six tubes and instruction manual in sealed carton, less dynamotor. Each... **\$12.95**



CROSS POINTER INDICATOR

Two 0-200 microampere movements, three inch case, many applications. A-1 condition. SPECIAL, each... **\$3.95**

RADIO RECEIVERS

- BC-453-A; 190-550 kc, complete with tubes; BRAND NEW IN ORIGINAL CARTONS... **\$6.95**
- used... **\$4.95**
- BC-454-A; 3-6 mc; complete with tubes; BRAND NEW IN ORIGINAL CARTONS... **\$5.95**
- used... **\$3.95**
- BC-455-A; 6-9 mc, complete with tubes; BRAND NEW IN ORIGINAL CARTONS... **\$5.95**
- used... **\$3.95**

TRANSMITTERS (274N Series)

- All Brand New in Original Cartons Complete with Tubes and Crystal
- BC-696-3-4 Mc... **\$7.95**
 - BC-457-4.5-3 Mc... **5.95**
 - BC-458-5.3-7 Mc... **5.95**
 - BC-459-7-9.1 Mc... **5.95**

DYNAMOTOR

DM 32A. Each 95c; 3 for... **\$2.00**

AN18/APT-10

Pre-amplifier model K-1, designed to raise output level of magnetic type microphone, complete with 2 tubes 6SL7GT and 28D7 and hand switch, brand new in original cartons.

Each **\$1.95** 3 for **\$5.00**

REMOTE CONTROL BOX

BC-4ED-A... **\$1.95**

ARB AIRCRAFT RADIO RECEIVER

The ARB is a six tube, four band, superheterodyne Aircraft Radio Receiver with built-in dynamotor, designed for the reception of MCW (tone or voice) or CW within the frequency range... **\$16.95**

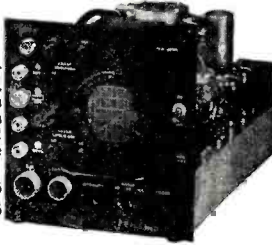
Automatic Frequency Control Unit



Western Electric type used for controlling frequency for teletype and telephone work, complete with 3-6SJ7 and 2-6H6 tubes. Complete unit, brand new in original box... **\$4.95**

BC-929-A

Contains power supply 110 V, 400 cycles, has 7 tubes such as 3CP1, brand new, complete with tubes. Each... **\$17.95**
Used, ea. **14.95**



APS-15

Has 45 tubes, one 5" scope tube, one 2" scope tube, has 3 meters, 4 power supply units 110V 400 cycles, complete with tubes. Each... **\$39.50**

BENDIX COMPASS RECEIVER MN-26

Remote control commercial type navigational receiver. Indicates direction of any desired transmitting station. 3 bands—frequency range: 150 Kc to 1500 Kc; has 12 6 V. type tubes. Brand new, original cost \$800. Now... **\$24.95**

- Accessories for above unit:
- Loop MN-20... **\$6.95**
 - MN-28 Control Box... **5.95**
 - MN-52 loop control unit... **1.95**

T-17B HAND MIKE

BRAND NEW... perfect carbon hand mikes, light wt., 200 ohms, single button, press to talk switch, 5 ft. rubber cord, plug, dust cover. ONLY... **69c**

VHF RECEIVER BC-701

Frequency range 170-180 Mc; IF 30.5 Mc; complete with 11 tubes; self-contained power supply; brand new in beautiful wooden carrying case... **\$9.95**

NAVY GLIDE PATH RECEIVER

Bolt type, complete with 3 6C6 tubes and tune from 90 to 95 Mc; operates from 12 or 24 V. brand New... **\$2.95**

VHF TRANSMITTERS

T-26/APT-2-450-710 mc... **\$12.95**
T-27/APT-3-85-135 mc... **14.95**
Above transmitters are amplitude modulated radar transmitters. Complete with all tubes such as 829, 832, 931, 6AC7, 6AG7, 5R4GY. Also 110 volt 400 cps. power supply. Brand new in original cartons. Manuals included.

GF12 and RU 17 NAVY RECEIVER and TRANSMITTER

Complete with receiving and transmitting coils, junction box, control boxes, plugs, power supply, instruction manual and spare parts which include tubes. Frequency range: 200 kc to 14 Mc. brand new in original carton. A real buy... **\$24.95**

GO-9

Navy type low and high frequency transmitter with power supply and tubes. Operates from 200 Kc to 18,100 kc; requires 115V. 500 cycles... **\$39.50**
Used. Complete with tubes.

HAND-TYPE MICROPHONE RS-38

Carbon type, with PL-68 plug, brand new... **\$1.95**
Used... **1.00**

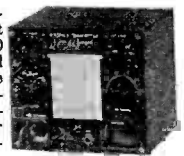
OXYGEN MASK MICROPHONE T44C

Used with SCR-522, magnetic type complete with JK-26 and PL-179. Used, A-1 condition... **95c**
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RCA AVT-112A—Aircraft Transmitter

For radio-telephone communication; for 6, 12 or 24 volt source frequency range from 2,500 to 6,500 Kc. Small in size and wt. (wt. 6 lbs.). Complete with 6 tubes, oscillator circuit, power amplifier modulators, dual tuning indicator and amplifier, with instruction manual, less crystal... BRAND NEW IN ORIGINAL CARTONS—ONLY... **\$12.95** each



Altimeter Transceiver RT-7/APN-1

Frequency 418-462 Mc FM, with 14 tubes: 3-12SJ7, 4-12SH7, 2-12H6, 1-VR150, 2-955, 2-9004; 27 V. Dynamotor. used in working condition... **\$7.95**

RECEIVER-POWER SUPPLY UNIT

For the APN-4 indicator; complete with 16 tubes: 110 V, 400 cycles. BRAND NEW... **\$10.95**

Used... **\$7.95**

SETCHELL CARLSON RADIO RECEIVER

Designed to receive A-N beam signals. 24-23 vdc 21.6 watts. Tube complement: 14H7 or 14A7, RF amplifier; 14H7 or 14J7, mixer; 14A7 or 14H7, IF amplifier; 14R7, detector and 1st audio amplifier, 28D7, output amplifier. 195 to 420 kc. 4" high x 4" wide x 6 1/2" long—wt. 3 lbs., 4 oz. Used, A-1 cond... **\$2.95**

BRAND NEW... **\$5.95**

RADIO TRANSMITTER and RECEIVER APS-13

Light weight air-borne radar system, radio transmitter and receiver APS-13; tube complement: 5-6J6, 9-6AG5, 1-VR105, 2-D21, unit is brand new, complete with tubes, the tubes alone are worth more than this LOW PRICE OF ONLY... **\$10.95**

GLIDE PATH RECEIVER R-89/ARN-5

Glide Path Receiver used in the Instrument Landing System covering the frequency range 332 to 335 mc; complete with the following tubes: 7-6AJ5, 1-12SR7, 2-12SN7, 1-28D7, and including three crystals 6497KC, 6522KC, 6457KC units are in A-1 condition for ONLY... **\$8.45**

BC-733 D LOCALIZER RECEIVER

Freq. 108-110 Mc; Tube complement: 10 tubes—1-12SQ7, 2-12SR7, 1-12A6, 1-AH7GT 2-12SG7, 3-717A: NOW ONLY... **\$6.95**

SCR-522 TRANSMITTER and RECEIVER

The standard very-high frequency airborne receiver transmitter. 100 to 156 megacycles. 4 channels selected from remote control box. Used, as is... **\$14.95**
Excellent Condition, \$19.95

BC-625

VHF transmitter, frequency range 100-156 Mc., four channels. Part of SCR-522. Complete with tubeless crystals. Used, good condition. ea. **\$6.95**

BC-624

VHF Companion receiver for above transmitter. Complete with tubeless crystals. Used, good condition. Diagram with either unit included. Each... **\$8.95**

VEEDER-ROOT METER AND CASE

Counts up to 1000. Each... **95c**

WESTON OUTPUT METER No. 687

3 scales 0-50. A-1 Condition. ONLY... **\$5.95**

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ELECTRICITY RADIO

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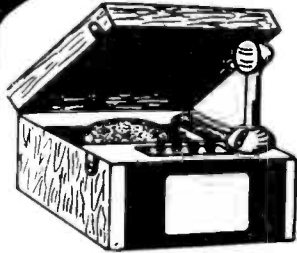
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Another Christmas Special!



FREE Clarostat metal cabinet with every kit of 10 standard controls and 5 standard switches—
your choice of sizes..... **\$9.05**

MECK DISC RECORDER \$79.00



For the latest in modern engineering, The John Meck Industries (Audar) portable disc recorder combines a transformer type amplifier with excellent volume and tone quality. Records cut and played back at 33 1/2 or 78 RPM. Complete with crystal mike and cutting and playback needles..... **\$79.00**
Weight 35 lbs.

MODEL 79—WEBSTER WIRE RECORDER

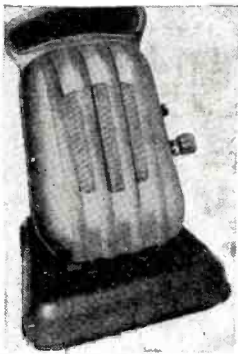


Foundation Unit
Especially designed for the experimenter, amateur and engineer for building a complete magnetic recorder or adding a wire recorder to a sound system. Physical specifications: 10 1/2" x 8 3/4" x 5 1/2" (3 1/2" below main plate, 2" above). Net weight 10 lbs. **\$52.92**
Net

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7x9x2, Natural Finish. List \$1.70 Net \$1.02	8x17x3, Black Wrinkle. List \$3.20 Net \$1.90	13x17x3, Black Wrinkle. List \$3.00 Net \$3.00
7x11x2, Natural Finish. List \$1.82 Net 1.09	10x14x3 Black Wrinkle. List \$3.12 Net 1.86	6x8x6, Black Wrinkle. List \$2.00 Net 1.20
5x9x3, Black Wrinkle. List \$1.82 Net 1.09	10x17x3, Black Wrinkle. List \$3.38 Net 2.00	6x9x3, Black Wrinkle. List \$3.00 Net 1.84

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This unit with your regular radio and NO extra interconnecting wires will provide superior results as a

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The "Ultra Mike" is light—economical to operate—completely self contained—no connections to power lines—portable. Complete with batteries, tubes, etc. Special **\$6.63**
Retail **\$18.00**

F.O.B. Chicago



MECK FM CONVERTER — \$14.95

Just announced by John Meck Industries... sensational! Any ordinary radio (regular AM radio) receives FM signals (88 to 108 MC). Dealers **\$15.95**
Net
Lots of 3... \$14.95

Webster Changers

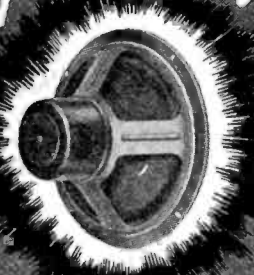
Model 50..... **\$21.17**
Model 56..... **26.66**
Model 70..... **42.34**

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PERMOFLUX CORPORATION

4900 WEST GRAND AVE., CHICAGO 39, ILLINOIS
236 SOUTH VERDUGO ROAD, GLENDALE 5, CALIFORNIA

- 64B1-20 C15—.1 µfd., 400 v. cond.
- 65B7-22 C16—250 µfd. mica cond.
- 64B1-24 C17—.02 µfd., 400 v. cond.
- 64B1-25 C18—.01 µfd., 400 v. cond.
- 64B1-12 C19—.005 µfd., 600 v. cond.
- 64B1-10 C20—.01 µfd., 600 v. cond.
- 67C6-25 C20a, C20b, C20c—30/30/20 µfd., 350/350/25 v. elec. cond.

- 66A1-5 C21a, C21b—3-40 µfd. dual trimmer
- 66B8-1 C22a, C22b, C23a, C24—3-40 µfd. trimmer

- 65B5-34 C25—1200 µfd. mica cond.
- 64B1-32 C26—.05 µfd., 200 v. cond.
- 64B1-28 C27—.25 µfd., 200 v. cond.
- 64B1-20 C28—.1 µfd., 400 v. cond.
- 65B7-5 C29—.20 µfd. mica cond.
- 64A3-4 L1—.0005 µfd., 500 v. cond.
- AD120 L1—Loop antenna
- AD116-1 L2—S.w. antenna coil
- AC105-2 L3—B.c. antenna coil
- AD116-2 L4—S.w. r.f. coil
- AB100-1 L5—B.c. r.f. coil
- AD116-3 L6—S.w. osc. coil
- AC101-1 L7—B.c. osc. coil
- 7A43 CH1—Filter choke
- AB103-1 CH2—Osc. choke coil
- 72B7 T1—First i.f. trans.
- 72B8 T2—Second i.f. trans.
- 80B1 T3—Power trans.
- 98A19 T4—Output trans.

STEWART-WARNER MODEL 9003-B

Part No.	Code and Description.
502186	1—Loop antenna
502110	2—S.w. antenna coil
502166	3—82 µfd., 500 v. cond.
502164	4—670 µfd., 500 v. cond.
502910	5A, 5B—2-15/10-40 µfd. trimmer assembly
502120	6—Pushbutton sw.
502910	7A, 7B, 7C, 7D, 7E—Trimmer assembly for push-button tuner
502907	8—540-1000 kc. coil
502908	9, 10—650-1300 kc. coil
502909	11, 12—975-1600 kc. coil
502161	13—270 µfd., 500 v. cond.
502165	14—1000 µfd., 500 v. cond.
502112	15—Broadcast antenna coil
502122	16A, 16B, 16C—Var. gang cond.
502119	17A, 17B, 17C—Bandswitch
502182	18—39 µfd., 500 v. cond.
502468	20—4.7 megohm, 1/4 w. res.
502127	21—560 ohm, 1/4 w. res.
502157	22—.05 µfd., 400 v. cond.
502155	23—.1 µfd., 200 v. cond.
502132	24—100,000 ohm, 1/4 w. res.
502295	25—.1 µfd., 500 v. cond.
502113	26—Broadcast r.f. coil
502159	27—50 µfd., 500 v. cond.
502130	28—22,000 ohm, 1/4 w. res.
502411	29—2 µfd., 500 v. cond.
502114	30—Broadcast osc. coil
502108	31A, 31B—2-15/2-15 µfd. trimmer assembly
502182	32—39 µfd., 500 v. cond.
502167	33—68 µfd., 500 v. cond.
502163	34—430 µfd., 500 v. cond.
502111	36—S.w. osc. coil
502151	37—.01 µfd., 400 v. cond.
502466	38—33,000 ohm, 1 w. res.
502102	39—First i.f. trans.
502125	40—220 ohm, 1/4 w. res.
502135	41—2.2 megohm, 1/4 w. res.
502157	42—.05 µfd., 400 v. cond.
502467	43—68,000 ohm, 1/2 w. res.
502103	44—Second i.f. trans.
502131	45—47,000 ohm, 1/4 w. res.
502271	46—260 µfd., 500 v. cond.
502117	47A, 47B—500,000 ohm vol. control & sw.
502150	48—.004 µfd., 600 v. cond.
502157	49—.05 µfd., 400 v. cond.
502468	50—4.7 megohm, 1/4 w. res.
502128	51—2200 ohm, 1/4 w. res.
502174	52—Power trans.
502160	53—110 µfd., 500 v. cond.
502152	54—.02 µfd., 400 v. cond.
502133	55—220,000 ohm, 1/4 w. res.
502410	56—.1 µfd., 400 v. cond.
502132	57—100,000 ohm, 1/4 w. res.
502134	58—470,000 ohm, 1/4 w. res.
502405	59—.25 µfd., 400 v. cond.
502135	60—2.2 megohm, 1/4 w. res.
110629	61, 62—6.3 v., 250 ma. dial lamp
502150	63—.004 µfd., 600 v. cond.
502154	64—.05 µfd., 600 v. cond.
502291	65—4700 ohm, 1/4 w. res.
502127	66—560 ohm, 1/4 w. res.
502118	67—Tone control sw.
504206, 504208, 504124	68—Output trans. for M-504205, R-504205, D-504205 speaker
504205	69—6" electrodynamic speaker
504205, 5042107, 504125	70—Cone & voice coil for R-504205, M-504205, D-504205 speaker
502207	71A, 71B, 71C—20/20/10 µfd., 25/400/400 v. elec. cond.
502137	72—330 ohm, 2 w. wirewound res.

The New Model 257

ELECTRONIC ANALYZER

THE MOST COMPLETE MULTI-RANGE,
MULTI-SERVICE UNIT EVER DESIGNED!!

**IT'S A HIGH FREQUENCY A. C.
VACUUM TUBE VOLTMETER**

(A true A.C.-V.T.V.M. employing a 1-A3 Diode which together with a resistance-capacity network is built into a specially designed Polystyrene High Frequency Probe).

IT'S A D.C. VACUUM TUBE VOLTMETER

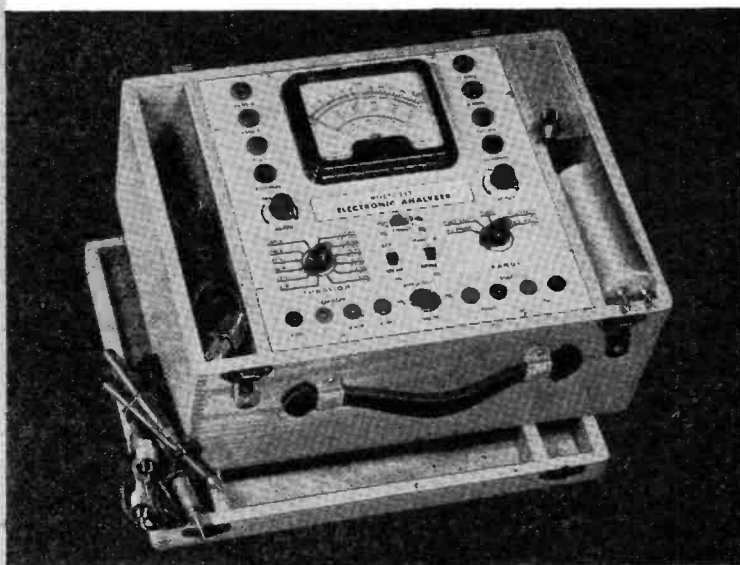
(At 11 megohms input resistance).

IT'S A CAPACITY METER

IT'S A REACTANCE METER

IT'S AN INDUCTANCE METER

IT'S A DECIBEL METER



IT'S A 1000 OHMS PER VOLT V. O. M.

Measures D.C. Voltages (at 1,000 ohms per volt) up to 3,000 volts, A.C. Voltages (at 1000 ohms per volt) up to 3000 Volts, D.C. current up to 15 amperes, Resistance up to 1000 megohms.

Sixty, yes Sixty—separate ranges are provided by this most versatile unit ever designed.

Specifications:

A.C. V.T.V.M. VOLTS: (Input resistance—10 megohms shunted by 8 micromicrofarads. Freq. Range—50 cycles to 500 Megacycles.) 0 to 3/15/30/75/150/300 Volts.

D.C. V.T.V.M. VOLTS: (At 11 Megohms Input Resistance) 0 to 3/15/30/75/150/300/750/1500/3000 Volts.

D.C. VOLTS: (At 1,000 Ohms Per Volt) 0 to 3/15/30/75/150/300/750/1500/3000 Volts.

A.C. VOLTS: (At 1,000 Ohms Per Volt) 0 to 3/15/30/75/150/300/750/1500/3000 Volts.

D.C. CURRENT: 0 to 3/15/30/75/150/300/750 Ma. 0 to 3/15 Amperes.

RESISTANCE: 0 to 1,000/10,000/100,000 Ohms; 0 to 1/10/1,000 Megohms.

CAPACITY: (In MFD) .0005—.2, .05—20, .5—200.

REACTANCE: 10 to 5M (Ohms), 100—50M (Ohms), .01—5 (Megohms).

INDUCTANCE: (In Henries) .035—14, .35—140, 35—14,000.

DECIBELS: —10 to +18, +10 to +38, +30 to +58.

The Model 257 comes housed in a beautiful hand-rubbed oak cabinet complete with test leads, V.T.V.M. probes and instructions. Size: 6½" x 10¼" x 14".

\$ 64⁵⁰ Net

AVAILABLE FOR IMMEDIATE SHIPMENT FROM STOCK—20% DEPOSIT REQUIRED ON ALL C.O.D. ORDERS

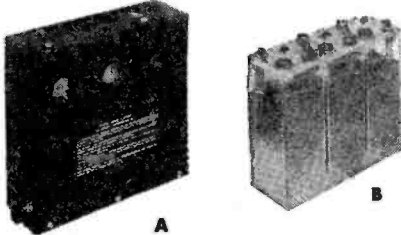
MOSS ELECTRONIC DISTRIBUTING CO.

DEPT. RN-12 229 FULTON ST.
NEW YORK 7, N.Y.

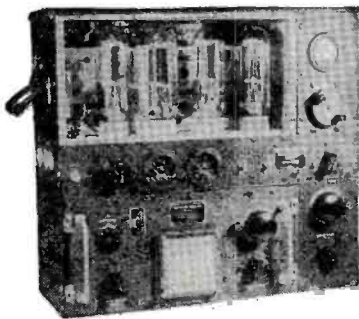


ESSE Specials!

WILLARD LEAD ACID CELLS

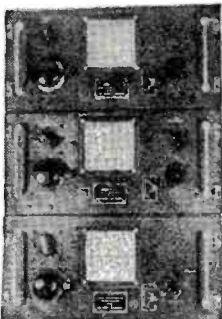


- (A) 6 V. (In metal carrying case)..... \$4.00
 (B) 6 V. (New) (Dry-charged)..... 3.00
 2 V. (New) (Dry-charged)..... 1.00
 (Add electrolyte specific gravity 1.625)
 (Drugstore)



BC-375E GE MOPA TRANSMITTER

with one tuning unit, choice \$17.50



BC-375 TUNING UNITS

- TU-6B,
 TU-5B,
 TU-7B,
 TU-8B,
 TU-10B,
 TU-9B,
 TU-26B
 \$2.25

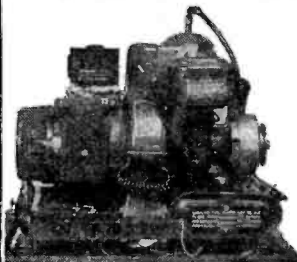
Antenna tuning unit BC-306A \$3.95
 Dynamotor PE-73C..... 4.95

HEADPHONES



HS-33 Headphones (New)..... \$1.60
 HS-30 Headphones with cushions. Low impedance..... 2.25

(HRU) DC POWER SUPPLY

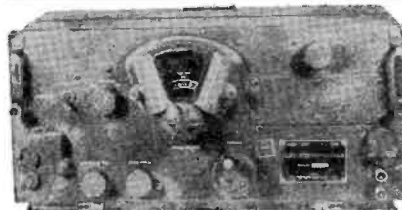


24-28 V. at 70 amp. 2000 watts gasoline engine generator with electric starter. Power supply which can be used to operate 24-28 V. equipment, to

start airplane engines, to charge batteries, as a welding machine, lighting system, or for an amateur radio station. Height, 21 1/2"; Width 17 1/2"; Length, 24 5/8" and weight, 115 lbs. **\$59.50**

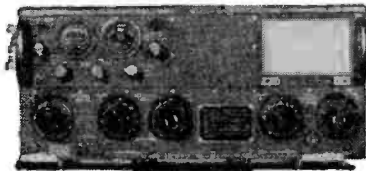
TELRAD 18-A FREQUENCY STANDARD

Checks signals in the range of 100 Kc. to 45 Mc. with a high degree of accuracy. Self-contained power supply for 110, 130, 150, 220, and 250 V. 25-60 Cy. AC. Complete with tubes, dual crystal, and instruction book. Brand new. One of the best buys on the surplus markets. **\$24.95**



BC-348 COMMUNICATIONS RECEIVER, \$49.50

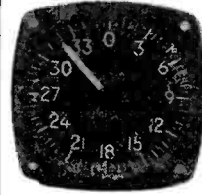
6 bands, 200-500 Kc. and 1.5-18 Mc. 2 stages RF, 3 stages IF, BFO, crystal filter, manual or AVC. Complete with tubes and 24 V. dynamotor. These receivers have been thoroughly checked in our workshop and found in excellent condition. BC-348, 110 V. AC power supply, including simple conversion instructions. Complete with tube. \$8.95



COLLINS AN/ART-13 TRANSMITTER

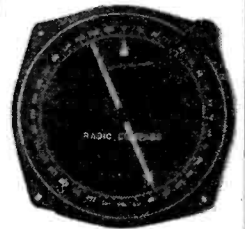
A compact, light-weight, modern, high-powered transmitter. Frequency range 2-18-1 Mc. on any of its 11 autotune crystal controlled or master oscillator channels. December 1946 "Radio News" gives conversion data for converting 24 V. DC operation to 110 V. AC. All of these are in exceptionally fine condition, tested in our labs. Weight, **\$88.50** 67 lbs. (Dynamotor included).

ALL EQUIPMENT ADVERTISED HEREIN IS UNCONDITIONALLY GUARANTEED TO THE CUSTOMERS' SATISFACTION TO THIS EXTENT: RETURN ANY ITEM ADVERTISED WITHIN FIVE DAYS AFTER DELIVERY FOR FULL REFUND EXCEPT TRANSPORTATION CHARGES (BOTH WAYS).



Selsyn Indicator (operates from 15-25 V. 60 cy. AC supply). 5" model..... \$2.85
 3" model..... 2.00

SELSYN INDICATORS

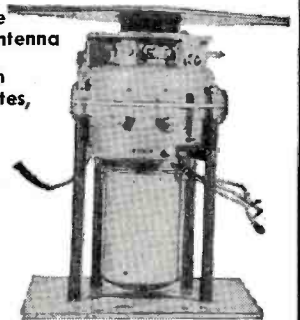


BEAM ROTATING MOTORS

Used to rotate your beam antenna

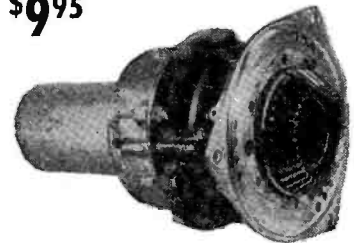
Motor with mounting plates, etc.

\$14.50



Motor only, 24-28 V.

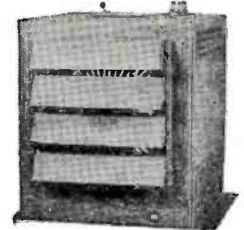
\$9.95



- Power Supply (transformer 110 V.-30V.) (New) \$4.95
- Telegraph keys (New)..... .45

ELECTROMODE HEATER..\$29.50

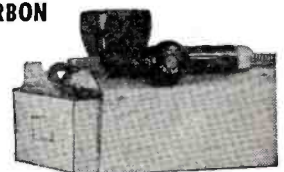
This is a heater used to heat the trucks of the SCR-299 mobile units—which proved highly successful during the war. Operates from 110 V. AC or DC. 1,500 watts. Contains blower unit for forced air heating which can also be used for fan during warm weather. Thermostatically controlled with motor protect Thermatron. Can be used for room heating.



T-17-B CARBON

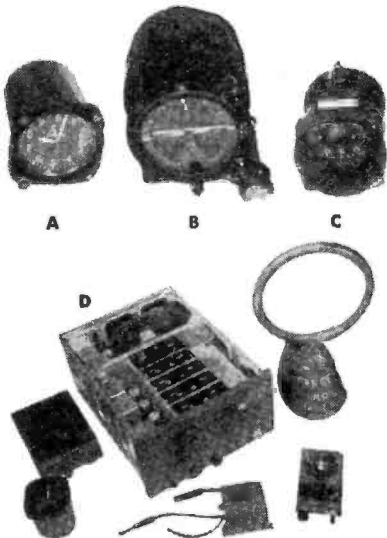
MICRO-PHONES

(hand mike) (New) .. \$1.35



Headphone Extension Cords..... \$0.75

AIRCRAFT SUPPLIES



- (A) Sensitive Altimeters.....\$9.00
- (B) Gyro-horizons.....7.50
- (C) Magnetic Compasses.....6.00
- (D) MN-26 Radio Compass (New).....69.50
- SCR-269F Radio Compass (New).....69.50

LANDING LIGHTS

24 V. retractable
600 watts. \$3.95



TUBE HEATERS

Can be used for various purposes.
.....\$0.75



Westinghouse
O-500 Milliamps
or O-10 Milliamps
meters, choice
.....\$3.50

SCR-522 Transmitter and Receiver. (Closing Out).....\$9.50

RCA AVT-12A Aircraft Transmitters. (Closing Out).....3.00

BC-929-A. (Closing Out).....4.00

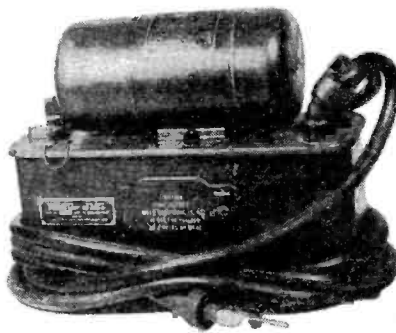
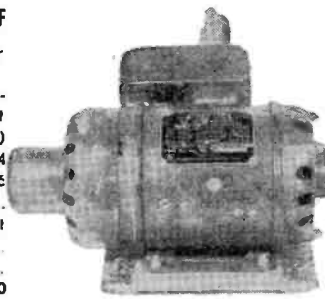


SETCHELL-CARLSON Receiver BC-1206-C

24-28 V. DC. Tubes, 3—14H7; 1—4R7; 2—8D7; 195-400 Kc. Size, 4"x4"x6 5/8" wide. 4 lbs. With manual. (New, in cartons).....\$5.95

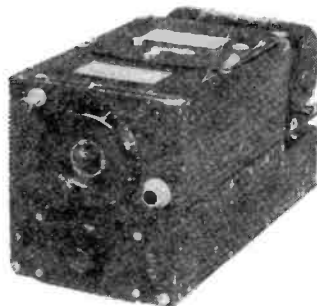
MG-149F Inverter

(Holtzer-Cabot Elect. Co.)
Input 24 V. DC 36 a m p s.
Output 115 V. 400 cy. AC, 500 V. A. Output at 90% P. F.....\$5.00

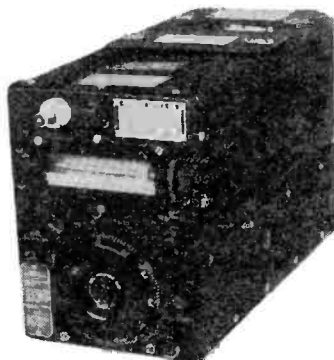


PE-103 Generator, Dynamotor power supply. Operates from 6 or 12 V.; delivers 500 V. DC at 160 Ma. (Brand New).....\$8.95

SCR-274N Command Set (ARC-5) components



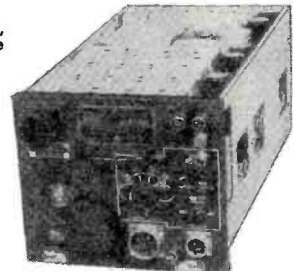
Modulator with dynamotor.....\$2.75
Receiver, 190-550 Kc. (BC-453-A).....3.25



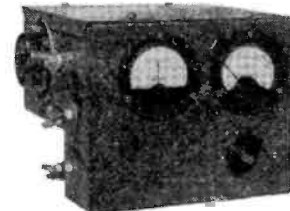
Transmitter, 3-7 Mc. (BC-966-A).....\$3.25

ARB (CRV-46151) AIRCRAFT RADIO RECEIVER

6-tube, 4 band, super-heterodyne receiver with built-in dynamotor. Designed for reception of MCW (tone or voice) or CW within the frequency range 195 Kc. to 9.05 Mc. We bought a carload of these in order to sell them at this price.....\$16.50



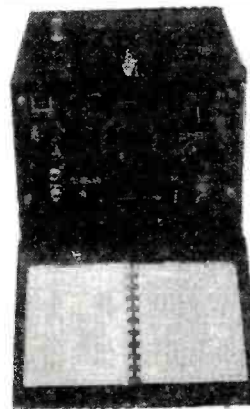
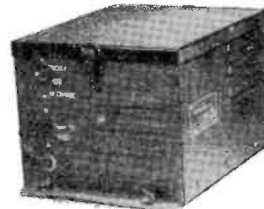
GENERATOR CONTROL BOX



Contains one 2 1/2" round 0-300 AC voltmeter and one 2 1/2" round 30-0-30 DC ammeter. Also plug, switch, relay, condensers and choke coil. (New).....\$5.85

RECTIFIER RA-63-A

Battery charger or rectifier or power supply units. 110 V. 60 cy. input; 12 V. 8 amp. output. (New) \$19.75



BC-221 Frequency Meter

Covers 125-20,000 Kc. Battery or 110 V. AC vibrapack operated. Beautiful equipment. \$39.95

CONDENSER

(Aerovox) 1 Mfd. 10,000 V.....\$21.50



Radio Co
130 W. New York St.
Indianapolis 4, Ind.

Unless Otherwise Stated, All of This Equipment Is Sold As Used
CASH REQUIRED WITH ALL ORDERS
Orders Shipped F.O.B. Collect



ESSE Specials!



OXYGEN TANKS

Aviators oxygen breathing bottles. Withstands 500 lbs. pressure. Non-shatterable. Choice of two above types A or B.....\$6.95

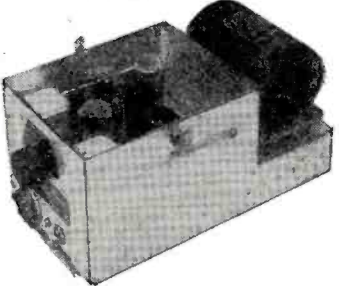


BC-1158 TRANSMITTER AND MODULATOR

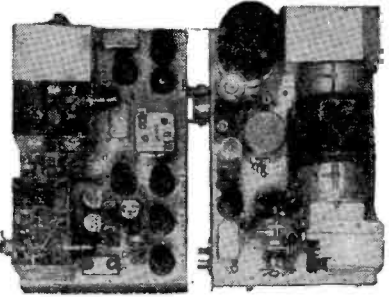
Made by Bendix for airborne operation. Designed for remote control. Power source 28 V. DC input. (Not included). Operates in any place in the 53-60 Mc. and 80-88 Mc. frequency band. Is crystal controlled (crystals not included). Has RF stages, amplifier and driver section, contains 4-815's and 10-125N7 tubes, 1-0/150 DC milliamp Weston meter which can be switched to various circuits. Has exhaust fan for ventilation. Can easily be converted to operate on several frequency bands. Size 12"x8"x18", 45 lbs. Limited quantity.....\$27.50

INTERPHONE AMPLIFIER

Type AM-26/AZC



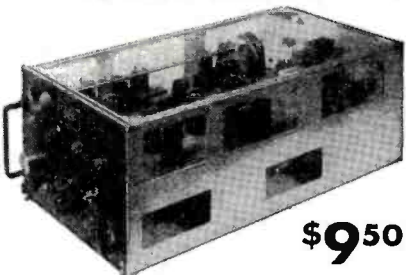
with 28 V. DC dynamotor. Contains 2-12A6 and 2-12J7 tubes. Easily converted for phonograph or intercommunication amplifier.....\$1.75



BC-966-A IFF

Approximately 2 meter frequency operation, 14 tubes, 350 V. DC dynamotor, 12 V. DC. input. Contains voltage regulators and many other fine parts. Worth more for parts than price asked...\$4.75

APQ-13 RECEIVER



\$950

17 tubes, 13 precision resistors, potentiometers, condensers, transformer, knobs, switches, pilot light, fuses.....\$9.50



Dynamotor unit MG-1A for SCR-522 transmitter and receiver.....\$3.75

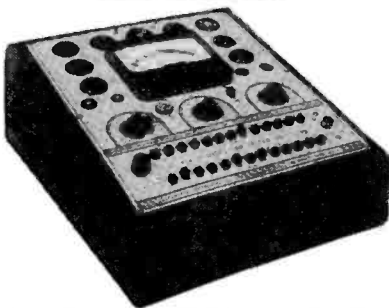
DETROLA AIRCRAFT RECEIVER



28 V. DC operated, 200-400 Kc. Good condition.

\$375

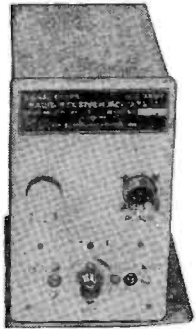
TUBE CHECKER



(Universal Instrument Co.) Counter model 501. Tests all tubes in use today. Brand new with manual and factory guaranteed.....\$37.50

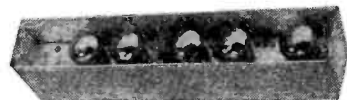
ALL EQUIPMENT ADVERTISED HEREIN IS UNCONDITIONALLY GUARANTEED TO THE CUSTOMERS' SATISFACTION TO THIS EXTENT: RETURN ANY ITEM ADVERTISED WITHIN FIVE DAYS AFTER DELIVERY FOR FULL REFUND EXCEPT TRANSPORTATION CHARGES (BOTH WAYS).

BC-357 MARKER BEACON RECEIVER



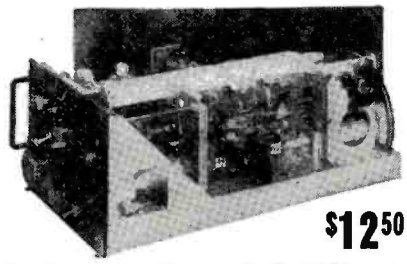
Ideal for controlling remote circuits for model aircraft, boats, etc. Operates from 75 Mc. Signal easily altered to 2 meter band. Tubes used and included: 12C8 and 12SQ7. Also sensitive relay. Circuit diagram included inside case. Size, 5 3/8"x3 3/4"x5 1/4". For 24 V. DC operation. \$1.95

IF AMPLIFIER STRIP



19 Mc. contains 5 Western Electric 7-17A tubes. \$3.95

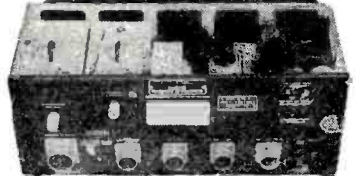
T-39/APQ-9 RADAR TRANSMITTER



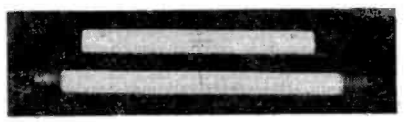
\$1250

Contains many excellent parts for the VHF experimenter such as a cavity oscillator using 2-RCA 8012 tubes rated at full output to 500 Mc. Tubes are forced air cooled by 24 V. DC motor, which is easily converted for 110 V. AC operation. Other valuable parts such as a pair of 807's, 2-6AC7, 1-931 and 1-6AG7 tubes; ceramic switch, potentiometers, gears, revolution counter, etc.

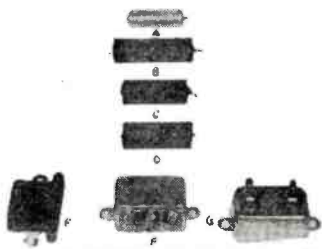
APN-1 RADIO ALTIMETER



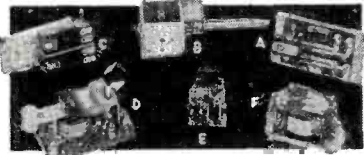
A complete 460 Mc. radio receiver and transmitter which can be converted for ham or commercial use. Tubes used and included: 4-12SH7, 3-12SJ7, 2-6H6 1-VR150, 2-955, 2-9004. Other components such as relays, 24 V. dynamotor, transformers, pots, condensers, etc. make this a buy on which you cannot go wrong. Complete as shown in aluminum case 18"x7"x7 1/4"...\$8.95



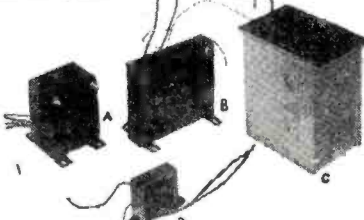
(A) Lapp 800-lb. safe working load insulators. \$0.95
(B) Lapp heavy duty insulators with strap mounts.....1.65



- (A) Condenser, .14 Mfd. 50 V. (metal clad). (New) . . . 100—\$2.50
- (B) Condenser, 16 Mfd. 150 V. (filter condenser). (New)20
- (C) Condenser, .05 Mfd. 400 V. (New)05
- (D) Condenser, .1 Mfd. 400 V. (New)05
- (E) Condenser, .3 Mfd. 50 V. DC (Bathtub). (New)05
- (F) Condenser, 3x.1 Mfd. 400 V. DC (Bathtub). (New)05
- (G) Condenser, (Aerovox) .02 Mfd. 600 V05



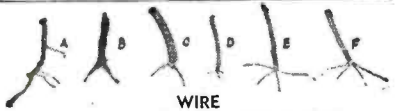
- (A) Relay (10M) 110 V. 60 cy. A_o operated DPST. (New) . . . \$0.75
- (B) Relay, 110 V. 6 cy. AC plunger type for door interlock. (New)85
- (C) Relay, (Clare) 50 V. .0345 amp. 11,300 ohms with 2 micro-switches. (New)75
- (D) Relay, (Leach) type 1253-DEW, 24 V. DC 160 ohms DPST (New)50
- (E) Relay, 6 meg. 5000 ohm DC resistance SPDT85
- (F) Relay, (Leach) type 1127-FR 110 V. 60 cy. DPST. (New)75



- (A) Filament Transformer, 110 V. 60 cy. pri.; Sec. 5 V. and 6 V. Center Tapped (cased). (New) \$0.95
- (B) Transformer 110 V.-30 V. (New). Made by Esse for beam motor 4.95
- (C) Power transformer completely cased. 110 V. 60 cy. pri.; Sec. has 600 V. CT 105 Ma. Also 5 V. at 3 amp. plus 2.5 V. at 5 amp. and a 6.3 winding. (New) 1.65
- (D) Transformer for Selsyn beam indicators. 1.95



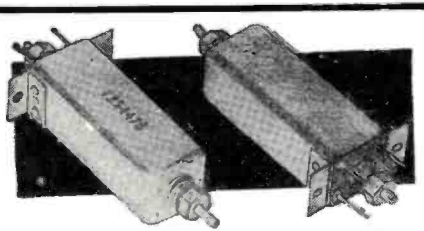
ARR-1 RECEIVER, 334-358 MC. \$4.95
Ideal for mobile receiver or converter on 2 or 6 meter band. Contains 4-954 type acorn tubes, connectors, etc.



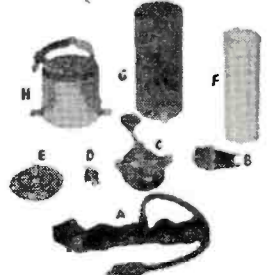
WIRE

- (A) 3 stranded conductors inside of a shield, about 90" long. Each \$0.10
- (B) 2 conductors of stranded wire, each strand about No. 8 gauge rubber covered twisted and cloth braid outer cover. ft. .07
- (C) Heavy duty rubber covered, 2 stranded conductors, flexible. Ideal for 110 V. AC power leads to heavy electrical machinery. ft. .10
- (D) 3 Conductors of No. 20 enameled cotton covered wire, color coded, completely shielded, moisture and fungus proof. Ideal for Intercom work. 50 ft. and 250 ft. rolls. ft. .03
- (E) 4 strands of braided wire, each rubber covered and color coded, one strand being shielded, cotton and cambric outer wrapping. ft. .05
- (F) Same as above, except the complete cable shielded. Minimum wire order 100 feet. May be assortment of above wire. ft. .07 1/2

- (F) Condenser, .25 Mfd. 400 V. (New) \$0.05
- (G) Condenser, .125 Mfd. 400 V. (Metal cased) (dual condenser) (New)05
- (H) Condenser, 1.75 Mfd. 50 V. (New)05
- (I) Condenser, .3 Mfd. 600 V. (metal cased). (New)05



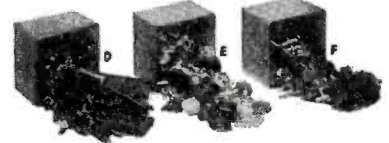
IF Transformer, 19.2 Mc. ea. \$0.20



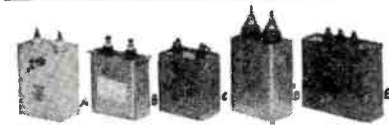
- (A) Throat Mikes 7 for \$1.00
- (B) Jeweled Pilot Assembly, Candelabra, screw base for 110 V. lamp. Mounts in 1" hole. (New)25
- (C) Telegraph Key J-37 (New)35
- (D) Phone Jacks for PL-55 Plug07 1/2
- (E) National Velvet Vernier dial drive, 6-2 reduction ratio75
- (F) Ceramic grooved coil forms. 5" length, 2" diameter, 30 grooves15
- (G) Millin 607 tube shields.25
- (H) 813 tube shields.35



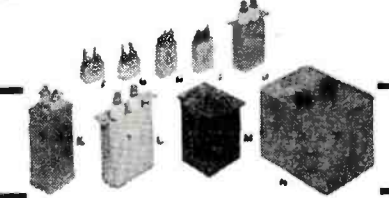
- (A) Resistor kit composed of 150 or more assorted wattages. Containing various resistors of up to 10 megohms. Many with gold bands. An honest-to-goodness bargain. . . Box \$2.65
- (B) Condenser Kit. Contains assortment of 25 various condensers including 2-2Mfd. 600 V. filters, 1-1000 Mfd. 15 V. filter 4-1 Mfd. 400 V. paper by-pass, 3-3-gang midjet trimmers, etc. 2.65
- (C) Hardware Kit containing about 5 lbs. of radio hardware including nuts, bolts, washers, shafts, gears, grommets, lugs, screws, spacers. It is a gold-mine of invaluable parts 1.95



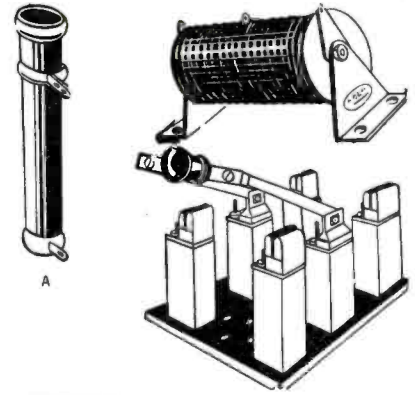
- (D) Resistor mounting tugs and terminal strip kit. Assorted sizes and snags. Many, Many, Many. . . \$11.00
- (E) Tube Socket Kit. 25 or more assorted sockets having various usable sizes. 1.50
- (F) Switch Kit containing assortment of 10 rotary and toggle switches 1.25



- (A) Condenser (Solar) 10 Mfd. 1000 V. (New) \$2.00
- (B) Condenser (GE Pyranol) 8 Mfd. 1000 V. DC. (New) 1.75
- (C) Condenser (Chi. Ind. Cond. Corp.) 4 Mfd. 2000 V. (New) . . 2.50
- (D) Condenser (Cornell-Dubilier) 1 Mfd. 4000 V. (New) 3.00
- (E) Condenser (Chi. Ind. Cond. Corp.) Dual 8.5 Mfd. 1000 V. (New) 3.50



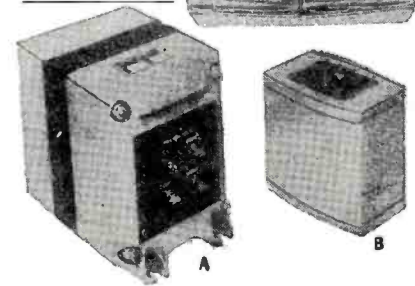
- (J) Condenser, (GE Pyranol) 2 Mfd. 600 V. (New) 50
- (K) Condenser, 2 Mfd. 600 V. (Aerovox). (New) 35
- (L) Condenser, 4 Mfd. 600 V. DC (GE Pyranol). (New) 50
- (M) Condenser, 4 Mfd. 300 V. (New) 35
- (N) Condenser, 30 Mfd. 330 V. AC (GE Pyranol). (New) 3.00



- A. RESISTOR
Wire wound adjustable divider resistor. 100 watt, 5,000 ohms. (New) ea. \$0.40
- B. BL-SELENIUM RECTIFIER
110 V. AC input; 110 V. DC output. .75 amp. rating. 1.35
- C. Antenna Switches, double pole, double throw. Size 8x4x2" (New) 2.00
Same as above, except SPST, size 8x4x2" (New) 1.00

FUSES

- Cartridge type, packed 10 to a box.
- 6 Amp. 250 V. Non-renewable. Box \$0.40
- 3 Amp. 250 V. Non-renewable. Box \$0.40
- 30 Amp. 250 V. Renewable. Box .75
- 3 Amp. 250 V. Renewable. Box .75
- Buss fuses, type 3AG, 10 amp. glass fuses, ea \$0.02 Per hundred. 1.35



- (A) Thorndarson Transformer type T-45920, Pri. 220 V. 60 cy.; Sec. 530 V. Center Tapped. \$4.95
- (B) Filament Transformer GE 7467175, 110 V. 60 cy., Sec. 6.3 V. at 13 amps and 6.3 V. at 1.2 amp. 2.95



- Sylvania Crystal type IN29 \$0.35
- AN/PRS-1 Mine Detector. (New) 9.50
- SCR-625 Mine Detector. (New) 67.50

Rectox Rectifier
32 V. AC input, 24 V. DC output, 5 amps. (New).
\$3.75

Esse Radio Co
130 W. New York St.
Indianapolis 4, Ind.

Unless Otherwise Stated, All of This Equipment Is Sold As Used
CASH REQUIRED WITH ALL ORDERS
Orders Shipped F.O.B. Collect



135-24

AND BETTER THAN EVER BECAUSE IT'S STEATITE!

It's good news that the popular JOHNSON 135-24 Stand Off Insulator is again available—good news, too, that it is now made of STEATITE!

STEATITE, a highly efficient insulating material, superior in every respect to porcelain, is now also being used in the manufacture of several other standard JOHNSON insulators.

Why is STEATITE better? Because its dielectric losses are but a fraction of that of porcelain:

While STEATITE assures lower loss insulation at any frequency, it is outstandingly efficient on the high frequencies. There is only a slight increase in price for JOHNSON insulators of STEATITE.

Available, in addition to the popular JOHNSON 135-24 Stand Off Insulator shown above, are the following JOHNSON insulators:



135-20		135-42
135-20J	135-40	135-42J
135-22	135-40J	135-44
135-22J		135-50

SEE THEM AT YOUR JOBBERS!

New Catalog On Request

JOHNSON
a famous name in Radio
E. F. JOHNSON CO. WASECA, MINN.

DON'T BE A DAGWOOD

Wipe the sleep out of your eyes and wake up to new business opportunities awaiting alert men.

YES, it is always the same with our comic friend, Dagwood. He's late to start, flies off to work in a whirlwind of frantic haste, only one object in mind day after day—get to work on time. Not that we decry the fine trait of promptness, but the daily routine of getting to work which offers no variations is liable to be a hazard to business progress.

If you are in the habit of following an identical routine every morning, catching the same bus, sitting in the same seat, driving down the same street, walking to your store from the same direction—shake yourself loose, snap out of it, upset your jigsaw puzzle and start putting it together afresh each day. For instance, try this antidrum prescription.

MONDAY: This morning get away just ten minutes earlier. Sure it's the toughest day in the week to get going. That Sunday of lolling around, relaxing, playing, has put you out of the mood for working. This is the morning you think how nice it will be after you've retired and don't have any Monday mornings to worry about—ever. It's a tough one to face anyway, so why not shock yourself into action with that ten minutes earlier start. After all, what's ten minutes in a lifetime. It may be the most profitable ten minutes you will spend all week. Why? How are you going to use it? Well, let's call it the weekly "spy game." To play this ten minute game you'll need: 1. A list of addresses of competitive stores (be sure to include chain and department stores). 2. A note book. 3. A good pair of eyes, and 4. A curiosity that outdoes any child you know. If you're driving, the game may cover more territory. If you're riding on a bus or streetcar, this necessitates getting off at a different corner than usual. If you're walking, it means changing your usual route—the additional fresh air will do you good anyway.

Now you've made up the list of your competitors so you can drive or amble past their stores, in order of appearance, working on toward your own shop in an organized fashion. As you pass each store, you stop long enough to take a good look. What do you see? Does the over-all store front look the same as the last time you saw it, or has the owner painted or reconstructed? Has he put up a new permanent painted or electrified sign or a new valance decoration on his show window? Get out your note book and pencil, brother, if he has and jot down just what's happened. Now take a long searching look through the show window. What's he featuring? A new product you didn't know he han-

dled? A new way of displaying an old product? New display cards? New sales messages? New lighting? No, no, don't just criticize. Examine and pick out the good points. Jot 'em down and make a note of how it occurs to you that you might do it better. He's after the same dollars you're hoping to pile in your till. What has he done that you can improve on? Sure, maybe you do think he's a dope, but give the devil his due when he comes up with a good one. Maybe you've had a chance to peek inside. What's that—new display tables, a new coat of paint, new lighting fixtures? "Well, well—he's not going to outsmart me" say you. Don't trust your memory, make notes of what you see that's good. Sure, make notes of what you see that's bad, too, and be certain you're not doing the same thing.

Time's up. That extra Monday morning ten minutes has given you a glimpse of a lot of things you'd have missed if you dashed right down to your own shop.

Now as you approach your own store you start to make mental comparisons. You've spotted some things you're going to do to your shop right away—after all here it is first thing Monday morning and there's no time like the present to get off on the right foot to arrange to trap the prospects who may go to buy from your competitor because of what you saw a few blocks away.

TUESDAY: This morning as you fling open your store door you glance with satisfaction at that fresh idea in the window, inspired by yesterday's spy game. Not bad—maybe a few finishing touches you can put on it today. This morning you're holding a meeting with your accounting department. Maybe it's a talk with yourself or maybe with an employee who handles these vital details for you. You're going to say "By this morning we have completed our summary of last week's business and the month to date. Let me see those comparative figures. How much business did we do last week on radios, on traffic appliances, on heavy appliances, on specialty sales? How much have we done this month vs. last month to date? What was our margin of profit on each category? How does our inventory stand? What were the cash sales? Did credit business or accounts receivable stay in balance with our cash sales? What is the total of accounts payable?"

Now you know just where you're going to place your selling effort for the rest of the week. Now you know just what element in your business

Senco Successfully Continues Buyers Dividend Plan To Include An Exclusive Radio and Radio Phonograph Combination Buy

4 TUBE AC-DC SUPER- HETERODYNE RADIO



featuring
Angle Dial
for easy
tuning

This model is a four tube superheterodyne receiver, AC-DC, giving six tube performance by the use of multi-purpose tubes, covering the frequency range of 530 to 1600 kilocycles and incorporating the features of beam power output, super-sensitive, high efficiency, permanent-magnet dynamic speaker, automatic volume control, and numerous other features producing improved performance. Complete with tubes... **\$13.95**

5 TUBE AC SUPERHETERODYNE RADIO PHONO COMBINATION



This model is a five tube superheterodyne receiver, giving seven tube performance by the use of multi-purpose tubes, covering the frequency range of 540 to 1700 kilocycles Standard Broadcast and incorporating the features of beam power output, tone control on both radio and record player operation, super-sensitive, high efficiency, permanent-magnet dynamic speaker, automatic volume control, loop aerial and numerous other features producing improved performance. Complete with tubes... **\$29.47**

100,000 RADIO TUBES

Every Tube guaranteed. Every Tube in carton.

Type	Lots of 10		Type	Lots of 10	
	Each	Each		Each	Each
1U5	36	30	7AF7	44	35
1V	45	40	14X4GT	44	35
1L4	35	49	177AGT	45	37
2A5	63	55	12AT6	50	45
2A2	79	72	12BA6	50	45
3A4	69	59	12X6	50	45
3Q5GT	79	70	12C8	49	45
5U4G	50	40	12J5GT	49	39
5W4GT	40	37	12K7GT	45	39
5V3GT	40	35	12K8	65	59
5Y4G	40	37	12Q7GT	45	39
6A7	50	45	12SA7GT	40	32
6A8GT	50	44	12Q7GT	40	32
6AC7	55	50	12SK7GT	45	35
6AK5	79	69	12SJ7GT	55	50
6AG7/6AK7	89	79	26	39	30
6B7	55	49	27	42	37
6C5GT	55	45	41	40	35
6C6	45	32	42	42	38
6C8G	45	37	43	54	49
6D6	45	37	45	49	39
6F6GT	45	39	47	49	39
6H6GT	45	39	56	49	39
6J5GT	45	39	57	45	35
6J7GT	42	38	58	45	39
6K6GT	45	39	71A	39	29
6K7GT	49	40	75	50	39
6L6G	95	89	76	45	39
6Q7GT	47	39	77	40	32
6U6G	40	35	78	40	32
6V4GT	45	40	80	40	38
8X5GT	49	40	83V	99	89
6SA7GT	44	37	84/8Z4	45	36
6SJ7GT	44	37	85	49	45
6SK7GT	44	37	25L6GT	49	45
6SL7GT	49	47	25Z5	49	45
6SN7GT	49	47	25Z6GT	45	39
6SQ7GT	44	37	35W4	43	40
6SG7	44	39	35Z3	44	35
6ZY5G	45	39	35Z5GT	44	39
7B6	44	35	35L6GT	45	39
7B7	35	44	50L6GT	50	45
7C6	44	35	117Z3	55	45
7Y4	44	35	117Z6GT	99	89
7X4	44	35	50B5	42	32
7X7	44	35	32L7GT	59	49

AC PHONO MOTOR AND PICKUP 60 cycles. 115 volts with Turntable. Complete **\$4.35**



OUTPUT TRANSFORMERS		
50L6	.....	.45 ea.
3Q5	.....	.45 ea.
6V6	.....	.50 ea.
SPEAKERS		
4" P.M. Speaker	.....	\$1.19
5" P.M. Speaker	.....	1.15
6" P.M. Speaker	.....	1.55
8" P.M. Speaker	.....	ea. 2.75
12" P.M. Speaker	.....	ea. 2.75
Afnico 5 Magnet	.....	5.49
Kit of 100 assorted insulated resistors popular	.....	\$1.79
onmages, 1/8, 1/4 & 1/2 watt	.....	.....
500 M ohm V.C. with Switch 2 1/4" Shaft. Popular	.....	.....
Brand	.....	.....
40 x 40 Electrolytic Cond. 150V.	.....	ea. \$0.40
50 x 30 Electrolytic Cond. 150V.	.....	.99 ea.
Military—6 Volt 4 Prong Auto Vibrator	.....	1.19 ea.
2 Volt Vibrator	.....	.....
829 Push Pull twin-unit. Beam power amplifier	.....	\$1.49 ea.
tube	.....	.....

25% Deposit on All Orders—Bal. C.O.D.
All Prices F.O.B. New York City
WRITE FOR LATEST BULLETIN

should occupy the precious manhours you and your staff have to spend for the rest of the week. This early Tuesday morning meeting with your accounting department has given you readings on your trade winds so you know just how to apply pressure to the helm of your commercial ship to keep it on course toward success. You'll never drift into bankruptcy if you'll look your business barometers squarely in the face every Tuesday morning.

WEDNESDAY: Here is the middle of the week. Time to call in the advertising and sales promotion manager. Are plans ready for the special promotion that's going to capture the dollars of next weekend's consumer spending? What seasonal opportunities are ahead? How are you going to make the most of national events which are shaping the thinking of the public? Has the window display, the store decoration, been planned for next week? Today's the day to plan it because it is going to take all the time you can spare from selling on Thursday and Friday to get the props together.

"How long since we've had a direct mail campaign?", you ask. "Have you checked Joe and Jim and Bill from the jobbing houses to find out whether there are any cooperative ad deals coming up?" "Let's take a look at all the advertising we are doing this week and get ready to brighten it up and make it sharper for next week?"

Yes, Sir, here's Wednesday morning and you're turning the spot light on your own advertising and sales promotion activities. You're being just as critical of your own efforts as you were of that "awful looking ad at the Jones Appliance store ran yesterday."

Better get to it. A week is slipping quickly away. Never let it be said you failed because you were just too late or just too lazy to attract customers by fresh, sparkling advertising.

THURSDAY: "Phew! I sure don't like the smell of this place this morning," you snort as you swing wide the portal. Is that so? What do you think the customers say to themselves? This is the day, Mister, to start doing something about cleaning up the store. Time to freshen the air, dust, polish, sweep. Sure you do it every day—or do you? Maybe just a once over lightly, eh? This is the day you're going to do some digging—regular white glove inspection stuff. Not much of the week left to welcome customers you know. By gosh, there's not going to be a whiff of old cigar butts, a finger-printed piece of chromium, a dust smeared cabinet, or fly-specked piece of glass in your business shop when this day's over! You know you get so used to looking at your store day after day you get to the point where you don't notice grime creeping up on it. The only way to make sure you're strictly on the gleaming side is to pull yourself up short at this Thursday morning inspection, look at everything as though you'd never been in there before—then dig, brother, dig.

SENCO RADIO INC. 96 WARREN ST. NEW YORK 7, N Y

BEEKMAN 3-6498

EASY—TECHNICAL—INTERESTING

LEARN THE E-T-I WAY

Electronic Technical Institute
A Resident School

Learn RADIO-ELECTRONICS

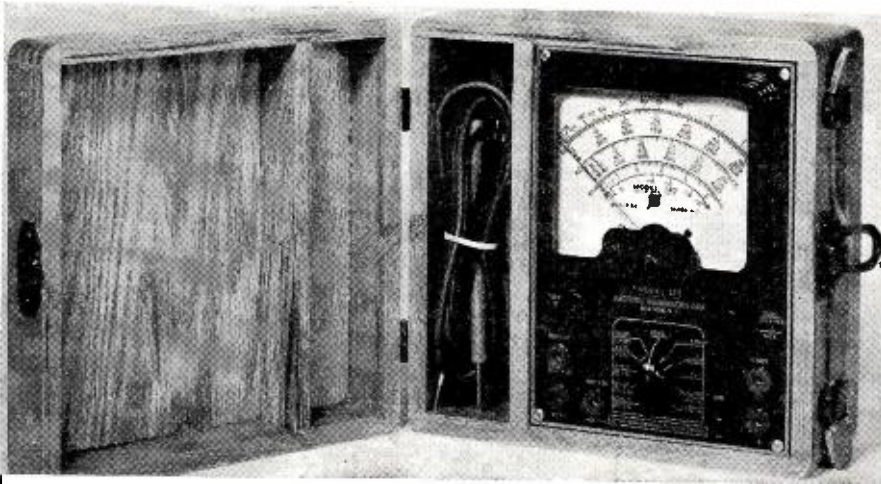
APPROVED FOR TRAINING UNDER GI BILL

Electronic Technical Institute combines use of daily laboratory training in construction and design of FM and AM transmitters and receivers—2-way radio. Vitalized classroom work includes training with SOUND MOTION PICTURES. Previous experience not necessary to enroll. Approved for veterans, and payment plan offered for non-veterans. 5-hour morning or afternoon classes and evening classes from 7 to 10 P.M.

Many earn additional income in spare time by installing or repairing transmitting or receiving equipment in yachts, homes, and automobiles. We have a free student placement service for your convenience.

Advanced training courses include preparation for passing commercial F.C.C. examinations. Resident evening classes in Amateur Radio, also Amateur Radio Correspondence Courses.

ELECTRONIC TECHNICAL INSTITUTE
771 VENICE BLVD., RN-11 Richmond 9573 LOS ANGELES 15, CALIF.



E. M. C. Gives Maximum Measurement Value Per Dollar
COMPARE Model 120 with ANY other 20,000 ohms per volt instrument!

Model 120 Gives you—

1. WIDEST resistance range (.2 ohm to 300 megs.)
2. HIGHEST AC voltage sensitivity (10,000 ohms/volt)
3. LOWEST PRICE \$29.95 for open face model, \$34.95 for Model 120-P. (portable)

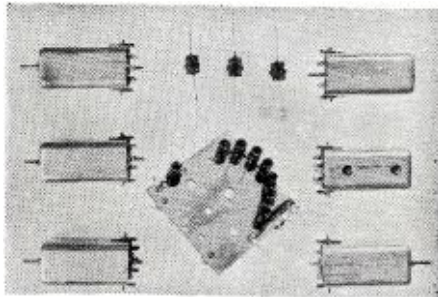
FOR FURTHER INFORMATION WRITE TODAY TO: DEPT. R

ELECTRONIC  MEASUREMENTS

CORPORATION

423 Broome St., New York 13, N. Y.

TELEVISION COIL KIT



Complete **\$23⁵⁰**

LOOK AT THESE FEATURES!

- Video IF Bandwidth of 4.25 MC that can operate ANY size picture tube with maximum resolution.
- Five stages Video IF permeability tuned with sound and adjacent channel rejection traps in shielded cans.
- 6 Channel RF Tuner, permeability tuned mounted on switch assembly plate.
- FM Sound Discriminator for TRUE FM.
- Can provide Video Operation for 10, 12, 15 or 20-inch picture tube upon further construction.
- Video Peaking Chokes to maintain bandwidth.
- Detailed Construction Manual & Parts List with every kit, for 20 Tube, 7 In. Television Set.
- Continued Service Bulletins.

ORDER DIRECT OR THRU LOCAL DEALER

TERMS

Shipped Parcel Post prepaid on receipt of check or money order. Or P.P. Collect on receipt of 25% deposit with order, balance COD.

RAY-LECTRON CO.

706 Tenth Avenue
BELMAR, N. J.

Get a new
ELECTRIC SOLDERING IRON

FREE

and assemble your own

MAGI-KLIPS

RADIO & ELECTRONIC EXPERIMENTER'S KIT



This is the same MAGI-KLIPS Kit—complete with all parts—that we sell ready assembled for \$29.75.

In knocked-down form with full instructions for assembly it is now available at the new low price **\$19.75** . . . complete with a new Electric Soldering Iron—the ideal iron for wiring your unassembled MAGI-KLIPS Kit.

Remember, you build 18 different experiments with your MAGI-KLIPS Kit. You actually teach yourself radio and electronics and have a lot of fun at the same time.

RADIO RECEIVER, HOME BROADCASTER, PHOTOELECTRIC RELAY CODE PRACTICE OSCILLATOR, SIGNAL TRACER, REMOTE CONTROL RELAY, Phonograph Transmitter, Inter-communication Amplifier, Code Transmitter Radio Frequency Oscillator, Telephone Line Amplifier, Electronic Switch, Phonograph Amplifier, Temperature Control Relay, Contact Detector, Electronic Metronome, Interval Timer (one-shot), Interval Timer (repeating).

Send for your copy of FREE booklet, "Electronics Made Easy."

DEER & TAYLOR COMPANY
Dept. N 1342 Milvia St. Berkeley 9, Calif.

FRIDAY: Time's running out. One chance for success out of 52 for the year has almost slipped away. Let's make this early Friday morning a supplier's review session. Let's see what salesmen have called this week. What did they have to offer? Did you make notes of their suggestions or were you too busy when they stopped in? Did they just pass the time of day, or did you only get a rough idea of some plan they had? If you haven't kept notes on their proposals, better rush out right now and get yourself a note book so next week you won't miss a bet, so next week you can jot down inspirations which need consideration after hours and might lead to expansion of your business. Right now is a good time to run through that stack of letters and circulars that you've been piling up on the corner of your desk all week. Maybe in the heap is a proposition from a current supplier or a new company you'd better investigate thoroughly. No telling when the mailman is going to whisk a hot deal through the door. Sure, you get loads of circulars, printed matter, but remember, friend, somebody has given a lot of thought, a lot of time and has spent good cold cash to send them to you. Maybe one of these pieces will give you an opening to boost your sales in a way you'd never thought possible.

SATURDAY: Brace yourself, brother! Here's the last fling, the pay-off day of the week. Get in early and bright. Stop across the street this morning and take a good look at your store. Is the stage set to make the best impression you can hope for on those Saturday shoppers? Window gleaming clean? Sign in order? How does everything look inside? Orderly? Set to command attention to the items you want featured this Saturday? Now take a good look in the mirror. Shaved? Shirt clean? Tie straight? Suit pressed? How about the expression? Smile muscles working well? Straightforward, earnest look-in-the-eye mechanism in order? Eager-to-serve expression all oiled up? Frame of mind ready to withstand silly questions by the hundred, ready to counter with hard-hitting sales clinching statements about every piece of merchandise in the store? How does the help react this morning? Have you greeted them with your best "Let's go and hit 'em hard" manner, pleasant, encouraging, inspirational? Yes, this is "let's take a look at ourselves" morning. This is the day we give ourselves a thorough going over, a slap on the back and a firm grip on our patience and good manners.

So, a week has been ended as the last light flickers out on Saturday night.

It's been a good week, a progressive week. If you keep alert by challenging some important side of your business each day—then doing something about it, you're on the tides which lead to a prosperous business.

-30-

RADIO NEWS

Prepare NOW

for a Better Job in RADIO ENGINEERING



Don't Delay—Write Today!

In This New World of Electronics Better Training Means Better Opportunities!

TODAY, the new war-developed techniques offer greater opportunities than ever existed in the early days of broadcasting! Micro-Wave Relay Systems, Television, FM Broadcasting, Mobile Communication Systems for Trains, Automobiles, Busses, Trucks, many Industrial Applications—these are just a few of the new techniques which offer marvelous, exciting opportunities to you who are alert—and are qualified!

Let Cleveland Institute Take Over Your Personal Up-Grading Problem! Qualified, competent instructors, ample, personalized instructional aids, orderly, progressively arranged study assignments in recognized, approved technical texts—these are only a few of the many superior advantages of CIRE's plan of personalized spare-time home study training for professional self-improvement.

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- A. Master Course in Radio Communication.** Covers complete preparation for broadcast station employment including preparation for FCC License Examinations.
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All Courses Include The Remarkable Workbooks of Instructional Aids, prepared by the instructing staff of Cleveland Institute. Choose the course best suited to your needs—Start with the section you are qualified to enter—Use the economical CIRE "Pay-As-You-Go-Plan."

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6. Audio and Radio Components and Systems (Design of Receiver and Transmitter Equipment).

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 Anyone can now own a good volt-ohm-milliammeter. There is a Chicago V.O.M.A. priced at only \$5.25. Chicago "Featherweights" that slip easily into the pocket are the original miniature radio test instruments. They are popular throughout the world.



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Chicago Instruments are available in a variety of ranges and sensitivities. You may see them at your Suppliers or get the complete details by writing for Bulletin No. 10.

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 Easy to install. The best belts for all sets. Supplied in kits of assorted popular belts with steel box.
 No. G-25 — Kit of 25 belts. List **\$6.70**

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 Complete alignment and neutralizing kit of 30 different tools. In leatherette case.
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 Steel stand on which you can place any phono turntable; ideal for repairmen; easily adjusted; sturdy steel construction. No. 5205—List **\$6.65**

G-C NE-O-LITE TESTER
 For testing fuses, appliances and any electrical circuits. 90 volts to 550 V., A.C. or D.C.
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10 mfd., 25 V.....	23c—10 for	\$1.90
20 mfd., 150 V.....	34c—10 for	2.75
40 mfd., 150 V.....	38c—10 for	3.10
8 mfd., 450 V.....	34c—10 for	2.75
16 mfd., 450 V.....	50c—10 for	4.10
20-20 mfd., 150 V.....	59c—10 for	4.70
50-30 mfd., 150 V.....	68c—10 for	5.40

500M Controls with Switch Ea., 59c
 10 for **\$5.50**

We carry a full line of tubes, batteries, speakers, amplifiers, test equipment, hardware, controls, etc.

FREE! Write for R.P.D.'s latest bulletin for more sensational Values!

Terms: Remittance with order plus postage or 25% deposit, balance C.O.D.

Radio Parts Distributors
 925 E. 55th St., Chicago 15, Ill.

Recording of Sound

(Continued from page 50)

The on-off toggle switch, pilot lamp, phone jack, and sensitivity control are all mounted on the front panel. All other miscellaneous parts, such as bypass condensers, resistors, etc., are mounted as close to their respective circuits as possible in order to reduce interaction between stages and avoid unnecessary troubleshooting after the completion of the unit.

The location of the two 7B7 lock-in tubes makes interstage shielding unnecessary. However, if the reader employs some other layout, especially a non-metallic chassis and panel, interaction (and feed-back) may be experienced. If this does happen, it will be necessary to mount an upright sheet-metal baffle between the power supply components (transformers and chokes) and the tuning condenser and other r.f. components. Interaction usually is noticed first at the high frequency end of the dial. Most readers will prefer to buy factory-made r.f. coils (both the antenna and interstage units) rather than winding them at home, since such manufactured coils may be obtained quite readily and are reasonably priced. They are designed to have a high Q and are completely adjusted. Several manufacturers supply these coils already mounted in shield cans of the proper size. Those readers having an assortment of shield cans may use the unshielded coils. However, one must bear in mind, when shielding an r.f. coil, that the smaller the diameter of the shield in respect to the diameter of the coil, the lower will be the Q, and consequently a lower gain will be experienced. A diameter ratio of approximately two-to-one and a length ratio of one and one-half-to-one is recommended.

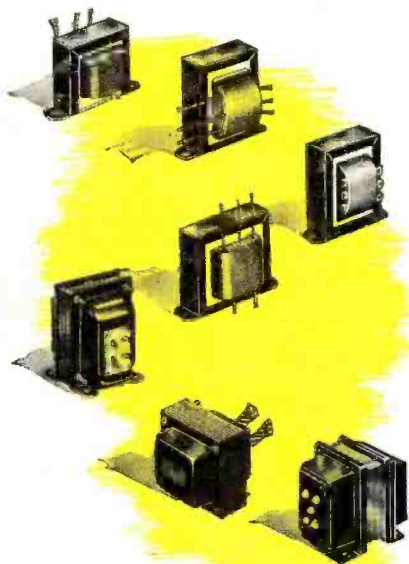
The filaments of the tubes and the panel lamp should be connected to the 6.3 volt section of the transformer combination, using twisted leads to insure freedom from 60 cycle hum. These leads should be dressed close to the chassis, as far as possible from grid or plate leads. The reader must not forget to ground one heater terminal to the chassis by means of a short, direct connection.

The use of inexpensive 1 ampere filament transformers as the power transformer was made possible by the use of dry disc rectifiers, which have no filaments to draw current. It is a good practice to connect the primary of the improvised power transformer to the line, and check the filament circuit for voltages, before completing other power supply wiring.

The two line bypass condensers (C_{12} and C_{13}) aid materially in elimination of line hum, and these units must not be excluded.

The screen grids should be wired with a 100,000-ohm, 1-watt resistor (R_2-R_6) in series with the positive side
 (Continued on page 110)

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name **STANCOR**
you can count on
SERVICE



The famous black-and-yellow STANCOR emblem stands for SERVICE... in guaranteed transformer performance... and in the friendly helpfulness of the Authorized STANCOR Distributor... who stands behind the product he sells... Yes, wherever you see the STANCOR emblem you know you will find the most complete selection of Replacement and General Purpose Transformers... advanced designs... and the universal application that make STANCOR first with radio service men... You bet you can look to STANCOR... for the standard of performance that assures you of satisfied customers.

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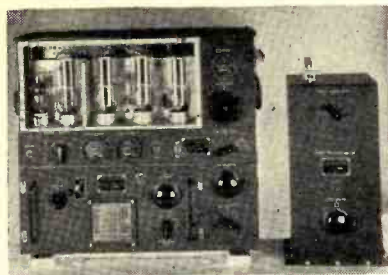


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Cost the Government \$1800.00
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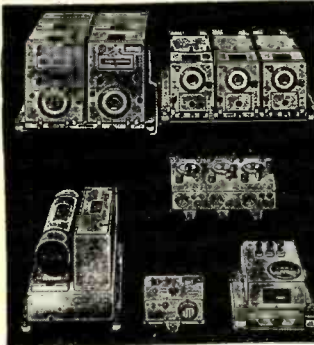
This is the famous transmitter used in U.S. Army bombers and ground stations, during the war. Its design and construction have been proved in service, under all kinds of conditions, all over the world. The entire frequency range is covered by means of plug-in tuning units which are included. Each tuning unit has its own oscillator and power amplifier coils and condensers, and antenna tuning circuits—all designed to operate at top efficiency within its particular frequency range. Transmitter and accessories are finished in black crackle, and the milliammeter, voltmeter, and RF ammeter are mounted on the front panel. Here are the specifications: FREQUENCY RANGE: 200 to 500 KC and 1500 to 12,500 KC. (Will operate on 10 and 20 meter band with slight modification.) OSCILLATOR: Self-excited, thermo compensated, and hand calibrated. POWER AMPLIFIER: Neutralized class "C" stage, using 211 tube, and equipped with antenna coupling circuit which matches practically any length antenna. MODULATOR: Class "B"—uses two 211 tubes. POWER SUPPLY: Supplied complete with dynamotor which furnishes 1000V at 350 MA. Complete instructions are furnished to operate set from 110V AC. SIZE: 21 1/2 x 23x9 3/4 inches. Total shipping weight 200 lbs., complete with all tubes, dynamotor power supply, five tuning units, antenna tuning unit and the essential plugs. These units have been removed from unused aircraft but are guaranteed to be in perfect condition.

BENDIX SCR 522—Very High Frequency Voice Transmitter-Receiver—100 to 156 MC. This job was good enough for the Joint Command to make it standard equipment in everything that flew, even though each set cost the Gov't \$2500.00. Crystal Controlled and Amplitude Modulated—HIGH TRANSMITTER OUTPUT and 3 Microvolt Receiver Sensitivity gave good communication up to 180 miles at high altitudes. Receiver has ten tubes and transmitter has seven tubes, including two 832's. Furnished complete with 17 tubes, remote control unit, 4 crystals, 24 volt dynamotor and the special wide band VHF antenna that was designed for this set. These sets have been removed from unused aircraft and are guaranteed to be in perfect condition. We include free parts and diagrams for the conversion to "continuously variable frequency coverage" in the receiver. The cost of this unit is only \$37.95.

BRAND NEW 12 VOLT DYNAMOTOR for SCR 522—\$12.00, 24 volt dynamotor—\$6.00. Used SCR 522, less dynamotor, remote control unit and antenna—as is—\$19.95. Wide band VHF antennas—\$1.95.

BRAND NEW BC 348 COMMUNICATIONS RECEIVER

Featuring coverage from 200 to 500 Kc. and 1500 to 18,000 Kc on a direct reading dial with the finest vernier drive to be found on any radio at any price—high sensitivity with a high degree of stability—crystal filter—BFO with pitch control—standard 6 volt tubes. Contains a plate supply dynamotor in a compartment within the black crackle finished cabinet, the removal of the dynamotor leaves plenty of room for the installation of a 110V, 25 or 60 cycle power supply. These receivers, which make any civilian communications receiver priced under \$200.00 look cheap and shabby by comparison, are only \$69.95 brand new. Power supply kit for conversion to 110V 25 or 60 cycles, is only \$8.50 additional.

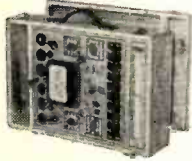


SCR-274N COMMAND SET

The greatest radio equipment value in history.

A mountain of valuable equipment that includes 3 receivers that use plug-in coils, and consequently can be changed to any frequencies desired without conversion. Also included are two Tuning Control Boxes; 1 Antenna Coupling Box; four 28V. Dynamotors (easily converted to 110V. operation); two 40-Watt Transmitters including crystals, and Preamplifier and Modulator. 29 tubes supplied in all. Only a limited quantity available, so get your order in fast. Removed from unused aircraft and in guaranteed electrical condition. A super value at \$29.95, including crank type tuning knobs for receivers.

1948 MODEL MUTUAL CONDUCTANCE TUBE TESTER \$49.95



No possibility of good tubes reading "Bad" or bad tubes reading "Good" as on dynamic conductance testers or other ordinary emission testers. Attractive panel and case equal to any on the market in appearance. Large 4 1/2" meter Calibrated micromho scale as well as a Bad-Good scale. Front panel fuse. Individual sockets for all tube base types—voltages from .75 volts to 117 volts and complete switching flexibility allow all present and future tubes to be tested regardless of location of elements on tube base. Indicates gas content and detects shorts or opens on each individual section of all local, octal and miniature tubes including cold cathode, magic eye and voltage regulator tubes as well as all ballast resistors. Name of the nationally known manufacturer withheld because of special price offer. Model "Q"—Slipping front counter case. \$49.95 Model "P"—Handsome hand-rubbed portable case. 54.95 Built-in roll chart with either of above \$5.00 extra.

SUPER SPECIALS YOU CAN'T NEGLECT

GOVT. AUDIO AMPLIFIER using 6V6's, 2 mike inputs and output at various impedance taps brought to jacks at rear panel. 9" high x 9" long x 6" deep. Shipping weight 18 lb. 2 Tech manuals and tubes included.—\$4.95.
Headphone Scoop—HS30 headsets in guaranteed perfect condition. Rubber earpieces included. 59¢ per pair OR 3 PAIRS FOR \$1.00.

RT-1579 consists of a three stage (cascade 6SJ7's and 6F6 output stage) high gain, high fidelity amplifier with 60 cycle, 110V power supply on the same 13 1/2 x 14 1/2 chassis, which is protected by a substantial steel cover over tubes and parts. Made by Western Electric with typical quality components such as a husky power transformer and oil condensers, this unit is obviously intended to give years of trouble-free service with no more need for repairs than a telephone. Disconnecting one wire each, from the special input and output filters, will result in as high a fidelity amplifier as can be obtained. Your cost with tubes, diagram and parts list included—\$14.95.

We also offer the **RT-1579** with a Raytheon Magnetic Voltage Regulator already installed beneath the cover. Imagine an amplifier complete with tubes, built to Western Electric quality standards, and immune to line voltage variations besides, making it perfectly suited for the most difficult industrial, circus, carnival, or commercial installations, offered for a total price of only \$19.95, our price for both units.

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CABLE ADDRESS BUFRAD

IMMEDIATE DELIVERY ON THESE SUPER-SPECIALS IN TEST EQUIPMENT!

MODEL 431

AC-DC Volt-Ohm-Milliammeter
Volts DC: 0-30/300/1500, at 2000 ohms-per-volt
Volts AC: 0-15/150, at ohms-per-volt
Milliamperes DC: 0-150
Ohms: 3000/300,000
Employs sensitive 425 microampere square meter, on aluminum panel. Two jacks are used for all ranges, by means of rotary selector switch. In handsome steel case, with snap-on carrying strap, complete with test leads. Shipping weight, 4 lbs.

YOUR COST, \$15.00



SIMPLEX VOLT-OHM-MILLIAMMETERS

These two instruments are housed in bakelite cases, and employ 2-inch meters.

MODEL 371

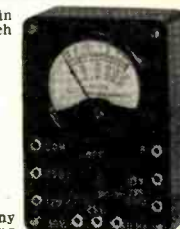
Volts DC: 0-3/15/30/300
Milliamperes DC: 0-25
Ohms: 0-10,000
With self-contained battery.

YOUR COST, \$4.55

MODEL 312

Volts AC and DC: 0-25/50/125/250
Milliamperes AC and DC: 0-50
Ohms: 0-100,000
Capacity Meter—.05 to 15 Mfd.

This instrument operates from any 110V AC or DC outlet. Shipping weight, 2 lbs. YOUR COST, \$5.85



MULTI-RANGE AC-DC VOLT-OHM-MILLIAMMETER WITH OUTPUT RANGES

MODEL 458

Volts DC: 0-5/10/50/100/500/2000, 1000 ohms-per-volt
Volts AC: 0-12.5/25/125/250/1250
Milliamperes DC: 0-1/10/100
Milliamperes AC: 0-2.5/25/250
Ohms: 0-1000/200,000/2,000,000
Output: -5 to +55 Decibels
Overall Accuracy: -1%



5 1/2 INCH RECTANGULAR METER

with two-tone aluminum scale, set at a 45° angle for easiest reading. Special-treated aluminum panel, mounted on a wrinkle finish welded steel case, equipped with rubber feet and collapsible handle for portability. Complete with self-contained battery and test leads. Shipping weight, 8 lbs. YOUR COST, \$25.20

FEATHERWEIGHT MINIATURE MODELS

Just slightly larger than a pack of cigarettes, though they feature high accuracy, large, easily readable scales, and rotary-switch range selection. Average weight, only 12 oz.; shipping weight, 2 lbs.

MODEL 450

Volts DC: 0-5/10/50/500/1000, at 1000 ohms-per-volt
Milliamperes DC: 0-1
Ohms: 5000/50,000/500,000
YOUR COST, \$10.60

MODEL 451

Volts DC: 0-10/50/100/500/1000
Volts AC & Output: 0-10/50/100/500/1000
Ohms: 0-500,000

10,000 ohms-per-volt on all ranges
Condenser is built-in for output ranges
YOUR COST, \$14.50

MODEL 452

Volts DC: 0-10/50/100/500/1000
Ohms: 200/20,000/200,000/2,000,000
10,000 ohms-per-volt on all ranges
Has sensitive 100 microampere meter
YOUR COST, \$14.50



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Dynamic mike or low impedance pick-up to grid... ea. \$0.49
12 for... 5.00

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3" MAGNETIC SPEAKER for Majestic portables or general replacement... \$2.25

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- #3—MOULDED BAKELITE CONDENSERS; 50 asstd. .0001 to .2 mfd. 200-600 WV. Clearly marked... 2.95
- #4—TUBULAR BY-PASS CONDENSERS; 50 asstd. .001 to .25 mfd. 200-600 WV. Standard brands... 2.49
- #8—KNOBS; 25 asstd. setscrew, spring and push button. Wood and bakelite... .98
- #10—VOLTAGE DIVIDERS; 10 asstd. multi-tapped. High wattages included... 1.98
- #20—SPEAKER REPAIR KIT. Save time and money with this professional kit. Contains: 25 paper rings, 25 voice coil forms, 10 spiders, 3 yds. felt strips, 20 chamois leather segments, kit of 16 shims and tube of cement... 2.49
- #27—PRECISION RESISTORS (Weston, Shallcross, etc.) ±1% wire-wound. 10 asstd. ohms to 400 K... 1.98
- #28—ROTARY SELECTOR SWITCHES. Six asstd. standard makes. Incl multi-deck and ceramic insul... 1.75

TUBES: Perfect condition, but not in sealed cartons. Most types in stock at up to 80% off list. Every tube guaranteed 90 days.

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- #42. 45 75 76 77 78 80 89 5Y3 6X6 or 6K7... .39
- #35. 36 37 39 54 5Y4 6C5 6E5 6J7 6N7... .49
- #17. 6S4 7 8K7 12SA7 or 12SK7... .49
- #1A7. 1B5 1N5 1R5 6U5 6X5 7A7 7C5 7C6 7Y4 or 50... .59

TUBE CARTONS: Plain white.

- GT size (1 1/2" sq. x 3 1/4")... Per 100 \$1.25
- Medium size (1 1/4" sq. x 4 1/4")... Per 100 1.45
- Large size (2" sq. x 5")... Per 100 1.75

RCA VICTOR POWER TRANSFORMER for models R-32, 45, 52 or 75. Unshielded... \$5.95

VARIABLE CONDENSERS. 2 gang. 365 mfd. Ball bearing shaft; O.D. 3/4" x 3/4"... \$0.75

BENDIX AMPLIFIER (Line of Sight) 115 V. 400 cycle. Contains: power trans., 3 audios. 6 oil condensers, plus other components worth many times the price. Black crackle finish case. 7" x 5 1/4" x 4". Shpg. wt. 9 lbs... \$1.95

CRYSTAL MICROPHONE UNITS. Famous make, sensitive diaphragm type. Small size (1 1/2" O.D. 1/2" deep) ideal for REGULAR or CONTACT MIKE or PILLLOW SPEAKER. Rubber shock mtd. metal frame. Less housing... \$0.69

AUDIO TRANSFORMERS—3:1, DC. Resist.: 800/7000. Hermetically sealed. 2x1 1/4" x 1 1/4"... \$0.69

LINE TRANSFORMER (Intercom. P.A. phone, etc.) Impedance: Pri. 250 ohms; Sec. 8 ohms with 5 equal taps. —16 to 0 db. 2" O.D., 2 1/2" high... .69

6 V. TELEGRAPH KEY AND BUZZER (W.E.). Fully adjustable platinum contacts. 3/4" bakelite base... \$1.25
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of the power supply. A .1 μ fd. condenser (C_3-C_6) should be connected between the screen grid and ground, to bypass to ground all fluctuations resulting from the radio frequency action on the electron stream inside the tube. This r.f. fluctuation, were it allowed to reach the d.c. power supply, could easily produce oscillations or other unwanted disturbances in the amplifier.

Plate circuit connections should follow, and it is well worth emphasizing again, that plate leads should be kept close to the chassis. The incorporation of the two resistor-condenser plate filters (R_1-C_1 and R_2-C_2) aid substantially in reducing interaction between stages.

The cathode circuit should now receive our attention and the two 100-ohm bias resistors (R_3-R_6) should be connected between the cathodes of the tubes and the 10,000-ohm potentiometer (R_7) which is used as a sensitivity control. The two condensers C_2 and C_3 should be connected between the cathodes and ground to smooth out the r.f. fluctuations.

The germanium diode is furnished with tinned pigtailed, and no soldering precaution is necessary other than that which one would exercise in connecting a resistor.

The power supply should present no problem other than the correct connections to the selenium rectifiers. The positive terminal of the *Sylvania* NC5 rectifier is marked "CATH." It is from this terminal that we get the positive d.c. output. Normally, these rectifiers are used directly from the power line but in our voltage doubler application complications will be introduced with respect to grounding of the chassis, etc. The use of two filament transformers connected as previously explained overcomes this problem, as well as supplying an isolated source of filament voltage.

Testing

Assuming that the wiring has been in accordance with the schematic diagram (Fig. 2), we are now prepared to test the unit. This testing can be successfully accomplished using a good volt-ohmmeter and a signal generator. More advanced testing can be per-

formed using an oscilloscope and an electronic voltmeter.

The signal generator need only cover the broadcast band (550 to 1600 kc.), since the tuner employs no i.f. amplifier. Should the reader not have access to a test oscillator of any kind, broadcast station carriers may be used conveniently. It is best to select three stations, one near the lower end of the broadcast band, one near the middle, and one near the high end. For this testing only, use the shortest antenna which will deliver good signals.

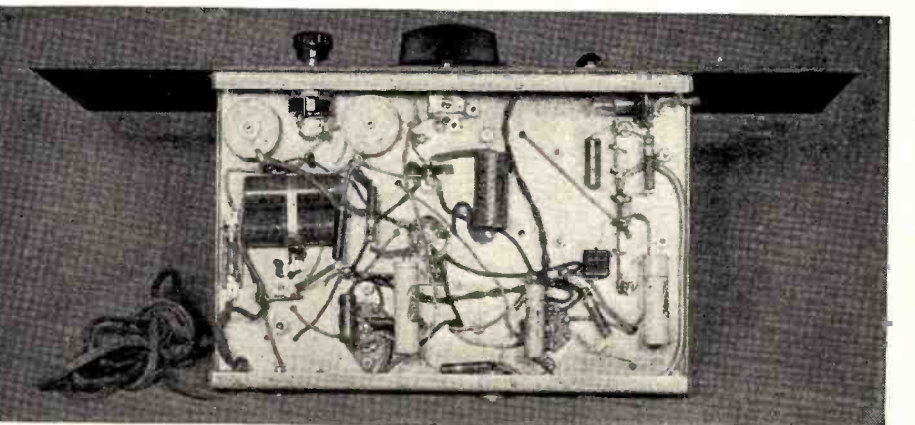
The reader should allow $\pm 10\%$ tolerance on all resistance or voltage measurements mentioned in the paragraphs which follow, unless otherwise stated. Step 1 in the testing and calibration program is a resistance check of the power supply. Connect the ohmmeter from point "A" (Fig. 2) to chassis. The resistance should be 50,000 ohms. Should the reading obtained be in excess of the $\pm 10\%$ allowed, check the filter condenser C_6 for a shorted condition, and the bleeder resistor R_8 for an open condition.

Connect the primary of the power supply to the 115 volt line and test voltages present at the filament of the tubes. This should be 6.3 volts. Having satisfied ourselves of the presence of the correct filament voltages, attention should be transferred to the plate supply. The d.c. voltage present at point "A" should be 250 volts, and at both plates should be 240 volts. The screen grid terminals should measure 100 volts.

We are now ready to apply our test signal. Connect a pair of high impedance headphones to the phone jack. Connect the output of a 400 cycle modulated r.f. generator to the antenna and ground posts of the tuner and adjust the frequency of the generator to 1500 kc. Also rotate R_2 of amplifier fully clockwise. The moving contact arm should now be located at the end of the potentiometer which is connected to the 100 ohm cathode bias resistors. If this is not so, change the end connection.

Rotate the tuning condenser (C_1) until the rotor plates are located at minimum capacitance (completely
(Continued on page 114)

Fig. 6. Under chassis view of t.r.f. tuner shows location of component parts.



MONEY BACK GUARANTEE We believe units offered for sale by mail order should be sold only on a "Money-Back-If-Not-Satisfied" basis. We carefully check the design calibration and value of all items advertised by us and unhesitatingly offer all merchandise subject to a return for credit or refund. You, the customer, are the sole judge as to value of the item or items you have purchased.



The New Model 60-T TUBE and SET TESTER

A COMPLETE TUBE TESTER

Tests all tubes including the new post-war miniature locals such as the 12AT6, 12AU6, 35W4, 50B5, 11Z3, etc. • Tests by the well-established emission method for tube quality, directly read on the scale of the meter • Tests shorts and leakages up to 3 Megohms in all tubes • Tests leakages and shorts of any one element against all elements in all tubes • Tests both plates in rectifiers • Tests individual sections such as diodes, triodes, pentodes, etc., in multi-purpose tubes.

\$49⁸⁵ Model 60-T operates on 90-120 Volts 60 Cycles A.C. Housed in sloping leatherette covered cabinet. Comes complete with test leads, tube charts and detailed operating instructions.
NET PRICE

A COMPLETE MULTI-METER

- 6 D.C. Voltage Ranges: 0 to 7.5/15/75/150/750/1,500 Volts
- 6 A.C. Voltage Ranges: 0 to 15/30/150/300/1,500/3,000 Volts
- 4 D.C. Current Ranges: 0 to 1.5/15/150 Ma. 0 to 1.5 Amps.
- Low Resistance Ranges: 0 to 2,000 Ohms (1st division is 1/10th of an ohm.)
- 2 Medium Resistance Ranges: 0 to 20,000/200,000 Ohms
- High Resistance Range: 0 to 20 Megohms
- 3 Decibel Ranges: -10 to +38, +10 to +38, +30 to +58 DB.

EXTRA: WE CAN NOW SUPPLY THE MODEL 60 HOUSED IN A BEAUTIFUL HAND-RUBBED OAK CABINET. COMPLETE WITH PORTABLE COVER MAKING IT SUITABLE FOR EITHER BENCH OR OUTSIDE USE. ONLY \$2.75 ADDITIONAL. SPECIFY MODEL 60-C

The New Model 650-A A.C. Operated SIGNAL GENERATOR



- Operates on 110-120 Volts 50 to 60 Cycles A.C.

- R.F. Frequencies from 100 Kc. to 35 Mc. on Fundamentals in 5 bands by front panel switch manipulation. One additional band provides Harmonics from 30 to 105 Mc.
- Audio Modulating Frequency—400 Cycles Pure Sine Wave. Distortion less than 2%.
- Attenuation: Features a newly designed 3-step ladder type of attenuator (T pad). The first step provides lowest output and can be multiplied by 10 and by 100 by turning the multiplier switch.

• Hartley Excited Oscillator Electron coupled to a Buffer Amplifier. Frequency stability is assured by modulating the amplifier stage.

Complete with coaxial cable, test leads and instructions. Heavy gauge grey crystalline cabinet with beautiful two-tone etched front panel. Size 9 1/2" x 10" x 6".
\$39⁹⁵ NET

THE PREMIER BANDSPREAD DIAL SIGNAL GENERATOR

EXCLUSIVE FEATURE! The "PREMIER" Model 570 is the ONLY low-priced Signal Generator with a MICRO-MASTER BANDSPREAD DIAL, equivalent to a scale length of approximately 60"—a major feature for logging, sharp and critical tuning.



Air Trimmers on All Bands Triple Copper Plated Shielding

EFFECTIVE LINE FILTER—pure 400 cycle modulation (less than 5% distortion).

Range 75KC-50MC on fundamental, and 50-150 MC on 3rd harmonic, useful for aligning FM and Television Receivers.

Accuracy better than 1%.

A.C.—115 volts, 50-60 cycles.

Overall size—12" x 12 1/2" x 5 1/2". Shpg. wt. 21 lbs.

Complete with co-axial cable and operating instructions.
\$54⁷⁵ NET

The New Model 670 SUPER METER

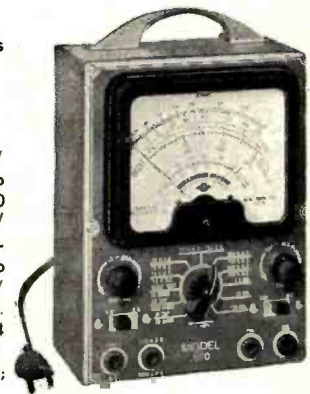
A Combination VOLT-OHM-MILLIAMMETER plus CAPACITY REACTANCE, INDUCTANCE and DECIBEL MEASUREMENTS

D.C. VOLTS: 0 to 7.5/15/75/150/750/1500/7500. A.C. VOLTS: 0 to 15/30/150/300/1500/3000 Volts. OUTPUT VOLTS: 0 to 15/30/150/300/1500/3000. D.C. CURRENT: 0 to 1.5/15/150 Ma.; 0 to 1.5 Amps. RESISTANCE 0 to 500/100,000 ohms, 0 to 10 Megohms. CAPACITY: .001 to .2 Mfd., .1 to 4 Mfd. (Quality test for electrolytics) REACTANCE: 700 to 27,000 Ohms; 13,000 Ohms to 3 Megohms.

INDUCTANCE: 1.75 to 70 Henries; 35 to 8,000 Henries

DECIBELS: -10 to +18. +10 to +38. +30 to +58

THE MODEL 670 COMES HOUSED IN A RUGGED, CRACKLE-FINISHED STEEL CABINET COMPLETE WITH TEST LEADS AND OPERATING INSTRUCTIONS. SIZE 5 1/2" x 7 1/2" x 3".
\$28⁴⁰ NET



The New Model 450 TUBE TESTER

Speedy operation—assured by the newly designed rotary selector switch which replaces the usual snap, toggle, or lever action switches.

SPECIFICATIONS

- Tests all tubes up to 117 volts
- Tests shorts and leakages up to 3 Megohms in all tubes.
- Tests both plates in rectifiers.
- New type line voltage adjuster.
- Tests individual sections such as diodes, triodes, pentodes, etc., in multi-purpose tubes
- Noise Test detects microphonic tubes or noise due to faulty elements and loose internal connections.
- Uses a 4 1/2" square rugged meter.
- Works on 90 to 125 volts 60 cycles A.C.

EXTRA SERVICE—May be used as an extremely sensitive condenser Leakage Checker. A relaxation type oscillator incorporated in this model will detect leakages even when the frequency is one per minute.
\$39⁵⁰ NET

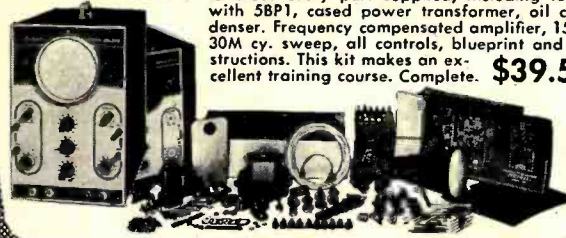


GENERAL ELECTRONIC DISTRIBUTING CO. Dept. RN-12, 98 Park Place
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THE NEW HEATH 5" OSCILLOSCOPE

Complete kit to build a beautiful 5" scope, cabinet, chassis and panel punched, formed and lettered. Every part supplied, including tubes with 5B1, cased power transformer, oil condenser. Frequency compensated amplifier, 15 to 30M cy. sweep, all controls, blueprint and instructions. This kit makes an excellent training course. Complete. **\$39.50**



RCA RECEIVER MODEL ARB

A brand new Navy communications type receiver with BROADCAST BAND. Covers 200 KC to 9.1 MC continuous, has two RF stages, electric motor band switching, complete with calibrated dial, 6 tubes, control head, remote control box, 24 volt dynamo, and circuit diagram.

**LIMITED
QUANTITY
AVAILABLE**



\$29.50

OIL FILLED CONDENSERS

CAP	WVDC	PRICE	CAP	WVDC	PRICE
5	400	\$.39	1.	1000	\$.49
5-5	400	.79	2.	1000	.69
4	400	.49	4	1000	.90
5	600	.59	8	1000	1.00
8	600	1.00	8-8	1000	1.95
2.5-2.5-5	600	1.50	.25	1500	.49
5-5-5	600	1.95	1.5	1500	.79
8-8-8-8	600	3.95	.1	3000	1.20
5-5	600	1.00	.25	3000	1.30
.1	1000	.29	.05	7500	2.50
.25	1000	.39			



Only 40 available

BC 438 FREQUENCY METER

A beautifully constructed frequency meter, built by Link for Western Electric, 5 tube, AC OPERATED, covers 195 to 215 MC, comes complete with tubes, standard crystal, calibration chart, circuit diagram, in used condition. The excellently filtered 110V AC power supply alone worth our price of..... **\$14.50**

BRAND NEW ARMY AIR FORCE ASTROGRAPH

The case of this unit makes the finest tool and service kit ever designed. Plywood construction, 14x11x10" high, with 8 covered compartments in the bottom for repair parts, leather handle, steel reinforced covers, hinged lid. Also excellent as case for radio phonograph, movie projector, camera, shell case, fishing kit, picnic kit, etc. The astrograph itself, (which cost the government \$125.00) makes an excellent contact printer, and can be used as a foundation for enlarger, strip mop holder, etc. The case alone worth twice the give-away price of. **\$3.95**



OIL FILLED BATHTUB CONDENSERS

200 Volt in .5, .1, dual .5 MFD.....	20 for \$1
400 Volt in .1, dual .1, triple .1, .2, .25, .5, 1, MFD.....	15 for \$1
600 Volt, .1 dual .1, triple .1, .25 dual .25, .5, 1.....	10 for \$1

PUSH BUTTON TUNER

This beautifully constructed unit was used on an Army FM receiver. A ten push-button assembly operating four gang silver plated tuning condenser drum dial manual tuning. Brand new. Shipping weight, 10 lbs. **\$2.50**



SPECIALS

Selsyn Indicators 5" Brand New \$2.95
PE 104A power supplies operate from 6 or 12 volt input — output 84V plate 1.4 volt filament \$4.95
Ceramic Variable Condensers 50 MMF screw driver adj. Special 5 for \$1.00
Lip Microphones T-45 in original sealed cartons \$1.00
Thermocouples for RF Ammeters, 3 for \$1.00
10 henry 50 ma Filter Chokes 2 for \$1.29
5B1 Cathode Ray Tubes..... \$2.49
5B1 Socket79
Synchro Motors 5SDG Brand New, per pair \$6.95
Kit of Screw Driver Type Potentiometers 10 for \$1.00
Kit of Metal Tubular Bypass Condensers 20 for \$1.00
Kit of Relays, excellent types .5 for \$2.50

BC 306 ANTENNA

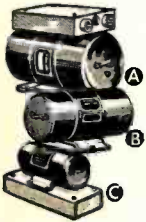
TUNING UNIT

GE unit from BC 375 matches 150 watt transmitter to antenna. Brand new..... **\$2.95**



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Consists of electric motor operating generator on same shaft. Many applications — operating radios from storage battery — using as motor.
Dynamotor A — Input 12 volts, output 1000 volts at 350 MA. **\$7.95**
Shipping weight, 72 lbs.
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Dynamotor C — Input 28 volts, output 220 volts at 60 MA. **\$1.50**
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RG-B/U FLEXIBLE

COAXIAL CABLE



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4¢ PER FT.

Ideal for feeding any antenna up to 1 K.W. All frequencies up to 250 MC. Brand new any length. Lowest price ever offered.

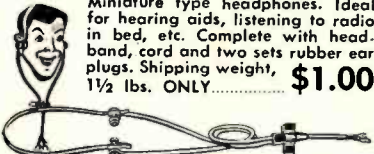
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Brand new transmitters covering 4-5.3 MC. Contains M.O. 1625, two 1625's as P.A., these make excellent VFO from conversion in May 1946 CQ. Complete in original cartons with tubes. **\$4.95**



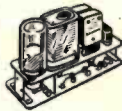
MINIATURE HEADPHONES

Miniature type headphones. Ideal for hearing aids, listening to radio in bed, etc. Complete with headband, cord and two sets rubber ear plugs. Shipping weight, 1 1/2 lbs. **ONLY \$1.00**



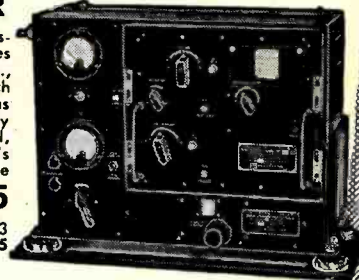
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The heart of the Army Walkie Talkie. Contains transmitter crystal and tank coil, receiver coil, tuning condenser and crystal; ideal foundation for small set. Shipping weight, 1 lb. **\$1.00**



BC 223 TRANSMITTER

One of the most desirable military transmitters, 4 crystal-controlled frequencies and master oscillator. Meters for Osc., Ant., and total current. Uses 46 speech amplifier, 2-46 modulators, 801 each as oscillator and power amplifier. Practically no conversion necessary: plug in crystal, mike and connect power supply and it's ready to operate. Brand new with one tuning unit and circuit diagram. (less tubes)..... **\$12.95**
Vibrator Power Supply PE 125 for BC 223 (12 V. operation) new..... **\$9.95**



NO ORDERS UNDER \$2. • • WE WILL SHIP C.O.D.



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BENTON HARBOR, MICHIGAN



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The most beautiful VTVM ever offered now available in kit form. Every part supplied: all punched, lettered and formed.

A balanced bridge circuit, 11 megohms input resistance, measures both AC and DC electronically. Ranges 3-30-100-300-1000 volts AC or DC. Ohmeter .1 ohm to 1000 megohms. Includes DB scale. Complete with tubes, 500 microamp meter, cabinet, blueprints, and instructions. Shipping Wt., 8 lbs.

BUILD IT YOURSELF AND SAVE 2/3 COST
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Aerovox hyvol .05 MFD at 7500 volts. Limited quan. **\$2.50**



OUR BEST CONDENSER BUY

An ideal power supply filter has 2.5 MFD., 2.5 MFD., and 5 MFD., sections at 600 V. working. All oil filled, extra special. **95c**

CONDENSER SPECIAL

Brand new Cornell-Dubilier 2 MFD. 600 V. oil filled filter condensers, porcelain insulators. **3 FOR \$1.00**

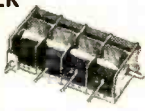


G.E. CIRCUIT BREAKER

Protect your equipment at one-fourth of cost, new G.E. 50 amp. 220 V. circuit breakers. **\$2.95**

4 GANG CONDENSER

A silver plated 147 MFD. per section variable tuning condenser - long 1/4" shaft, an outstanding surplus buy. **\$1.00**



AIRCRAFT INTERPHONE AMPLIFIER

New BC 347C using 6F8 tube with tube uncner, transformers, diagrams, etc. **\$2.95**

2 1/2" VOLTMETER

Ideal for making pocket tester, scale 0-3 D.C. volts, made by Weston and Simpson. Tester diagram and Multiplier Resistors for 30-300 V. D.C. included. **\$1.95**



MILITARY CONVERSION POWER TRANSFORMER

Especially for 24 volt receivers. Supplies 500 volts C.T. at 50 MA., 5 V. at 2A. and 24 V. at 1/2 amp. To convert command sets without rewiring. **\$2.95**



TRIMMER CONDENSER KIT

10 brand new vari-ables 12 MMF to 50 MMF ceramic insulated. **\$1.00**

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Five and ten watt units. **15 FOR \$1**

455 KC I.F.'s

Dual slug tuned square can. **3 FOR \$1**

BATHTUB CONDENSER KIT

.1 MFD. to 1. MFD. up to 600 Volt. **20 FOR \$1.00**

TRANSMITTER CRYSTAL KIT

4 mounted crystals between 2 MC and 3 MC. **4 FOR \$1**

SOCKET KIT

20 beautiful octal, loctal and miniature sockets. **20 FOR \$1**

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Perfect sizes from 1/2 to 2 1/2 MH. **10 FOR \$1**

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All knob types in 25 and 50 watt I.R.C., etc. **5 FOR \$2.95**

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An excellent assortment with silver mica and regular. All color coded or marked. **25 FOR \$1.00**

CERAMIC CONDENSER KIT

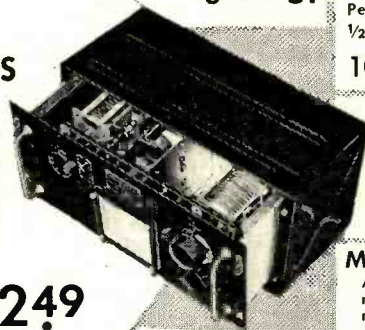
20 beautiful condensers all marked or coded, many zero temp. coef. types. **20 FOR \$1.95**

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The best available all insulated color coded in 1/2-1-2 watt sizes. **100 FOR \$1.95**

MODEL BC 375 TUNING UNITS

These units need no introduction but ours are brand new with the cabinet, which is ideal for a receiver case, at the lowest price yet. State model number preferred and we will ship as close as we can.



At least a \$30.00 value in parts for **\$2.49**

MODEL BC 728 PUSH BUTTON RECEIVER

An excellent portable push button permability tuned receiver covering 2-5 Mc. Easily converted to broadcast band, operates from 2 or 6 volts with six tubes. PM speaker - two vibrator power supplies slightly used. Only 100 available.



\$14.95

BC 645 GENERAL ELECTRIC TRANSMITTER-RECEIVER

A beautiful brand new tranceiver operating in the 450-500 Mc range. Comes with 15 new tubes (list price tubes alone \$58.00) and all conversion data and diagrams. Covers 420-450 ham bond, citizens two way communications band, mobile ham band, and Exp. television band. Cost government over \$400.00. Our price complete.



\$14.95 2 FOR \$27.00

BC 733 RECEIVER

A Western Electric 10 tube receiver cover 100-120 Mc. complete with 10 tubes, crystals, etc. Used condition.



\$7.95

NO ORDERS UNDER \$2.00 WE WILL SHIP C.O.D.

 Living Room Concerts	More Economical	 Airport & Train Announcements	Cannot Tangle	 Broadcast Station Monitoring
Longer Playing Time	Now Available! 8 HOURS OF CONTINUOUS PLAY ON THE MAGNETAPE* RECORDER!			30 Second Rewind
 Industrial Factory Work Music	 Now — record and play back on this amazing instrument any sound that can be heard, and many that cannot — from a concert hall symphony, to the beat of your heart. Simple interchangeable capstans provide a choice of three tape speeds for high fidelity, medium fidelity, or up to 8 hour voice recording. The ideal recorder and playback unit for home, office, industry, and broadcast station.			 Conference Recording
Quieter Operation	Write today for our free illustrated technical catalog featuring our complete series of Magnetape Recorders and accessory equipment.—Send 25¢ in stamps or coin for our new booklet, "Elements of Magnetic Tape Recording — and 999 Applications." * Trademark			Easy Editing
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GENERAL  ELECTRIC

THE SIMPLEST

FM CONVERTER

Converts 40-50Mc FM Tuners and receivers to 88-108Mc operation. Simple to attach and adjust. No power required. Hundreds now in use all over U.S.

Model 1002A List \$10.00

FM INTERFERENCE TRAP FOR TELESETS

Eliminates FM and amateur interference from tele image by absorption of interfering signal. Two adjustments provide for elimination of signals in 80-115Mc and 40-60Mc Ranges.

Model 1005A List \$10.00

CRYSTAL CONTROL FOR FM TV AND BC RECEIVERS

Send 25c (no stamps) for booklet describing applications of quartz crystal control for local oscillators of your home receivers.

See Your Local Parts Jobber or write for information

CRYSTAL DEVICES CO.

1819 Broadway, NEW YORK 23, N. Y.

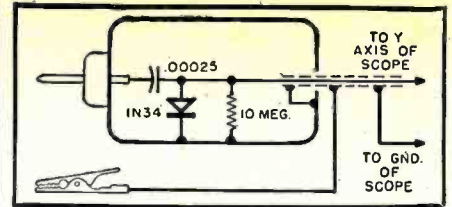


Fig. 7. The r.f. probe.

open). Adjust output of the signal generator until a signal is heard in the headphones. To adjust the amplifier, vary the trimming condensers located on the main tuning condenser C_1 until the signal is loudest. As the signal increases above the comfortable listening point, reduce signal strength by lowering the output of the signal generator. In cases where a radio station carrier is used in place of a signal generator, the signal strength may be reduced by shortening the antenna wire.

More advanced readers may adjust the unit with the aid of an oscilloscope. The amplitude of the wave represents the measured voltage output and at the same time the distortion of the amplifier may be visually inspected. To do this properly, proceed as follows:

Step 1. Connect output of signal generator to the antenna-ground input of the amplifier.

Step 2. Connect ground of scope to chassis of amplifier.

Step 3. Connect generator, scope, and amplifier to line and warm up for 15 minutes to stabilize these units so that accurate measurements may be taken.

Step 4. Connect the circuit shown in Fig. 7 in series with the Y axis input of the scope and the antenna ground of the amplifier, and note the audio waveform on the scope. Inasmuch as this represents the output of the generator, the reader will have an excellent source of comparison as we proceed with our stage-by-stage visual alignment.

Step 5. Transfer the probe to the grid of the first 7B7 tube and note the waveform and voltage gain on the scope. An amplification of about 1.5 should be experienced.

Step 6. Transfer the probe to the plate of the first r.f. tube, adjust the trimmer of the first stage tuning condenser C_1 until the amplitude of the waveform present on the screen of the oscilloscope reaches maximum. This waveform should be the same shape as that noticed directly from the generator. If any noticeable distortion of this waveform is experienced, readjust R_2 . If readjusting R_2 does not clear up the defect, check R_1 for correct value of resistance and check C_2 for either an open or shorted condition. Another possible source of distortion is that C_3 may be open. This would most likely cause oscillation and reduce the stage gain. This distortion procedure also holds true for the second r.f. stage.

Step 7. Proceed to align and check the next stage of the unit in the same

RADIO NEWS

manner, moving the probe to the plate of the second r.f. tube.

Step 8. To complete the visual alignment, we shall discard the r.f. probe and connect the Y axis input of the scope to the junction of C_{10} and C_{11} . The waveform now present on the screen of the scope is that of the audio output from the detector. The waveform at this point should be comparable to that witnessed at the first and second r.f. stages. The trimmer on the third stage tuning condenser (C_3) should be adjusted for maximum amplitude.

Step 9. With the scope connected as in **Step 8**, readjust the three trimmers of the tuning condenser C_1 for maximum output. The over-all gain of the amplifier at 1000 kc. is approximately 1200.

Although the tuner described is sensitive enough to pick up strong signals with a random length of wire, we strongly urge the use of the best possible antenna. For maximum efficiency, a long wire, well insulated, and mounted outdoors as high in the air as possible, is recommended. A simple single wire is entirely adequate.

(To be continued)

Signal Generator

(Continued from page 59)

upon the setting of the "Modulation" panel knob (R_{10}) at power line frequency rate, thus eliminating the need for special synchronizing conditions between signal generator and oscilloscope.

As a result of this frequency modulation action, the output signal is varied above and below its center frequency. The fixed oscillator signal is proximity mixed with the variable oscillator output. Because of the heterodyne action, the output frequency delivered by the signal generator is any possible combination of 40 megacycles plus and minus the frequency to which the main dial is set. (For example: When the main dial is set to 10 mc., frequency modulated outputs are obtained at 30 mc. and at 50 mc. The first is 40-10 mc.; the second, 40+10 mc.) To determine the dial setting required for any center frequency needed for FM alignment, it is only necessary for the operator to add or subtract the desired frequency mentally to (or from) 40 mc., and then to set the main dial of the generator to either this sum or difference frequency. Either one of these settings will give output on the desired center frequency.

The range of frequency-modulated center frequencies delivered by the Model 906 is 90 kc. to 210 mc.

The unit becomes an emergency beat-frequency audio oscillator when the main dial is tuned in the vicinity of 40 megacycles. (With "Modulation" switch set to FM, and sweep width set to zero). This is because the heterodyne beat note between the fixed- and variable-frequency oscil-

TELEVISION ASSEMBLY UNIT

STEADY

CLEAR

BRIGHT

No Eye Strain



For the first time — a 10" Flat Surface Screen Picture unit available in assembly form. This is not a kit but a complete assembly. Picture is 51 square inches.

Also available

A 12" Screen picture, 75 square inches, at a slight additional cost.



Superior performance is obtained with a new IF Video & Sound Strip (pat. pend.), aligned, wired, pre-tuned, tested and tested. All the above circuits are contained on one chassis, ready to use when delivered. This unit designed and constructed by engineers. Licensed by Western Electric & Radio Corporation of America.

Easier to operate than your home radio.

10" FLAT SURFACE

C R TUBE INCLUDED

\$229.50

51 SQ. IN. PICTURE COMPLETE WITH ALL TUBES AND COMPONENTS

PRICE F.O.B. OUR FACTORY



FRONT END

IF STRIP

ALSO AVAILABLE 12" C R TUBE INCLUDED

\$259.50

75 SQ. IN. PICTURE COMPLETE WITH ALL TUBES AND COMPONENTS

PRICE F.O.B. OUR FACTORY

GUARANTEED

To operate to your satisfaction when simple directions are followed.

- FRONT END will handle 13 Television Channels. It is so flexible that any number of channels from 1 to 13 can be used. We are now supplying channels 2 - 4 - 5 - 7 - 9 - 11 - 13 with this front end. Install the other channels as desired. Aligned and tested, ready to use when delivered. Merely connect B plus, filament and output I.F. leads to the television chassis. It is not necessary to make any R.F. alignments.
- 29 RCA Tubes included plus 10" flat faced CR tube or 12" CR tube
- Heavy Duty RCA 6.8 oz. slug 12" PM speaker
- Specially designed dipole antenna with 60 foot lead in.
- 4.5 mc band width for greatest picture definition.
- Approximately 10,000 volts second anode potential for better contrast and brightness.
- 5 IF pictures stages
- 2 sound IF stages with Limiter and Discriminator
- High fidelity obtained with FM sound reproduction
- Overall chassis size 17"x19"x3"
- Complete pictorial and schematic diagrams supplied with assembly
- IF frequency — Audio 21.6 Picture 26.1
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VARIAC. Gen. Radio type 200 B 115 volt input 135 volt 1.5 amps. Max. output.

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TRANSFORMERS. 1—with primary variable from 0-135 volt, secondary from 0-3500 volt; 1—with primary 117 volt secondary 0.3 V at 1.2 Amp, 275 volt center tap to each side, 150 volt at 3 Amp.; 1—with 117 volt primary, secondary 4 volt at 16 amp. and 2.5 volt at 1.75 amp.

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Weston Model 895 Type 3 A. A rectifier type voltmeter with 5 ranges of 1, 5, 6, 15, 60 and 150 volts and

A multirange DB meter for a zero signal level of 8 milliwatt on a 50 ohm load. Scale graduated to indicate -8, -4, "0," +4, +8, +12, +16, +20, +24, +28, +32 DB at "0" on the DB scale or a total spread of 56 DB.

A plate fastened on back of instrument gives instructions and conversion data for use on other than 500 ohm circuits.
 Dimensions 5 1/2" x 3 3/4" x 3 1/4". **NET \$19.50**

PANEL METERS

Signal Strength ("S") Meter—Simpson 25, 3 1/2", rd fl bake case. Use this on the plate circuit of your receiver to show the relative strength of incoming signals. Sc calibrated—0 to 100 DB above 1 microvolt, 5 MA Zero right mvt with translucent sc. for internal sc illumination from rear of meter. Comp with socket, lamp and leads. For further details refer to pages 164,165 & Fig. 730 B of Radio Amateur's Handbook.
\$4.50

Decibel Meters—Weston 301, Type 21, 3 1/2", rd fl bake case, minus 10 to plus 6, 6 M.W., 600 ohms; General purpose type 6-10 scale. Standard reading, 45-62% overthrow, 5000 ohms internal resistance at ODB. **\$8.50**

—W.H. RC-35, minus 10 to plus 10, ODB equal; 1.897 V, 6 MW, 600 ohms, 3" square. **\$4.50**

Totalizing Hour Meters—G.E., 3 1/2", rd fl bake case; Up to 9,999.9 hrs. Operates on 10-12 volt 60 cycle. Ideal for counting the total hours of operation of the power tubes on transmitters.
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—J.B.T., 30-2", Dual range covers. Frequency ranges from 48-52 cycles and 58-62 cycles; Dual element, Vibrating Reed type, 115 volt, 3 1/2" rd fl metal case. **\$5.95**

D.C. Voltmeters—W.E., 500 V, 1000 ohms per volt; 3 1/2", rd fl bake case, concentric style. **\$5.00**

—Weston 301, 3 1/2", 4 K.V. with external pre-resistor. **\$8.50**

—W.H., NX-35, 1.5 KV with 1000 ohms per volt, ext prec wire wound resistor & mg clips. 3 1/2", rd fl bake case. **\$7.25**

—W.H., NX-35, 20 KV with ext prec wire wound 1000 ohms per volt resistor and mtg clips. **\$21.00**

D.C. Milliammeters—G.E., DO-41, 30 MA, 3 1/2", rd fl bake case. **\$3.50**

—G.E., DO-41, 50 MA, black scale, 3 1/2", rd fl bake case. **\$3.25**

—G.E., DO-41, 200 MA, 3 1/2", rd fl bake case. **\$3.25**

D.C. Microammeters—W.E., 100-0-100 microampere, approximately 950 ohms resistance, 3 1/2", rd fl bake case, concentric style. **\$6.50**

—Triplet, 100 ua mvt, approx 500 ohms resist, sc cal 0-3, 0-15 & 60 V MA, 4" Rect fl bake case. Knife edge pointer. **\$5.50**

—G.E., DO-41, 200 microampere mvt, Knife edge pointer, sc mkt "Set Carrier" supp with paper V.O.M.A. sc, 3 1/2", rd fl bake case. **\$4.95**

A.C. Voltmeters—W.H., NA-35, 15 V, (100 MA) 3 1/2", rd fl bake case. **\$3.95**

—W.H., NA-35, 150 V (10 MA) 3 1/2", rd fl bake case. **\$5.50**

MARITIME SWITCHBOARD

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lators then lies in the audio-frequency spectrum. The instrument is not recommended for regular, continuous use in this manner, however, since it was not designed expressly for this application, and frequency stability accordingly is not too good at the low audio frequencies.

Attenuator. The r.f. signal from the oscillators is delivered to the attenuator through coupling condensers *C₁* and *C₂*. *R₁* is the "fine control" potentiometer of the attenuator unit and is operated by means of the panel knob labelled "Microvolts."

The attenuator is of standard ladder-type design, except that it has been made a 4-step, instead of conventional 5-step unit, in order to minimize the detrimental effect of shunting capacitances and to reduce "strays" which are inescapable in any 5-step attenuator.

While the attenuator is not unusual in appearance, being of the same general design so frequently shown in print by instrument designers and technical authors, we point out here that the actual fabrication of an efficient attenuator is not so simple as first inspection of the circuit might lead one falsely to conclude. Attenuator design is a definite art acquired, it would seem, by long experience and "know how." Considerable cutting and trying were necessary *after the fundamental design work*, in order to evolve the successful attenuator in the signal generator shown here.

The "Multiply By" switch, *S₁*, enables the operator to select any one of four r.f. output voltage ranges which multiply the "Microvolts" (*R₂*) setting by 1, 10, 100, or 1000. These ranges each may be multiplied by a further factor of 10 when the output r.f. voltmeter has been set to its "X10" deflection.

In order to standardize the attenuator, provision has been made in other signal generators for adjusting the oscillator r.f. output voltage so that exactly 1 volt r.m.s. (as indicated by a

self-contained v.t. voltmeter which is the basic hallmark of any true signal generator) is applied to the attenuator input. In order to obtain 1 microvolt from the instrument, it then becomes necessary to attenuate to the extent of 1,000,000 to 1. This is not an easy operation to accomplish efficiently, and the 1-volt standardizing voltage probably has been justified only by the onetime difficulty in producing a reliable v.t. voltmeter for voltages under 1 volt. In the Model 906 design, a signal input of .1 volt to the attenuator is used on all except the 0-100,000-microvolt and 0-1 volt ranges. This is a very important improvement, since stray radiation from the signal generator is reduced by a factor of 100 times at low oscillator voltages (strays decrease as the square root of the oscillator output voltage). Oscillator output is controlled by means of potentiometer *R₃*, operated by the "Meter" knob on the front panel.

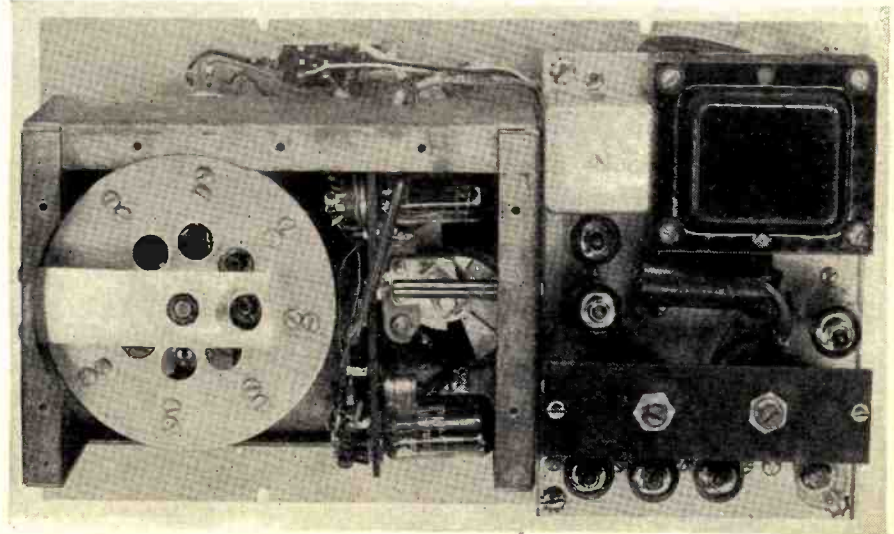
The r.f. output of the generator is the voltmeter reading times the "Microvolts" potentiometer setting times the "Multiply By" setting of the attenuator step switch.

The "Hi-Output" jack, *J₁*, delivers continuously variable r.f. output, controlled by "Microvolts" potentiometer *R₂*. This r.f. output voltage is 0 to 0.1 volts r.m.s. when the meter is set to "X1" by means of "Meter" potentiometer *R₃*—and 0 to 1 volt when the meter is set to "X10."

R. F. Voltmeter. The vacuum-tube voltmeter employed in the instrument to standardize the attenuator is a special version of the "Vomax," the all-purpose v.t. voltmeter manufactured by the same company. The indicating meter may be seen in the upper right-hand corner of the front panel in Fig. 1, its scale only visible through a panel window, small to hold down "strays."

The balanced v.t. voltmeter circuit includes 6AL5 tube *V₁*, 6J6 tube *V₂*, and the indicating meter, *M*. The voltmeter is capacitance coupled to

Fig. 3. Internal view of the signal generator. Easily seen are the small, efficient tubes; shielding; unique mechanical arrangement to insure short leads; and simplified assembly. The coil switching turret is seen on the left-hand side.



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BC-733-D 10-tube crystal-controlled superhet receiver complete with 3-717A, 12SQ7, 12A6, 2-12SG7, 12AH7, and 2-12SR7 tubes. Set includes full complement of 6 crystals for operation in 10K.3-110.3 MC range. Receiver CMA type-certificated (TC-1045) for lateral blind landing guidance. Operates from either 14 or 28 VDC dynamotors (not supplied). Parts value exceeds our low price many times. MA-2163 **\$9.95**

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the signal generator circuits through condenser C_a .

One-half of the 6AL5 acts as the shunt-diode signal rectifier; the other half provides contact potential balance. One-half of the 6J6 tube is the d.c. meter amplifier; the other half provides stabilization.

Potentiometer R_{21} is the zero-set control for the v.t. voltmeter. Potentiometer B_{20} sets the meter range ("X1" = 0.1 volt; "X10" = 1 volt). For improved stability of this electronic voltmeter circuit, and in order to minimize grid current flow and to protect meter M against burnout due to possible overload, the 6J6 tube, V_5 , is operated at reduced plate voltage through a voltage divider comprised by resistors R_{35} and R_{36} . Also, the heaters of the v.t. voltmeter tubes are operated at reduced voltage through the dropping resistor, R_{38} .

Output Terminal Box. The 3-foot, permanently-attached, shielded output coaxial cable of the Model 906 is terminated with a shielded 3-post terminal box, which delivers the metered-output signal voltages from much less than 1 to 100,000 microvolts. In addition to extending the shielding of the instrument just as far as practicable to the point of signal delivery, the output terminal box provides a constant output impedance of 15 ohms.

A .02 μ fd. isolating condenser, C_{11} , permits connection to be made directly to amplifier plate circuits and to other high-voltage d.c. points, without damaging any portion of the attenuator in the signal generator. The inclusion of this condenser *inside the terminal box* makes unnecessary the common bad practice of picking up any convenient, unshielded junk-box condenser when the signal generator must be isolated (as far as d.c. is concerned) from the device into which its signal is being fed.

With this output arrangement, the operator may take his signal directly from across 15 ohms, or through the insulating condenser.

AM Modulator. Standard 400-cycle amplitude modulation is available within the instrument when the "Modulation" switch is thrown to its AM position.

The heart of the AM modulator is the 400-cycle, stabilized output audio oscillator which includes 6AU6 tube V_6 , and 6C4 tube V_7 . The operating frequency of this oscillator is set and stabilized by a Wien bridge comprised of resistors R_{22} , R_{23} , R_{24} , condensers C_{14} and C_{15} , and the stabilizing lamp, PL_1 .

A buffer amplifier, designed around 6C4 tube V_8 , isolates the audio oscillator from varying load effects and thereby further stabilizes the modulator operation.

The 400-cycle amplitude modulation is variable from zero to over 100 percent by means of potentiometer R_{30} . This modulation percentage control is seen in the lower left-hand portion of the front panel.

Power Supply. The internal a.c. power supply is conventional, being

comprised principally of power transformer T_1 ; 6X4 rectifier tube V_9 ; and the filter sections CH_2 , R_{31} , C_{20} , C_{21} , and C_{22} .

The power supply components, together with the audio-frequency modulator and v.t. voltmeter components, are mounted on a separate aluminum chassis, as may be seen in Fig. 3.

A line-frequency (50 or 60 cycles) voltage, for the frequency modulator, is delivered by the voltage divider made up of resistors R_{10} and R_{38} in series and R_{30} in parallel with R_{36} , when switch S_2 is set to FM position.

The r.f. line filter, connected between the power transformer primary and the line plug (see Fig. 2), will be discussed in the next section.

Shielding and Filtering. The purpose of any signal generator is to deliver a metered and controlled, modulated or unmodulated, signal directly to the point of use. The signal from a good instrument does not arrive by any other paths at all except through the generator output cable, and does not leak past the controlling attenuator. Any signal, or portion thereof, which passes directly from the oscillator to the point of use, detouring the meter and attenuator circuits and the output cable, is unmeasured and serves to impair the accuracy of tests and measurements made with such a generator. One usual path of such stray signals is over the power line from signal generator to receiver (or other device under test). Another is direct radiation of the signal through the intervening space between the signal generator and point of use. This latter radiation generally takes place directly from the oscillator and is occasioned by ineffective shielding.

In order to prevent direct radiation, the shielding of the Model 906 has been worked out most carefully. The two radio-frequency oscillators, the frequency modulator, and all of the associated circuit components are housed inside a single, substantial metal shield box. This is a thick, multiple copper-plated chamber. All leads entering this box are shielded and filtered. Edges of the shield box cover overlap the box flanges, and the cover is fastened tightly to the box by means of some 14 screws placed at a number of points—many more than are required for purely mechanical reasons. The box itself is insulated from the instrument panel by means of heavy steatite spacers. By preventing metallic contact between the shield box and instrument panel, except at selected points, loop circuits are avoided and the oscillator field is confined.

The attenuator ladder section is separately shielded; and, as may be seen from an examination of Fig. 2, leads to this section and to potentiometer R_2 are individually shielded.

The front panel of the signal generator is laminated of steel and aluminum in order further to reduce radiation in the wide frequency range of the instrument. The enclosing cabinet is made of steel, this metal being

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415	426	437	447	466	479	492	503	515
416	427	438	448	468	481	493	504	516
418	429	440	451	469	483	494	505	518
419	430	441	453	470	484	495	506	519
420	431	442	457	472	485	496	507	522
422	433	443	458	473	487	497	508	523

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450kc	459.259kc
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374	377	381	385	

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393	397	403	407	

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This crystal fixed frequency receiver comes with full conversion instruction for variable tuning of all ham bands and broadcast. A highly selective superheterodyne receiver, 110 V.A.C. power supply built in. Uses the following tubes: 6K7—RF Amplifier; 6K8—Mixer and Oscillator; 6K7—I.F. Amplifier; 6F7—Detector and A.V.C.; 6C8—Output and Noise Suppressor; 80—Rectifier. Dimensions: 3 1/2x19x11 1/2 inches. Comes complete, brand new, with one set of coils and two sets of tubes..... **\$16.95**

Extra set of coils.....\$2.95

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Brand new G.E. 3" square panel motor 0-150v, ideal for checking primary voltage.



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Brand new General Electric 2" round panel meters 0-300. **\$2.97**



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used especially to minimize low-frequency radiation (non-magnetic shields are not efficient at low frequencies).

Transmission of radio-frequency energy back into the a.c. power line is prevented by the power line filter. This is a multi-section unit composed of inductors L_3, L_4, L_5 and L_6 , and condensers $C_{23}, C_{24}, C_{25}, C_{26}, C_{27}$, and C_{28} . All of the filter coils, and condensers C_{25} and C_{29} are housed in the shield box seen to the right of the power transformer in Fig. 3. The other filter components are mounted under the shield box, beneath the power supply sub-chassis. Diagram-wise such a filter looks simple indeed. In cold fact its design is but one of the many headaches encountered.

Shielding is completed by the terminal box on the end of the output cable. This unit extends the instrument shielding right up to the receiver or other device to which the signal is to be delivered, provided the shortest possible leads are employed between the terminal-box binding posts and the receiver.

The manufacturer claims strays from the Model 906 signal generator to be less than 0.1 microvolt at 90 kc., rising slowly to never more than 2 microvolts at 30 mc. Actual tests on production models of this instrument, however, have shown less than 0.2 microvolt stray transmission up to 35 mc.

-30-

What's New (Continued from page 88)

Model 250 volt-ohm milliammeter.

The instrument is permanently fastened into the Roll Top Case which is made of heavily molded bakelite and is large enough to provide a compartment for leads beneath the instrument. The front is covered by a Roll Top Panel, a sliding cover of narrow bakelite segments on a backing of cloth. A flick of the finger opens or closes the roll top. A heavy leather carrying handle completes the assembly. The case is so designed that the Model 260 may be easily serviced for battery replacement.

Further information on this unique housing may be secured from *Simpson Electric Company*, 5208 West Kinzie Street, Chicago, Illinois.

COMBINATION TESTER

A new combination signal tracer and electronic volt-ohmmeter has been introduced to the trade by *Coastwise Electronics Co., Inc.* of Los Angeles.

This recent addition to the company's "Ferret" line of test instruments is known as the Model 730 and features a germanium crystal probe developed during the war and recently released for commercial use. The probe is light in weight and because no tube is required measures only $\frac{1}{2}$ " in diameter.

The new tester is capable of testing a full audio range from 0-20,000 cycles, and provides r.f. measurements up to 110 mc. The v.t.v.m. measures a.c. or d.c. on seven scales from 0-3000 volts. The ohmmeter has a range of from



0-10 megohms center-scale on seven bands.

Catalogue sheets on the Model 730 are available from *Coastwise Electronics Co., Inc.*, 130 North Beaudry Avenue, Los Angeles 12, California.

KNOB KITS

Of particular interest to the radio serviceman is the *General Cement Mfg. Co.*'s announcement of a new line of knob kits for radio applications.

These kits are made up of molded plastic knobs of a new modern design

Fahnestock Clips

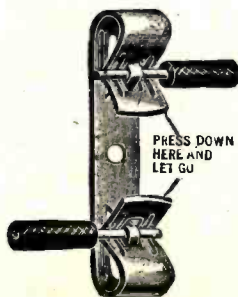
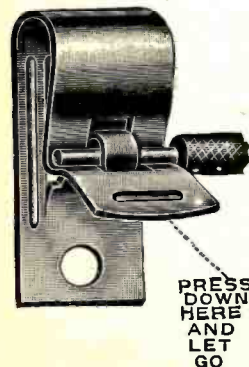
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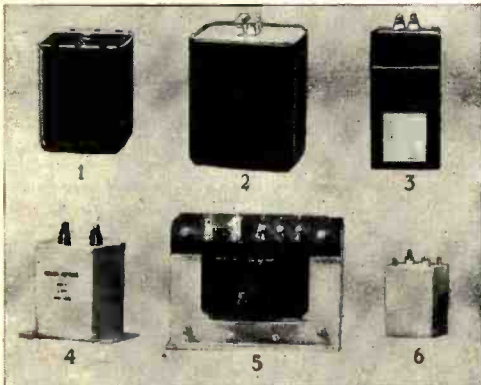
What better time to give yourself the Receiver or Test Equipment you've always wanted . . . especially when Walter Ashe's big "Surprise" trade-in allowance on your used equipment means really important money-saving. So make your selection right now. Tell us what you have to trade. We'll respond with an extra liberal offer that's sure to please you. Act today. Wire, write, phone or use the handy coupon below.

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| Cornell Dubilier | Sprague |
| Coastwise Electronic | Supreme |
| Waterman | Superior |

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No matter how busy I am I make a point of spending a part of each day on the sales floor. This enables me to keep in close touch with the preferences of our customers, including the young fellows who are buying equipment for the first time as well as the old-timers who have been doing business with us since 1922. Often the newcomer will volunteer, "My dad said I could get it at Walter Ashe," while the "regular" acknowledges, "I know I can always get here what I want . . . when I want it. My reply to both is, "Depend on us to stock what you want and need at all times. And that's a promise!"

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National HRO-7T (less speaker and pwr. supply)	279.00
National NC-240DT (less speaker)	225.00
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National NC-46 (less speaker)	97.50
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RME DB-22A	66.00

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- #4—Filter Condenser, 2 Mfd. at 4000 VDC. Shpg. Wt. 7 lbs. 4.50
- #5—RCA Modulation Xformer. For tubes up to 10,000 ohms. P to P. Sec. #1 450 Ma for beam tubes plates. Sec. #2 80 Ma for screen grids. Shpg. Wt. 55 lbs. 14.95
- #6—Filter Choke, 4.5 Hy, 150 MA, 70 ohms. Shpg. Wt. 5 lbs. 1.29

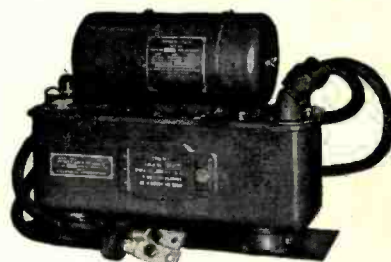
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Regular T-17B SURPLUS carbon mikes as used by the AIR FORCES during the WALT. 300 ohm, with push-to-talk switch, cord, and plug. Brand New in original overseas shipping boxes. Shpg. Wt. 3 lbs. Only **69c**



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Filter Condenser, 3 MFD. X 440 VAC good for 1500 VDC. Shpg. wt. 3. 1.50	Swinging Choke, 2 to 6 Hy, 500 MA. Shpg. Wt. 28. 11.85
Plate Transformer, 2500 VCT, 150 MA, Pri 115 VAC. Shpg. Wt. 18. 9.95	Dual Filament Xformer, Two 5 VAC X 5.25 Amp. Secs. Pri 115 VAC. Shpg. Wt. 8. 1.95
Filament Transformer, 5 VAC at 25 Amps. Pri 115 VAC. Shpg. Wt. 9. 6.15	Plate Xformer, 3200 VCT at 525 M. A. Pri 115 VAC. Shpg. Wt. 35. 29.95
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Flate Face Pictures, 13 Channels.
Model 621TS—7" Set.....\$296.80
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Part No.	Price
47204X	RCA FRONT END consisting of a complete television 13 channel tuning assembly including tubes, coils, switch, input converter, IF transformer, and fine tuning connectors, ready to attach to a suitable IF input.....\$97.50

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47204X1	RCA IF and Video coil kit contains all the necessary IF and video coils for a complete 4 megacycles wide band-pass as well as the sound IF and discriminator transformers for a complete television set.....\$33.00
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47201D2	Deflection YOKE for use with 5TP4 projection kinescope..... 14.90
47201X1	Yoke mounting hood for above yokes... 2.75
47202D1	Magnetic focusing coil for 5TP4, 10BP4, 15DP4 for use in series with divider... 9.10
48202D1X	Magnetic focusing coil for same as above but 10,000 ohm D.C. resistance. 9.90
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475301	H.V. capacitor, .1 mfd 7500 volt working, grounded negative GE Pyranol.... 7.50
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RCA HIGH FREQUENCY SWITCH AND COIL ASSEMBLY

RF unit, used in TRK12 RCA television receivers consisting of 5 band range switch with shield plate and mounting studs, including 5 polystyrene antenna coils, permeability tuned, each consisting of primary ring, secondary coil and primary mica capacitors. The assembly can be used in TELEVISION, F.M. and other HIGH FREQUENCY APPLICATIONS.

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To be used in conjunction with the above switch assembly 2-4.5 MMFD.
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7EP4	DUMONT	23.25
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12AP4	RCA	75.00
15AP4	DUMONT	129.50
20BP4	DUMONT	270.00

All tubes are brand new, perfect, in factory sealed cartons, late production.

Send 50 cents for complete catalog including diagrams for RCA, G.E., Dumont, Andrea and Viewtone Television Receivers.

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and are available in walnut and ivory patterns. Four kits are available; 35 assorted push-on knobs and needle cup; 28 assorted spring knobs and needle cup; 24 assorted set screw knobs and needle cup; and 30 assorted all type knobs and needle cup.

Further information, illustrated literature, and prices on these knob kits are available from *General Cement Mfg. Co.*, 919 Taylor Avenue, Rockford, Illinois.

PORTABLE ANALYZER

A new test instrument, the Model 10 "Rangemaster," has recently been introduced to the trade by *Bradshaw Instruments Company* of Brooklyn.

Designed especially for servicemen and hams, this new instrument features three direct reading capacity ranges, and a separate ohmmeter which permits the measurement of leakage as well as capacity.



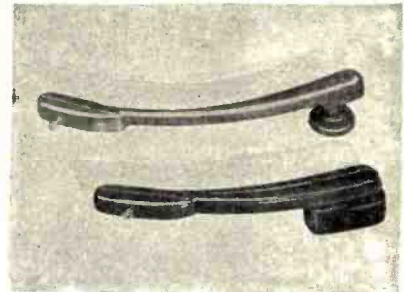
Three a.c. current ranges capable of measuring up to 15 amps., and a 1 volt a.c. range which may be used as a sensitive output indicator for align-

ment work are also included. Twenty-two separate ranges are incorporated in the meter which is available in either kit or assembled form.

Full information may be secured by writing Dept. P., *Bradshaw Instruments Company*, 942 Kings Highway, Brooklyn 23, New York.

NEW PICKUP UNIT

Amplifier Corp. of America is in full scale production on the new *General Electric DL 1RM 6C Variable Reluc-*



tance Magnetic Pickup which is furnished with tone arm and permanent jewel-tipped needle as a complete unit.

The new pickup unit is available in two styles, the *Studio Transcription Model 160GE* which will play records up to 16" in diameter, and the *Program Phono Model 120GE* which takes conventional records up to 12" in diameter.

Although originally developed for use with *Amplifier Corp. of America's ACA-100GE* amplifier, these pickups may be used with any sound system properly equipped with the necessary preamplification.

The company points out that these new arms offer the user less record wear because of the soft needle suspension, less distortion because of the soft spring jewel mounting, less needle scratch because of response only to

A tour of inspection of RCA Victor's television receiver factory highlighted the recent visit of 37 radio set manufacturers to Camden, New Jersey for the two-day television clinic conducted by the company. Here, L. W. Teegarden (left), Vice-President in charge of RCA Tube Department displays a ten-inch kinescope to F. M. Sloan (center) and Harold Schaefer of Westinghouse.



RADIO NEWS

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YOU CAN HAVE IMPROVED No-DRIFT FM
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SUPER DELUXE
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**5
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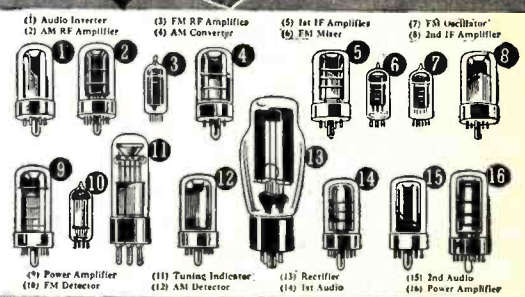
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12w. models operate up to 8 indoor speakers, effectively cover outdoor audience of 2500.

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2 to 4 high gain input channels and 2 to 4 high or low gain radio or phonograph input channels.

High fidelity reproduction at any setting of volume controls up to full rated output with less than 4% distortion.

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TOOLS FOR CRAFTSMEN

GREENLEE



lateral vibrations and less needle talk because of the very light and small stylus assembly.

Literature giving all of the salient points of these two pickups is available from *Amplifier Corp. of America*, 398-2 Broadway, New York 13, New York.

TRIPLETT V.O.M.

The *Triplett Electrical Instrument Co.* has just introduced a new pocket-sized V.O.M. for the routine checking
(Continued on page 196)

Television Installation

(Continued from page 54)

nal. The direct wave and reflected wave "B" are both weak; and due to the angle at which these waves strike the dipole, the effect of these signals is further minimized. An actual screen view of this condition of 3-signal reception [see inset, Fig. 7] shows from left to right: the faint direct wave, next the very strong reflected wave via path "A," and last, the weak reflected signal via path "B." When the simple dipole was replaced with a directional antenna—consisting of a dipole-and-director—the unwanted images of the direct wave and reflected wave "B" were eliminated. A clear, ghost-free picture image (Fig. 3) was provided by the reflected wave "A."

Whether ghost images are utilized or eliminated depends entirely on the type and nature of the urban location. The individual problems to be overcome in a city or metropolitan installation are many, but the effects of ghost reception are undoubtedly the most difficult to solve.

Special Antennas

Despite thorough "probing" of some urban locations, it is sometimes impossible to find a suitable site entirely free from ghost interference. In such instances, the direct signal and one or more reflected signals arrive at the location from almost the same direction, and a conventional dipole-and-reflector antenna (Fig. 1) often has insufficient directivity to reject the unwanted signals and accept the direct signal. When this happens, ghost-free reception is only possible by using one of the several kinds of highly directional antennas, which have been designed and developed for this purpose.

Extreme directivity, however, means extreme selectivity. This characteristic thus limits the use of many highly directional antennas to reception of only two or three adjacent channels. To accommodate a customer's preference for reception of two widely separated channels (for example, channel 2 and channel 6), it may sometimes be necessary to install two complete, highly directional antenna systems. There may even be similar occasions where three separate systems are required.

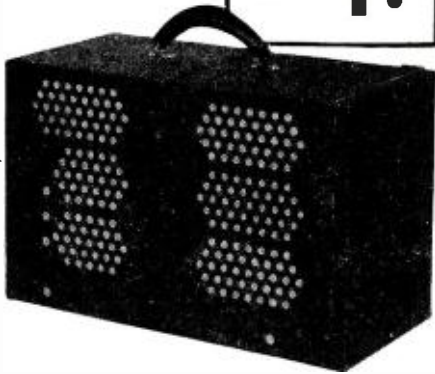
RADIO NEWS

EXTRA SPECIAL!
STEEL
Instrument Cases



XB313
Size 8¾" x 7½" x 18"
ONLY \$1.00

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Size 8¾" x 11½" x 18"
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BLACK wrinkle finished steel cases for use on oscilloscopes, V. T. Voltmeters, Amplifiers, Portable Transmitters, Receivers, Test Equipment, etc. Supplied with smooth black ¼" thick masonite panel, nickel plated screws and brackets. The two sides are perforated for ventilation. Case has strong, genuine, split leather handle.

Make your own special equipment and give it that professional appearance. Order several in both sizes as supply is limited.

• Shipping weight each approximately 8 lbs. Terms orders under \$5.00 full amount with order. Larger orders 20% with order balance C. O. D. Include sufficient money for Parcel Post, unused balance refunded. Minimum order \$3.00.

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Fig. 8. High-gain, ghost-free reception is obtained with a single channel antenna, consisting of director, dipole, and reflector.

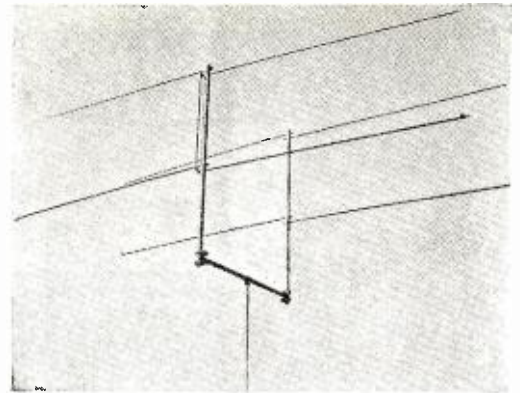


Fig. 9. This stacked array consisting of two dipoles with respective reflectors, provides good directivity without displaying excessive selectivity characteristics at the video receiver.

Because many urban locations require the use of these highly directional antennas to obtain adequate, ghost-free, interference-free reception--the technician should be familiar with the more popular and practical types.

Regardless of their unusual design and appearance, however, all kinds of highly directional antennas are sited and oriented according to the *Basic Procedure of Installation* (Table 1).

Since a degree of directivity is obtained when either a director or a reflector is used with a single dipole, a combination of both director and reflector with a dipole (Fig. 8) provides much greater directivity. Although originally designed by *Workshop Associates* for single-channel operation, the antenna can be used for reception of adjacent channels with fairly good results.

A variation of the dipole-and-reflector antenna is the *RCA* stacked array (Fig. 9) consisting of two dipoles, one above the other, with their respective reflectors. Also known as a *double-doublet*, the array is directional without too-sharp selectivity thus permitting the antenna to be tuned to any of the six television channels (1 to 6). A variation of this

array is the *TACO* dual dipole-and-reflector (Fig. 10) used here at a high elevation not only to provide strong, ghost-free signals but also to overcome local "noise" interference of an industrial district; a good example of the importance of antenna height for adequate reception.

Although widely used in suburban areas, so-called "broad-band" antennas, or *folded dipoles*, are seldom satisfactory for urban installations, particularly in commercial or industrial locations in large cities--because they are not sufficiently directional to eliminate ghosts or reflected images.

The goal of high directivity on every channel with a single antenna can only be achieved through use of one of the rotatable antenna assemblies now on the market. A dual-element type developed by *Farnsworth* (Fig. 11) has one dipole for reception of channels in the popular "lower" television band (44 to 88 megacycles) and a much shorter dipole for reception of channels in the "upper" band (174 to 216 megacycles). Motor driven, with precision control of direction, the arms rotate in a complete circle so that the dipoles can be directed broadside to any desired television station on any channel. Few television cus-

Fig. 10. Dual dipole and reflector installed at a high elevation to insure ghost-free reception with minimum of interference from surrounding district.

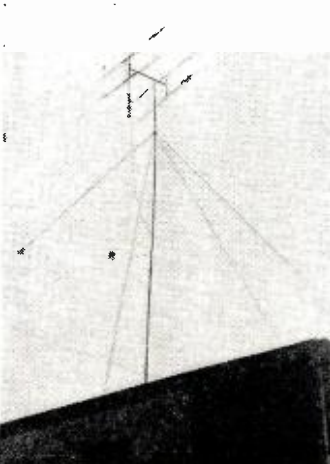
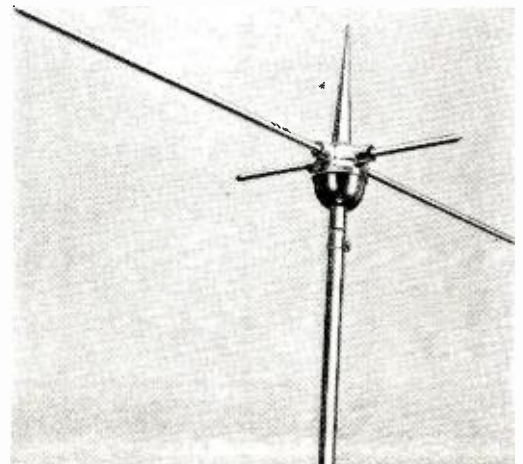


Fig. 11. A dual-element rotatable dipole antenna provides high directivity on all television channels. A precision motor control is used to provide for the accurate tuning of several different and widely separated television stations.





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Clean stocks — long leads — mounting feet — made to fit where you need them.
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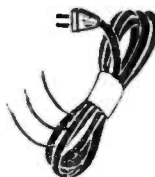
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Min. orders \$2.00, prices FOB Pasadena. 25% deposit on all orders.	

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tomers, however, appreciate the need for directivity as a means of obtaining ghost-free reception. Despite good engineering design, such antennas are likely to prove expensive toys instead of useful instruments for fine reception.

(To be continued)

Publicity Means Sales

(Continued from page 43)

will be a long, slow process to get most of your prospects to the point where they know that the "Ideal Appliance Center" is run by the Mr. Milligan they read about in the papers.

Here is an example. You win the annual golf meet of the local Elks Club. The newspaper story says: "Stewart Milligan, local radio merchant, yesterday walked off with the gold cup at the annual Elks Club golf meet . . ." If the reader has seen a sign saying, "Milligan's Appliance Center," the reference to your being a radio merchant rings a bell. Otherwise, the name "Milligan" means nothing to him and this sort of publicity is lost. The same thing is true along every type of personal publicity. Get full benefit from it, if you can, by associating your name with the name of your store.

3. Select your audience carefully on every story you plan to send to newspapers or radio. You have a rather definite buying area that includes the great majority of your prospects. In a small town, it may mean the whole town and rural areas for thirty miles

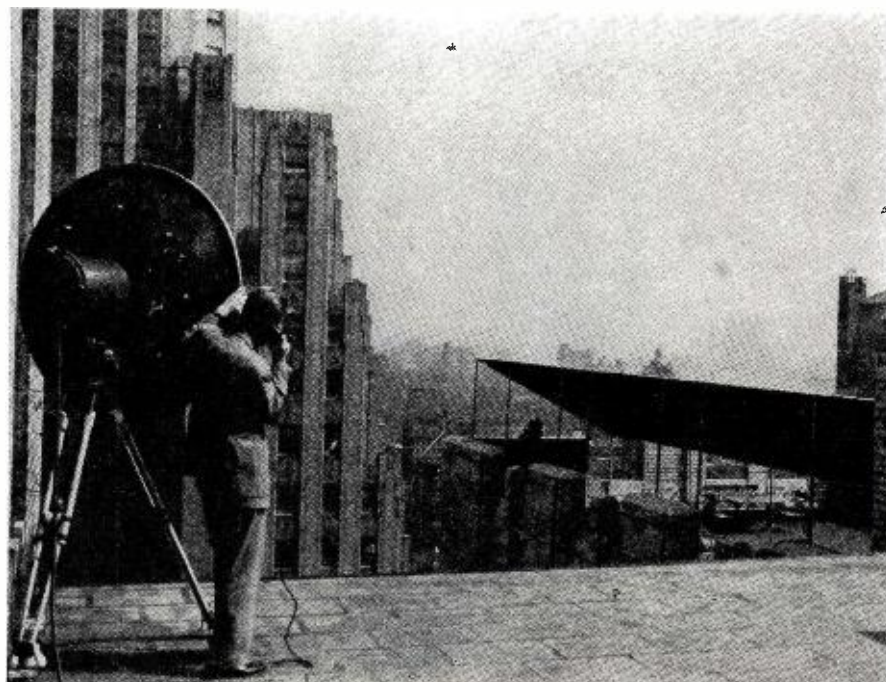
around; in a big city, it might be only one square mile. You must concentrate your efforts in your sales area if they are going to pay off.

Suppose your store is located in Elgin, Illinois. *The Chicago Daily News* may be read by 30% of your prospects, while the Elgin paper is read by 90%. Even though the Chicago paper's total circulation is twenty times that of the local paper, the latter is likely to do you more good. So, if you must choose where to send a story about yourself or your business (as in the case of a feature-type story that only one paper will use) you'd be wiser to place it in Elgin. Mere volume of circulation does not necessarily mean effectiveness.

In most respects, the publicity handling will be the same for the dealer in a small town as for one in a big city. The first has his local newspapers, either small dailies or weeklies, while the second is likely to have a community newspaper or two which serve the people in his own buying area. In almost all respects, these community newspapers are edited and prepared in the same way as small town papers, and will use publicity from a dealer in the same way.

For the dealer in a medium sized city, which is not large enough to have community newspapers but is too large to have newspapers with a community tone, the acquisition of space for the dealer's publicity is likely to be more difficult. It must compete with a broader scope of other material—world and national news, as well as a greater area of local sources. In this case, the news value of the dealer's

The reflecting parabola at the left, mounted on the terrace of the Waldorf-Astoria Hotel in New York, was used to receive television picture signals beamed from a similar microwave relay link transmitted on a roof of the New York Hospital, two miles away, when operations at the hospital were televised by RCA Victor for the benefit of members of the American College of Surgeons who recently held an annual clinical congress at the hotel. The experiment was hailed as a demonstration of the contribution television may make to surgical education.



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6B—3,000 kc to 4,500 kc, TU
9B—7,700 to 10,000 kc, TU
10B—10,000 to 12,500 kc, TU
22B—350 to 650 kc. Will supply
closest unit to specified freq. at
time of shipment. Each... \$2.75

From TCE and GP-7. Ideal
basis for ECO Rig. Ranges: A
350-800kc, B 800-1500kc, C 1.5-
3mc, E 4.525-6.5 mc, F 6.2-
9.05mc, Complete
set of 5... \$11.00

Units C or E, Each... \$2.75
Units A, B, E, Each... \$2.00

**GIBSON GIRL EMERGENCY XMTR:
SCR578A**

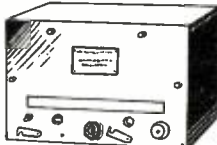
Transmits automatic SOS signal on 500
kc emergency wave. Can be manually
keyed to transmit additional information.
No batteries required. Hand
cranked..... \$25.00



TEST SET 159TPX

Signal Generator: 150-200 mc.
With calibration chart. Operates
on 400 cy. but can be converted
to 117VAC or mere replacement
of revr type pwr
xtmr..... \$50.00

Test Set 159TPX measures fre-
quency between 150 and 200 mc.
by heterodyne method. Pwr.
output of xmtr can be measured
directly. Measures DC voltages
up to 500 V. Operates on 110 V,
400 cy. but mere replacement of
power xtmr makes it operable
on 110 V, 60 cy. Complete with
tubes, crystal, calibration chart.
New..... \$49.50



R4-ARR2 RECEIVER

UHF receiver (approx. 300 Mc.)
with following tubes. 7—9001's,
3—6AK5's, 1—12A6.
New..... \$17.50
W/dynamotor..... 19.20
Less dynamotor, but w/xtmr for
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Switch operates at 1800 rpm,
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Switch is DPDT, and was ori-
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switching of Yagi radar an-
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With Batteries..... \$21.65

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HS 30 HEADSET: A featherweight
headset with insert type phones that
cut background noises to a minimum.
Low impedance (500 ohms) assures
efficiency and high fidelity..... \$0.85

Matching transformer to match 800
ohms to 5000 ohms output..... \$0.85

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8000 ohms im-
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May be modified for 6 or 2 meter opera-
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20 DB drop, has short right angle, about
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Flexible Coaxial Connector, rigid coax to
rigid coax 1/2" diam..... 2.50
10 CM Dipole and Reflector with Type "N"
Fitting..... 2.75
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U), with flange. Gold plated. App. 10"
high..... 17.50
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Stub-supported rigid coax, gold plated, 5'
lengths. Per 5' length..... 5.00

3 CENTIMETER

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Wave Guide 90 deg. bend E plane with
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joint..... 6.00
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output..... 5.25
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bend choke..... 2.50
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type, Model 1551 (TFX II GA)..... 20.00

1.25 CENTIMETER

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cover..... 3.50
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Wave guide experimental kit.
Consists of: One direct-read-
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my load w/crystal probe. One
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10 CM ECHO BOX, com-
plete with micrometer adjust
cavity and resonance indicat-
or. Type TS 238/GP. With
calibration chart..... \$105.00

10 CM WAVEMETER, Model "SL." Micromer-
eter adjust cavity with micro-ammeter resonance indi-
cator. Includes 115 VAC operation converter sec-
tion. In grey metal carrying case, complete with
cables & spares. Made by Western Electric. \$135.00

W.E. 1138A. Signal generator, 2700-2900 Mc.
range. Lightweight tube oscillator with attenuator
and output meter, 115 VAC input, reg. Pwr. supply.
With circuit breaker..... \$50.00

MOTOR GEN. T.U. 43 A

Input: 24-28 VDC @ 62 A. Output: 115 VAC,
7 A., 800 CPS..... \$15.00

MICROWAVE TUBES

3J31 (1cm)..... \$17.50
Magnet for 3J31..... 8.00
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QK 59, QK 60, QK 62 Tun-
able packaged Magnetrons
(10cm)..... ea. 45.00
Small Quantities of Other Types
Write for Information



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(All primaries 117 V, 60 cy)
Filament Xfmrs:
No. 5058: sec. No. 1: 6.3 V
@ 2 A CT; sec. No. 2:
6.3 V @ 2 A CT... \$2.45
No. 5126: 5 V @ 3 A CT,
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A CT..... \$3.25
No. 5100: 6.3 V CT @ 1.2
A, 5000 volt test... \$2.45
No. 5083: 6.3 V NCT @ .6
A, 6.3 V NCT @ 1.5
A..... \$1.85
No. 5057: 6.3 VCT @ 1 A, 5 VCT @ 3 A, 5
VCT @ 3 A..... \$2.75
No. UX 6899: 5 V @ 5.5 A, 5 V @ 5.5 A,
29000 V test..... \$24.50



VIBRATOR TRANSFORMER

Input: 24 V, 12 V, or 6 V. Output: Two 120 V
windings @ .175 KVA. Plus 11 V winding.
Ea..... \$1.50

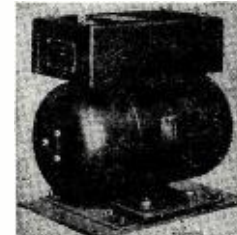
SPECIAL SPECIAL

Transformer to supply filaments of equip-
ments using 12-volt tubes. Input: 117 V
60 cy, Output: 26 Volts @ 2 A..... \$1.50

CHOKES

6 Hy @ 150 Ma..... \$2.00
6 Hy @ 300 Ma..... 4.50
1 Hy @ 800 Ma, 7.5 ohms..... 8.95
Dual choke, 2-2 Hy. @ 100 ma..... .90
Dual choke, 7 Hy @ 75 Ma, 11 Hy @ 60
Ma..... 1.95

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PE 73 CM, Pow-
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375 input: 28 V
DC, Output:
1000 VDC @ 350
Ma. Starting re-
lay, filter, etc
\$4.95

Mfrs: Write for
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VDC @ 350 Ma. New, with
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Without Filter..... 1.60
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DM-34: In 14VDC 2.8A Out 220VDC 80 ma..... \$2.49
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Aerovox..... \$17.50
1.5 mf @ 8000 VDC..... \$12.50
Aerovox..... \$12.50
10 mf @ 25KV..... \$75.00
.01 mf @ 25 KV..... \$20.00

MICA

.08 mf @ 1500 VDC, Sprague
MX60..... \$11.50
.03 mf @ 2000 VDC, CD
551A-50..... \$12.75
.045 mf @ 2000 VDC, Sangamo
G1..... \$12.75
.0015 mf @ 20 KV, Aerovox 1970-404..... \$25.00
.001 mf @ 20KV, Sangamo G3..... \$25.00
.0051 mf @ 15KV, Sangamo G4..... \$25.00
.006 mf @ 10 KV, Sangamo G3..... \$17.50
.002 mf @ 15 KV, Sangamo..... \$20.00
Isolating Capacitor, Cornell-DuBrier PL 1417,
106-110 mmf @ 10KV AC (peak). Each... \$3.50
MFRS: Send your requirements for bathubs.
Micas, Hardware, resistors and connectors.

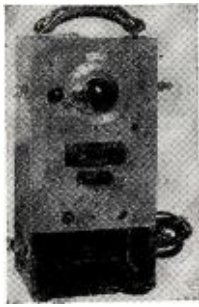


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Send Money Order or Check. Shipping charges sent C.O.D.

COMMUNICATIONS EQUIPMENT CO.

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LEEDS THE HOUSE YOU HAVE KNOWN FOR 25 YEARS



BC-438 FREQUENCY METER

110 volt AC operated, range 195 to 215 megacycles; complete with tubes, crystal, calibration curves and schematic: **\$9.95** only

BC-1066A-UHF 2 Band Receiver, battery powered. Tubes 2-957, 1-10BCT. Very easily adjusted to 2 meters. In wooden case, with schematic... **\$3.95**

MICA CONDENSERS

Aerovox, type 1590-H-229 low loss, bakelite case; capacity 0.4 Mfd 600v EPF, 18 amps at 3000 KC; 25 amps at 1000 KC. Special... **95c**
 .01 Mfd 600v DC postage stamp type... **5c**
 15 ass't silver micas, special... **95c**

VARIABLE CONDENSERS

100 Mfd double bearing, silver plated, Isolanite insulation; can be ganged either end... 25c; 10 for **\$2.50**
 25 Mfd balanced stator one hole mtg. Isolanite insulation, polished plates; Swell for UHF... **29c; 10 for \$2.50**
 110v Pilot assemblies... **39c**
 ARC-5 Banana plugs silver plated; doz... **10c**
 Antenna plug 48-P-1 for 522A... **15c**
 FT-243 Crystal holders... **15c**
 FUSES—8 AG 1/100 amp Inst type; doz... **50c**

General Radio Power Transformer

550-0-550 V at 100 Ma. 6.3 V at 3 amps. **\$1.95**
 5 V at 3 amps.

Relays G.E. high current, 24v coil, 2000 amp. contacts. **39c**
 Sigma plug-in type; 5-prong; 200 ohm, 4 Ma DC... **95c**
 300 ohm twin leads, outdoor or indoor, 100 feet... **\$2.95**
 Circuit Breaker, Heineman, 3-5-25-35-65 amp... **95c**
 50 Millivoltmeters, basic movement, can be used for any range, with use of shunts and resistors... **\$1.95**

RADIO TRANSMITTER & RECEIVER APS 13

Tunes 410/420 megacycles; light weight airborne Radar, 17 tubes, including 5/6J6; 8/6AG5; 2/212; 1/VR105 and 30 megacycle I.F. strip. **\$11.95** All for.



OIL FILLED CONDENSERS

All Standard Brand—Guaranteed

16 Mfd, 400v DC WE... 98c	8 Mfd, 1500v DC... \$3.25
0.05 Mfd, 600v DC dvr... 15c	10 Mfd, 1500v DC... \$3.50
0.1 Mfd, 600v DC... 15c	7 Mfd, 330v AC... \$1.25
2 x 0.1 Mfd, 600v DC... 25c	7.5 Mfd, 330v AC... \$1.25
1 Mfd, 600v DC... 25c	1.78 Mfd, 330v AC WE... 25c
2 Mfd, 600v DC... 49c	1 Mfd, 5000v DC... \$2.95
10 Mfd, 600v DC... 98c	0.1 Mfd, 7500v DC... \$1.50
1 Mfd, 1000v DC... 39c	2 x 0.1 Mfd, 7500v DC... \$2.00
2 Mfd, 1000v DC... 29c	0.2 Mfd, 8000v DC... 98c
0.5 Mfd, 1500v DC... 25c	2 Mfd, 10000v DC... \$17.50

General Radio Co. VARIACS

200-B 170KVA 0-135v output, 1 amp... **\$12.50**
 V-5 860KVA 0-135v output, 3 amp... **\$18.50**
 V-SMT 860KVA 0-135v output, 5 amp... **\$25.00**
 V-10 1.725KVA 0-135v output, 10 amp... **\$32.00**
 V-10MT 1.725KVA 0-135v output, 10 amp... **\$40.00**

NATIONAL CO. PRODUCTS

ACN Vernier dial 5 x 7/16... **\$2.98**
 AR-16 air spaced exciter coils, for 5-10-20-40-80 meters; end, center or swinging link... **\$1.15**
 XB-16 Socket for above... **33c**
 Complete stock of NATIONAL CO. receivers
 Condensers, dials and other parts ON HAND.
 Catalog on request

WIRE WOUND POTENTIOMETER

100,000 ohm, precision made. G.R. type; 25 watt, 6" diameter. Brand new. **\$1.95**
 Our supply of chassis, panels and cabinets, black crackle finish, are priced LOW—as usual.



If not rated 25% with order, balance C.O.D. All prices F.O.B. our warehouse New York. No order under \$2.00. We ship to any part of the globe.

LEEDS RADIO CO.

Dept. RN12

75 VESEY STREET

CORtlant 7-2612 New York City 7

releases must be especially high, and the material prepared with greater care to make it rate space in the papers. A story that appears will reach not only the dealer's buying area but other sections which ordinarily would be considered out of his zone. Such publicity can very greatly expand the area from which he draws his sales.

There are other factors that will determine your selection of an audience. One publication may reach a large group of low-income families, while another reaches a smaller group of high-income families. In all probability, the audience you reach in the second publication will provide more sales and larger ones. Home owners usually are better prospects than apartment dwellers, women generally make more decisions on radios and appliances than men, and so on. Keep these points in mind in planning publicity.

4. At the same time, cover all reasonable possibilities. Unless a story is naturally limited to one paper (for example, you have a proposal for a new license law which calls for the support of a newspaper and cannot effectively be proposed to all papers simultaneously) give it to every paper and radio station which might use it. Not only will this assure you the fullest possible coverage, but it will protect your relations with the papers and stations. Be sure that all get the story at the same time. (Methods for handling news releases will be discussed later.)

5. Always remember that the foundation of the reputation you are trying to build is fair play. Ballyhoo alone, not based on a sound business policy, builds up a name to the point where, when unsound practices cause trouble, they are played up in the press and in conversation beyond normal proportions because of the prominence of the person involved. Select from your business practices some special feature, develop a slogan or identifying phrase, such as "You're sure of satisfaction at Milligan's" or "We're as near as your phone," and use this in your advertising. Then let it be a theme—not used—but implied whenever appropriate, in your news releases.

6. Good publicity springs from activity. Doing things makes news. For personal publicity that will reflect to the advantage of your store, join local civic groups, instigate plans for local improvement, talk before business groups, work with news-making committees, be active in church and social organizations. For business publicity, do things that are different; offer a free orange squeezer to every dark-eyed, blonde woman in the circulation area of the newspaper in which you place the story; give a bottle-warmer free to every veteran of World War II upon the birth of his first child. These things not only will attract attention to you through regular publicity channels, but they'll make real friends of the people who receive the free item.

7. Develop a sense for news. If

From: Your name
 Name of Store
 Address
 Telephone

For Immediate Release
 (or indicated time of release)

If you have dark eyes and blonde hair, and are under 30, you're due for some easy squeezing.
 Milligan's Appliance Center, 84 Main Street, is giving every girl between 16 and 30 who has these striking features a newly patented orange squeezer, to introduce the new item. Stewart Milligan promises to take care of all who qualify anytime Thursday between 8:30 a.m. and 6 p.m.
 Note: Any traces of recent peroxide rinses will disqualify applicants, Milligan said.

Fig. 1.

you should employ a one-armed veteran to sell refrigerators, there is a real human-interest in the fact he can demonstrate how to remove ice cubes—and it will show how easy the refrigerator's trays are to handle. Many events and plans that come up normally can be developed into news, if you'll cultivate the sixth sense of watching for them.

8. Co-ordinate your publicity with your advertising. This doesn't mean that you should try to get the editor to run a story every time you place an ad. Many editors resent this, and as a general rule the larger the paper the more dangerous this practice becomes. Instead, plan your advertising to take advantage of stories appearing in the papers. If you run a unique sale, for instance, get the stories into the papers, then come out with your ads. Also establish a theme for your store's policy, perhaps based on the slogans mentioned earlier, and use this theme in both publicity and advertising.

9. Know how to handle the mechanics of publicity. The method of preparing a publicity release is shown in Fig. 1. When the story covers more than one page, end each sheet with the end of a paragraph, and then mark "(more)" at the bottom of each page except the last.

Except where an unusual feature that will attract attention is involved (as in the story shown in Fig. 1) get all essential facts into the first paragraph, answering the questions "who," "what," "when," "where," "why." If the story in Fig. 1 were written in ordinary news style, it might start like this:

"All girls between 16 and 30 who have blonde hair and dark eyes will receive a newly patented orange squeezer free Thursday at Milligan's Appliance Center, 84 Main Street. The offer is made to introduce the new device, according to Stewart Milligan."

Except when the story must not appear before a certain time for a legitimate reason, mark the story "For Immediate Release," thus permitting the editor to use it whenever he wishes.

Pictures accompanying your story should be on 8 by 10 inch glossy paper. Of course, they should be clear and sharp and have as much reader-interest as it is possible to put into them. A picture of a beautiful girl examining a new refrigerator is far more likely



(Above photo taken at servicing bench of the Heppe Co., Phila.)

ALL 16 RIDER MANUALS!

Ever stop to think how many successful servicing shops, with which you are personally acquainted, have complete sets of Rider Manuals? Ever notice how many photographs of servicing benches, illustrating success stories in magazines, show all Rider Manuals?

This is more than coincidence. It is irrefutable evidence of how Rider Manuals profitably meet the day-in-day-out data needs of busy shops.

Now, consistent with "Seventeen years of Continuing Service to the Servicing Industry," Rider has further ANTICIPATED your needs by establishing the "24 Hour Data Service" explained below.

Here is further justification for the faith of the many thousands of servicemen

who have depended upon and benefited by the time-saving, authoritative*, money-making data supplied by Rider Manuals.

It is such informed publishing which has resulted in Rider Manuals pouring out profits for servicemen year after year after year. It is such progressive services which suggest you be sure your shop has the sign of successful servicing—all sixteen Rider Manuals.

* Rider Manual data is the OFFICIAL AUTHORIZED servicing data right from the service departments of the companies that made the sets. No one knows better than the manufacturer what servicing procedures are best for his product. This is the basis for the authority and the success of Rider Manuals.

VOL. XVI SHOULD BE OVER YOUR SERVICE BENCH, NOW!

Volume XVI is the first to be issued under our new three-volumes-a-year publishing schedule which brings you systematically-bound, authoritative* servicing data at the earliest practical date.

It contains data from 94 manufacturers—a greatly increased percentage of "clarified-schematics"—a generous number of photographs on small table models and a separate "How It Works" book, in addition to the usual authoritative information you have come to depend upon in previous Rider Manuals—and this is made available to you in Volume XVI at the greatest possible economy; less than a penny a page. Your jobber has Volume XVI in stock now—Enjoy the benefits of its use—get it today!

768 Pages
Plus
"How It Works" Book
\$6.60



NEW

24 HOUR DATA SERVICE

On November 30, 1947, we instituted our new photostat service to supply you with information on any newly issued, or old, receivers. For 10c (stamps are OK) we will send you the schematic, voltage data and parts list and everything else which will fit on the two pages. Additional manufacturers' data is 5c a page with a maximum charge of 35c for everything up to seven pages. If the manufacturers' data requires more than seven pages, each additional page is 3c. Here is a way to get whatever service data you need between Rider Manual publication dates.

ADDING FURTHER WEIGHT TO THE VALUE OF OUR "SEVENTEEN YEARS OF CONTINUING SERVICE TO THE SERVICING INDUSTRY"

RIDER MANUALS—16 VOLUMES

Volume XVI.....	\$ 6.60
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RIDER MANUALS Mean SUCCESSFUL SERVICING

TELEVISION HEADQUARTERS

TELEVISION FOUNDATION KIT

The television foundation kit consists of the most essential (and expensive) parts needed in the construction of a television receiver starting with the high voltage power supply, for the picture tube, right through to the antenna. The kit contains the high voltage picture tube transformer (for five or seven inch tube), 2X2 filament transformer, low voltage transformer for the receiver, cathode ray filament transformer, filer choke, 6.3 filament transformer for the 16 six volt tubes along with the five volt transformer for the 5U1. The two high voltage filter condensers, blocking oscillator, transformer all R.F.'s sound and video I.F.'s peaking coils, discriminator transformer. Rectine, tubes 2X2 and 5U4, the picture tube 5BP4, an all aluminum Elincor dipole antenna are also included. Of course there is the easy-to-follow 26-page instruction book, with a large 12 by 18 schematic diagram. The instructions include television theory, circuit functions, explain scanning give preliminary voltage measurements, parts layout and final adjustment of the television receiver which facilitates easy alignment without the use of elaborate test equipment. The only knowledge necessary to build this set is the ability to read a simple schematic diagram. Most radio men will have many or all of the minor parts not included in the foundation kit.

Remaining set of necessary tubes \$16.95

RAY-LECTRON COIL KIT

INCLUDES:

1 Oscillator Tank Coil, 1 Antenna Coil, 6 RF Tuning Coils, all mounted on Switch Assembly Plate; 5 Video IF Coils, Shielded Permeability Tuned; 1 Shielded Discriminator Coil; 3 Video Peaking Coils, and Instruction Manual containing Circuit Diagram for 20 Tube Seven Inch Picture Tube Set, together with detailed Assembly Instructions, and Parts list.

The design of these Coils makes it possible to obtain satisfactory operation with the ENTIRE service range of ANY Television Station. Complete

\$23.50

NEW TELEVISION COIL KIT 510

Build a 10" or 15" television receiver. Complete kit of permeability tuned video I.F., RF, and Sound Coils for high quality television receiver designs. Contains all necessary coils for 3 stages 4mc. wide video, 2 stages sound, discriminator, peaking, oscillator, and RF. Complete instructions included.

\$9.95

ALL CHANNEL R. F. UNIT

For use in Building your own custom-made Television Receiver — Any size or type Transvision all-channel R.F. unit is factory pre-wired and tuned for 7 channels (covers all channels in lower and higher bands in any single area operating presently or in the future). Average sensitivity 20 microvolts; has R.F. stage before oscillator; complete with 3 tubes: 1-6AK5, 1-6AKG, 1-6C4; input impedance 300 ohms, balanced to ground. Size—9½" deep, 4½" high, 6¾" wide. Net

\$31.95

CATHODE RAY TUBES

5BP1	\$ 3.95	5TP4	\$54.00
5BP4	4.95	7GP4	19.40
7EP4	18.95	9AP4	50.00
7DP4	21.60	10BP4	39.60
	12AP4		\$60.00

NIAGARA COMPONENTS

CONDENSERS

CF 45—1 mfd—3500 volt DC	\$ 1.98
CF 48—.05 mfd—2500 volt DC	1.09
CB 18—.25 mfd—4000 volt DC	2.95
ER25AD—dual 25 mfd per sect. variable condenser	2.04

SOCKETS

11 prong isolant scope socket	\$ 0.59
Octal socket	12
Special hi. voltage socket for 2X2	.59

TRANSFORMERS

T8.6—Scope transformer—2500 v. @ 4 a., 2.5 v. @ 1.75 a., 6.3 v. @ .6 a.	\$ 9.95
TS.5—Western Electric—D303184—hi. volt 4200 v. @ 9 ma lo. volt. 640 v. @ 200 ma—fil. 6.4 v. @ 5 a., 5.4 v. @ 3 a., 5.1 v. @ 3 a., 2.5 v. @ 1.75 a.—complete television hi. & lo. volt. trans. in one compact oil filled unit—will handle any television tube	12.95
TCH 2—Scope transformer 1750 v. @ 4 ma and matching fl. trans. 6.3 v. @ .8 a., 2.5 v. @ 1.75 a.	7.95
TCH 3—W. E. Scope trans. 2500 v. @ 10 ml and matching fl. trans. 6.3 v. @ 2 a. and 2.5 v. @ 3 a.—combination	9.95
HF 16—Filter choke 10 hy @ 150 ma	1.95
LO 2—25 ma R.F. choke	.59

MISCELLANEOUS

Trimmer—single 3—30 uuf	\$ 0.20
dual 5—50 uuf	35
13" X 17" X 3" steel chassis cadmium plated	1.95
High voltage wire—50 ft. roll	1.00
Peaking coil	.45

Write for Complete Catalog

NIAGARA RADIO SUPPLY CORP.

160 Greenwich St.

New York 6, N. Y.

to be used than a picture of the refrigerator alone. Each picture must have a caption, written on a separate piece of paper and attached to the edge of the picture in such a way that it can be removed easily without damaging either the caption or the photograph. Be sure the caption contains all essential information, including the addresses of persons shown. Before using a picture for publicity or advertising, get a signed note from everyone who appears in the picture, granting permission for such use. This will avoid serious legal embarrassment.

Address the story and/or picture to the editor who is most likely to use it—city editor, women's editor, financial editor, etc. If it is convenient, have the story delivered to the newspaper office. Otherwise mail it, being careful to protect pictures from damage.

Except in the special instances already mentioned, send the same story

to all outlets. In the case of pictures, however, when more than one pose or idea is available, send a different picture to each paper. When each paper gets a different picture, mark each "This Picture Exclusive" so the editor will know his competitors will not carry the same one.

Publicity is not a competitor to advertising—it is a supplement. Everything you send out as publicity must have *real* news value to the publication that receives it, or it will not be used. Make every story and every picture as close to the highest journalistic standard as possible.

The chief requirements for a highly effective publicity program are imagination, alertness, and a little effort. When well done, it can bring surprisingly great returns over a long period. Add it to your bag of merchandising tricks.

-30-

HIGH FREQUENCY ALLOCATIONS REVISED

By Kenneth R. Boord, ISW Department

ON October 2, after nearly 5 months of deliberation, the International Radio Conference of Atlantic City (New Jersey, U.S.A.) completed its work and representatives of the 78 nations taking part signed the International Radio Regulations of Atlantic City. The Atlantic City Regulations will replace the regulations adopted at the 1938 Cairo Conference, and will go into effect January 1, 1949, except for those below 27,500 kc. Allocations below 27,500 kc. will go into effect on a date to be set by the Conference for approval of new frequency list, which will meet in March of 1949; present estimate of the effective date is September 1949.

The Provision Frequency Board (PFB) will meet in Geneva, Switzerland, in January 1948, to begin preparation of the new International Frequency List. There will be a permanent International Frequency Registration Board (IFRB) in Geneva, to consider future assignments, after the new frequency list goes into effect. Headquarters of the International Telecommunications Union will be moved from Berne to Geneva.

The International Broadcasting Conference on High Frequency Broadcasting concluded its sessions in Atlantic City on September 27. Since this was a preliminary conference, no final documents were signed. A full-scale International Conference on High Frequency Broadcasting will convene in October 1948 in Mexico City. In March 1948, a Planning Committee of this Conference will meet in Geneva, to draft a frequency assignment plan for all high frequency broadcasting stations. The plan drafted will be presented for consideration and revision at the Mexico City Conference.

By the International Radio Regulations of Atlantic City, (1) high frequency broadcast, (2) tropical broadcast, and (3) amateur allocations were made as given in the accompanying table.

Region 1—Europe, Africa, Near East, Asiatic USSR, and Mongolian Peoples Republic.

Region 2—The Americas.

Region 3—Asia (except as noted under Region 1) and Oceania.

The allocations given in the table are worldwide except where otherwise indicated. (Asterisks indicate bands shared with other services in the same region.)

As has been indicated in the table, from 50 to 100 kilocycles will be added to each of the broadcasting bands between 6 and 17 megacycles. In the amateur allocations, major changes will be the addition of a 21-megacycle band, deduction of 50 kilocycles from the 14-megacycle band, and reduction of the width of the 7-megacycle band in Regions 1 and 3.

HIGH FREQUENCY BROADCASTING

Kc.	Region
*3900-3950	3
*3950-4000	1 and 3
5850-6200	All
*7100-7150	1 and 3
7150-7300	1 and 3
9500-9775	All
11,700-11,975	All
15,100-15,450	All
17,700-17,900	All
21,450-21,750	All
25,800-26,100	All

TROPICAL BROADCASTING

(Usable in Tropical Zone Only)

Kc.	Region
*2300-2495	3
*3200-3400	3
*4750-5060	(except 4995-5005)

AMATEUR

Kc.	Portions may be assigned in restricted areas, if it will not interfere with Lorán.
*1800-2000	All
*3500-3800	All
*3800-3900	Regions 2 and 3.
*3900-4000	Region 2.
7000-7100	All
*7100-7150	Exclusive in Region 2, shared with Broadcasting in Regions 1 and 3.
7150-7300	Region 2, also shared usage in China and New Zealand. (In USSR, 14,250-14,350 is also allocated for fixed services)
14,000-14,350	All
21,000-21,450	All
*26,960-27,230	Region 2, Australia, New Zealand, South Africa.
28,000-29,700	All
Mc.	
50-54	Regions 2 and 3, South Africa and Rhodesia.
144-146	All
146-148	Regions 2 and 3.
220-225	Region 2.
*420-450	All
*450-460	Regions 1 and 3.
1215-1300	All
2300-2450	All
*3300-3500	Regions 2 and 3.
*3500 3900	Region 3.
5650-5850	All
5850-5925	Region 2.
10,000-10,500	All

-30-

XMAS GREETINGS TO FRIENDS AND CUSTOMERS



SETCHELL CARLSON RADIO RECEIVER BC-1206-C

Designed to receive A-N beam signals. 24-28 vdc. Tube complement: 14A7, RF, 14H7, 14J7, 14H7, IF amplifier, 14R7, detector and 1st audio: 28D7, output, 195 to 420 KC 4" high x 4" wide 6 1/2" long. Weight 4 lbs.

Priced At Only..... \$198

Less tubes
Complete set of tubes..... \$2.89

TUBE KITS

Complete set of tubes for SCR-522
\$17.95

Complete set of tubes for BC-348
\$7.95

Complete set of tubes for BC-312
\$7.95

Specify Model Numbers

Combination Offer

Both Items
\$2.25

HS-16 HEADSET

- 8000 ohms Hi-impedance
- Noise proof
- Most sensitive phone built
- May be used as a sound powered intercom.

Light, durable, efficient. Molded neoprene earcups shaped to completely envelop entire ear. Adjustable steel headband extends or retracts. Especially suited to hams, commercial operators, aircraft pilots, recording engineers and many others. Can be used with simple Xtal to make complete radio receiver.

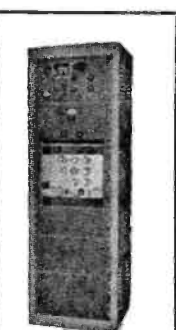
Original Cost \$25.00
Special..... **\$1.89**

6 foot extension cord..... \$0.49

NEW, STANDARD BRAND TUBES

TYPE	PRICE	TYPE	PRICE	TYPE	PRICE
1A3	0.98	6SL7	\$0.89	417A	\$19.95
1A7GT	1.10	6SN7GT	.89	446A	2.80
1B24	4.50	6X4	.89	703A	7.50
1G4	.98	6SR7	.89	705A	4.95
1G6	.98	6SS7	.75	713A	1.65
1H4Q	.98	6U5	.89	715B	4.95
1L4	1.10	6V6GT	.99	717A	.75
1R4/1294	1.29	6V6G	.89	723A/B	9.95
1T4	1.10	6X5	.89	800	2.25
1H5	.99	6X5	.89	801A	.75
1NSGT	1.10	7AE7	.75	802/RK25	1.49
1N21B	.35	7C4	1.50	803	8.95
1LN5	1.92	7C5	.89	807	1.25
1R5	1.10	7F7	1.25	808	2.95
1S5	1.10	7L7GT	1.39	809	1.50
2A3	1.10	7D7	1.50	811	1.95
2C22	.98	12A6	.89	812	3.25
2C26A	.75	12AH7	1.10	812H	6.90
2C34	1.15	12AT6	1.10	813	8.95
2C40	2.60	12BA6	.89	814	4.49
2C44	1.75	12BE6	.89	815	2.25
2D21	.85	12C6	.89	826	1.75
2E22	1.50	12J5	.69	828B	3.95
2E25	3.95	12K5	1.25	830B	5.25
2E30	2.25	12SA7GT	.99	832A	2.25
2J32	20.00	12SG7	.89	833A	34.50
2J33	20.00	12SH7	.89	836	1.15
2J36	20.00	12SL7	.79	837	2.50
2J851	.85	12SK7	.89	838	3.75
2K2	4.94	12SL7	1.10	841	1.20
3A4	.49	12SN7GT	.79	845	3.75
3B7	.98	12SQ7GT	.99	860	3.00
3B22	4.95	12SR7	.79	861	50.90
3B24	1.95	12X3	.89	865A	.75
3D6/1289	1.85	14A7	.49	872A	2.25
3E29	2.95	14B7	1.10	874	1.95
3Q4	1.10	14H7	1.25	884	.75
3Q5GT	1.10	14J7	1.25	923	.49
3S4	1.10	14R7	1.10	954	.75
4C35	7.95	15E	1.50	955	.75
5R4GY	1.15	23D4	.49	956	.75
5T4	1.95	23D6	.89	957	.75
5U4	.98	24G	1.35	958A	.75
5V4G	.98	25A6GT	.75	959	.75
5W4	.98	25L6GT	.75	991	.50
5Y3	.60	25Z5	.75	1005	.39
5Y4G	.59	25Z6	.98	1006	.75
5Z3	.89	28D7	.75	1613	1.75
5Z4	.89	30	.78	1614	1.75
6AB7/1853	.99	32L7	1.50	1616	2.95
6AC7	.99	34	.98	1619	.98
6AG5	.99	35L6GT	.75	1624	.98
6AG7	.99	35Y4	1.10	1625	.98
6AK5	.99	35W4	.89	1851	1.25
6AL5	.99	35Z3	.99	2050	.90
6AQ5	.98	35Z5	.69	2051	.90
6AT6	.75	36	1.10	5514	3.95
6A16	.89	37	.69	7193	.49
6B4	1.29	38	.89	8005	3.25
6B6G	.89	39/44	.59	8011	4.95
6B8	.89	41	.69	8012	4.95
6C4	.64	45	.64	8016	1.49
6C5	.51	46	.65	8020	5.95
6C6	.75	47	.90	9001	1.15
6C21	12.95	50B5	1.89	9002	.98
6D5	.75	50L6GT	.75	9003	.98
6F4	1.95	70L7	.89	9004	.98
6F5	.51	71A	.69	9005	.98
6F6	.95	75	.69	9006	.69
6F6G	.80	75T	2.95	HF100	6.95
6F7	1.25	76	.75	HV69	1.75
6F8	1.10	77	.75	HY75	1.25
6G5	1.10	78	.75	HY61B	1.25
6H6	.89	79	1.10	OZ4	1.25
6J4	1.50	80	.53	RK60	1.25
6J5	.59	82	.98	RK72	8.50
6J6	.89	83	.89	T20	1.95
6K7	.89	83V	.98	T240	2.95
6K6	.69	84	.75	V70D	6.90
6K8	.79	85	.89	VR78	.75
6K8	1.25	100T5	3.00	VR90	.75
6L6	1.25	117L7	1.89	VR105	.75
6L6G	1.20	117Z3	.89	VR150	.75
6L7	.98	117Z6GT	1.10	Z25	1.95
6N7	1.25	121A	2.65	902	2.95
6Q5	.98	205B	4.50	913	3.00
6Q5G	.98	211	1.25	2AP1	2.25
6Q7	.89	215A	3.00	3AP1	3.45
6R7	.98	217C	7.50	3BP1	2.95
6SA7	.90	250R	3.95	5BP1	3.95
6SC7	.85	274B	1.50	5CP1	5.45
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6SG7	.89	307A	6.25	5FP7	4.50
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Master Oscillator MI-19427-B

This unit was built for R.C.A. Add a final—becomes a complete transmitter with signal shifter. 2-20 mc—also FM—only a few cycles drift from cold start. Complete with regulated power supply and heavy duty deluxe rack. Illustrated flyer giving complete description, technical summary and specifications available upon request.

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We have a complete power supply containing all the necessary parts down to the line cord, pilot light switch & terminal block & delivers the following voltage—300 v. DC @ 250 mills, 150 v. of regulated bias and sufficient 12 v. to operate the tubes of both receiver and transmitter. Complete at the amazingly low price of..... **\$14.95**

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Pair in Series for 110 v. AC

Type I—5 1/4" long, 3" dia.—50 v. AC, 50 cy.—4 lbs..... **\$9.95** pr.

Type II—6 1/4" long, 4 1/4" dia.—115 v. AC, 50 cy. 11 oz..... **\$12.95** pr.

Type III—2 1/2" v. long, 2 1/2" dia.—50 v. AC, 50 cy. 11 oz..... **\$6.95** pr.

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EDWARDS F-M RADIO CORP.
168 Washington Street
New York 6, N.Y.



Ten Meter Transmitter

(Continued from page 61)

and, what will prove to be rather annoying, will cause slight capacities (such as that existing between the adjusting screwdriver and ground) to detune the final. When the transmitter has a load connected, this detuning effect will not be serious because the final tank circuit becomes broadly resonant. No effect of unbalance in the oscillator tank circuit will appear since one side of this circuit is at ground r.f. potential.

The oscillator and final amplifier tank coils are wound on 1/2" polystyrene rod, dipped in polystyrene coil dope to insure no change of inductance, and are soldered directly to the tank condensers. The tank circuits can then be installed as complete units. These circuits were designed to be rather broadly resonant so that any crystal, over a small band of frequencies, could be plugged in without the necessity for retuning. The antenna link is just three or four turns of wire around the center of the final tank coil with the ends soldered onto the antenna terminals. The number of turns should be determined experimentally since it will depend upon the type of antenna used.

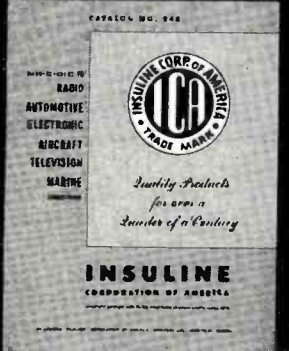
There will be a certain amount of interaction between coils L_2 and L_3 due to the periodically changing magnetic fields set up by them. By placing the coils axially perpendicular to one another this effect can be minimized. The oscillator plate tank circuit is effectively across the grid of the final amplifier so that if there were sufficient coupling between coils an oscillation condition would be initiated in the amplifier and the crystal would no longer control the transmitter frequency. Such a condition could easily cause the transmitter to be operating outside of the 10 meter amateur band, which is an FCC offense for which the operator is held responsible.

The cathode coil and condenser for the tri-tet oscillator can be seen directly inside the chassis near the crystal socket in Fig. 4. If a 40-meter crystal is used the cathode capacity should be about 50 μfd . Somewhat greater driving power is available when the oscillator doubles rather than quadruples so it is desirable to use a 20-meter crystal, which will probably mean changing the cathode capacity. This can best be determined by trial. The cathode coil (L_1) consists of 40 turns of No. 26 enameled wire, close-wound on 3/4" diameter polystyrene rod and dipped in polystyrene coil dope. It may be found that more power from the oscillator can be obtained by changing the number of turns on this coil. The coil should not be dipped until the proper operating condition has been found.

The meter switch has four positions which will read as follows: (1) Oscillator plate current, (2) Final amplifier

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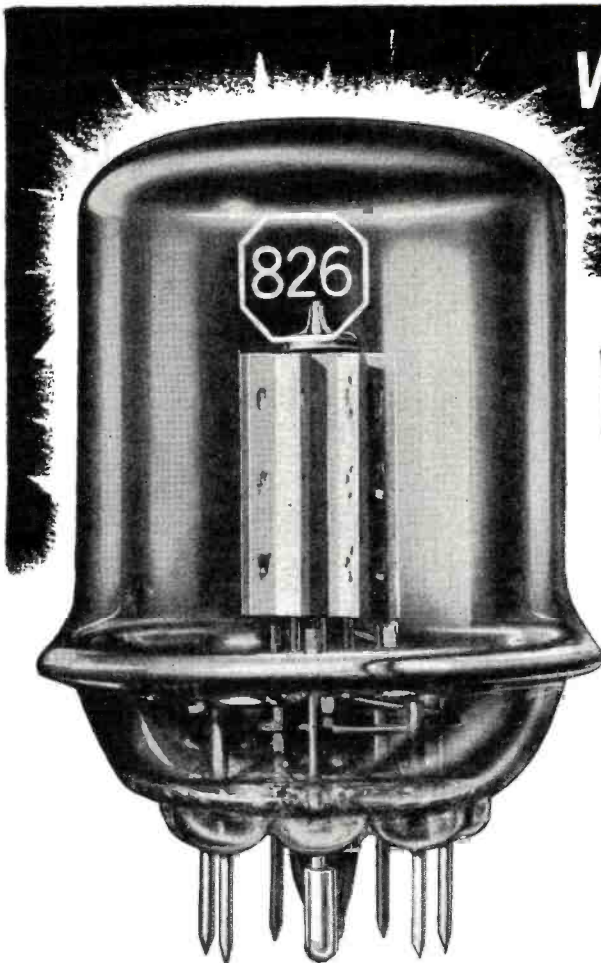
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The 826—60 Watt UHF
Transmitting Tube..... **49c**
(LESS THAN THE PRICE OF A RECEIVING TUBE)

Accustomed as we are to excellent values in Government radio equipment, we were amazed at the remarkably low price at which we were able to get these 826's. The regular Amateur net price is \$9.25 and worth it! So you can see why we're calling this the TUBE SPECIAL OF THE YEAR. Build your new rig around the 826. Order plenty of spares as we doubt if you will be able to duplicate this price when our stock is gone.

UHF Operation up to 250 MC.

The 826 will perform beautifully in your 2 meter rig as well as on the lower frequency bands. Use it as a final amplifier, modulator, doubler, buffer, or oscillator. In fact, the 826 is good for practically any R.F. or audio application.

826 Specifications

These tubes are standard make, brand new, JAN inspected, and packed in their original cartons.

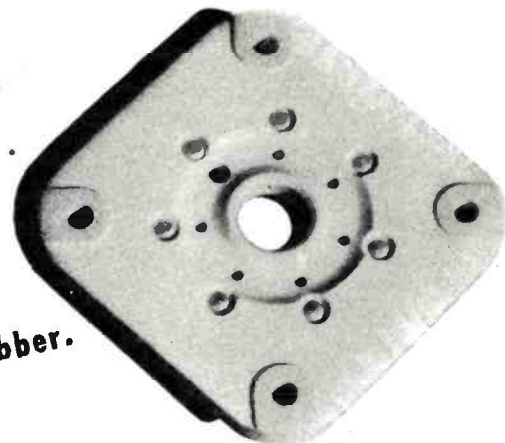
At our low price, 826's can be shipped only in boxes of 4 for \$1.96. Add 25c for each box of 4 tubes for prepaid shipment to any part of the continental U. S.

		<u>Power Output</u>	<u>Watts</u>
Max. Plate dissipation	60 watts		
Filament volts	7.5		
Filament amps.	4	Class C amp.	86
Max. plate voltage	1000	Class C plate mod.	53
Max. plate current	125 m.a.	Class B telephony	22
Approx. grid drive	6 watts	Grid modulated	25
Max. freq. full rating	250 mc.		

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Ceramic tube sockets for 826, 829B and 832 tubes . . . only 50c each.

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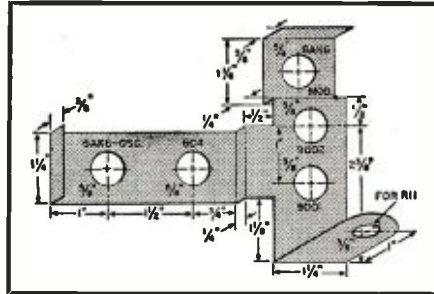


Fig. 6. Mechanical details of chassis.

grid current, (3) Final amplifier plate current, and (4) Final amplifier plate voltage. The meter switch is wired in such a way that one side is always positive and the other side is always negative. A multimeter such as is manufactured by *Simpson* or *Triplet* can then be connected permanently to the meter terminals, if desired, and all currents and voltages can be read by merely turning the selector switch on the meter and the meter switch on the transmitter. The resistors R_3 , R_4 , and R_6 , are mounted on the meter switch before the switch is placed permanently in the box. This is necessary to prevent the resistor leads from short-circuiting. The meter switch can then be wired into the circuit quite easily.

The crystal microphone, which is a high impedance device, works directly into the grid of a high gain 9001 pre-amplifier stage and is followed by another stage of audio amplification using the 9002 miniature triode. The voltage applied to the second audio amplifier is adjusted to give the necessary modulator output voltage by the gain control, R_{11} , shown on the front panel in Fig. 2. There is sufficient gain in the three stages of audio that inverse feedback can be used in the 9002 and the 6AK6 pentode modulator, which tends toward better quality speech and relieves the necessity for putting in two cathode bypass condensers.

Power requirements are 250 volts d.c. at 50 ma. and 6.3 volts a.c. at 0.75 amps. This can be obtained from most commercial communications receivers. The heater current will present little, if any, overload and plate current for the transmitter is used only when the receiver does not draw current. The entire transmitter can be mounted in a vacant corner of the receiver if desired and controlled from the "Send-Receive" switch on the receiver. The only equipment necessary on the operating table would then be the receiver and a microphone.

Tuning the transmitter is as follows: With a crystal between the limits of 7125 kc. and 7425 kc. placed in the crystal socket and with the meter switch in position 1, set the multimeter to the 100 ma. scale and rotate C_4 with a screwdriver. A slight dip in the oscillator plate current should appear, which indicates resonance. The dip will be quite small since the oscillator is quadrupling. It is important that the oscillator be tuned to the



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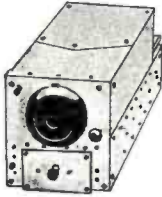
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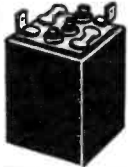
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Less calibration book.



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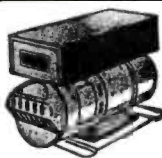
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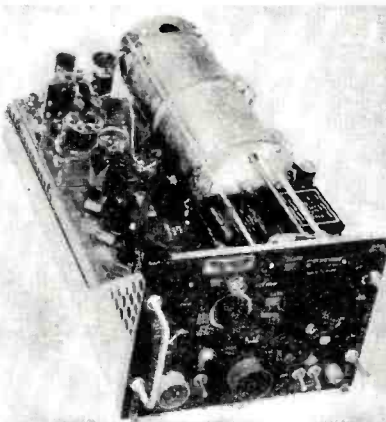
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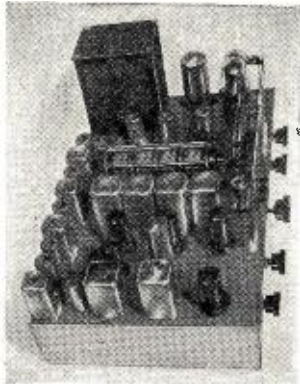
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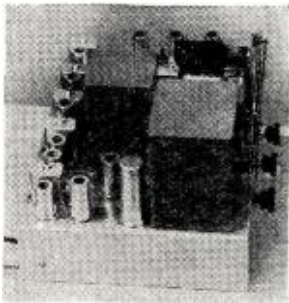
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fourth harmonic of the crystal. This cannot be over-emphasized because any other harmonic would cause operation of the transmitter outside of the 10 meter band. Next, the 6C4 amplifier must be neutralized. To do this, remove the plate voltage from the amplifier by unsoldering the lead to the amplifier plate current meter switch position 2 and the multimeter to the 10 ma. scale, and rotate C_4 through resonance. With the neutralizing condenser C_6 all out there should be a slight variation in the amplifier grid current. By increasing the neutralizing capacity the grid current variation should become smaller as C_4 goes through resonance until no grid current variation is observed. When this condition is reached, the amplifier is completely neutralized. After resoldering the plate connection, set the meter switch to position 3 with the multimeter on the 100 ma. scale and again rotate C_4 through resonance. Quite a pronounced dip should be observed, going from 20 ma. when out of resonance to 2 or 3 ma. at resonance. When the antenna is clipped onto the antenna terminals the minimum plate current should rise to 15 or 18 ma. It may be necessary to vary the number of turns on the antenna link to properly load the amplifier.

With the plug for the crystal microphone inserted in the mike connector the transmitter is ready for operation. The transmitter frequency should be checked on a receiver to make certain that the transmitter is on 10 meters. If an oscilloscope is available it could be used to determine the optimum setting of the audio gain control. If one is not available, the best setting of the audio gain can be determined by listening to the transmitter on a nearby receiver. It is recommended that the top and bottom covers of the transmitter be removed when operating, to provide for proper ventilation.

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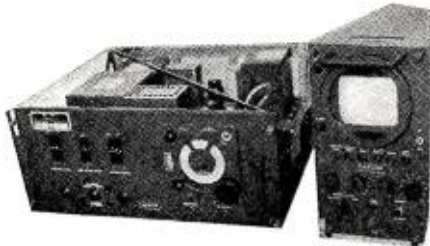
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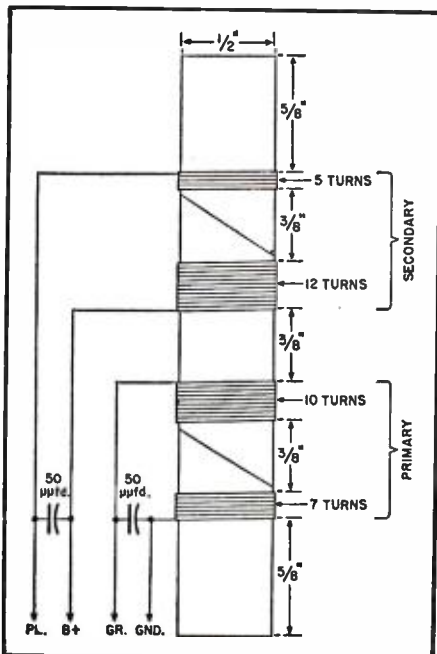
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10.7 mc. I.F. Transformers

(Continued from page 55)

ameled copper wire spaced symmetrically as shown. The individual windings are divided, that is, the primary winding has 10 closewound turns spaced 3/8" from 7 closewound turns and the secondary winding has 12 closewound turns spaced 3/8" from 5 closewound turns. The primary winding is spaced 3/8" from the secondary. This division of turns of each winding is purposely done in order to accommodate the length of travel of the "slugs," get the necessary mutual relationship between windings, and eliminate any undesirable disturbances that may result in having the "slugs" too close to one another. Both coils are wound in the same direction with the topmost ends of each winding being connected to the plate and grid terminals respectively. The coil windings are connected directly to the coil form soldering lugs; the primary terminals at the base and the secondary terminals at the top. The secondary coil connections are transferred to the base by means of rigid conductors so placed as to lie midway between the shield can and the coil form. The fixed capacitance of each winding is a 50 μfd. tubular, ceramic condenser, which is enclosed within the shield. Both tuning "slugs" are grounded by soldering a lug to the stationary nut in which the threaded member of the "slug" rotates and connecting this lug to the ground terminal. This is shown in Fig. 1 at the extreme right of the finished coil; the top right lug being the one that is soldered to the top "slug" assembly. Once the windings have been satisfactorily placed upon the form they should be given a thin coat of liquid polystyrene coil dope

Fig. 3. Mechanical details of 10.7 mc. I.F. transformer construction.



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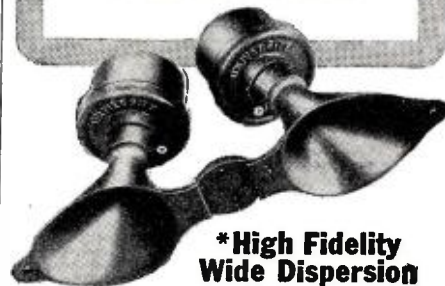


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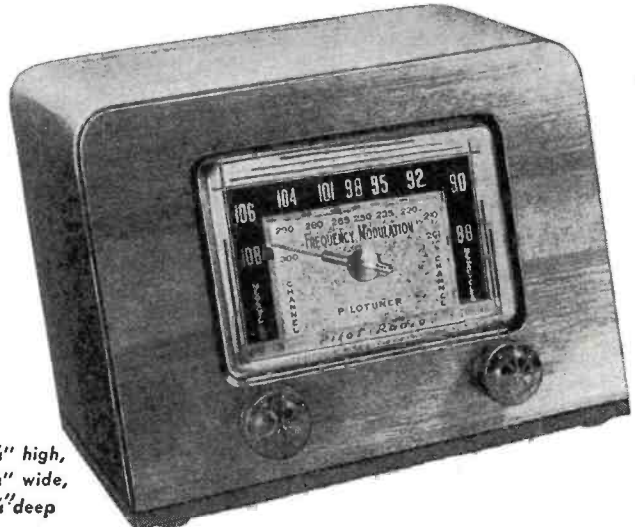
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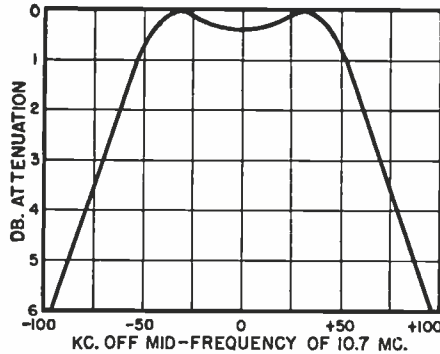


Fig. 4. Over-all characteristic curve of i.f. amplifier. Instruments used were Ferris model 16C signal generator and General Radio model 726A vacuum tube voltmeter.

before attempting to solder the ends to the lugs.

A typical two-stage 10.7 megacycle i.f. amplifier circuit, using the transformers just described, is shown in Fig. 2. The circuit is of conventional design and possesses no unusual features besides the generous use of .01 μ fd. mica condensers and 100-ohm, $\frac{1}{2}$ watt resistors in the plate and screen voltage supply circuits. The use of these components helps considerably in reducing interstage oscillations and spurious responses.

The attenuation versus frequency curve for such an amplifier is shown in Fig. 4. This is an over-all characteristic for the entire amplifier consisting of three transformers and two pentode amplifier tubes. To obtain such a characteristic, the amplifier must be aligned stage-by-stage, using the following procedure: Connect the output of a frequency-modulated signal generator (in the 10 mc. range) to L_1 and connect a vacuum tube voltmeter across the plate load resistor, R_6 . As the frequency, at constant output, of the signal generator is varied in 10 kilocycle steps on either side of the 10.7 mc. midfrequency, the readings of the vacuum tube voltmeter are noted. Adjust the inductive tuners of the transformer, L_1 , L_2 , until a symmetrical characteristic curve, similar to the one shown in Fig. 4, is obtained. Repeat the process for each additional stage by merely moving the connections of the vacuum tube voltmeter across to the plate load resistor of the next tube in the amplifier. The characteristic curve obtained by succeeding tests should not lose the general shape of the one obtained in the first stage. An increase in gain should be the only outstanding difference. Should the characteristic of two stages together not coincide with the characteristic obtained from one stage alone, it will be evidenced by a nonsymmetrical curve. Such nonsymmetry will appear such that the "peaks" will not be equally spaced or do not have the value of minimum attenuation. Correct adjustment of the tuning "slugs" will correct such misalignments. It must be borne in mind that after the first transformer has been properly aligned, just as much care must be exercised in aligning succeeding trans-



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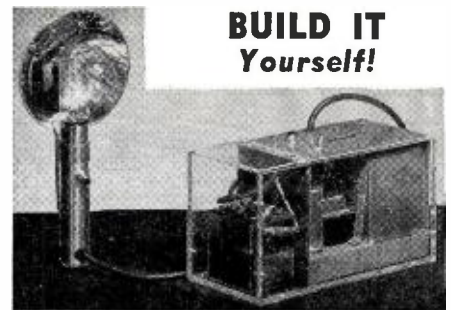
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Type H.F. Triode; Max. power output 90W. Max. operating freq. 300 M.C. A rare bargain.

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417A	\$ 9.80 ea.
446A	\$.74 ea.
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WL531 \$29.95 ea.
Type Kenotron Vacuum Rectifier, Air Cooled. Inverse Peak Volts, 50,000. Peak Amps. 75.

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804	\$ 3.75 ea.

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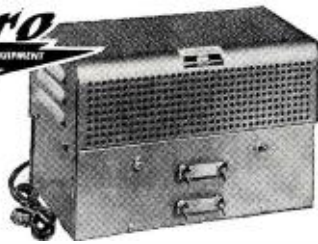
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Compact, Sturdy, 18-gauge steel construction. Handsome blue Hammerloid finish. Comes completely equipped including 6' rubber cord and plug. Vastly superior and costs no more than batteries for equal service.

Send for complete description of this up-to-the-minute power supply.

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formers. For, no matter how desirable a characteristic has been obtained for all but one of the transformers, the maladjustment allowed in this one transformer will be definitely reflected upon the over-all amplifier characteristic.

After the entire amplifier has been aligned stage-by-stage, minor adjustments of the tuning "slugs" can be made to improve the final characteristic. After these final adjustments, a drop or two of collodion or polystyrene coil dope placed upon the threaded "slug" mounts will preserve their settings.

-30-

Automatic Key

(Continued from page 51)

matic dots and automatic dashes; the dots are made exactly as heretofore described; however, when the keying arm is in the dash position it closes the micro-switch S_1 . This switch is mounted snugly against the keying arm on the dash side; only a slight movement of the lever in the dash direction is required to close the switch. Closing this switch places C_2 , in addition to C_1 , across the relay, prior to closing the relay circuit. The total capacity across the relay, in this position, is three times as much as it was on the dot side, consequently the relay will stay in three times as long for dashes as it will for dots. This is the correct relationship. After S_1 is closed the keying lever then makes connection with contact B . The relay operation, in this instance, is the same as in the dot position except for the difference in timing.

It should be noted that the key does not consume any power except when actually operated. It can be left plugged into the power outlet at all times.

Components

The relay used in the model illustrated has a 5000 ohm coil with double-pole, double-throw contacts. (Potter & Brumfield type LM 11). However, any double-pole, double-throw relay with a coil of from 5000 to 10,000 ohms and with adjustable contacts and spring tension, can be used. The range of the speed control R_1 is wide enough to compensate for this change. The physical size of the relay should be as small as possible if a compact key is desired.

The condensers C_1 and C_2 are in a single can. This can has three 10 μ f. units in it. The can is the negative side for both condensers. One 10 μ f. unit is for C_2 , the other two units are paralleled and used for C_1 .

The rectifier is a 100 milliampere dry disc selenium cell rectifier. These units are very compact and are ideally suited for use in apparatus of this type.

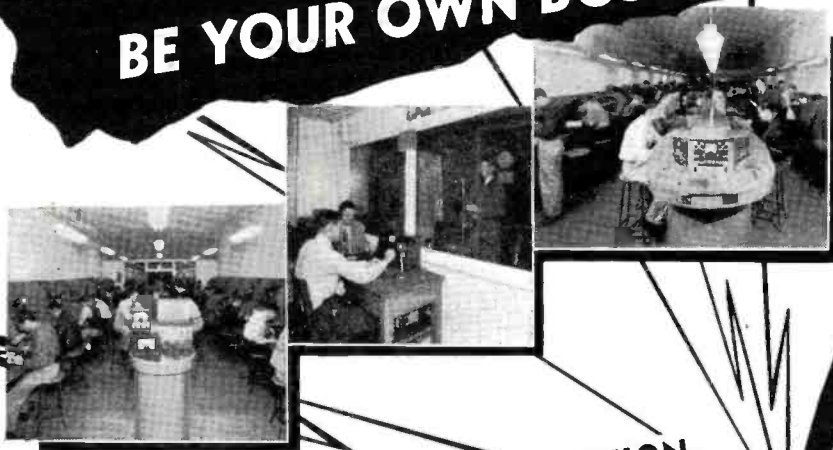
Construction

Placement of parts is not important. The unit can be made in any size or

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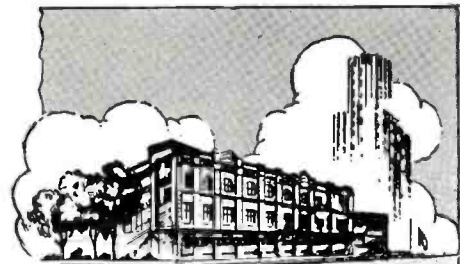
Radio (and its allied fields—electronics, television, radar) now looms as a major industry in the United States offering a constant and ever-expanding field of wealth and opportunities. Each new development points the way toward further improvements and an increasing demand for men and women, specialized in this field.

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 (*Complete with tubes, less cabinet)
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 Dual 30 mmf. Air Trimmers, 10 for **69c**; 50 mmf. Air Trimmers.....10 for

Bargain! Guaranteed!

100 Assorted Bypass Condensers 600V
 Value \$11.00. **\$6.95**
 SPECIAL.....

SUPERIOR Model 670

Super-Meter

A Combination Volt - Ohm Milliammeter plus Capacity Reactance Inductance and Decibel Measurements.

Complete with test leads and instructions **\$28.40**



Full line of **Weston-R.C.P.-Supreme**
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Write Dept. RN-12. 20% Deposit with order required. Please add sufficient postage. Excess will be refunded.

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shape that meets the needs of the builder. In the model illustrated, all parts were mounted on a bakelite baseboard and panel, and insulated from the metal case. It should be remembered that one side of the electric power line is connected to the ground side of the circuit. The following precautions should be taken to lessen danger of shock or short circuits. If a metal box is used, it should be insulated electrically from all parts. Another method is to connect the power cord with its ground side connected to the metal box.

The keying lever shouldn't present any problem. As previously stated, it is merely a spring arm pivoting between two contacts. The illustrations should clear up any difficulties. If a more elaborate key is desired, the movement on a standard "Bug" should be studied. It can be duplicated in the average workshop with little effort. The only advantage this movement has over the spring arm is the fact that separate tension adjustments are available for dots and dashes. With a spring arm the over-all tension can be adjusted but the tension will be the same for both dots and dashes. This, however, is not a disadvantage; it is the correct adjustment for any type of side operating key.

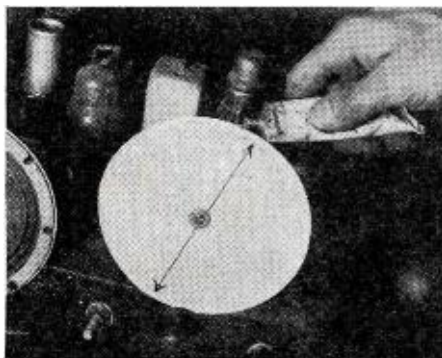
In conclusion, a word might be said about operating this key. When used as a straight "Bug," that is with automatic dots and manual dashes, anyone proficient in the operation of a standard mechanical "Bug" can sit down and operate this key without further ado. Mastering the automatic version is a different story. A considerable amount of practice is required. Such practice is well worthwhile, inasmuch, as it is almost impossible to distinguish the key transmission and a tape transmission when the key is correctly and skillfully operated.

-30-

FRICITION DRIVEN DIALS

PLASTIC dials that are friction driven at the rim often develop flat spots or "lows" along the perimeter and, as a result, sometimes stick at these spots.

This can be corrected by applying the requisite number of layers of cement to the low spots. Do not attempt to fill up the hollow with one application of glue as it will not harden properly and will subsequently drop out of shape. Apply several thin layers, allowing each to dry, until the spot is built up. M.A.



Within the Industry

(Continued from page 30)

Radio Distributing Corporation, a wholly owned subsidiary of Zenith Radio Corporation.

Mr. Nangle joined the company in 1944 after having served with the Army-Navy Expediting Production Agency. Prior to the war, he had been in radio sales for nine years, beginning his radio career at the *Boston Store* in Chicago.

* * *

LEO G. SANDS, formerly a sales engineer with the *Bendix Radio Division* of *Bendix Aviation Corporation*, has been promoted to the post of District Sales Manager of mobile radio sales, with headquarters in Chicago.



In his new post, Mr. Sands will coordinate the sales activities of the Chicago branch office as related to railroad radio equipment and v.h.f. two-way radio systems for taxicabs.

Mr. Sands was formerly in charge of the company's branch office in Kansas City and joined the *Bendix Radio Division* in 1946 after serving as an electronics engineer with *Curtiss-Wright Corporation* at Bloomfield, New Jersey. From 1942 to 1944 he was foreman in radar maintenance for the War Department at Sacramento Air Depot in California.

* * *

WALTER J. NILES was recently elected to the post of president of *Frederick Hart & Co., Inc.*, manufacturers of sound-on-film recorders and other electronic equipment.

Mr. Niles, who succeeds Charles R. D'Olive, joined *Hart* a year ago as vice-president and general manager. He joined the company after serving as general manager of *International Business Machines Company's* plant No. 2 at Poughkeepsie.

He has been closely associated with the electrical and electronics manufacturing fields throughout his business career.

* * *

WILLIAM HATTON, well-known engineer in the field of international telephone communications, has been named Director of Manufacture of the *International Telephone and Telegraph Corporation* and its world-wide manufacturing and sales affiliate, the *International Standard Electric Corporation*.



In his new post, Mr. Hatton who has been associated with *I. T. & T.* and its affiliated companies since 1919, assumes, in addition to his present duties as Director of Engineering, full re-

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946

OF RADIO NEWS, published Monthly at Chicago, Ill., for October 1, 1947.

STATE OF ILLINOIS }
COUNTY OF COOK }

Before me, a Notary Public, in and for the State and county aforesaid, personally appeared Arthur T. Pullen, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the Radio News and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily, weekly, semiweekly or triweekly newspaper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the act of August 24, 1912, as amended by the acts of March 3, 1933, and July 2, 1946 (section 537, Postal Laws and Regulations), printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, William B. Ziff, 185 North Wabash Avenue, Chicago 1.

Editor, Oliver Read, 185 North Wabash Avenue, Chicago 1.

Managing editor, Wm. A. Stocklin, 185 North Wabash Avenue, Chicago 1.

Business manager, Arthur T. Pullen, 185 North Wabash Avenue, Chicago 1.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member must be given.)

(Ziff-Davis Publishing Co.), 185 North Wabash Avenue, Chicago 1.

William B. Ziff, 185 North Wabash Avenue, Chicago 1.

B. G. Davis, 185 North Wabash Avenue, Chicago 1.

A. Ziff, 185 North Wabash Avenue, Chicago 1.

S. Davis, 185 North Wabash Avenue, Chicago 1.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date as shown above is..... (This information is required from daily, weekly, semiweekly, and triweekly newspapers only.)

Arthur T. Pullen
(Signature of business manager.)

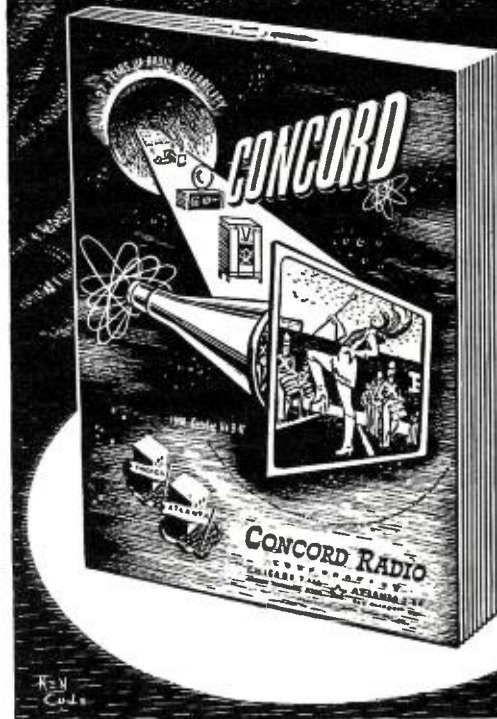
Sworn to and subscribed before me this 25th day of September, 1947.

[SEAL] George H. Fisher.
(My commission expires December 17, 1950.)

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VFO and XMTR

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Brand new, in original Signal Corps packing; delivers 160 mils at 500 volts; operates on 6 or 12 volts d-c; complete shock-mounted assembly includes breakers, switches, relays, filters, and cables.....\$9.95

New 304TH Tube at.....\$4.95 each

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sponsibility for the system-wide coordination and development of manufacturing methods.

GEORGE F. DEVINE is the new Commercial Engineer for *General Electric Company's* Specialty Division at Syracuse, New York.



Responsible for the performance, appearance specifications, and quality control of the division's products, Mr. Devine will make his headquarters at the company's Electronics Park in Syracuse.

He has been employed by *General Electric* since 1935 and prior to his most recent appointment worked on the design of the company's line of home receivers.

During the war, Mr. Devine was assigned to naval ordnance projects and in 1945 received the Naval Ordnance Development Award for his work on anti-submarine electronic devices.

P. R. MALLORY & CO., INC., of Indianapolis has appointed two new representatives to cover sales territories in the southern states.

Grady Duckett of Atlanta will serve *Mallory* distributors in North Carolina, South Carolina, Georgia, and Florida.

The Texas, Oklahoma, and Louisiana territory will be serviced by Porter Holland of Dallas, Texas.

JOSEPH A. McLAUGHLIN has been selected to fill the post of East Central Regional Manager for the *Crosley Division of Avco Manufacturing Corporation*.



For the past two years Mr. McLaughlin has served as Brooklyn Sales Manager for the *Crosley Distributing Corporation*. He is a veteran of 18 years in the radio and appliance business and during the war served with both Army and Navy as an industrial specialist in connection with radio and radar manufacture and procurement.

GENERAL ELECTRIC COMPANY is currently sponsoring a traveling FM workshop for the purpose of educating radio technicians for the better servicing of FM radio receivers.

The company has scheduled 33 meetings during the 35 state visit of the caravan during which time special technical and educational FM demonstrations are being held in metropolitan areas.

Experienced *GE* commercial and engineering personnel are accompanying the FM caravan.

WESTINGHOUSE ELECTRIC CORPORATION has announced the promotion of two key members of the Company's

**Wire, Tape, & Disc
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Webster Model 80 Wire Recorder. Complete with crystal microphone, 3 spools of wire, and tubes. Ready to record and play back, only

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All standard brand and type receiving tubes—any quantity—50% off. Write in your needs.

AC line cords..... 17c.

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Famous-make auto radio antennas. Telescope or whip type—50% off. 66 inch \$2.48. 68 inch \$2.73. Write for others.

Punched chassis 5 tube 8 1/2x4x1 1/2. 15c.

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Send in your name and address for our mailing list.

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While they last—Any Quantity

Superhet circuit 1900-16500 K.C.; 110 Volt 60 Cycle A.C.; one stage R.F.; B.F.O., noise and sensitivity controls; audio output limiter; rack mounting; complete with coil; complete set spare tubes; original crates.

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extensive education and training program.

Henry N. Muller, Jr., former manager of graduate student training, has been promoted to the post of manager of the entire educational department. His former position will be filled by Guy Kleis who previously served as supervisor of the engineering training program.

In his new position, Mr. Muller will supervise both the university relations and graduate student training programs. The graduate student training course, managed by Mr. Kleis, is a combination of work assignments and classroom study programs that bridge the gap between college and the industrial world.

-30-

International Short-Wave

(Continued from page 65)

Trinidad is your station and we want to give you a broadcasting service to which you will be proud to put the Colony's name."

The staff of *Radio Trinidad* includes a number of highly skilled men who have worked in broadcasting for many years and whose business it has been to arrange program schedules that would be satisfactory for listeners. Daily programs have been designed to include a number of old and familiar favorites to those who have been *Rediffusion* subscribers in Port-of-Spain, but these are new to listeners in other parts of the islands. There are many new features for all listeners.

The station is equipped with a transmitter which delivers 2 kw. of fully-modulated power to the antenna system which, on medium-wave, is a simple "T" aerial. The transmitter design follows conventional lines, with the exception that a unique feature is the ability to switch rapidly from one frequency to an alternative frequency. The transmitter is built to work on 1295 kcs., medium-wave, and also on 6.085 and 9.625, short-wave, in the 49- and 31-meter bands, respectively.

Telephone lines provided by the Trinidad Consolidated Telephone, Ltd., connect the transmitter at Caroni to the studios in Port-of-Spain. These lines are specially treated so that the quality of the programs originating in the studios at Broadcasting House does not deteriorate because of the length of the lines over which the signals have to pass before modulating the transmitter.

An emergency generating plant of 15 kw. capacity is installed at Caroni so that the service will not be seriously interrupted in the event of a breakdown in electric supply. There is also an emergency 500-watt transmitter which can operate on all three frequencies. This transmitter is being operated normally as an alternative service on 9.625, radiating the same

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ELECTRIC MOTOR REPAIR is the ideal, easy-to-understand book for beginners. Hundreds of motor repair shops use it for training new helpers and in daily use at the bench. Send coupon today! Practice from **Electric Motor Repair** for 5 full days. If not more than satisfied—if you're not fully convinced that, at last, here is the ideal training for YOU, just send the book back. Every cent of your money will be cheerfully refunded **AND NO QUESTIONS ASKED!**

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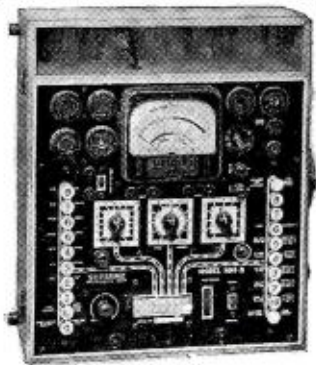
Send me a copy of "ELECTRIC MOTOR REPAIR" for which I enclose \$5 (\$5.50 foreign); or send book C.O.D. for this amount (no foreign C.O.D.'s) and I will pay postman \$5 plus postal charges when he delivers it to me. If book is not satisfactory for any reason, I'll return it within 5 days and you guarantee to refund my \$5.

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Any craftsman distinguishes himself by the appearance of his tools and equipment. For 19 years SUPREME equipment has identified thousands of successful radio service engineers. SUPREME equipped repair shops distinguish themselves for their professional appearance, dependability, and profitable operation.

One among the complete group of SUPREME radio testers is the Model 504B Tube and Set Tester.

- **METER**— large 4-inch square-face meter, 500 microampere.
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- **SIMPLICITY**— roll chart carries full data for tube setting. No roaming test leads when using multi-meter—only push a button.

SPECIFICATIONS

DC VOLTS — 1000 Ohms per volt: 0-5-25-100-250-500-1000-2500.
AC VOLTS — 0-5-10-50-250-1000.
OUTPUT VOLTS — 0-5-10-50-250-1000.
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Electrolytics checked on English reading Scale at rated voltages of 25-50-100-200-250-300-450 volts.

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Check dry portable "A" and "B" batteries under load.

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programs simultaneously with the 1295 kcs. medium-wave transmitter. In the event of a breakdown in the main transmitter at Caroni, the emergency transmitter will be tuned to work on 1295 kcs., thus ensuring continuation of the medium-wave service while the main transmitter is being repaired.

In addition, the station is equipped with the latest type of "outside" broadcast equipment and soon will receive a central control desk together with independent balance and control units for each of the new studios now being built at Broadcasting House. These balance and control units will enable the producers of each "live" program in the studio to adjust the tonal balance of the program to their satisfaction before the signal is further amplified and routed via the control desk to the Caroni transmitter.

Other equipment includes high-efficiency recording apparatus for both 33 1/3 and 78 r.p.m., playbacks, and a portable short-wave transmitter for use in reporting topical events or in giving running commentaries on sports at places where telephone lines may not be available.

The station currently is operating on 1295 kcs., 231.65 meters, medium-wave, 2 kw., and on 9.625, 31.16 meters, short-wave, 500 watts. (*Actually, the 31-m. transmitter is being logged in the United States on approximately 9.645.*)

Schedule is week days at 0600-0800,* 1100-1300, and 1500-2200; Sundays at 0600-1300, 1500-2200. News is relayed from the BBC at 0600, 1100, 1500, and 2000; local news is given at 0700 and 1755, but on Sundays the latter period is devoted to "Caribbean Review," in which the Caribbean Commission gives news of its activities and lets each part of the Caribbean area know what is doing in other parts. (Incidentally, this program is to be broadcast from almost every station in the West Indies and in four different languages.) Radio Newsreel is relayed from the BBC daily at 1600, and there are children's programs daily at 1615-1700.

As a general rule, all broadcasts are in *English*, but there is Hindi-urdu for Indian listeners on Sundays at 1230-1300 in "The Indian Hour," and at 1900-2000 on Saturdays. Occasionally, short paragraphs may be given in Dutch or French.

Reception reports are welcomed, and will be verified if correct. *An IRC is required.* QRA is Radio Trinidad, Broadcasting House, Port-of-Spain, Trinidad, B.W.I.

Trinidad has an area of 1864 square miles and its estimated (1945) population is 546,088. It is the most south-

* (Note: Unless otherwise indicated, time herein is American EST; add 5 hours for GCT. Time is indicated on the basis of a 24-hour clock, that is, 1 a.m. is 0100, 1 p.m. is 1300, etc. All times indicated as 1:00 through 2:00 fall in the p.m. so in order to convert the times, subtract 12 hours from figures over 12 to get the p.m. time. "News" refers to newscasts in the *English* language. "V" following a frequency means that the frequency varies.)

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Self contained 117 Volt 60 Cycle power supply. Sensitivity control. B.F.O., Noise control. Uses 2-6K7, 1-6K8, 2-6C8, 1-6SN7, 1-80.

Complete with full instructions for converting to a four band receiver, 2 kits of tubes, Manuals, etc. Brand New in original Crates. No coils or crystals. **\$13⁹⁵**

Worth the price for the tubes alone.

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erly of the West Indies, lying off the north coast of South America. Attached to it for administrative purposes is the island of Tobago with an area of 116 square miles and an estimated population of 25,358. Capital is Port-of-Spain. Both import and export trade are heaviest with the United States. Of 1,192,844 acres on the island of Trinidad, 348,850 are cultivated. Products are mostly asphalt, oil, with derivatives therefrom. The island's great asphalt lake of 114 acres is immensely valuable and seems inexhaustible.

As we wind up our visit to *Radio Trinidad*, we extend the very best wishes to its staff with the fervent hope that VP4RD may continue to make its services of real and lasting value to the Colony.

* * *

Saigon Report

J. Pipon, head of the English Department of *Radio Saigon*, 198, Rue Chasseloup-Laubat, Saigon, French Indo-China, informs me that the station is extremely pleased with the reports received on the special broadcast of March 16, dedicated to readers of this department. Verification cards have been sent to all those who furnished correct reports, Mr. Pipon advises. However, those cards mailed around April 5 appear to have been lost in transit, and duplicate cards are now being forwarded by the station.

Here is a summary of reports received by *Radio Saigon*, as of August 9, on the March 16 special broadcast for RADIO NEWS readers:

United States—California, 7; Pennsylvania, 6; Ohio, 3; New Jersey, 2; Illinois, 1; Maine, 1; Massachusetts, 1; Connecticut, 1; West Virginia, 2. *New Zealand*—29. *Australia*—10. *Canada*—2. *India*—2. *England*—2. *Sweden*—2.

"Reports from California, Illinois, and Ohio all say that reception was excellent," Mr. Pipon comments, "while listeners in other parts of the United States write that reception was quite variable. The broadcast was picked up easily in New Zealand and in most parts of Australia. Reports from India also specified good reception, but listeners in Sweden and England could hardly hear us, apparently." (Reception in Continental Europe and the British Isles was hindered greatly by interference from *Radio Wien*, Vienna, on the 11.78 frequency.)

* * *

Spanish Project

Through the courtesy of Eddy Copper-Royer, Comptoir International de Publicité, New York and Paris, we offer readers these interesting excerpts from an interview Mr. Copper-Royer had with Senor don Valentin Ruiz Senen, Madrid, Spain, president of the Compañia de Radiodifusion Intercontinental, with regard to the projected super-powered Spanish station to be located on Fernando Poo Island, off the West Coast of Africa: "As a matter of fact," said Senor

Radio Parts Company

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Radio and Phonograph VALUES

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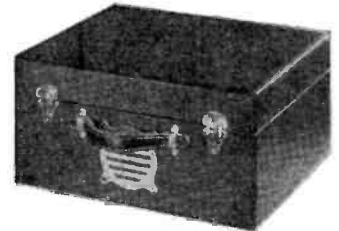
With built-in loop antenna, in attractive black plastic cabinet, fine quality.

For only \$13.95 ea. Three for \$13.50 ea.

★ THE HOLLYWOOD PORTABLE PHONOGRAPH

Three-tube amplifier, high gain crystal, fine phono motor, 4" speaker. In attractive leatherette covered carrying case.

Only \$13.95 ea. Three for \$13.50 ea.



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5-tube AC-DC radio. High Gain Crystal Pickup. Smooth Running Phono Motor. In attractive High Finish Wood Cabinet.....\$24.95 ea.

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This Month's Specials

EAR PLUG TYPE HEADSET

Designed to fit in user's ears. Headband can be set to fit the head. Magnetic phones, complete with cord and holding clip.

An Exceptional Buy. \$1.99 ea.



BUILDER'S CHASSIS

Just the thing for your television set, scope, or large amplifier. Measurements, 17x15x4". \$2.49 ea. Six for.....\$2.39 ea.

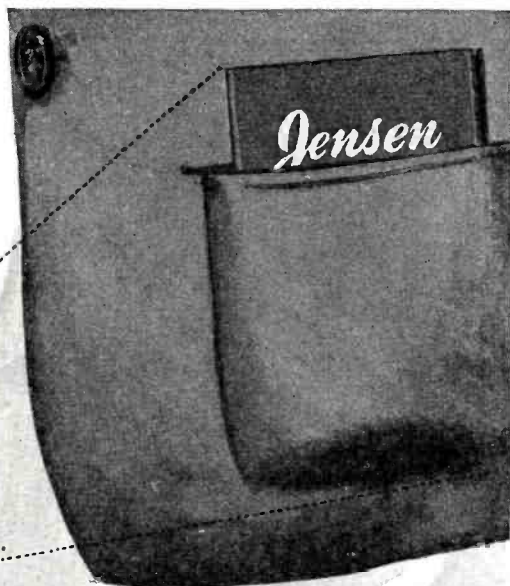


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Radio Servicemen who take the Jensen Phonograph Needle Saleskit on service calls say they would not be without it. This handy kit, shown above, helps demonstrate fine needles, sells on sight, adds \$\$\$s to your income.

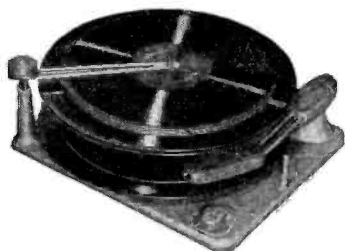
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Ruiz Senen, "we decided the construction of a 200,000 watt broadcasting station would be located on Fernando Poo Island, such station to give a world-wide service covering Europe, Africa, North and South America and as far as the Philippine Islands. The first steps which have been taken up to the present time is the constitution of Compania de Radiodifusion Intercontinental, formed with a capital of 24,000,000 pesetas.

"After studying the whole problem, we found that the best location for a perfect distribution of our broadcast would be around and in the equatorial area. This is one of the reasons for which Fernando Poo Island seems to be one of the best locations on which to build high sound projectors reaching all over the Atlantic area. The broadcasting power will be 200,000 watts in the antenna, but as such will not have a round radius but will be directed, the power which will reach the countries where the antenna will be beamed will be around 160 kw., based on the same principle as Americans realized for two intercontinental broadcasting stations in California, securing a complete and full service to Korea, Manchuria, and Japan.

"Distances do not exist, and when the Fernando Poo station—which will be called 'Radio Atlantica'—is on the air, radio listeners in San Sebastian, Madrid, Pamplona, London, Milan, Stuttgart will hear it as well as a local station. The wave to be used will be as short as possible, probably in between the 13- and 17-meter bands in daytime, and 25- to 30-meters at night.

"Regarding the Spanish Government's attitude toward this great enterprise," added Senor Ruiz Senen, "it could not be more enthusiastic and satisfactory. Understanding the international interest in such an enterprise and the prestige of the Spanish nation which will bring under such form, at the disposal of all the nations, a powerful instrument of exchange, the Government granted a concession to build and operate this station. The Governor General of Guinea, Senor Bonelli, took a very important part in establishing the conditions under which the station is going to be built and will have to be operated, up to the point that he authorized the construction in a large area of 60 acres located at Musola. The Compania de Radiodifusion Intercontinental, to which the concession has been granted, is looking forward and will create offices everywhere in the principal economic centers such as New York, Buenos Aires, Brussels, Lausanne, Milan, Lisbon, Paris, and so on. There will be a delay of 18 to 19 months before the first broadcast can be on the air. Programs will be recorded every day in the principal centers of the United States, in London, and so forth; then they will be shipped by air to Fernando Poo. This will give to the programs the imme-

RADIO NEWS

diate reaction of all international artistic activities and the station will in such a way broadcast the best radio production in all lines.

"To conclude," said Senor Ruiz Senen, "in this dynamic time in which the whole world tries to reorganize an international economy and a great cultural and commercial exchange between the nations, I am proud that Spain will give one of the best instruments to help a return to peace and prosperity and with its high idiom, maintain the constant and tense attention which will carry a cultural spirit which is eternal."

Mr. Copper-Royer states that this is the first time since 1936 that American equipment is going to Spain. An order has been placed with a well-known concern in the United States for two 5 kw. transmitters—one of which will be delivered to Madrid, the second to Fernando Poo. These transmitters will be used by Compania de Radiodifusion Intercontinental to establish a direct circuit between the head office in Madrid and the station in Musola. It is probable that the 200 kw. transmitter will also be ordered from the United States, especially since this is the only country where such powerful equipment has already been constructed, he adds.

* * *

Verification Data

HHCN sent letter-*verie*, signed by Carl Etienne, 55 Ave. Christophe, Port-au-Prince, Haiti, it was stated that the station is authorized for 5 kw. but is using only 100 watts at present; may change frequency soon to escape bad aircraft QRM, and will notify verieholders of such change. (Arthur)

LRA verified for Paul Kary, Pennsylvania, a special transmission of Argentine folklore music, heard July 19, and dedicated to delegates of the Telecommunications Conference in Atlantic City, New Jersey, U.S.A.; transmission was over commercial transmitters LQD, 19,400, and on 18.150; it was stated LRA is extremely interested in receiving reports on programs and signals; regular schedules are given as LRA-5, 17.720, 1500-1530 on Fridays *only*; LRA-1, 9.690, relaying medium-wave LRA at 0800-2200; the program of LRA-5 on Fridays is a special one from the Ministerio de Relaciones Exteriores y Culto, directed to *all* American countries. QRA is LRA, Radio del Estado, Palacio de C. y Telecomunicaciones, Del Jefe de la Division de Radiodifusion, Buenos Aires, Argentina.

Radio Club Argentino, Av. Alvear 2750, Buenos Aires, Argentina, desires reports on the signals of LRA-1, 9.690, and says each correct report will be verified by QSL card. (Courtesy ARRL)

The Navy Department in Washington is sending out verifications on reports of reception last winter of NAVE, aboard the *Mount Olympus*, flagship of the Antarctic Expedition.

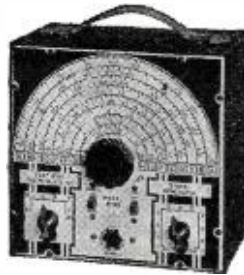
HIIR, La Voz de Fundacion, San
December, 1947

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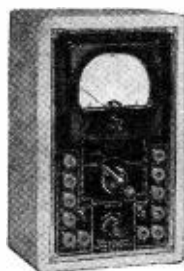


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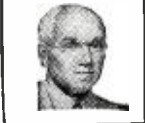
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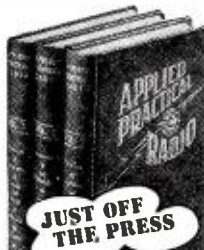
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Cristobal, Dominican Republic, verified by nice yellow card with photo of studio and transmitter building on one side; QRA is Broadcasting HI1R, La Voz de Fundacion, % Luis F. Alberti, Director, San Cristobal, Ciudad Benemerita, Cuna de Trujillo, Republica Dominicana. GBSS, *Queen Elizabeth*, verified on prepared form and with letter; not permitted to state type of transmitter used, but gave power as 400 watts on phone; antenna is single-wire vertical; uses 17.640 when working WOO, and 17.600 when working GBC, Rugby; also uses 13.210, 8.830, and 4.412.15, latter *only* when within a few hundred miles of port; wants reports on all these frequencies. It is suggested that DX-ers follow shipping news in metropolitan papers (such as the *New York Times*), and send reports to New York when ship docks; QRA is HMS *Queen Elizabeth*, Cunard White Star Liner, Radio Station GBSS (aboard), % E. D. Walker, Technical Operator, West 50th Street Pier, New York, New York, U.S.A. PUH, Rio de Janeiro, Brazil, 20.750, verified; QRA is "Radiobras," Companhia Radiotelegrafica Brasileira, Caixa Postal 500, Rio de Janeiro, Brazil; verification was on prepared form. QRA of Sendergruppe Rot-Weiss-Rot is ISB-Radio-Sektion, Seidengasse 11, Wien VII, Austria. (Kary)

Club Notes

New Zealand—Harold J. Barr, Hon. National Secretary, New Zealand DX Club, informs us that the official bul-

letin of that group, "The N.Z DX-Tra," is now being published in Auckland in conjunction with the Headquarters of the Club. Material for the bulletin should be addressed to "The N.Z. DX-Tra Committee," 9, Westmere Cresc., Westmere, Auckland, W. 2, New Zealand. Any inquiries regarding membership and so on, however, should still be addressed to Mr. Barr at 10, Koraha Street, Remuera, Auckland, S.E. 2, New Zealand.

United States—A complete worldwide SW log has just been issued by the Newark News Radio Club, 215 Market St., Newark 1, New Jersey. It is one of the most thorough compilations I have seen; subscribers receive it for \$1. Compiled by James J. "Jimmy" Hart and M. F. "Matty" Williams, short-wave editors of NNRC, the log contains three sections—stations listed by frequency; stations listed by countries and cities; and last minute tips. Appended is a list of low-frequency police stations, compiled by Robert Knox.

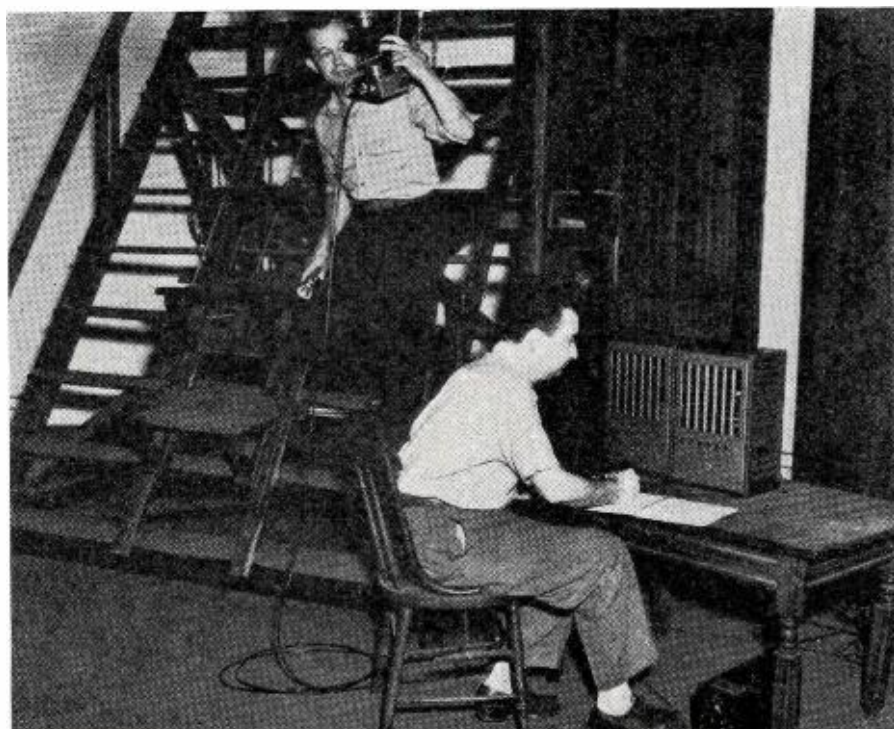
This Month's Schedules

Albania—ZAA, 7.852, Tirana, has news at 1515. (Miers)

Algiers—Radio *Algerie*, 11.835, is heard in French to close at 1700, fair to good signal. (Pelland)

Andorra—Radio *Andorra*, 5.980, is heard to 1800 or later. (Pelland) Good level in Pennsylvania; announces "Aqui Radio Andorra" in Spanish and "Ici Radio Andorra" in French (Kary) At 1600 now gives a program of re-

Counting the photons, or light particles, arriving from a star is the unusual occupation in which I. M. Levitt (left) and William Blitzstein were engaged when this photograph was made at the Flower Observatory in Highland Park, near Philadelphia. A photometer of their own design, which is the first astronomical device to count such photons, is used by the two scientists in their experiments. Levitt is shown adjusting the photomultiplier tube attached to the eyepiece of the telescope, while Blitzstein is seen tabulating results obtained with two RCA Electronic Time Interval Counters, used to count electron impulses generated by the phototube.

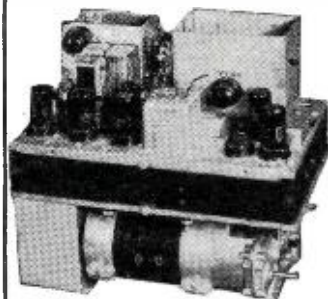


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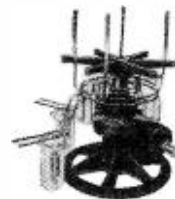
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| 40 ohm | 15c | 100 ohm | 20c |
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cordings for Belgium; *English* period, formerly 1600-1630, is either discontinued or at a new time. (Pearce) Probably is around 1800.

Angola—Radio Clube de Angola, Caixa Postal 229, Luanda, Angola, Portuguese West Africa, in verifying by Spanish letter, listed CR6RA, 11.035, 400 watts; CR6RC, 11.730, 150 watts; CR6RL, 16.172, 1 kw.; CR6RN, 9.742, 1 kw., and additional frequencies were given as 9.500 and 7.299. (Nilsson) Correct frequency of CR6RL is 15.895. (Kary) Output is 1 kw. (Laubscher) The 9.472 channel is heard with good level in Newfoundland, 1300-1600, while the 15.895 outlet, in parallel, is poor. (Peddle) CR6RB, 9.165, is still being logged in Australia, fair signal, to closing at 1400 with Portuguese National Anthem. (Gillett)

Australia—Radio Australia recently revised schedules. The Eastern North America "morning" beam went back to old time of 0800-0915, over same frequencies, VLB, 9.54, VLC7, 11.84. The "evening" beam to Eastern North America is now 1645-1815 on VLA7, 17.800, with VLC9, 17.84, in parallel to South America; news at 1745. The "morning" West Coast beam is now 1000-1115 on VLA8, 11.76, VLB9, 9.615; "evening" West Coast transmission now begins 15 minutes earlier, that is, runs 2330-0045, radiated from VLA5, 15.32, VLC7, 11.84, VLG6, 15.24. (Worris, Balbi) The Forces' program runs 2200-2300, VLB5, 21.540, VLC9, 17.840, VLG6, 15.240; on Saturdays and Sundays runs 2100-2300 with VLA9, 21.600, added; to Europe, 0100-0145, VLC9, 17.840; to Tahiti, 0100-0145, VLG6, 15.240, and on Saturdays VLA6, 15.200, is added; to British Isles and Europe, 0200-0315, VLA6, 15.200, VLB10, 11.740 (except Saturdays), with VLC9, 17.84, used 0245-0315 *only*. To New Caledonia, 0245-0345, VLC4, 15.320, VLG3, 11.710; to Forces, 0330-0700, VLA6, 15.200, VLB10, 11.740; to Asia, 0355-0700, VLC4, 15.32, VLG10, 11.760, with VLB10, 11.740, used 0700-0900, and VLC4, 15.32, used 0700-0750. To Europe, 0900-1000, VLA6, 15.200, VLG10, 11.76; 0930-1000, VLB4, 11.810; 1500-1615, VLG4, 11.840, and others.

Striking of the clock at Melbourne's post office building is heard often these days in *Radio Australia* transmissions. (Worris)

VLW3, 11.830, Perth, is scheduled 2230-0500. (Nankervis) May run to 0515 or 0530 on occasion.

Austria—Blue Danube Network, 7.220, Salzburg, is often good level in Britain at 0030 with news; callsign seems to have changed from KOFA to KZCA (?). (Pearce)

Azores—Ponta Delgada, 11.090, has excellent signal in Newfoundland around 1300-1530. (Peddle)

Bechuanaland—ZNB, 5.900, is being heard again in Australia just prior to closing at 1430 with "God Save the King," recorded music with occasional announcements. (Gillett) Location is Mafeking.

Belgian Congo—Leopoldville ap-

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pears to have replaced OTC2, 17.745, with OTM2, 9.745, in the 1530-1645 beam to Britain and British Colonies in Africa; news at opening. The 11.645 channel, although not announced, is sometimes heard in parallel.

Brazil—ZYB-7, 6.095, Sao Paulo, is heard evenings from around 2030. (Pelland) PSF, 14.685, Rio de Janeiro, heard with test program in Portuguese to 1700 daily; signs off with Brazilian National Anthem. (Hart via NNRC)

British Guiana—ZFY, 6.000, Georgetown, sends an excellent signal to Newfoundland around 1530-2000. (Peddle)

Burma—Rangoon is scheduled 0115-0145, 2015-2030 on 9.54; 0915-1015 (English session) on 6.035, news at 1000. (Radio Australia)

Celebes—Makassar's 9.265 channel is scheduled 1730-1830, 2300-0130, 0500-0930. (Nankervis) *Is complete schedule.*

Ceylon—Radio SEAC, 15.23, is heard on West Coast with weak signal around 0900; 15.12, in parallel, is much stronger. (Baxter)

The 15.120 outlet has excellent signal in the East on Sundays, 1230-1430, during the special beam to the United Kingdom.

China—XGOY, Chungking, recently replaced 15.170 with 1.913 in the North American beam, 0745-0835, and in the beam to Europe at 0845-1045; 7.152 is still announced as in parallel. News at 0800 (relayed from XGOA, Nanking), 0900, 1000. XGOY's 9.663 outlet has an improved signal here in the East in the China-South East Asia beam, 0535-0735, news at 0600. The 11.913 beam to America, 0745-0835, has terrific CWQRM and it may be that XGOY will move shortly to the 49-m. band, (approximately 6.145) where it was heard last winter. It is also likely that soon transmissions will be one hour later than the schedule just given; this also applies to times of English newscasts. Other Chinese outlets may be similarly affected.

XORA, 11.725, Shanghai, has English hours at 0400-0500, news at 0430.

Canton's 11.65 outlet carries news (relayed from XGOA, Nanking) at 0800.

XGIO, approximately 8.450, Shanghai, is reported heard irregularly, usually around 0830 with items at dictation speed; leaves the air normally around 0940.

XMAG, 4.275, Nanking, is heard in New Zealand at 0600 with AFRS programs. (Gray)

Paul Dilg, Monrovia, California, informs us that recently XNCR, 7.495, one of the Communist-controlled stations, was heard at 0740 with news, and signing off at 0800. The outlet on about 6.070 gives a call of XGHT, which is the old Hatan call sign; this channel relays XNCR to 0800 and then continues to 0900. There is a third Communist-controlled relay outlet, XGNC, around 6.470 (varies), which also relays XNCR to 0800, then,



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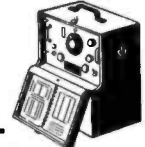
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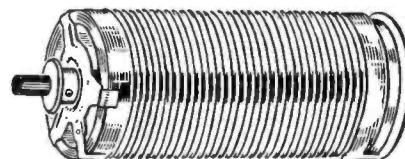
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• Oscilloscope Transformer. Jefferson. 2000v at 10 ma. Fully encased and shielded. Stand-off insulators on top. Upright type. Diagram included. Brand New. \$5.95 net. Cat. #A-103.
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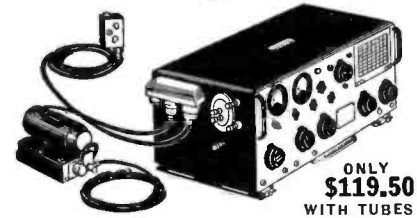
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100	25v	.48
12	50v	.34
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20	150v	.38
24	150v	.38
30	150v	.40
50	150v	.48
8	450v	.38
10	450v	.42
16	450v	.54
20	450v	.60
40	450v	.80
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16-16	150v	.50
20-20	150v	.52
30-30	150v	.60
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50-30	150v	.68
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10-10	450v	.74
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like XGHT, continues to 0900 close-down. XNCR drifts from 6.020 all the way to above 6.080.

Curacao, PJCI, 7.250, Willemstad, is fine level in Newfoundland, 1730-2000. (Peddle) Widely heard.

Czechoslovakia—Prague has revised schedules; news is at 1245 on 11.840, and at 1445 and 1645 on 9.553; the 9.553 transmitter closes at 1700 with announcement that Prague will be back on 15.35 to North America in *English* and *Czech* at 1800-1900. (Pearce) It is possible that by now the North American beam will have returned to time of 1900-2000, which was the schedule last winter.

Denmark—Danmarks Radio, Copenhagen, is scheduled over OZF, 9.520, 1145-1545; and over OZH, 15.165, 1100-1430; uses 6 kw. (Mattsson) OZH2, 15.320, Skamlebak, is heard Sundays 0700-0800 when VLC4 is off this frequency. (Legge via NNRC)

Dominican Republic—HI2T, 11.900, La Voz del Yuna, Ciudad Trujillo (formerly at Monsignor Nouel), is heard evenings in parallel with 7.275; bad QRM from CXA10, Uruguay, and CE1190, Chile. (Legge via NNRC)

Egypt—SUX, 7.863, Cairo, has a good to excellent signal with slight QRM in Newfoundland, 1515-1630 closedown. (Peddle)

Ethiopia—Addis Ababa's 19-m. outlet (approximately 15.057) has not been reported as heard lately. Formerly closed at 1500.

Finland—Helsinki's 15.190 and 9.505 outlets have news daily at 0715; poor signals in Britain; sign-off is 0725. (Harrison) Similar reception in Newfoundland. (Peddle) Also scheduled with news for 1925 but not reported as heard lately.

France—Paris appears to be using 11.7 to North America, 1915-2015, announced to have power of 100 kw. but in Florida it is not as strong as the parallel stations on 11.845, 9.55, 15.35. (Worris) Official schedules to North America are given as 1700-1715, 15.24, 15.35, 17.85; 1915-2015, 9.55, 11.845, 15.35.

French Indo-China—Radio Saigon is being heard in Sweden on 18.397 from 1030. (Nilsson) This transmission is beamed to France and is heard on West Coast; call is FZS, which is Saigon's phone station. (Dilg)

The 11.78 channel is again audible here in the East, evenings. Opens at 1830 with "La Marseillaise"; news is scheduled for 1945, and sign-off is around 2005. In latter part of transmission is buried usually by carrier from the U.S. outlet on 11.79. Parallel frequency is officially listed as 6.165.

English news periods of *Radio Saigon* are at 1945, 0500, 0900. (Kary) Final closedown for the day is at 1015. (Park)

Hanoi has replaced 9.645 with announced 6.048; gives call as "*Radio France in Hanoi*." News at 0700, off around 0755. (URDXC)

French Morocco—Rabat's 9.080 channel is heard on West Coast at

0145-0500. (Nankervis) Is also scheduled for around 1315-1905.

French West Africa—Radio Dakar, 11.715, is being heard in Eastern United States to around 1800 close-down. (Pelland) Widely heard with good level.

Germany—DTSP, 15.105, was heard at 0900 recently in a point-to-point broadcast; very good level. (Pelland)

AFN, 6.080, heard on West Coast signing on at 2300, heard as late as 1500 through bad CWQRM. (Nankervis) Full schedule believed to be 2200-1700; Hamburg, 6.115, runs 0000-1600; Leipzig, 9.73, 2200-1700; Berlin, 6.070, 2200-1700; Baden-Baden, 6.320, 2230-1730. (Short Wave Listener, London)

Iceland—Reykjavik, 12.235, is still used occasionally for special broadcasts from this country; if anyone picks up this one, reports may be addressed to Horst Egilson, Secretary, Ríkisutvarpid (Iceland State Broadcast Service), Reykjavik, Iceland. (Short Wave Listener, London)

India—AIR, Delhi, has replaced the 100 kw. station on 11.850 with 11.830, 10 kw., call is VUD4. AIR schedules remain primarily the same.

Iran—EPB, Radio Teheran, 15.100, is still being heard well in Eastern United States with news at 0715, then music and announcements to sign-off at 0730. (Pelland) *EQB*, 6.155, is scheduled 2230-2315, 0930-1400. (Short Wave Listener, London) *Tabriz*, 12.180, is heard in Britain around 1240 to 1300 closedown with military march; uses some western recordings. (Pearce)

Iraq—HNF, 6.780, Baghdad, reported at 1330 with Arabic music. (Short Wave Listener, London) Is heard in Britain at 1530 with Eastern type programs; has time signals on hour and half hour; fair strength. (Harrison)

Ireland—Radio Eirrean, 9.595, is good level in Newfoundland with news 1610-1630. (Peddle)

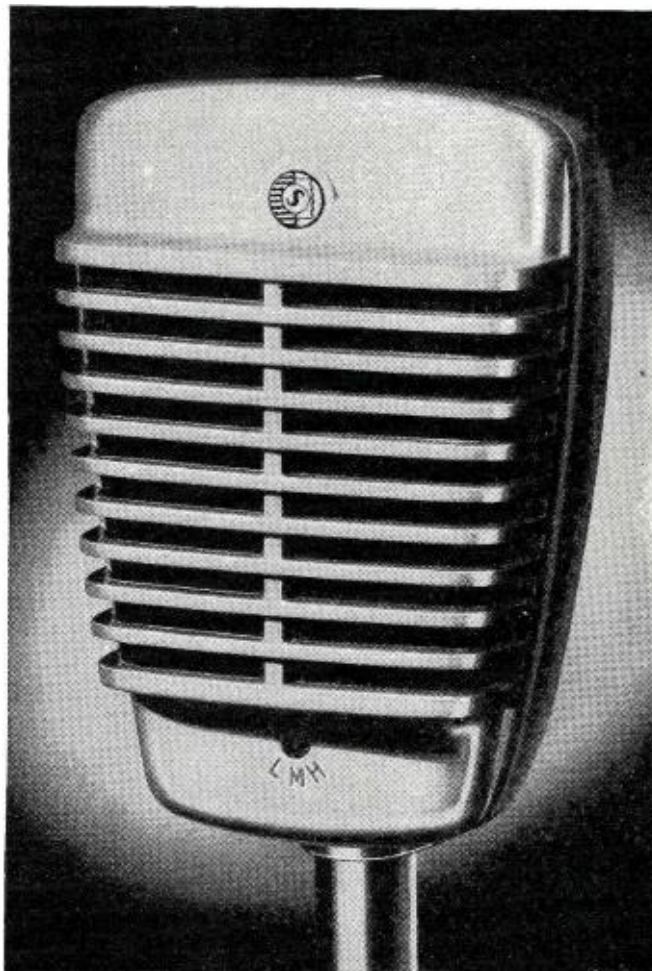
Italy—Radio Italiana has replaced 9.63 with 15.120 in the North American daily transmission 1910-1940, news at 1930; fair to good signals; 11.81 is announced in parallel; the 15.12 transmitter appears to be on the air (in Italian) at least an hour prior to beginning North American program; on Mondays at 1910 presents a request musical program for U.S. listeners. Gives QRA as Italian Broadcasting System, ROI, Rome, Italy. (Worris) Transmitter may be at Milan.

Jamaica—ZQI, 3.48, has good signals in Pennsylvania to nightly sign-off at 2200; has local and world news at 2100. (Glenn) Signs on at 1930. The 4.950 outlet is scheduled 1600-1730, with world news at 1715.

Japan—WLKS, Kure, the British Occupation Forces' Station, has moved to 6.065; relays news from *Radio Australia* at 0400. (Gray) Schedule is 1630-0830, Saturday to 0900. (URDXC)

The AFRS outlet in Tokyo on 6.015 is again being heard here in the East,
December, 1947

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fair to good around 0600-0700; sometimes announces Tokyo-Yokohama.

JKG, 9.695, carries sports events (in Japanese) irregularly around 2200-0230, not daily.

Java—PMW is a new outlet for Radio Batavia heard on 17.630 beaming to Middle and/or Near East from 1200-1245 in English and Arabic; news at start. The "Voice of Free Indonesia," 11.001, has news at 1200. (Nilsson) PMW is heard on West Coast. (Dilg)

The Indonesian news agency, Antara, broadcasts daily by "CQ" call around 8 megacycles, giving the latest news of the Far East. (Miers) Schedule was not given.

Radio Raja Indonesia is now on 9.355 from 9.405; scheduled 0930-1130; no English, only Indonesian dialects. (URDXC)

Korea—A new station in this country is reported as JBBK, Pyongyang, 4.400, Russian-controlled, scheduled 0300-0800. (URDXC)

Lebanon—Radio Beirut, 8.036, is heard in Sweden signing off in French at 1600. (Nilsson) Also heard in Newfoundland, good signal but some CWQRM. (Puddle)

Luxembourg—Radio Luxembourg's 6.090 channel was recently heard in French in Rhode Island at 0020, very good signal. (Pelland) The 9.525 outlet has been heard on West Coast, testing around 0040-0100. (Nankervis) Also has been testing on 15.350.

Malaya—In a letter to Paul Kary, Pennsylvania, the British Far Eastern Broadcasting Service, P.O. Box No. 434, Singapore, Malaya, advises that Radio Malaya was the original BMA radio. "We shared studios for a short time from December 1945 to February 1946, but we are an entirely separate organization with our own studios and transmitters now. Radio Malaya serves the local population of Malaya, and B.F.E.B.S. broadcasts on short-waves only to non-British territories in South East Asia, outside Malaya, so our angle of program approach differs. We relay many BBC programs from London" Schedules give the Orange Network on 11.735, 6.77, daily, 0030-0130, 0300-1200, news at 0100, 0400, 0645, 0900 (Radio Newsreel), 0915, 1100, 1145; the Purple Network on 15.30 and 9.69, daily, same schedule. English portions on both networks are identical. Program summary is carried by both networks at 0330 on Wednesday, Thursday, Friday. The 9.69 channel is experimental and is subject to change.

Monaco—Radio Monte Carlo, 6.130, is heard in Britain with some fading around 0230; has man and woman announcers. (Pearce) This outlet was supposed to increase power in July but so far it would appear this has not been effected.

New Caledonia—Radio Noumea has returned to its old frequency of 6.208 from 6.160; closes down at 0500. (Cushen)

New Guinea—Biak, 7.200, Dutch New Guinea, signs off at 0630 with

Gasoline driven 110V. 60 Cycle AC Generators. You'll never see another bargain like this. 2500 Watts, 115 v. 60 cycle, New \$250. Slightly used \$200. Briggs and Stratton Engines. 1000 Watts, 115 v. 60 cycle, New \$175. Briggs and Stratton Engines.

600 Watts, 115 v. 60 cycle, New \$85. Slightly used, \$50.00. Wisconsin Engine.

Trylon steel ladder towers, 50 foot, new, complete with mounting base guy wire and insulators, hardware, wrenches, rope (320 ft.), gin pole and instructions, everything but the labor. \$100.00 each. Four \$75.00 each. In 3 wood boxes, 550 lbs.

Tuning control knob for SCR-274N and ARC-5 radio receivers, BC-946, BC-453, BC-454, BC-455 and Navy versions. Also contained in this kit are Allen wrench, Phillips Head screw driver and a metal tube puller for removing those hard-to-get-at tubes. Priced at \$1.00 a kit, 3 kits for \$2.00. Postage paid.

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GLENDALE CALIFORNIA

"A Perfect Day" Sign-on is 0500. Uses both Dutch and *English*, many American recordings. Speech modulation is poor. (Gray)

New Zealand—Frequencies allocated to New Zealand's National Broadcasting Service are 6.080, 9.540, 11.780, 15.280. The service should get under way by some time this month. Already tests have been heard irregularly.
(Continued on page 190)

Voice Controlled Relays

(Continued from page 57)

and switchless break-in operation is maintained. The gain control R_6 is adjusted to permit positive operation of the relay without maintaining high enough gain so that any extraneous noises actuate the control circuit. In radio-telephone operation it is desirable to keep the gain as low as possible and talk closely into the mike in a normal voice, to prevent the receiver loudspeaker as well as other sounds from automatically throwing the transmitter on the air. Placing two or more sensitive relays in series will permit the unit to perform a multiplicity of operations.

Utilizing a voice controlled relay in conjunction with a transmitter increases the over-all percentage of efficiency. For, when there are pauses or short silent periods, the equipment is placed in power-saving "standby" until the instant that modulation recommences.

The "master control" switch in Fig. 3 is a five-position, three-pole affair and serves the following purposes:

Position 1 disconnects the a.c. line and the entire unit is off.

Position 2 connects the a.c. line to the unit, turning the heaters of all tubes on, while keeping the high voltage off the unit. Position 2 also shorts R_{10} and C_{10} , the time delay constants. This is the standby position, when the transmitter is to remain in "standby" for long periods.

Position 3 is the full automatic voice control. The heaters are on, the high voltage is applied, the time constants are in normal and the bias is correct for V_1 . Ready to operate.

Position 4 removes the major portion of the bias from V_1 by shorting the potentiometer R_{11} . This keeps the relay closed and independent of audio input to V_1 . This is for adjustment, for maintenance, or for the use of the unit as a preamplifier without relay control.

Position 5 grounds the grid of V_2 , keeping audio from actuating the relay. A key inserted in the jack provided for the purpose shorts the bias control and operates the sensitive relay as an ordinary keying relay for c.w. operation. Another set of contacts can be added to the switch making it a four-pole, five-position affair, and the extra set of contacts can be used to disconnect the power from the final modulators while in the 5th or c.w. position.

December, 1947

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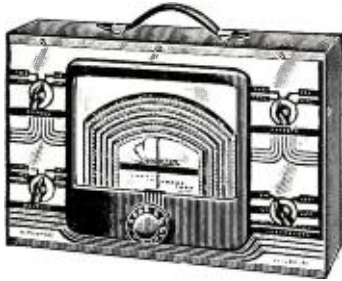
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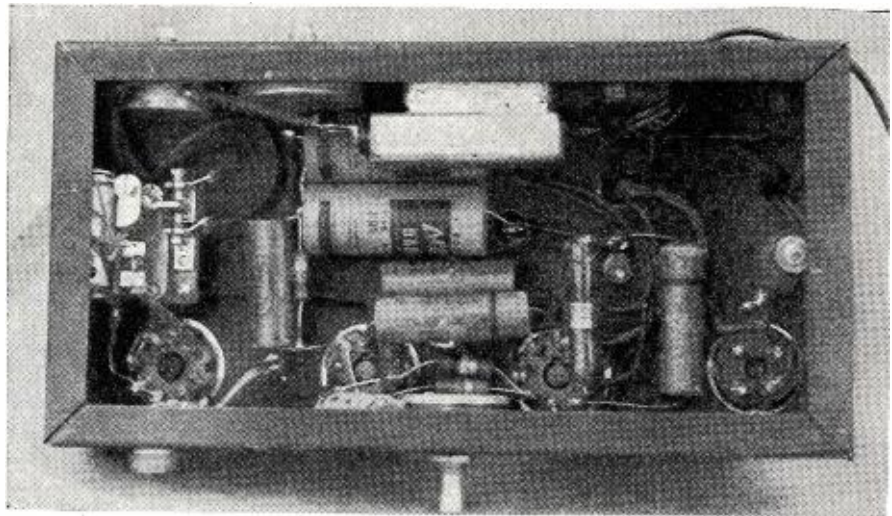
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Under chassis view of the voice controlled relay unit. This particular piece of equipment was used to drive a paging system. Schematic diagram is shown in Fig. 2.

The relay contacts, in transmitter control operation, are perhaps best connected in the exciter circuit to permit complete and instantaneous break-in operation with a minimum of mechanical operations.

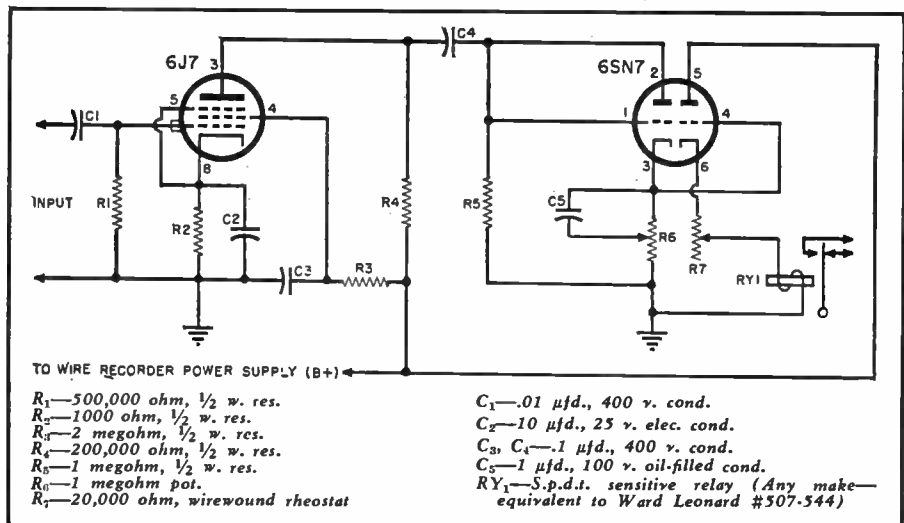
An interesting unit is diagrammed in Fig. 4. This unit is now under construction and installation. It is to be installed in a wire recorder. The relay contacts will be used to start the wire motor and automatically turn it on and off as the voice operates it. In the office it can be used by an official as a dictating machine. The recorder is placed in the "record" position and concealed in some convenient corner or closet. The microphone is plugged in as it would normally be and all the user has to do is pick up the microphone and start talking. This starts the motor pulling the wire. The time delay constants will keep the motor running for as long as desired after the dictation is stopped. Experiment has shown that a four second delay is adequate for dictation. No switches for the busy executive to bother about. Everything is automatic. No discs to

replace. Then at the end of the day, the secretary rewinds and plays back the wire recorder. The machine is used as it would normally be used without the addition of the automatic voice controlled relay unit. The measurements of this unit will be small enough to permit it to be easily fitted inside the wire recorder case. It uses a 6J7 pentode amplifier and a 6SN7 rectifier and relay control tube. The power is taken right off the wire recorder supply. The grid of the 6J7 is connected through a coupling condenser to the plate of the output tube of the recorder amplifier.

There are many uses suggested by the unit. The relay can be made to operate a counting device or a stepping relay. Being a sound-operated device it can be made to operate an alarm circuit when a pre-determined audio level is reached. This is designed for the ham, the experimenter, the serviceman, the public address system, the engineer, the laboratory, the office, the production plant, or for the gadgeteer. It can be a necessity or it can be a toy.

—30—

Fig. 4. Schematic diagram of unit that is now under construction. It is the author's intention that this piece of equipment control the operation of a wire recorder.



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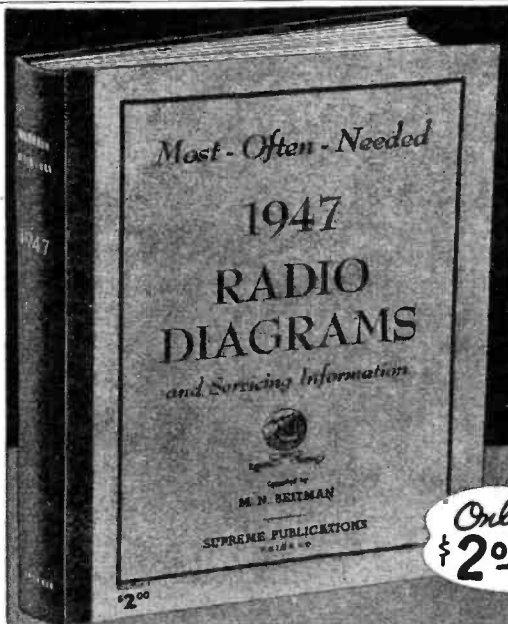
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Technical BOOKS

"TELEVISION RECEIVER CONSTRUCTION" by Arthur Liebscher. Published by the author. 47 pages. Price \$1.50.

In this "how-to-do-it" book, the author has broken down the constructional process into 243 well-defined steps, beginning with the sorting and labelling of components to the installation of the last tube and turning on the television receiver.

Each series of steps is pictured so that non-technically trained persons who might have difficulty reading a schematic diagram can construct this television set without assistance.

The first chapter is devoted to a brief resumé of how television works. The discussion is non-technical and should prove of interest to the layman. A second chapter is devoted to the precautions which must be taken by the constructor in handling the high voltages present in a television receiver. The necessary tools and instruments are listed and explained in a separate chapter while a complete parts list including quantity, type, suppliers, and descriptions of the components is given in Chapter 4.

Details on inspection test and alignment, operation of the receiver, troubleshooting, antenna construction, and a glossary of television terms completes the text.

The receiver described in this book is the same unit described in Mr. Liebscher's article "Learn as You Build—Television" appearing on page 39 of the September issue of RADIO NEWS.

The material is clearly presented and no difficulties should be encountered by the constructor who follows instructions "to the letter." The lavish use of photographs and sketches further clarifies the presentation.

"PRINCIPLES OF ELECTRICAL ENGINEERING" by T. F. Wall. Published by Chemical Publishing Co., Inc., Brooklyn, New York. 554 pages. Price \$8.50.

This text is a comprehensive study of the basic principles of electrical engineering. The author has presented the subject in an orderly and well-thought out progression which starts with a thorough discussion of the basic technical units used in electrical engineering. A complete discussion of absolute units, the M.K.S. system, and the rationalized system is included.

Latest data on synthetic insulation materials, as applied to high-frequency applications, should be of particular interest to the radio engineer. One chapter is devoted to the principles of propagation, through space, of electromagnetic waves, with particular reference to the method of calculating energy relationships of receiving and transmitting antennas.

One valuable addition to the book

RADIO NEWS

is a Bessel functions table in a simplified, easy-to-use form.

Ordinarily we would not recommend this book as a home-study text, but because of the clarity of presentation there is no reason why a student with a *thorough* background in mathematics shouldn't derive much benefit from a serious and careful study of this material.

A series of test examples covering each chapter are included in the book and those using the text can easily check their grasp of the subject by solving the problems related to the subject matter.

A rather comprehensive appendix has been provided and covers certain mathematical relationships, hyperbolic function tables, skin effect, and physical constants.

* * *

"ELECTRICAL ENGINEERING—PROBLEMS AND THEIR SOLUTIONS" by T. F. Wall. Published by *Chemical Publishing Co., Inc.*, Brooklyn, New York. 307 pages. Price \$5.00.

In this companion volume to "*Principles of Electrical Engineering*" the author has extended the subject by a practical discussion of actual engineering problems and how they may best be solved.

A detailed, step-by-step description of problems covering the whole field of applied electricity and magnetism has been presented and then the author has carefully laid the foundation for the correct solution of the individual problem.

Each chapter contains a series of problems which might be encountered by the electrical engineer. Directly following each of these problems is a complete technical solution to the problem including the necessary formulas, mathematics and test procedures to be followed.

The structure of the book follows closely the companion volume and the two texts should be used together to provide maximum coverage and comprehension of the subject under discussion.

Like the book, "*Principles of Electrical Engineering*," the student studying independently will require a good working background of mathematics before tackling this text.

-50-

SERVICE GROUPS

LAST month we published a fairly comprehensive list of radio servicemen's associations in the United States, Canada, and Scotland.

The names and officers of three additional organizations have been furnished this office. Please add these names to your listings.

Radio Servicemen's Assn. of Luzerne County; E. L. Manual, Sec'y., 183 Bradford Street, Wilkes-Barre, Pa.

Radio Servicemen's Assn. of Salisbury; Harry Cohen, 219 Highland Avenue, Salisbury, Md.

Detroit Radio Servicemen's Assn.; Mr. Buchart, 12019 Hamilton, Detroit, Mich.

We will welcome additions and corrections for these listings at any time.

December, 1947

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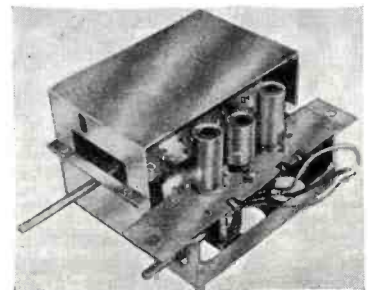
ALL TRANSVISION KITS ARE COMPLETE—Nothing more to buy! . . . All Transvision Television Kits are **COMPLETE** with all tubes, including picture tube, wired and pre-tuned RF units and IF's, high gain folded di-pole antenna with 60 ft. lead-in cable, wire and solder.

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12" Table Model Cabinet. . . . **LIST \$44.50**
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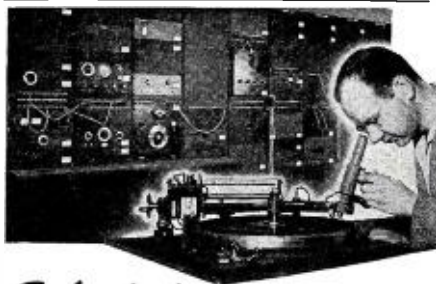
Table model cabinet in walnut finish for 12" model. . . . **\$44⁹⁵**

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Readers are asked to write directly to the manufacturer for the literature. By mentioning RADIO NEWS, the issue and page, and enclosing the proper amount, when indicated, delay will be prevented.

MARINE RADAR BOOKLET

Installation views of radar equipment and actual radar scope photographs taken at strategic points in Chesapeake Bay, the Great Lakes, and the Neches River near Port Arthur, Texas are included in a new booklet on marine radar just issued by *Westinghouse Electric Corporation*.

The booklet explains how radar enables the navigator to see through "blind" weather, at distances from 100 yards to 32 miles. Sketches show how two developments, the two degree beam and the .3 microsecond pulse of the transmitted radar signal, improve bearings and range resolution.

Copies of booklet B-3845-A may be secured from the *Westinghouse Electric Corporation*, P.O. Box 868, Pittsburgh 30, Pennsylvania.

CATALOGUE SHEET

Telegraph Apparatus Co. of Chicago is now offering a new catalogue sheet describing the company's line of plugs, jacks, connectors, prods, and clips.

Complete specification and prices for these units is given.

A copy of the catalogue sheet, along with the newly revised price list, will be forwarded upon request to *Telegraph Apparatus Co.*, 412 South Green Street, Chicago 7, Illinois.

SHEET MICA PRODUCTS

A new price list and discount sheet covering compressed sheet mica products has just been released by *The Macallen Company* of Boston.

Included in the listing are India plate, amber plate, flexible plate, mica paper, mica cloth, mica and fish paper, mica and rope paper, mica and cellophane, India heater plate, amber heater plate, mica and fiberglass combinations, mica tape, mica fiberglass tape, mica tubing, mica V rings, and mica commutator rings.

A copy of this new listing is available from *The Macallen Company*, 16 Macallen Street, Boston, Massachusetts.

SPEAKER CATALOGUE

The company's complete line of loudspeakers is illustrated and described in the new catalogue, No. 1010, recently issued by *Jensen Manufacturing Company* of Chicago.

The 24-page catalogue, which contains useful information and data, is arranged by groups to facilitate reference. Included in the listing are the company's Standard Series, Concert Series, Extended Range Single-Radiator Series, Coaxial Series, Bass Reflex

Reproducers and Cabinets, and the Professional Series.

Three pages of the catalogue are devoted to a listing of impedance matching transformers in both fixed and adjustable impedance designs. A comparison chart has been included showing all *Jensen* models in their relative gap energy levels. Each band of gap energy is separated from the next by 1.5 db.

Copies of *Jensen* catalogue No. 1010 are obtainable from any company distributor or from *Jensen Manufacturing Company*, 6601 S. Laramie Avenue, Chicago 38, Illinois.

REFERENCE CHART

A handy, vest pocket reference chart containing special sales features for the complete *Stromberg-Carlson* radio line is now available to authorized dealers for use by their floor salesmen.

Features of each set in the line are listed, along with selling points for freshman salesmen.

Copies of this chart may be secured from *Stromberg-Carlson* distributors.

RADIO KITS

Eagle Electronics, Inc. of Irvington, New York, have published a new bulletin covering their line of "Pict-O-Graph" radio kits.

Included in the bulletin is information about the company's 1, 2, 3, and 4-tube a.c.-d.c. regenerative receivers, two 5-tube superheterodynes, a 4-tube t.r.f. receiver, a code practice audio oscillator, 3-tube and 4-tube amplifiers, wireless phono oscillator, crystal radio, and v.t.v.m.

A special constructional technique has been incorporated in the instruction manuals which accompany each kit.

A copy of this bulletin may be secured by writing *Eagle Electronics, Inc.*, Irvington, New York.

A.S.A. PRICE LIST

American Standards Association has issued a new price list covering available standards on civil engineering and construction, mechanical engineering, electrical engineering, automotive, transportation, ferrous materials and metallurgy, non-ferrous materials and metallurgy, rubber, etc.

This new listing is available free of charge from *American Standards Association*, 70 East 45th Street, New York 17, New York.

IRC DISPLAY

International Resistance Company of Philadelphia has developed a novel

RADIO NEWS

and colorful display piece for the merchandising of their volume control cabinets and resistor assortment kits.

The display is specially designed for adaptability to most space requirements on the counter or in the window. It is constructed in three sections which are easily erected and can be used individually or as a unit.

Displays are available to *International Resistance Company's* distributors who should contact the company at 401 North Broad Street, Philadelphia 8, Pa.

SALES AID FOLDER

A new sales aid folder, illustrating and describing the complete line of promotional pieces and displays prepared for the radio dealer and serviceman, has just been issued by the *RCA Tube Department*.

This handy catalogue, from which the radio dealer and serviceman can select store display material or mailing pieces, or otherwise plan a complete business getting program, describes 32 separate items ranging from counter to window displays to mats for newspaper advertising.

The folder is available free of charge from *RCA* distributors.

CRYSTAL DATA

Technical data covering twelve widely used crystal types is given in the new Bulletin No. 201 just issued by *Premier Crystal Laboratories, Inc.*

This four-page bulletin is profusely illustrated with photographs and drawings and includes specifications of crystal characteristics, frequency ranges, construction features, and physical dimensions. Information on supersonic crystal blanks and hints on ordering are also given.

Bulletin No. 201 may be secured by writing *Premier Crystal Laboratories, Inc.*, 57-67 Park Row, New York 7, New York.

SPECIALIZED EQUIPMENT

Of particular interest to manufacturers, testing and research laboratories is the new 43-page booklet "Specialized Testing and Measuring Equipment Catalogue" just issued by the *Apparatus Department of General Electric Company*.

The contents of the catalogue have been broken down into eleven sections with each individual section being devoted to a particular type of equipment. Covered are magnetic equipment; time, speed, and torque measuring equipment; force, strain, and thickness gauges; color, light, and spectro equipment; chemical analysis equipment; resistance and insulation testing equipment; materials testing equipment; vibration, sound, and balancing equipment; vacuum and pressure measuring units; electric circuit testing devices; and miscellaneous test units.

Applications for copies of this catalogue should be made to the *Apparatus Department, General Electric Company*, Schenectady, N. Y. —50—

December, 1947

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your **hallicrafters**

headquarters

COMPLETE STOCKS

Henry has everything in the ham field



S-38 Biggest little buy on the market. Frequency range: 540 kc to 32 Mc in 4 bands. Separate electrical bandspread dial. CW pitch control adjustable from front panel, automatic noise limiter. Self-contained PM dynamic speaker **\$47.50**

QUICK DELIVERY

Shipments 4 hours after receipt of order



SX-43 Hottest ham performance ever at this price. All essential ham frequencies from 540 kc to 108 Mc. In the band of 44 to 55 Mc, wide band FM or narrow band AM, just right for narrow band FM reception is **\$169.50**



SX-42 Greatest continuous frequency coverage of any communications receiver—from 540 kc to 110 Mc. Six bands; AM, FM, CW. Combines in one superb unit a top-flight standard and VHF communications receiver; standard short wave and FM broadcast receiver. Finest Hallicrafters equipment **\$275.00**

TRADE-INS

You can't beat Bob Henry for trade-ins. Write, wire or phone today about your equipment and Bob Henry will make you a better offer than you can get anywhere else.

TIME PAYMENTS

Because Bob Henry finances the terms himself you get a better break. Save time and money, deal with Bob Henry on his personal, profitable time payment plan.

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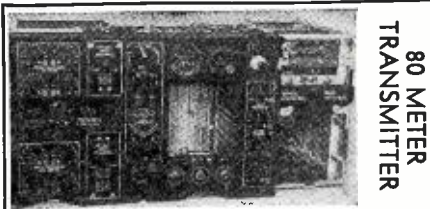
HENRY RADIO STORES

11240 Olympic Blvd
LOS ANGELES 25
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"World's Largest Distributor of Short Wave Receivers"

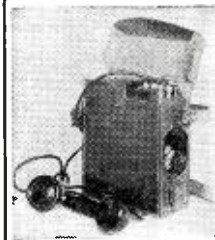
NEW MINIATURE, SUPER POWERED FILAMENT POWER SUPPLY

BY BOB GUNDERSON, W2JJO



80 METER TRANSMITTER

Type BC-653-A, 2 to 4.5 Mc, 100 watts cw, 22 1/2 watts phone. Tubes include 1613 MO, 807 buffer, two 814's in parallel for PA, 1613 modulator. Gov't cost \$1227. Your last chance to get this fine set at such a ridiculous price. BRAND NEW w/tubes & diagram, less dynamotor...\$29.00; w/o tubes...\$15.00

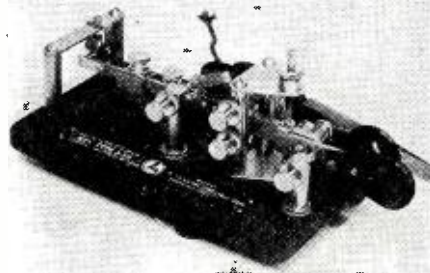


PORTABLE FIELD TELEPHONE EE-8

With handset, generator, ringer, etc., in leather or heavy web case (please do not specify). Requires 2 flashlight cells. Fine for garage extension, farm phones, warehouses, etc. For local or common battery lines.

TUBES: 6BB-40c; 6HG-35c; 884-55c. NEW, in orig. cartons.
NEW, ea. . . . \$15.95
two for . . . \$31.00
GOOD USED. . . \$9.95
ea., two for \$19.00
USED, FAIR. . . \$6.95
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HIGH QUALITY SPEED KEY . . . \$5.85



MONEY-BACK GUARANTEE If you are not well pleased with this fine key made by Lionel on the pattern made famous by a well-known speed key mfr. Army J-36. BRAND NEW IN ORIGINAL BOXES, four for \$23; each . . . \$5.85
Very slightly used, perfect. . . . \$4.45

SPECIALS THIS MONTH (Dec. only)

ATTENUATOR, Daven T-800; "T" network: 10 steps 0.5 db per step, 50,000 ohms Z plus or minus 5%; Linear: shaft 1/4" x 15/16" . . . \$2.95

FM TRANSMITTER-RECEIVER



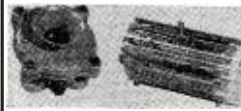
Allimeter type RT-7/APN-1, freq 418-462 Mc FM; with 14 tubes: 3-12SJ7, 4-12SH7, 2-12H6, 1-VR150, 2-855, 2-9004, 27V dyn, diag.; easily converted to communications; as shown, still a few left. BRAND NEW, \$8.88; or GOOD, USED. . . \$6.88

REMOTE CONTROL UNITS

RM-12 (left): good for commercial or amateur stations. Has handset, ringer, generator, Weston 301 (or equal v) db meter. Contains EE-8 phone. Used . . . \$11.95

RM-13: same as above but includes 115 V 60 cps power supply, one tube amplifier; w/2 tubes. Used . . . \$14.95

RM-29 (right): like EE-8 telephone but in metal case 6 1/2" x 5" includes generator, ringer, coil; no handset. Used. . . \$4.95



HORN - SQUAWKER, 115 V A.C., 5 1/2" x 3 1/2" x 4 1/2", weather-proof case, Navy type . . . \$4.85
LOADING COIL w/5 sliding taps, 35 turns #14 wire on P.C.C. form 3 1/2" x 4" . . . \$2.95

ATTENUATOR, Daven T-800; "T" Network: 10 steps 0.5 db per step, 50,000 ohms Z plus or minus 5%; Linear: shaft 1/4" x 15/16" . . . \$2.95

INVERTER, PP-68/U; input 6 or 12 VDC; output 115 V 60 cps, 15-50 watts; 8 1/2" x 8 1/2" x 9 1/2"; UN. USED, GOOD . . . \$12.95

TRANSFORMERS, Filament: #16 @ 16" . . . \$1.88

SCOPE, 4000 v rms @ 10 ma using 2X2, Jern. 1158 shielded . . . \$3.88

Postage extra. Minimum order \$2.00. FREE LIST. TERMS: Net cash, 25% deposit on C.O.D.'s.

ELECTRONIC SUPPLIES

317-R East 2nd St. Tulsa 3, Okla.

ONE of the outstanding battery developments is the new line of "Vitamite" miniature lightweight storage batteries. These batteries are secondary, or rechargeable, (lead acid) type cells. They are durable, leakproof, and non-spill as there is no free-flowing electrolyte within the batteries.

A photograph of the "Vitamite" Flyweight Battery, Model 2A0.45 is shown in Fig. 1. This battery weighs one ounce, measures 9/16" x 7/8" x 1 13/16" and delivers an open circuit voltage of 2.2 volts, with short circuit current of better than 10 amperes. When fully charged, the battery can deliver in excess of 250 ma. for approximately 1.5 hours. At a discharge rate of 200 ma., the battery will run in excess of two hours to an end voltage of 1.7 volts, with corresponding increases in life at 100, 60, and 50 ma.

For the amateur, this 2 volt cell lends itself nicely to small battery-powered transmitters and receivers using miniature and subminiature tubes, to field strength meters, to heterodyne monitors, etc. Tubes having two volt filaments, such as the 19, 30, 31, 32, 33, 34, 1B5, 1F5, 1J5, 1J6, etc. are quite satisfactory types for use in numerous kinds of equipment. Tubes in the 1.4 volt classification such as types 1A7, 1N5, 1H5, 1C5, 1Q5, 1A5, 1T5, 3Q4, 3Q5, 3S4, 1S4, 1S5, 1T4, 1R5, and many others may be used, with appropriate values of dropping resistance. Incidentally, the writer has used this dropping resistor as a means of providing "C" bias voltage for equipment. The 1.4 volt filament type acorn tubes, such as the 957, 958 and 959 are also applicable for amateur and experimental applications.

In addition, the new subminiature line of tubes introduced a short time ago, will meet many of these applications. A list of the most popular of these tubes is given below, and operating data can be obtained from tube manuals. The design of circuits with which such tubes can be used may be left to the amateur himself.

CK502AX, CK503AX, CK505AX, CK506AX, CK507AX, CK510AX, CK512AX, CK518AX, CK520AX, CK521AX, CK522AX, CK556AX, CK568AX, CK569AX, 2E31, 2E32, 2E35, 2E36, 2E41, 2E42, 2G21, 2G22.

The "Vitamite" Bantamweight Battery, Model 4A0.90, delivers 4.4 volts, open circuit, and has two lead acid cells, each twice the size of the Flyweight series. The battery measures 1 3/16" x 3 3/16" x 1 7/16", and weighs 4 1/2 ounces. A pair of floats built within the battery provide a means for visually checking the condition of the battery at all times. At a discharge current of 250 ma., the battery will supply this current for 3.5 hours, to an end voltage of 1.7 volts per cell (3.4 volts). This unit can well serve in the above mentioned circuits and in test equipment such as the common multimeter.

Owners of the Flyweight or Bantamweight Batteries may purchase ready-made charging equipment. However, a

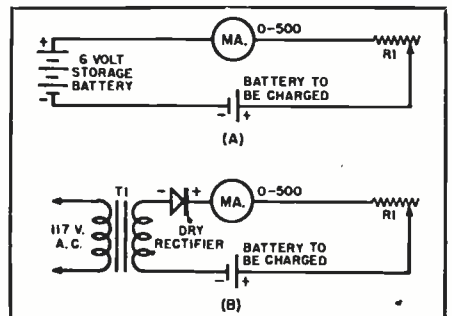


Fig. 1.

variety of methods for charging these batteries is possible. The simplest method is to charge these batteries from the standard automobile battery, as shown in Fig. 2A. The series resistor R₁ may be a fixed or variable resistor, or may be made up with one or more pilot lamps, depending upon the type of bulb available in the amateur's "junk box." The charging rate for the Flyweight should not exceed 140 ma., and at this current rate, the charging time is from eight to ten hours. The charging current for the Bantamweight should not exceed 250 ma., with the same charging time. Lower charging currents result in less gassing and, therefore, distilled water need not be added as often. Also a lower charging rate results in a more uniform chemical action, which gives longer battery life.

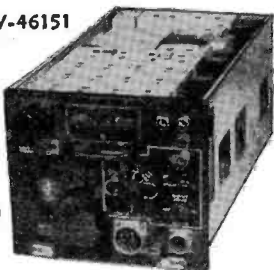
The most satisfactory method for charging these batteries, however, is illustrated in Fig. 2B. The transformer is a common six-volt filament transformer which can deliver at least .5 amperes. The rectifier can be either copper oxide or selenium oxide. In this particular charger the rectifier is a single selenium plate. The value of the series resistor will depend upon the type of battery, together with the particular type of rectifier, and the value of the line voltage.

Fig. 2.



**NAVY-CRV-46151
AIRCRAFT
RADIO
RECEIVER**

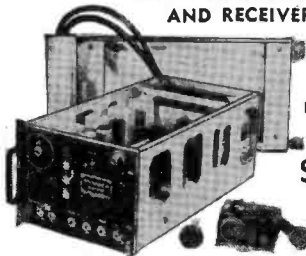
INCLUDING
CASE
\$16 50



Four bands, including broadcast (195-9,050 KC). Circuit is six-tube superheterodyne with mechanical band change or remote operated electrical band change. Remote band change and tuning controls included, making this set readily adaptable to mobile ham use. Powered from self-contained 24 V. DC dynamotor.

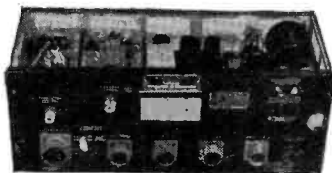
The sets are complete with tubes, mounting rack and remote controls. No cables.

**ARC-4 TRANSMITTER
AND RECEIVER**



INCLUDING
CASE
\$19 75

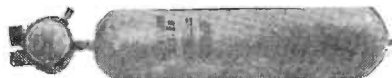
Operates on any of its 4 predetermined crystal controlled frequencies in the range of 140 MC. Complete with tubes, remote control, junction box, shock mounting base and connecting plugs. This unit is ideal for amateur UHF or mobile telephone. Operates from self-contained 24 V. DC dynamotor. 12 V. available upon request.



RADIO ALTIMETER APN/1

A complete 460 mc. radio receiver and transmitter which can be converted for ham or commercial use. Tubes used and included: 4-12SH7, 3-12SJ7, 2-6H6 1-VR150, 2-955, 2-9004. Other components such as relays, 24 V. dynamotor, transformers, pots, condensers, etc., make this a buy on which you can not go wrong. Complete as shown in aluminum case 18"x7"x7 1/4".

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OXYGEN TANKS

These oxygen tanks, removed from surplus aircraft, have a capacity of 500 lbs. pressure. Type D2, with complete regulator assembly. Size of tank 22"x5".

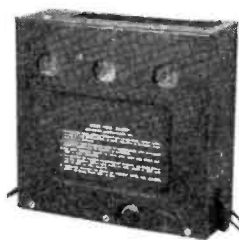
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**NEW WILLARD RECHARGEABLE
STORAGE BATTERY**



New 6 Volt battery in spill-proof clear plastic case, housed in metal case for easy mounting. Applicable for a wide range of uses where battery power is needed. Shipped dry. Uses standard battery electrolyte available everywhere

Price, each.....\$4.00
In lots of ten, each.....\$3.35
Without metal case, each.....\$3.00
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**Brand New SCR-625
MINE DETECTOR**

**ATTENTION, PROSPECTORS, MINERS,
OIL COMPANIES, PLUMBERS, ETC.**

Metallic Objects Only

Used by the Army to detect buried metallic mines. Its private use suggests the location of underground or underwater pipes, cables and ore-bearing rock, the location of metallic fragments in scrap materials, logs, etc., and the screening of personnel in plants for carrying of metallic objects.

New, complete in original overseas packing container. Originally sold by War Assets for \$166.00. The U. S. Forestry Service has recommended procedure for using the SCR-625 Mine Detector to find concealed metal in tree logs and other timber products.

\$55 00



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Under the personal direction of Frank Melville, former Airlines, Merchant Marine, and Broadcast technician, you may soon qualify as:

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- RADIO AMATEUR
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- TELEVISION TECHNICIAN
- HOME RECEIVER REPAIRMAN
- VISUAL TELEGRAPH OPR. (SLIP TAPE)

MELVILLE RADIO INSTITUTE believes vocational training means vocational training. Thus we, like many radio schools, teach ample theory. But, unlike most schools, two-thirds of our technical students' time is spent in laboratories and shops, where, with superior equipment, they learn by doing — not memorizing.

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We cannot replace this instrument at this price. Therefore, it's first come, first served. Please send check or money order. C.O.D.'s filled only if deposit of \$5.00 accompanies order.

REG. PRICE
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\$29.95



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ELECTRONIC VOLTMETER
OHMMETER

A special "buy" makes this offer possible. This famous meter gives constant accuracy and guaranteed performance. Stable bridge circuit type. Hand calibration. Acid etched panel. 500 micro-amp Simpson meter. Reversal switch for positive or negative indication. Resistor in DC probe permits read-

ings in signal carrying circuits. Meter Ranges DC 0-3; 0-30; 0-150; 0-300; 0-600. AC 0-3; 0-30; 0-150; 0-300. Ohms 0-1000; 0-10M; 0-100M; 0-1 Meg.; 0-100 Meg. In original cartons. 1 pair test leads and 1 DC probe included. Complete instructions and diagram.

RADIO DISTRIBUTING COMPANY

140 SOUTH SECOND STREET • HARRISBURG • PENNA.

USE A KILOVOLTER HIGH VOLTAGE POWER SUPPLY for TELEVISION

Model 6
4000-6000 VOLTS D.C.
FILTERED & SHIELDED
* IT'S SAFE. No 60 cycle a.c. means no dangerous high capacity condensers.

- * Does a PERFECT JOB with the 7GP4; the new, brighter 7JP4; the just out 10" electrostatic tubes.
- * GUARANTEED 3 months.

* ECONOMICAL. Compare cost of transformer, filter condensers, rectifier and insulation.

\$17.95

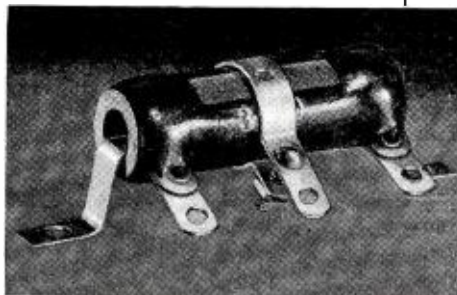
C-B MFG. CO., 412 W. 37 St., N. Y. 18, N. Y.

Experimental Work? Development and Design?

Eliminate Your Resistance Guesswork with LECTROHM ADJUSTABLE RESISTORS

They're ideal for unknown or variable resistances . . . as potentiometers and voltage dividers. Durable vitreous enamel coating . . . accurately spaced winding of low temperature coefficient resistance wire . . . low loss ceramic cores . . . silver soldered connections—these are quality features built into every Lectrohm Adjustable Resistor.

Complete range of carefully rated styles from 1 to 100,000 ohms and from 10 to 200 watts. One adjusting lug supplied with each resistor. All standard sizes and ratings available for immediate delivery.



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INCORPORATED

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Division of National Lock Washer Co.
Newark, N. J.

Write for
Lectrohm
Catalog
—It's Yours.



Television Tubes (Continued from page 42)

revealed in 1932 by Bernard Schmidt, a research assistant in a German laboratory. At that time astronomical photography was unsatisfactory, due to spherical aberrations caused by the mirror used to reflect light from the stars and planets to the camera. By placing a "correcting lens" (corrector plate) between the mirror and the camera, Schmidt discovered that he obtained much clearer pictures. These plates, however, had to be ground by hand, and prior to the war there were only a few in existence because of the extreme difficulty of their manufacture. During the war, American scientists developed a new method for mass producing these "corrector plates" which were used in infrared viewing devices. Now, tens of thousands of these plates, embodying the same technique are being used for television reception. They are made by heating a flat piece of glass until it flows into the specially curved surface of a refractory on which the glass is placed. This mold is made of special composition that does not adhere to the glass and yet permits it to assume the desired curvature. One side of the glass is then ground and polished to a plane surface.

The mirror is aluminized in such a way that the reflectivity will be as high as possible. The problem of aluminizing large surfaces and producing an aluminum surface of the required durability was not simple, but it was solved.

Another contribution to the development of television receiving sets was the result of a war-time invention for producing glareless glass. This process makes possible the reception of clearer, sharper television pictures. The successful removal of light-consuming reflections from a television tube's glass face, which serves as the screen of a *direct-viewing* home television receiver, has been obtained through a new glare-removal technique which also produces images of greater clarity when applied to the optical system of the *projection* type. The technique was developed during the war to increase the efficiency of such military optical instruments as binoculars which gained over 60 per-cent in light transmission when reflections were reduced. Reflections are removed by directly coating the face of the television tube with a secret chemical composition. It is not necessary to disassemble the tube for the coating process or to apply the coating in the vacuum chambers used in earlier glare-removing techniques.

The coating improves the reception of television pictures by: (1) *Reducing reflections* in the glass face of the tube caused by light sources in the room housing the receiver; (2) *Reducing the intensity of false images*

caused by reflections from the outer surface of the image-producing fluorescent screen in the tube, thus increasing the sharpness of the images. (3) *Reducing light losses* from reflections, thus increasing the amount of light transmitted.

It is a tribute to glass craftsmen, machine designers, optical technicians, skilled operators, and electronic engineers that these relatively high temperatures, automatic operations, accurate optical amplification, and extreme electronic sensitivity can be used effectively in such narrow confines as the interior of television tubes—the iconoscope and the kinescope—an accomplishment which has been due to the efforts of these men of vision and skill working in close cooperation.

—50—

Traffic Transmitter

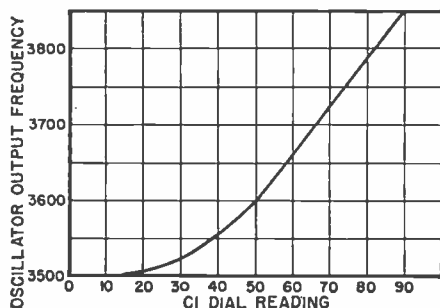
(Continued from page 47)

nearly as great as the output obtained when operating "straight through" on 80.

The tuning of the amplifier tank will be somewhat different from the usual, and the following procedure is recommended:

1. Disable the 807 by removing the plate cap and, with the key closed, resonate the oscillator plate tank by using a neon bulb or a pickup loop and a pilot lamp.
2. Set the output condenser C_{14} to maximum capacity, and replace the plate cap on the 807.
3. Apply all voltages by pressing the key, and rapidly rotate the condenser C_{12} until resonance is reached. This will be indicated by a sharp dip in the reading of the plate milliammeter.
4. If the meter reading attained in step 3 is less than 80 mils, which will probably be the case, slowly decrease the capacity of the condenser C_{14} , all the while maintaining the plate current at a minimum by rotating the condenser C_{13} in the opposite direction. It will be noted during this procedure that the "minimum" plate current will steadily increase. Continue this procedure until the indicated current is about 80 milliamperes.
5. Retouch the tuning of the condenser C_8 for *maximum* reading of the meter.

Fig. 2. Calibration curve.



December, 1947



Ken Sawyer

Maybe the Next Generation Will Just Love to Practice!

It's only a wild dream now, of course, but perhaps science will be able to do something about Youth's greatest burden—learning to play the piano.

Marvels *are* being accomplished by electronics. And wherever you find applied electronics—or electric circuits of any kind—*there* is a place for Cannon Plugs.

For Cannon Plugs make circuits flexible—easy to install, change, repair. Cannon Plugs make electric contacts positive and firm—disconnects quick and simple. See what Cannon Plugs can do for your equipment. Write for Cannon Condensed Catalog.

Here's a clever number, picked at random from the Cannon Catalog—a cord plug with socket insert and cable clamp, (Type AP-CG-15), to be had in 2 to 8 contacts. A removable cap makes it easy to install. Interesting? Why not learn the whole story? Send for the Type AP Bulletin showing the various standard fittings in this series.



CANNON ELECTRIC DEVELOPMENT COMPANY

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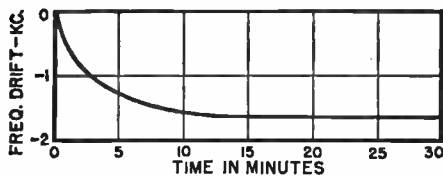


Fig. 3. Frequency drift vs. time. Curve shows that drift is negligible after the first five minutes of operation.

In tuning the condenser C_1 over the range of the 80 meter band it will be found that it will be necessary, in the average installation, to retouch only the condenser C_1 for minimum plate current at each desired output frequency. The tuning of the oscillator plate tank condenser C_1 is broad enough to permit the oscillator to "put out" over the entire band.

For forty meter operation it will be found that closing the switch S_2 and repeating the steps 2 to 5 will provide output at the desired frequency. In each case the use of an absorption wavemeter coupled to the output inductor is recommended in order to ensure that the output circuit is tuned to the desired band.

Upon completion, it was decided to make qualitative measurements of the amount of drift of the oscillator as it was allowed to run continuously. The resultant graph of drift vs. time is illustrated in Fig. 3, and it will be obvious that the drift is negligible after the first five minutes of operation.

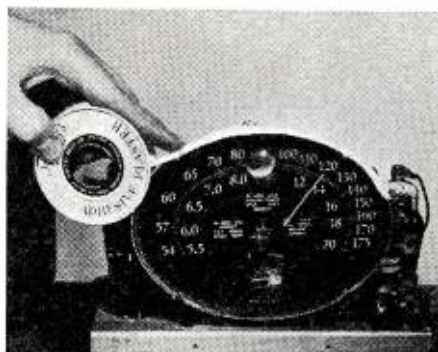
The operator will find that the transmitter described herein really is "what the doctor ordered" for traffic work, and will also find that this really flexible rig is hard to beat in contests and the like when the ability to QSY rapidly to the frequency of a calling station, and the snappy break-in permitted by the keyed oscillator really pays off.

The author wishes to express his thanks to W2TYU who offered many helpful criticisms of the output signal at various times during the development of preliminary models. —50—

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CERTAIN radios use a glass cover over the dial as in the case illustrated. The glass often becomes chipped under the holding clamps so that it is free to vibrate at some frequencies and make an annoying sound.

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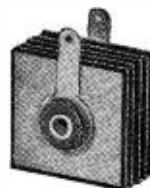


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(Continued from page 74)

tween the primary and secondary windings of the r.f. tuning transformer, the typical double-humped tuning characteristic illustrated at Fig. 4B results. This may be flattened and broadened somewhat (with attendant reduction in gain) as shown in Fig. 4C by shunting the windings with resistors of appropriate value.

Frequency Conversion

It is common practice to use a single local oscillator to beat the incoming frequency-modulated video signal and amplitude-modulated sound signal (which is 4.5 mc. higher in frequency) into a video r.f. signal and a sound i.f. signal respectively.

Frequency conversion of both the video and audio signals to the proper respective intermediate frequencies is accomplished in the frequency converter. The conventional pentagrid converter tubes that are successfully used in ordinary sound broadcast receivers are not satisfactory for television receivers because they are troubled by undesirable interaction between the signal and oscillator circuits at frequencies above about 60 mc. This results in considerable variation in the oscillator frequency and output voltage. The conventional triode-hexode converter is not completely satisfactory. Consequently, at this writing, television receivers employ a separate oscillator (usually a triode) and a pentode mixer as shown in Fig. 3. Use of a pentode mixer has the added advantage of generating only about 1/4 as much noise as does a conventional pentagrid converter.

Since two separate signals (video and sound) having carrier frequencies which differ by the amount 4.5 mc. (see Fig. 2) are applied to the mixer, the signal of the local oscillator, beating with each, will produce in the plate circuit of the mixer tube two i.f. signals (video and sound) whose carrier frequencies also differ by 4.5 mc.

It is now standard practice to purposely have the oscillator frequency higher than both the video and sound r.f. carrier frequencies, with the result that, since the video r.f. carrier frequency is always 4.5 mc. lower than that of sound r.f. carrier (see Figs. 2 and 5A) the difference between the oscillator and sound r.f. carrier frequency is less than the difference between the oscillator and video r.f. carrier frequency. This is illustrated in Fig. 5B. Consequently, the frequency of the sound i.f. carrier will always be 4.5 mc. less (lower) than that of the video i.f. carrier. This is illustrated in Fig. 5B. Observe that the result of employing an oscillator frequency higher than that of either the video or sound r.f. carrier frequencies is to "invert" the frequency relation of the video and sound carriers when they are both translated to intermediate frequencies

December, 1947

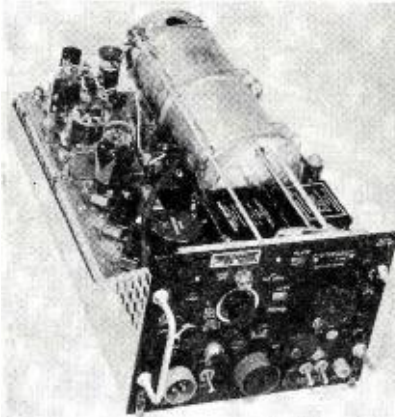
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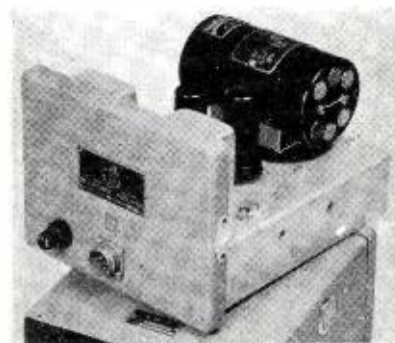
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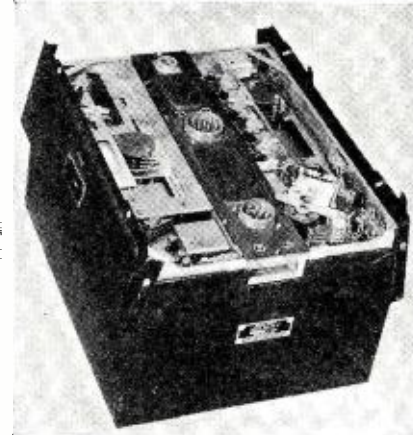
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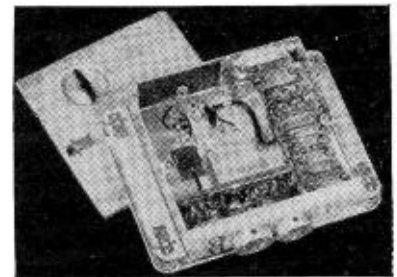


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at the plate of the mixer tube. The reason for wanting this inversion to occur will be pointed out further along in this discussion.

The frequency of the sound i.f. carrier has now been standardized by the RMA at between 21.25 and 21.9 mc., thus providing a necessary tolerance for manufacture of the tuning units required in sound i.f. amplifiers. The frequency of the video i.f. carrier will be 4.5 mc. higher than this, that is, between 25.75 and 26.4 mc.⁵ Use of these standard video and sound i.f. values throws all possible image frequencies outside of the TV band.

Fig. 6 illustrates this and also summarizes pictorially what has been said about "inversion" of the video and audio carrier frequencies as a result of the frequency conversion process. The position in the frequency spectrum of the video and sound signals (marked *V* and *S* respectively) transmitted by a television transmitter assigned in each of the six television channels between 44 and 88 mc. is illustrated at the center. Observe that for each transmitter, the sound carrier frequency (*S*) is 4.5 mc. higher than the video carrier frequency (*V*). Also observe that the shape of the video transmission characteristic is similar to that illustrated in Figs. 1 and 2. The local oscillator frequency required for reception of the signals of each of the transmitters is indicated in its proper frequency position to the right, and labeled *Osc.* (Use of a sound i.f. of 21.9 mc. has been assumed.) The video and sound *image* frequencies (*V_i* and *S_i* respectively) corresponding to the signal of each of these transmitters are drawn dotted in their proper frequency positions at the far right. Observe that since all such frequencies fall outside of the television broadcast band, no signal from a television transmitter can qualify as being the *image frequency* signal for that from another television transmitter. Hence no television signal can cause image-frequency interference with reception of another. The sound and video i.f. carries (*S_{i,j}* and *V_{i,j}*) that

result in receivers tuned to these television signals are shown in their proper frequency positions at the far left. Observe that the video i.f. carrier is 26.4 mc., which is 4.5 mc. higher than the 21.9 mc. sound i.f. settled on. Observe also that this frequency relation is "inverted" from that which exists between the corresponding video and sound r.f. carrier frequencies *V* and *S*.

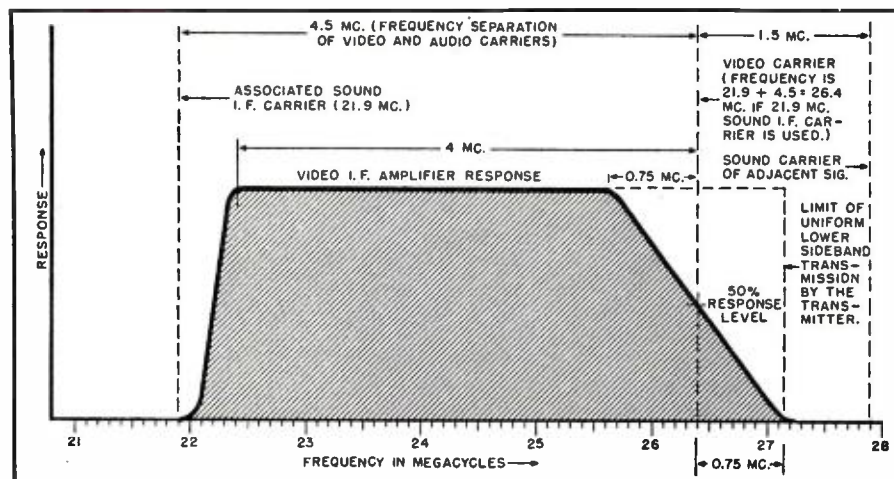
Separation of the Video and Audio I.F. Signals

Since the mixer plate circuit contains both the video i.f. and accompanying sound i.f. signals, these signals must be separated before they are fed to the separate i.f. amplifiers employed to amplify them (see Fig. 3). It is especially important that none of the sound signal voltages enter the video i.f. amplifier and reach the cathode-ray picture tube, since they will produce alternate dark bands across the picture. The intensity of these bands will change with the variations in the sound program. The possibility of video signal entering the sound i.f. amplifier is not important because the video signal is amplitude-modulated and would be automatically suppressed by the pulse-clipping action of the limiter stage of the FM sound i.f. amplifier. In addition, since the FM sound i.f. transformers have a comparatively narrow passband acceptance characteristic that is only about 80 kc.⁶ in total width (approximately 40 kc. each side of the intermediate carrier frequency), and the nearest video signal is .5 mc. (or 500 kc.) away from the audio carrier (see Fig. 2), the likelihood of interference from

⁵ Pre-1941 television receivers generally used a sound-channel i.f. of 8.25 mc. and a video i.f. of 12.75 mc.

⁶ The acceptance band of the sound i.f. amplifier is purposely broadened somewhat beyond that required for reception of the ± 25 kc. deviation FM sound signal transmitted by television broadcast transmitters because of the difficulty of keeping the local oscillator frequency from drifting. (Oscillator frequency drift results in a change in the video and sound intermediate frequencies produced). By purposely broadening the acceptance band of the sound i.f. channel, slight variations in oscillator frequency will have no appreciable effect on the quality of the reproduced sound.

Fig. 7. Ideal over-all bandpass acceptance characteristic for video i.f. amplifier in a television receiver employing a 21.9 mc. sound i.f. (postwar television standards). Note the variations in this diagram as compared with those shown in Figs. 1 and 2.



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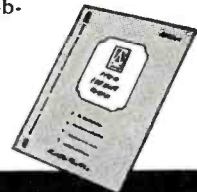
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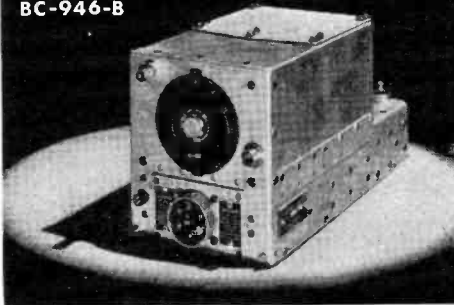
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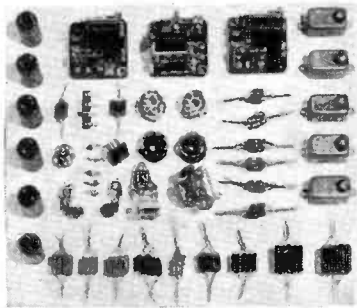
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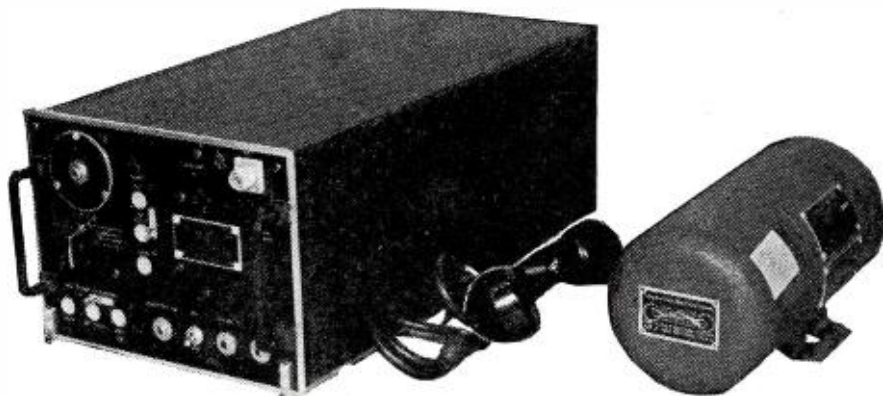
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this source is remote. The usual trouble of this kind that is encountered is the presence of sound signal interference in the picture, and not vice versa.

Separation of the video and accompanying sound i.f. signals is accomplished by circuit arrangements that differ somewhat with each manufacturer. However, they all consist basically of the use of a suitable filter network (since the frequencies of these two signals differ by 4.5 mc.) that diverts these signals to their respective i.f. amplifier systems, as illustrated in Fig. 3.

A suitable filter is also employed to prevent the sound signal from the television transmitter operating in the next lower channel (see Fig. 6) from entering the video i.f. amplifier, for this too could cause interference in the picture.

The Sound I.F. Amplifier

Since the 21.25 (to 21.9 mc.) FM sound i.f. signal has fundamental characteristics similar to those of the i.f. signals dealt with in ordinary high-fidelity FM sound broadcast receivers, it is amplified, passed through a limiter to remove any amplitude modulations that have been picked up, then applied to a discriminator for suitable demodulation, conventional audio gain stages and on to a loudspeaker (see Fig. 3) in accordance with normal high-fidelity FM sound broadcast reception practice.⁷ Most television receivers employ two sound i.f. stages with the second stage designed to provide the limiter action. In the more elaborate receivers, two limiter stages are employed to provide more thorough limiter action.

The Video I.F. Amplifier

Returning now to the output side of the filter network that separates the video and sound signals (see Fig. 3), we have the video i.f. signal which has a bandwidth 4 mc. wide. This signal is applied to a specially designed video i.f. amplifier whose passband acceptance characteristic (at least in television receivers employing the larger picture screen size) is usually made somewhat greater than 4 mc.

Fig. 7 illustrates what might be considered an ideal over-all bandpass acceptance characteristic for a video i.f. amplifier designed for a video signal having the standard transmission characteristics illustrated in Fig. 1. It should be carefully studied, and the

⁷At the time when most of the prewar television receivers were built, television transmission standards called for an amplitude-modulated sound channel. In these receivers, the i.f. passband was quite wide (of the order of 250 kc.). When the standards were later changed to specify frequency-modulation for the sound channel, most of these receivers were modified to include a suitable discriminator in the sound channel, but in some cases the expedient of simply moving the i.f. passband slightly so that the center frequency of the sound i.f. carrier fell in the middle of the slope of one side of the passband characteristic. Although this is admittedly sound signal is accomplished as the frequency varies up and down along the slope of the passband characteristic. Although this is admittedly not the ideal method of accomplishing FM reception, it has proven fairly satisfactory in these receivers since the fidelity capabilities of the sound channel are rather limited anyway due to the limitations imposed by the use of AM transmission.

following important things about it observed:

(1). An unusually wide passband is required.⁸

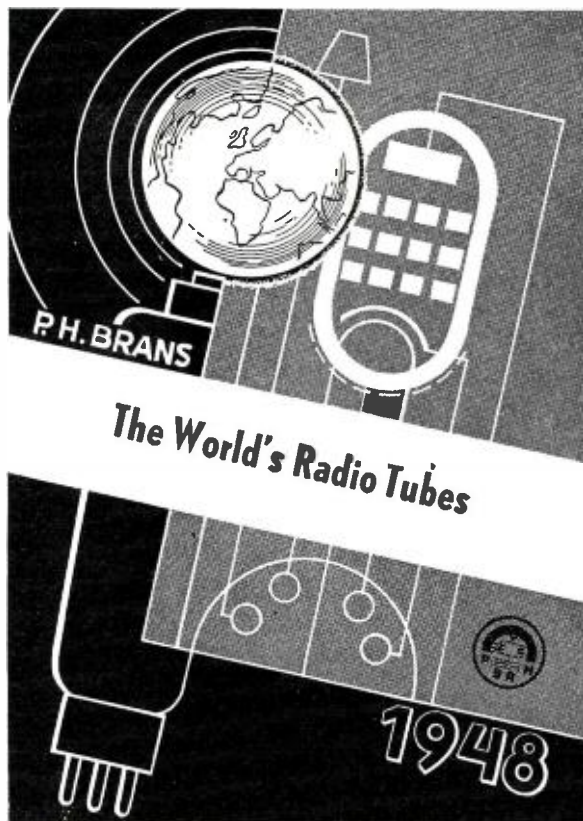
(2). The response at the carrier frequency of the sound i.f. signal 21.25 mc. (to 21.9 mc.) is purposely made very poor (see Fig. 7) in fact the response at this frequency is usually made at least 40 db. below that at the midfrequency level. The purpose of this is to drastically attenuate associated sound i.f. signal voltage that may get through the preceding separation filter network, and so keep it out of the video channel of the receiver. To further insure complete rejection of the associated sound i.f. signal from this channel, a 21.25 mc. (to 21.9 mc.) tuned rejection circuit will be found in an early video i.f. amplifier stage of some receivers. To prevent the sound signal from the adjacent lower-frequency television channel (see Fig. 2) from getting into a 25.75 mc. video i.f. amplifier of a receiver (crosstalk), a $25.75 + 1.25 + 0.25 = 27.25$ mc. tuned rejection circuit (see Fig. 7) is also inserted in an early video i.f. amplifier stage of some television receivers.

(3). Because the modified single-sideband (vestigial) method employed for the transmission of the composite video signal (see Fig. 1) would result in over-emphasis of the lower-frequency video modulations, the passband response characteristic in the video i.f. amplifier must be designed to compensate for this so that all modulation frequencies will be restored to their proper relative amplitudes in order to achieve, for the complete transmitter-receiver system, essentially flat response over the entire video modulation frequency band. This is accomplished by designing the video i.f. amplifier response characteristic with the unusual shape illustrated at the right of Fig. 7. It will be observed that the energy at the video carrier frequency is attenuated to one-half intensity; the transmitted upper sideband components from .75 mc. above the carrier to 4 mc. above the carrier (these invert to from .75 mc. below the carrier to 4 mc. below the carrier in the "inverted" diagram of Fig. 7), are allowed through at full intensity; the transmitted lower sideband components beyond .75 mc. below the carrier frequency (above the carrier frequency here) are attenuated completely (cut off).

It is obvious that the video i.f. amplifier bandwidth and response-curve

⁸The reason for employing a higher intermediate frequency in the video i.f. amplifier than in the sound i.f. amplifier may now be discussed. It arises from the wider passband requirements of the video i.f. signal. The higher the video i.f. used, the smaller becomes the ratio of the 4 mc. video bandwidth to the intermediate frequency and the easier it becomes to design band-pass networks possessing the required sharp end attenuation and higher resistor loading. Consequently, a higher amplifier gain per stage may be realized.

The oscillator frequency is made higher than either the incoming video or sound r.f., carrier frequencies so that due to the "inversion" which takes place, the video i.f. carrier resulting from the frequency conversion process will be higher in frequency than the sound i.f. carrier (see Fig. 5B).



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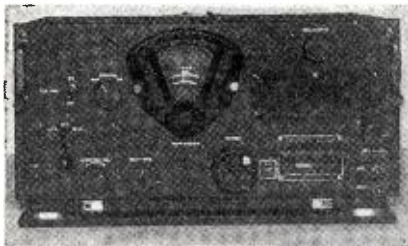
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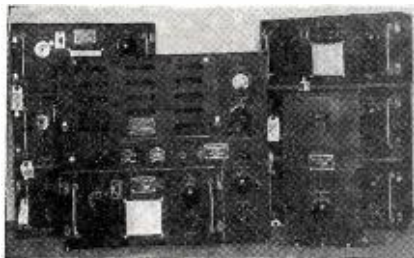
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shape requirements are far more difficult to satisfy than are those in sound i.f. channels. Not only is the 4-mc. bandwidth to be passed more than 26 times as great as that in a high-fidelity FM sound channel, but the over-all band acceptance characteristic required is of rather complicated and precise form. This makes accurate design and adjustment (alignment) of such video i.f. channels a very important "must."

In order to obtain the unusually wide 4 mc. over-all passband characteristic required in the video i.f. amplifier, double-tuned interstage coupling transformers are used. The primary and secondary are deliberately over-coupled sufficiently to produce a broad double-peaked response characteristic, then the secondary (and usually the primary) is sufficiently loaded with shunt resistance to flatten out the major portion of the peaks. Obviously, the gain per stage is much less under these loaded conditions than is the gain in the narrower-band i.f. amplifiers employed in the sound channels of superheterodynes. Consequently, even though high-gain r.f. pentode amplifier tubes of the latest type are used, it is not unusual to find four or five such stages of video i.f. amplification employed in a television receiver in order to provide sufficient gain.⁹

The smaller table model television receivers which employ small diameter cathode-ray tubes having picture screen widths of the order of 5 or 7 inches do not require as sharp an image as is necessary when the larger C-R tubes are used. The sharpness of the reproduced image is a function of the bandwidth of the video signal applied to the picture tube. Consequently, since extremely fine picture detail is not required in such receivers it is not necessary to reproduce the higher modulating frequencies of the video signal. Therefore, the i.f. band-acceptance width is usually sacrificed for increased gain per stage so that fewer video i.f. amplifier stages are required and the receiver cost is correspondingly reduced. The selectivity of the video i.f. tuning circuits in these receivers will be found to be such that band-acceptance widths of only 2.5 or 3 mc., instead of the full 4 mc., are employed.

Rest of the Video Circuits

After passing through the successive video i.f. amplifier stages the composite video signal (which contains both the picture impulses and the synchronizing information) is applied to a diode video detector (see Fig. 3) which demodulates it. From there

⁹ Most cathode-ray picture tubes can be modulated over the useful brilliance range by a signal of the order of 50 volts. A well-designed video amplifier stage (see Fig. 3) roughly will provide a gain of 20 to 30—let us say a gain of 25. This makes necessary a detector output of approximately $50/25 = 2$ volts. Four video i.f. stages having a 4.5 mc. passband (see Fig. 7) usually will produce a gain of approximately 10 each or $10 \times 10 \times 10 \times 10 = 10,000$ total. This results in a mixer output signal strength requirement of $2 \div 10,000 = .0002$ volt, or 200 microvolts.

RADIO VALUES



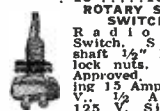
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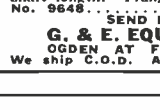
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it proceeds through the video amplifier and on to the control grid of the cathode-ray picture tube. Also necessary are the pulse clipper, sync pulse separator, and horizontal and vertical sync sweep generators (all shown in Fig. 3) whose actions need not be discussed at this point.

I.F. Amplifier Design and Circuits

In this detailed discussion of the selectivity and passband acceptance characteristics required in the i.f. amplifiers of various types of receivers, no details of the i.f. amplifier components or circuits usually employed to achieve the desired performance have been given. The aim has been to first acquaint the reader with the requirements to be fulfilled in each type of receiver. In the next few articles of this series, the actual details of i.f. transformer construction, i.f. amplifier circuits, and methods of achieving wide-band response, variable bandwidth and freedom from interference will be explained.

(To be continued)

Hands That See
(Continued from page 67)

are soon heading for the FCC offices. Keynoting the entire course is the practical application of the basic radio instruction absorbed by the student. The school's high fidelity audio system which serves the auditorium and playgrounds is an outstanding example of this application. With this system, programs are recorded for future presentation to assemblies, recordings by the student choral group are made for study and analysis, and general sound coverage is given the school for regular or extra-curricular activities.

Bob Gunderson's own call, W2JIO (Jump In the Ocean), is the basis for the "shack" in the school's administration building, where many of the boys are indoctrinated in the pounding of brass and talking one's self hoarse. The fellows are proud of their work at the school, especially Bob, for here, tomorrow's citizens are training today to become independent, self-sufficient members of an honorable profession and a happy fraternity.

-30-



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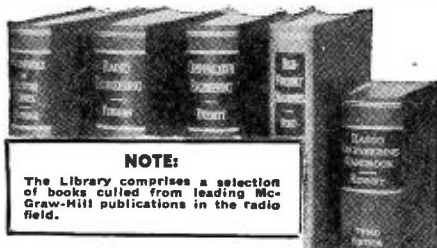
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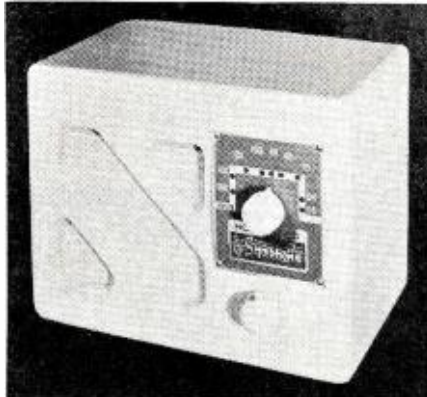
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NEW RECEIVERS for Winter Market

TABLE MODEL RADIO
Symphony Radio & Television Corporation of Los Angeles has just introduced a new table model receiver in the low priced class.

Known as the S-90, this four-tube



receiver has a 4" speaker. This model is available in either a natural wood finish or ivory.

Full details on the *Symphony* line will be furnished upon request to *Symphony Radio & Television Corporation*, Los Angeles, California.

FIVE-IN-ONE TV UNIT

Garod Radio Corporation of Brooklyn have announced a new five-in-one television receiver, their Model 42FMPT2, which combines television, AM-FM and short-wave, automatic record changer, and record storage space.

This model features a 10" picture tube, an automatic station finder, and image synchronizer. The receiver cir-



cuit employs 34 tubes, 4 rectifiers, and 1 ten inch picture tube.

The phonograph has a two-post automatic changer which accommodates 10 twelve inch or 12 ten inch records.

The unit stops automatically at the end of the last record.

Full details on this new model receiver, which is moderately priced, may be secured from *Garod Radio Corporation*, 70 Washington Street, Brooklyn 1, New York.

COMBINATION-RECORDER

Featuring a 6-tube a.c. receiver, the new "Ultratone" Model PR-7 radio-recorder-phonograph just announced by *Audio Industries* of Michigan City, Indiana, provides, within a single unit, complete home entertainment.

A dual speed recorder makes records at either 33½ or 78 r.p.m. The plywood case is covered with *DuPont Fabricoid*. The case is fully enclosed to protect the recording and reproducing unit. A companion extension speaker, available at an extra charge, converts the unit into a public address system. A specially designed midget microphone facilitates recording.

Audio Industries, Michigan City,



Indiana, will furnish additional information on the "Ultratone" line of radio-recorders to those requesting it.

RADIO-CAMERA

Air King Products Co., Inc., of Brooklyn, New York, has recently introduced a novel radio-camera portable which is causing quite a stir in the industry.

This new *Air King* radio-camera weighs less than four pounds complete with batteries. It is 9½ inches high, 4¾ inches wide and 3¾ inches in depth. The radio is equipped with miniature tubes and operates on one 67½ volt "B" and two flashlight type "A" batteries. The camera is housed in an eveready case and contains a 50 mm. meniscus lens. It can take both black and white and color pictures, using number 828 standard film. The unit is equipped with an adjustable strap which permits either shoulder or hand carrying of the unit.

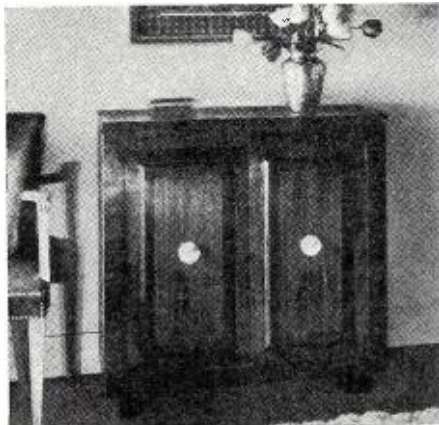
Further information on the radio-

camera may be obtained from *Air King Products Co., Inc.*, 1523 Sixty-Third Street, Brooklyn 19, New York.

"THE MODERN"

Freed Radio Corp. of New York has just added a new AM-FM radio-phonograph console to the *Freed-Eisemann* line of home receivers.

Designated "The Modern," this unit is constructed of striped African mahogany veneers and is available in both blonde and brown mahogany finishes. The receiver incorporates a 20-



tube radio section with a separate power supply with an undistorted output of 20 watts and a coaxial speaker system with a high-fidelity tonal range of 30 to 15,000 cycles. The phonograph equipment consists of a *Garrard Inter-*

Mixer Record Changer that plays 10" and 12" records, in any sequence, automatically.

Prices and delivery information will be supplied by *Freed Radio Corporation*, 200 Hudson Street, New York 13, New York, upon request.

LOW-COST PORTABLE

Production on the new Model 300 portable radio has been announced by *Philco Corporation* of Philadelphia.

Designed to sell in the low-priced class, this new portable operates on a.c.-d.c. as well as batteries. The unit weighs only 12½ pounds with batteries. Among its features are a beam power pentode audio system, and oval speaker. A built-in high impedance antenna has been included to facilitate pick up of distant stations.

The *Philco Model 300* is housed in a hardwood cabinet with novel decorative spatter lacquer finish and contrasting ivory grille with brown plastic controls.

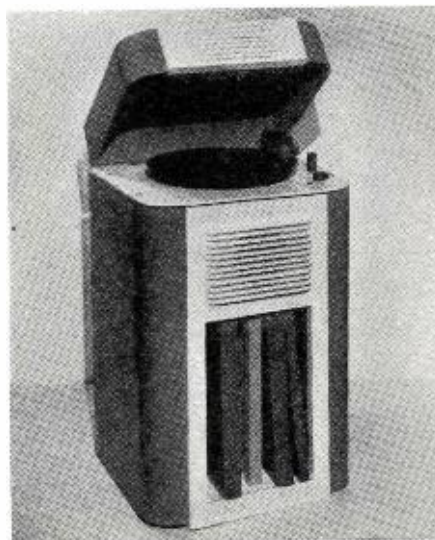
The unit is now in production at the *Philco Corporation* plant in Philadelphia.

CHILD'S PHONOGRAPH

A new line of electrically amplified phonographs for children is now available from *Universal Mart Associates Corp.* of New York under the trade-name "Fon-O-Pal."

One of these units, the "Disc-Jockey," is a console model equipped

with a two-tube amplifier, high gain crystal pickup, 5" Alnico V speaker, and a.c. motor and turntable for playing both 10" and 12" records.



Sides and top of this unit are made of pressed masonite and comes either in red or blue. The front grille and sound board is made of kiln dried white pine and finished in buff. Provision is made for housing both 10" and 12" record albums. The finish on the unit is washable. Rubber feet on the bottom of each cabinet help prevent scraping.

Universal Mart Associates Corp., 15

The New Model 247

TUBE TESTER



Model 247 comes complete with new speed-read chart. Comes housed in handsome, hand-rubbed oak cabinet sloped for bench use. A slip-on portable hinged cover is included for outside use. Size: 16¼" x 8¼" x 5¼".

20% deposit required on all C.O.D. orders.

Features:

The Model 247 incorporates a newly designed element selector switch which reduces the possibility of obsolescence to an absolute minimum. Any pin may be used as a filament pin and the voltage applied between that pin and any other pin, or even the "top-cap."

The new free-point system described above permits the Model 247 to overcome the difficulties encountered with other emission type tube testers when checking, Diode, Triode and Pentode sections of multi-purpose tubes, because sections can be tested individually when using the new model 247. The special isolating circuit allows each section to be tested as if it were in a separate envelope.

The Model 247 provides a super sensitive method of checking for shorts and leakages up to 5 Megohms between any and all the terminals. Continuity between various sections is individually indicated.

One of the most important improvements, we believe, is the fact that the 4 position fast-action snap switches are all numbered in exact accordance with the standard R.M.A. numbering system. Thus, if the element terminating in pin No. 7 of a tube is under test, button No. 7 is used for that test.

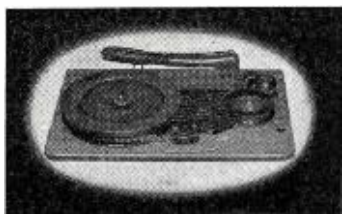
ONLY
\$29.90

MOSS ELECTRONIC DISTRIBUTING CO.

DEPT. RN-12, 229 FULTON ST.
NEW YORK 7, N. Y.

THIS WIRE RECORDER HAS EVERYTHING

(Including Record Player)



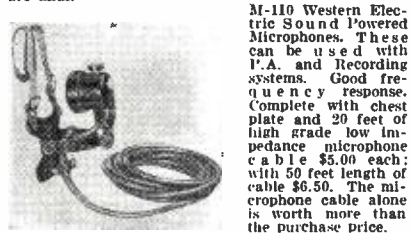
—and you can build it easily!

Model B-1 Magnetic Wire Recorder. (Foundation Unit) records up to 1 hour continuously. Full range fidelity 30-8000 CPS records from standard phono records, radio or microphone. This model uses two motors—one for play-recording, second motor for rewind. Connect to amplifier or radio. Model B-1 (as illustrated above) with crystal mike, 1 hour spool of wire, phono pickup, 40 K.C. oscillator wired and tested, and schematic diagrams.

1 Model B-1.....\$65.00
2 Model B-1's.....60.00 each
3 Model B-1's.....55.00 each

Quantity prices prevail while present stock of Recorders lasts. Prices will go up again after these have been disposed of. See your friends and act now. A diagram of a simple 4 tube amplifier for portable usage to connect to this Recorder can be had by requesting same.

Quantity sales ordered in name of one customer shipment will be made to same. Remit payment in full for Recorders with order. All Recorder sales are final.



M-110 Western Electric Sound Powered Microphones. These can be used with P.A. and Recording systems. Good frequency response. Complete with chest plate and 20 feet of high grade low impedance microphone cable \$5.00 each; with 50 feet length of cable \$6.50. The microphone cable alone is worth more than the purchase price.

NATIONAL UNION RADIO TUBES

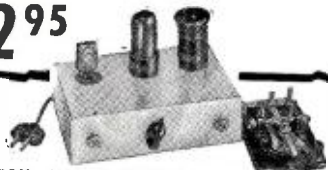
Standard individually cartoned tubes. Discount 50% plus 10% from current list prices. Minimum order 50 tubes. Mail your order promptly with remittance. On hand large stock of standard and hermetically sealed wire wound resistors, mica condensers and other parts. Surplus assemblies too numerous to mention. Write us your needs.
30% Deposit with C.O.D. Minimum Order \$3.00
Recorder orders remit in full

Electronics of Staten Island, N. Y.
(Formerly Clarion Sound Eng. Co.)
P. O. Box 169

Gibraltar 7-8975 Staten Island 1, N. Y.

TRANSMITTER KIT

\$12.95



APPROX. 6 TO 10 WATTS INPUT

COMPLETE with built in power supply for 115V AC and DC

Key (as illustrated) with plug\$1.25 additional
Extra coil75
Crystal mounted, within 10 KC of freq. 80 or 40 meters 1.50 additional
20 meter crystal 3.50 additional

All condensers, choke, resistors and Resonance indicator lamp mounted and soldered. Only six wires to connect. Ready to operate within 15 minutes. Wire, coil for one band, 80-40 or 20 meters, and tube supplied. Excellent as a standby rig, or for local contacts. Ideal for apartment house use. No BCL-QRM. Size 7x7x2. Complete instructions included. We will wire and test this kit for \$2.00 additional.

Terms: 20% deposit, balance C.O.D.

TEK-KIT LABS

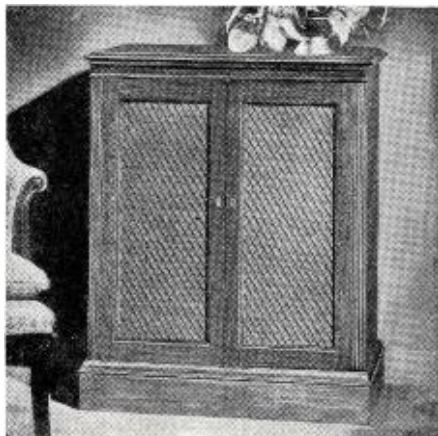
P. O. BOX 6,
Kew Gardens 15, N. Y.

182

Moore Street, New York 4, New York, will supply additional information on the "Disc-Jockey" or other units in their line on request.

MAGNAVOX "BERKELEY"

The beauty of 18th Century cabinetry has been faithfully reproduced in the *Magnavox* "Berkeley," a new



radio-phonograph which has been designed to fit into the modern home.

Available in mahogany finish, this new receiver features 18 watts undistorted power output, two 12" "Duosonic" speakers and a precision automatic record changer with noiseless feather-touch pickup.

The cabinet is 35" high, 30½" wide and 18" deep. This same model is also available with Armstrong FM carrying a tube complement of 14 amplifier tubes, 2 rectifiers, and 2 tuning tubes.

The *Magnavox Company* is located in Fort Wayne, Indiana. Requests for additional information on the "Berkeley" should be addressed to the company.

TAVERN TV SET

Colonial Television Corporation of New York has announced production on a new multi-color illuminated cabinet, the first of its kind to house a television receiver.

The new club model, No. 1530 "Vision Master," has been designed especially for taverns and other public viewing places.

The new cabinet was designed by Henry Anchester, who was instrumental in designing the present-day illuminated juke-box cabinets.

Colonial Television Corporation, 2139 Harrison Avenue, New York, New York, will merchandise the new unit.

AM-FM-PHONO CONSOLE

The popular "split lift-up" top has been incorporated in the new Model H-168 AM-FM-phonograph combination just announced by *Westinghouse Electric Corporation*.

Available in either mahogany or blond avodire finish, this new receiver provides full-width record storage space for 52 albums or 350 single records.

Featuring the new arc vernier dial, illuminated by edge and indirect lighting to provide a rainbow of color along

DECEMBER SPECIAL

Two Gang super-het tuning condensers?.....\$0.75
3 for 2.00

OPERATES FROM A BEAM OF LIGHT

Photo-electric relay kit complete with all parts including tubes, relay, sensitivity control and simple assembly instructions. Build your own magic eye alarm system—use light beam control. Only \$4.95.

LABS - SCHOOLS - INDUSTRIALS - GET ON OUR MAILING LIST—SEND US YOUR REQUIREMENTS.

Allied relay-24v. d.c., d.p.d.t. 10 amp. contacts, 75c; 10 for\$5.00

G. E. Solenoid operated contactor
#CR2820—controls 8 circuits—operates on 115V, 60CY. 4¼x9¾, 15 amps contacts double break each circuit, G.E. Catalog price \$25.00. YOUR PRICE.....\$5.95

4 mfd. @ 800V oil filled with mtg. clamp, 59c; 10 for\$ 5.00

Dual 14mfd. @ 200V electrolytic-K88677; made by W.E., 59c; 10 for 5.00

Leach 8V. dc relay, 3 pole n.o., \$1.25; 10 for 10.00

UTC "S-6" input Xmtr.—line or mike to grid; dealer's price, \$3.10. Your cost, \$1.25; 10 for 10.00

Weston #478—3¼" Bakelite; .0-8V AC, \$3.95

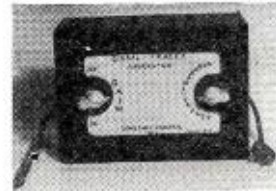
Weston #307 R.F. amps. .0-1.5 2%, 3.95

Westinghouse Filter choke—4 by @ 90 mills, 300 ohms res. hermetically sealed 2" can 69c; 5 for 3.00

25% deposit with order; balance C.O.D.; save COD charges; send full amount.

RADIO DEVELOPMENT & SALES CO.
382 State Street Brooklyn 2, N. Y.

2-IN-1 CHANNAL ANALYZER NEW PENCIL THIN PROBE



Extremely sensitive tracer permitting signal to be heard at any stage of radio under test. Uses new Pencil Thin Probe with loud speaker operation.

Plus a signal generator that delivers a strong A.F. I.F. and R.F. Signal, permitting the serviceman to trace and align any portion of receiver under test. Uses a multi-vibrator network.

A.C. D.C. operated.

Only two controls for complete operation.

SERVICEMAN'S NET PRICE.....\$14.95

See your local jobber.

If he can't supply you write us direct.

CONSTANT ELECTRIC

112 Cornelia St. Brooklyn 21, N. Y.

LEARN RADIO!

IN ONLY 10 MONTHS
PREPARE FOR A GOOD JOB!
COMMERCIAL OPERATOR (CODE)
BROADCAST ENGINEER
RADIO SERVICEMAN

Television Servicing—15 Months

(Approved for Veterans)

SEND FOR FREE LITERATURE
BALTIMORE TECHNICAL INSTITUTE
1425 EUTAW PLACE, BALT. 17, MD.

ROTA-BASE

NEW HANDY LAB. DIAL actually gives a "prong" picture of radio tube connections, INSTANTLY, ACCURATELY. No more valuable time lost thumbing pages or lengthy readings. Filament, grid, plate, cathode, etc. to more than 300 tube types are shown. NOW ONLY \$1.00 post-paid, or sent C.O.D. plus postage. Order TODAY, money refunded if you are not delightfully pleased.

RED MFG. CO.

11390-P, Burbank Blvd., N. Hollywood, Calif.

LOWEST PRICES ANYWHERE

TUBES: Standard Brands — sealed cartons — All Types 60% to 80% off.
HAND MIKE: "SHURE" Sig. Corps Type T17B. 5 ft. cord and PL 68. New. \$1.75.
MIDGET CHOKES—"UTC"—Universal replacements 69c each.
Send 20% Deposit—Bal. C.O.D.—Fast Service. —Perfect Mdse.—Write for Catalog—**COMMERCIAL RADIO**
36 BRATTLE ST.—BOSTON 8

RADIO NEWS

the full arc of the tuning band, this combination console has a tuning range of 540 to 1600 kc. on AM and 88 to 108 mc. on FM with a tuning ratio of 16 to 1.

Using a low-pressure crystal pickup and permanent needle, the H-168 has the new *Westinghouse* Speed Record Changer that plays 12 ten inch or 10 twelve inch records.

The receiver uses seven tubes plus rectifier and has a 10" electrodynamic speaker. Two built-in antennas are included in this model with provision for outside antennas if desired.

The *Home Radio Division* of *Westinghouse Electric Corporation*, Sunbury, Pa. will supply additional information on the Model H-168 upon request.

-30-

FRSMAP CONVENTION

THE Federation of Radio Servicemen's Associations of Pennsylvania has announced plans to hold its first annual convention in Philadelphia, January 11, 12, and 13 at the Bellevue-Stratford Hotel, Broad and Chestnut Streets.

The PRSMA is acting as host to the statewide group with Dave Krantz, president of the Philadelphia group serving as chairman in charge of arrangements.

Mr. Krantz points out that this meeting will convene for the purpose of exchanging mutually profitable ideas on operating a successful service business.

Persons interested in attending this convention may secure full details from Dave Krantz, 2109 South Seventh Street, Philadelphia, Pa.

-30-

COMMUNITY RADIO-PHONE SERVICE

A GROUP of prominent Freeport, Long Island citizens have recently banded together to form a new non-profit organization known as the Freeport Community Radio Association.

The purpose of this organization is to provide a new community radio-phone service which will be available to any resident of Freeport, Long Island and vicinity.

Designed to fill a need for radio-telephone services in small communities, continuous 24-hour operation of the central station will be provided. Central station equipment will be installed on the roof of the First National Bank and Trust Company. The signals are carried by telephone line to the switchboard of a local telephone answering exchange where the operator will acknowledge the radio call, take any message for delivery, and then relay it to its destination by ordinary telephone connection with any telephone subscriber of the Bell System. In a similar manner, messages may be transmitted from any telephone to the central station operator and then by radio to mobile units. No actual line connections are made with telephone circuits of the Bell System under this arrangement.

The new system will operate on the 152.03 and 157.29 mc. bands. Frequency modulation equipment is being used. Selective calling is used throughout the system.

-30-

December, 1947

RESCO HAS IT-FOR LESS!

BC 645 ULTRA HI-FREQUENCY TRANSMITTER-RECEIVER



You Read About It in Feb. QST!

Originally operated in the frequency band from 450 to 500 M.C. Can be converted to 420 MC amateur band. Consists of complete transmitter and modulator system, and receiver. Instructions for conversion to AC supply. Complete with 15 tubes.

1495



Burgess De Luxe VIBRO TOOL

Complete with 22 attachments and case. Engraves on metal, glass, stone, plastics. Cuts patterns on cloth, rubber; tools leather, etc.

With Needle 110 V AC, 60 Cycle—**9.90**
Alone 4.50 | No. V 150, Complete

For Beginners and Experimenters ELECTRIC MOTOR KIT



Consists of complete set of 33 precision parts for building an electric motor that really runs, plus profusely illustrated 32-page book "The Drama of electricity"

264

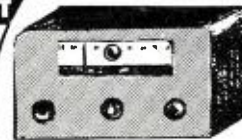
U. S. Army Signal Corps HS-18 HEADSET



Standard type . double phones, 2000 ohms D.C. resistance; 8000 ohms impedance, similar to Trimm featherweights. Brand new, in original packing. Complete with cord, plug, leather-trimmed headband. Adjustable

1.49

Meissner's BREWSTER MODEL FM RECEPTOR



Adds frequency modulation to any regular AM set. Complete with 8 tubes

38.33

AUDIO FIDELITY — Flat within 2 DB from 50 to 15000 C.P.S.
ANTENNA INPUT Impedance—300 ohms
SENSITIVITY—40 microvolts
CONTROLS—Tuning and combination volume control—line switch
POWER SUPPLY—105 to 125 volts, 50 or 60 cycle AC

NEW SHURE T-17 MICROPHONE



Single button mike used by armed forces. Perfect speech qualities. For portable rigs or simplified home transmitter, or where carbon mike is specified. In original cartons. With rubber covered 5-ft. cord and plug, cover, and switch.

1.49

"RADIOGRAPH" for fun



Includes a complete kit of parts with earphone to build crystal receiver. Also 3-way telegraph outfit (blinker, buzzer, sander). 2 persons can practice code, one sending, one receiving, through earphone. Complete with instructions and radio dictionary.

1.95

4-Prong 6-Volt VIBRATOR



Similar to Mallory 294 or Radiant 5300

1.29 ea. 1.15 ea. 1.05 ea.
Lots of 125 of 25

Include Postage With Cash Orders

WRITE FOR FREE VALUE-PACKED BULLETIN

Listen to FM Stations with PILOTUNER



A complete tuner less audio system.

29.95

PILOTUNER features:
3 gang copper condenser — Heavy duty transformer — Own power supply
— Tuned R.F. stage — Walnut cabinet — 8 3/4" wide;
6 3/4" high;
5 3/4" deep.

Radio Electric SERVICE CO. OF PENNA., INC.

7TH AND ARCH STREETS, PHILA. 6, PENNA.
Branches: 5930 Market St. & 3145 N. Broad St., Phila.
Also in Wilmington, Del., Easton, Pa., Allentown, Pa., Camden, N.J.

NEW VINYLITE FREQUENCY RECORD

33 1/2 & 78 RPM; 50 to 10,000 CPS; voice announcements; unmodulated grooves for checking rumble content. Available your local jobber or

UNIVERSAL RECORDING CORP.
20 North Wacker Drive
Chicago 6, Illinois

RADIO ENGINEERING!

COMPLETE Radio Engineering Course. Bachelor of Science Degree. Courses also in Civil, Electrical, Mechanical, Chemical, Aeronautical Engineering, Business Administration, Accounting, Secretarial, Science. Graduates successful 64th year. Enter Jan., March, June, Sept. Write for catalog.

DEGREE IN 27 MONTHS

TRI-STATE COLLEGE 16127 College Ave. ANGOLA, INDIANA

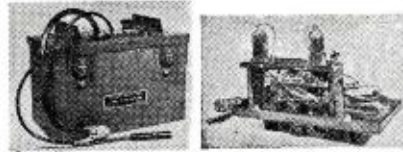
VERIFIED SPEAKERS

"Let The Guarantee Protect You Too"

2232 University Avenue Inc. St. Paul 4, Minnesota

**ATTENTION: PROSPECTORS-EXPLORERS
FIND HIDDEN TREASURES!**

Do you seek hidden treasures or rare metallic ores? If so, construct a U.S. Army Type of Metallic Mine Detector from these U.S. Army Mine Detector Amplifiers that we are offering at a ridiculously low price. Complete Amplifier (as illustrated) (less tubes and batteries) with Battery case and cables. Cables, headphone cord and jack (no phones). Complete Army wiring diagram. U.S. Army DETECTOR SET Amplifier Type AN/PRS-1, as described. Only **\$2.95**



CLOSED **OPEN**
No C.O.D.'s. Eveready 45 volt batteries #482. \$1.65 ea., 6 volt A. 73c, 2-1N5 tubes, 95c ea.
U.S. SIGNAL CORPS 5 METER SHORT WAVE XMTRS.

(72.2Mc) XMTRS and TUBE only, less mike, batteries and antenna. One 1½ volt dry cell and 67½ volts of B operates it. Just attach di-pole, key or mike, connect the batteries and it's ready to use. Signal Corps spec. wired with silvered wire, mica condensers, and precision resistors. Highly stable circuit with Lo-Loss silvered inductance. (Adjustable paddler) Schematic supplied. Converts easily to walkie-talkie and Ham bands. **\$2.95**

Only No C.O.D.'s

FEDERAL SELENIUM RECTIFIERS
Lots of 12 **65c**
Single Lots **75c**

**BRAND NEW WESTON SENSITIVE RELAYS
MICRO-AMMETERS MODEL 705**
(2½-0-2½ 2-0-2 range)
Cost Uncle Sam \$45.00. Our price **\$10.00** with A.C. Rectifier.



GENUINE SIGNAL CORPS FEATHER-WEIGHT HEADPHONES WITH CORD AND PLUG 2000 OHMS-8000 OHMS IMPEDANCE **\$1.00**

**SPRAGUE-CORNELL-DUBILIER
OIL FILLED FILTER CONDENSERS**
1.-MFD-1000 working volts. **\$1.00**
4 for

WEBSTER RECORD CUTTING HEAD
Here is your opportunity to buy a genuine WEBSTER HOME RECORDING CUTTING HEAD. These units are all Brand new and were made for a nationally advertised manufacturer to be in their quality Home Recording Radios. Size 1½x2¾ ready to fit your cutting arm or bracket. **\$2.95**

NEWARK SURPLUS MATERIALS CO.
324 Plane Street Dept. N. Newark 1, N. J.

**WAREHOUSE
CLEARANCE**

25 Lbs. **\$250** 25 Lbs.

Miscellaneous Radio Parts and Sub-Assemblies
• SWITCHES • FUSE HOLDERS
• CONDENSERS • PILOT LIGHTS
• RESISTORS • CABLES
• INSULATORS • TRANSFORMERS
• DEFROSTERS • SOLENOIDS
• MOTORS, 110 VAC • HARDWARE ASS'T.
• THROAT MIKES • TERM. BOARDS
• ANTENNA BASES
Lots of other items Hundreds of Pieces.
Remit with order only \$2.50 for each unit wanted.
No shipments outside of U.S.A. Sorry, no C.O.D.

SPECIAL VALUES!

NEON LAMPS, ¼ W., G.E. type NE 16, per 100 **\$15.00**
SOCKETS, for the above (4 on a strip), per 100 **10.00**
CAPACITORS, G.E. Pyranol, 1 MFD 500 V.D.C., per 100 **30.00**
CAPACITORS, G.E. Pyranol, .25x.25 MFD 1000 VDC, per 100 **30.00**
CAPACITORS, Indua. cond., 4 MFD 600 V.D.C., per 10 **4.00**
RELAYS, Guardian Elec., 25 V.A.C. SPST, per 100 **25.00**
RELAYS, G.E., 1 amp DPDT, 8000 ohms, 10 MA, per 8 **2.50**
BATTERY CLIPS, Mueller, 25 amps, per 100 **4.00**
MOTORS, Emerson 24 V.D.C., series wound back geared, 100 RPM-Torque, 150 oz. ft. 3 x 6", Each **3.50**
TOGGLE SWITCHES, SPST, ¼" shank, screw term., per 100 **15.00**
PILOT LITE, Dial Lite Co., 1" mounting, cand. base (red only), 125 V., per 100 **35.00**

GEORGE BROOKS & ASSOCIATES
777 West Adams Street Chicago 6, Illinois

LETTERS

from our readers

A COMPLAINT

I think your mag is tops, except for the "hire-purchase" system of your articles—"continued on page so and so."

"The mag is full of time saving instruments, but to read about it is a hopeless case. Why not complete first one story and then start on the next one."

W. Niemann
Johannesburgh, South Africa

Yours is not the only complaint on this score, Mr. Niemann, but take it from us, it is not as easy to correct as you might think. We are doing everything we can to alleviate this situation.

* * *

ENGLISH RADIO

WITH reference to your 'Letters from Our Readers' page in the September issue of RADIO NEWS and with particular reference to the letter from Robert Barlow, I would point out that International Reply Coupons are available at any main post office in this country, at a price of 6 pence (10 cents) each. These can be exchanged in almost any country in the world for local postage stamps, of a value to pay the ordinary letter post to the United Kingdom.

"I have sent these to two or three American manufacturers and all have replied to me. I would also mention that it is possible to obtain dollar currency, in the United Kingdom, to purchase technical publications.

"The great snag, of course, is when one decides to construct a device from an American circuit. Most U. S. receiving and low-power transmitting tubes are available at present here, being government surplus equipment, but of course this source will dry up soon. It is in the other components that the snag crops up.

"As an example, I was very kindly sent the specs on the 'R-9'er' by General Electric, and I decided to construct it. However, the construction notes state that the 'Q' of the coils must be high, and that the dimensions were critical. The notes specify certain Millen coil formers, without giving dimensions and of course unless one is prepared to spend a considerable amount of time and money on trying various coil formers which are made in this country, of which there is a very poor selection available at present, one has to give up the idea of being the proud owner of an 'R-9'er.'

"However, we're better off here than some countries in Europe, as we do have an industry which turns out high-class components, although only a limited range.

"As regards prices, ours are very

much higher than yours. The retail price of a new 807, manufactured in this country, is approximately \$6.50, although a government surplus 807 costs \$3.50. A 6L6 costs \$3.75, and standard r.f. pentodes, such as the 6SK7 and 6K7, cost \$2.50. (These prices are government controlled prices). A 1000 v. d.c. 100 µfd. variable condenser for a transmitter cannot be obtained much under \$4.00.

"As you can see from the foregoing, to build one's own receiver, or a 150 watt transmitter (which is the legal maximum here) costs one a very considerable sum, even if most of the components are purchased on the surplus market. For this reason, most people here try and make their gear as efficient as possible with the minimum of components.

"Finally, I would like to say how much I appreciate your magazine, and I hope to be a subscriber, the Chancellor of the Exchequer permitting, for many years to come."

N. H. Pettifor
Member, R.S.G.M. & A.R.R.L.
Sutton, Surrey

Thanks for the interesting sidelights on the radio game in England.

* * *

CYPRUS REPORTING

LOOKING through my July issue of your excellent magazine RADIO NEWS, page 140, I came across 'We Get Around.' Yes, I guess you do at that!

"My wife wishes to thank you sincerely for the information sent along.

"Our chief entertainment here is our SX-28A. I enclose a list of the few hams we get and thought you might like to pass them along in the issue. They might be interested to know that they can reach out to this little island."

S. C. Hanford
Skouriotissa, Cyprus Island

Thanks, Mr. Hanford, for your letter and your listing. He indicates that the following U. S. amateur stations can be heard in Cyprus; W1SI, W1GP, W2FG, W2AFQ, and W2QWS.

SOME FILE

THE other night I was looking over some of my old back issues of RADIO NEWS and came across the enclosed ad from the August, 1935 issue.

"Would it be possible to secure the booklet mentioned or a reasonable facsimile?"

G. V. Tatham
177 Grenadier Road
Toronto, Ontario

That certainly must be some file of back issues you have there Mr. Tatham.

SERVICEMEN-AMATEURS

Why GUESS About Capacitors

For Only \$24.95 You Can Own a
SOLAR CB-160 ANALYZER



- Measures capacitance of electrolytic, paper, mica and air trimmers. Range from .00001 to 70 Mfd. in 3 ranges (48 in. of scale).
- Detects defective capacitors—directly indicates leaky, shorted, or wrong capacity units, and intermittents.
- Direct reading of all measurements eliminates extra charts.
- Measures power factor of any electrolytic directly on a scale in percentage.
- Cathode Ray Tube balancing—the "magic eye" 6E5 tube gives sensitive visual balance "Quick as a Wink."
- Measures resistance directly in ohms—50 ohms to 2 meg. in two ranges.
- Measures insulation resistance of capacitors and insulation at voltages up to 450—Self contained power supply.

(This instrument being offered at this low price due to slight damage on bottom of cabinets. Instruments otherwise guaranteed perfect.)

Solar CBB160—Same features as above except extended capacity range to 800 Mfg. Special Net—\$34.95 (Reg. Price \$39.80). (Cabinets slightly damaged as mentioned above.)

Solar CF-160 Exam-meter—\$59.70—Combination condenser tester and vacuum tube vo ltmeter. This unit allows for checking condensers under actual load.

Also in stock for immediate delivery

Triplet 625N—10M/20M ohm per volt AC-DC multimeter.....	\$44.10
Triplet 2405—Square line—25M ohm per volt AC-DC V.O.M.....	55.61
Triplet 666H—Pocket type—AC-DC Multimeter.....	19.60
Triplet 2413—Square Line—Tube Tester.....	48.51
Triplet 2432—Square Line—Signal Generator 75 KC to 50 MC.....	86.73
Radio City 802N—Combination Tube Tester and Multimeter.....	59.50
Radio City 461—20M per volt. AC-DC Multimeter.....	39.50
Radio City 447—1,000 ohm per volt. AC-DC Multimeter.....	17.95
Radio City 808—DeLuxe Tube and Multimeter.....	39.50
Radio City 705—Signal Generator.....	49.50
Radio City 710—Portable Generator. AC-DC.....	17.95
Radio City 776—Dynatracer—complete with tubes.....	29.95

ORDER NOW From this ad—immediate attention guaranteed. Write us about your requirements as we are glad to be of any assistance. All standard lines in stock.

ADSON RADIO CO.

221 Fulton St.

New York 7, N. Y.

Fixing Radios the Old Hard Way?



The Feiler Stethoscope does everything but make the actual repair. And the Stethoscope does it faster, better and much easier. Thousands of radio men, many with little experience, are already fixing radios and other electronic equipment this new way.

You will find that just this one low priced unit and a few basic hand tools are all you need to fix practically any radio.

Here is the new Model TS-5 "Pocket Stethoscope" built to take out on the job. It's light, compact and rugged yet performs like the bench models. Stethoscopes are available in 4 types ranging from \$9.85 to \$34.95.

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December, 1947

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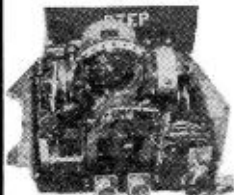
Name

Address

- | | |
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| <input type="checkbox"/> Laboratory | <input type="checkbox"/> Service Man |
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Aluminum casing, housing one 400-cyc., 115-v., 3-ph. motor propelled Gyroscope • two 24-v. DC shunt-wound Motors • 2 Electronic Relays • Auto-Transformer • and hundreds of other parts. A masterpiece of precision. 15x14x9"; 36 lbs.

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Consists of magnesium cabinet that mounts

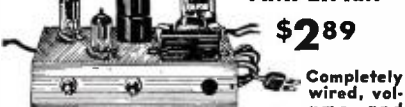
- 7 DPDT Allied Relays • 1 SPST Relay
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This unit is of special interest to "hams"! The cabinet would be excellent for small transmitters or receivers. 12 1/2 x 14 x 10"; 23 lbs.

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\$289

tone controls. Complete with tubes; 2-9002; 1-6V6 or 6K6; 1-6X5. 6V6 output Trans. for above unit.....44c

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Gen. Cement, dial cable #73, 100 ft., heavy linen.....	1.95
AC-DC choke 250 ohm.....	.45
6 ft. rubber cord.....	.17
4" Speakers P.M.....	\$1.15
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Wire, cotton on rubber covered, all colors.....	per 10
20 Ga. stranded, per 1,000 ft. spool.....	\$6.00
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Tubular electrolytic cond. Ea. per 10	
40x40 150v.....	\$0.45
50 150v.....	.30
30 150v.....	2.75
10 50v.....	2.25
.01, .05, .005, 600v.....	.15
.1-600v.....	.50
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.....ea.	.20

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25% DEPOSIT. BALANCE C.O.D.
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Spot Radio News

(Continued from page 20)

color, and language, but united in a common objective of furthering the technical means for world-wide understanding."

CONFIRMING THIS attitude was Charles R. Denny, recently-resigned chairman of the Federal Communications Commission and one of the ring-leaders at Atlantic City. He said: "To me, the cooperation, goodwill, patience, and perseverance of the delegates to the Atlantic City conferences were inspiring. They arrived with varying interests and with widely differing initial positions." (NOTE: For instance, U.S. gave up one major point—having permanent headquarters for international radio here. Switzerland was favored by many delegates, and U.S. voted with the majority.) "They made friends with each other. They worked hard. They worked with great skill. They solved numerous technical problems of immense difficulty. They submerged their individual differences for the common welfare. The success of their efforts insures the orderly use and the maximum growth of communications throughout the world." And P.S.—as we said before—will the United Nations please copy?

ONE THING that Mr. Denny found and frowned upon at Atlantic City and now points to with alarm is that, while other nations, almost without exception, are expanding their international broadcasting facilities, we are cutting ours down. When the war began, we had 13 short-wave transmitters sending programs to South America and Western Europe. During the war, this increased to 40, and by 1944 we were broadcasting over 1000 hours of programs in 40 languages and dialects each week. But today our operations are down to 232 program hours per week, leaving us a poor third in international broadcasting. Russia and England place first and second. "The Voice of America," in Mr. Denny's words, "has become a whisper." He adds: "Broadcasters have a duty even above and beyond their duty as citizens to take steps to insure that the United States plays its proper role in this important field. The voice that reaches out from our shores must be firm and clear. It must be heard throughout the world."

THAT FM IS STILL ROLLING along became dramatically clear following their first annual convention early in the fall, during which a number of new plans were revealed. One was the proposal that sets be built with, say, ten buttons, all but four of which would be tuned to variety-program stations. The other four would hook up with networks specializing in one type of feature only. There would be a net catching only classical music,



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another exclusively devoted to dance tunes, a third to features, a fourth to news. Thus listeners would be able to get what they wanted when they wanted it without so much as looking at a program or turning a dial. . . . How fast this type of broadcasting will become a reality depends on the speed with which FM itself develops audiences, but experts in the field say that such networks are not too far in the future.

THIS WAS A TOUGH YEAR for sunspots, according to the world's greatest authorities, who hasten to assure you that they will be able to predict future radio sunspot troubles with far more accuracy than formerly. This prediction of solar activity, which as you may know greatly affects radio communication and is evidenced by spots on the sun, has been advanced through the application of a new statistical method by two Americans—A. G. McNish and Virginia Lincoln, of the National Bureau of Standards. The method should also prove helpful in determining long-term weather variations and climatic changes. Teamed with the American method is basic information on sunspot numbers obtained from the Zurich, Switzerland, Observatory, which has kept records on all types of solar activity since long before radio was developed. Indeed, 1949 will mark the hundredth anniversary of the Zurich records. Also helping the Bureau of Standards experts are amateurs belonging to the American Association of Variable Star Observers as well as professional sources such as the Naval Observatory.

SUNSPOT HARVEST this year will be among the biggest of all time, the researchers report. May ran the highest score. The May record was preceded by the three largest sunspot groups ever observed in February and July, 1946, and in March and April of this year. The February group of '46 covered an area on the sun's surface of over a hundred times the area of the earth's disc. On the other hand, at times in a sunspot cycle, they reach almost zero. This was true in April, 1944, when only one sunspot showed for the entire month. The importance of sunspot prediction is shown by comparison of radio transmission in 1944, a lean year, and this year, a record-breaker. During '44, transmission across the North Atlantic was rarely possible for frequencies above 20 megacycles. During '47, when the extremely high annual sunspot number of 126 is predicted, already transmissions using frequencies above 50 mc. have been logged over this path.

EVERYBODY USING radio in a big way follows the Bureau of Standards predictions closely. This includes airlines, steamship lines, television and radio schools, universities, radio and telegraph companies, manufacturers of communications equipment, con-



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The NEW Monosets incorporate a volume control feature that permits the wearer to control volume of sound at the point of reception. Write Department AU for information.

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500 ohms—Part No. 2569
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SENSITIVITY
88 d.b. above .000204 dynes per square centimeter for 10 microwatt input.

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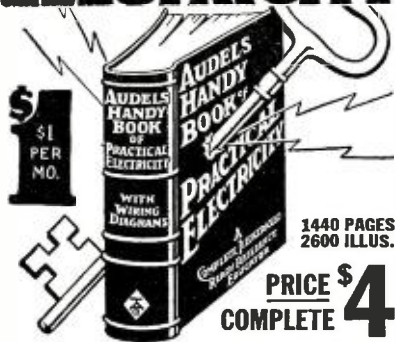
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sulting radio engineers, newscasters, research labs, and electric power companies. Federal agencies, among them the Weather Bureau, State Department, FCC, CAA, the Forest Service and the Coast Guard, are also steady customers. Bureau of Standards issues predictions each month for the following three months.

COULD BE YOU ARE ALREADY FAMILIAR with the electronic analog, the radio brain that can calculate three million times faster than the human mind, but here are a few items on it that you may have missed. They were recently released by the men who developed the gadget. The fathers of the device are W. T. Stark and W. C. Schaffer of the Wright Engineering Department and C. A. Philbrick of Philbrick Researches. The analog can solve over a million mathematical operations in a single day, operated by a single engineer. Put it another way—in one two-hundred-and-fortieth of a second it can crack a problem that would take a highly-trained engineer or mathematician a full day to solve. Wright is using the machine to solve various problems covering a wide range of engine types. A typical one; investigating the attainment of temperature control under conditions of maximum power and efficiency in a jet engine. Expensive engine operation was minimized by designing control components from the analog data. Thus time-consuming tests were drastically cut without subjecting the engines to possible damage under actual test. . . . In operating the analog, a skilled expert presents the problem to the machine by setting a number of dials and reading the answers on either of two screens similar to those used in television sets. The answers are given in graphs intelligible to trained technicians, and are permanently retained by a camera which takes pictures of the screened solutions.

WITH ITS MOST successful National Radio Week (Oct. 26-Nov. 1) now a matter of history, the industry, this time under the leadership of the National Association of Broadcasters, is staging another nation-wide campaign, this time against juvenile delinquency. Justin Miller, president of NAB and spearhead of the campaign, has launched it by urging the public to "call on radio to help with increasing frequency." "Broadcasters," he added, are becoming increasingly conscious of their civic responsibility and are not only willing but anxious to cooperate with local government officials in all movements for community welfare."

BEFORE SOME NORTHERN COMMUNITY is snowed in and learns the value of ham radio in keeping them in touch with the outside world, mention should be made of amateur work done during the recent devastating Florida hurricane.

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3 TUBE AC-DC
Wired Vol. & Tone Control . . . **\$2.75**
Uses 12SQ7, 50L6, 35Z5.
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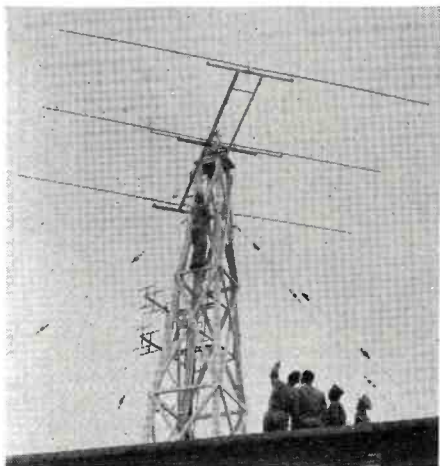
Adapt your present RCA, GE, Crosley, Philco television receiver for a 6x8 foot projected picture with the addition of a 30 KV-RF power supply and a 5TP4 projection lens assembly. Complete pictorial construction details of the 30 KV supply and projection system based on actual New York tavern installations described in booklet just published at \$2 each, postpaid.

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2898 Jerome Avenue, New York 58, N. Y.

Authorized by the Federal Communications Commission, the ham network in Florida started operations almost before the big blow had died down to bridge the communications gap caused by downed wire circuits. FCC monitoring stations at Powder Springs and Miami were ordered to stand by, and P. H. Herndon, Jr., Atlanta FCC man, rushed to Miami to coordinate the work. Everything on the ham circuit was ready for activity before the first wire communications, telephone links between Atlanta-Miami and New York-Miami, went down. Aided by the American Radio Relay League, FCC cleared amateur frequencies between 3905 and 3915 kc., enabling hams within 1000 miles of West Palm Beach to get messages out. Coordinating the work up North was the FCC monitoring station at Laurel, Md., and more than 1000 hams in the greater Washington area got in on the job. Typical of their reaction to the work was the comment of Maj. Burke Edwards of Chevy Chase, Md., who spent most of his time during the night that the hurricane was at its height answering queries of relatives on the welfare of their loved ones in the stricken area. Asked if he had been bothered by the requests, Edwards said: "Bothered? No. We're always glad to be of help."

TELEVISION FOUND A NEW USE recently when the first public view of surgeons performing operations was televised for the benefit of doctors attending the eighteenth annual scientific assembly of the District of Columbia Medical Society in Washington, D. C. The operations were televised from Georgetown and Doctors Hospitals to the Statler Hotel, where the medics assembled. —30—

Constant and continuous radio contact by the AAF in Washington with aircraft flying anywhere in the world is made possible by the new Signal Corps-engineered rotary beam which depends on rotating, receiving and transmitting antennas which point in the direction of and "follow" aircraft in flight. The planes need no special radio equipment for this communications miracle. Here AAF officers explain the new beam to a visiting scientist as S/Sgt. Edwin B. Rosenberg of River Falls, Wisconsin climbs up an antenna tower to make an inspection.



December, 1947

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Merry Christmas
and a
Prosperous New Year

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	Each	10	100
20 mfd..... 150V	\$0.21	\$1.79	\$16.95
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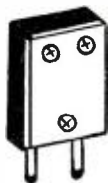
	Each	10	100
.01..... 600V	\$0.08	\$0.55	\$ 4.60
.02..... 600V	.06	.55	4.75
.05..... 600V	.06	.55	4.95
.1..... 600V	.07	.55	5.49
.25..... 600V	.11	.98	8.95
.005..... 1700V	.14	1.25	9.95
.01..... 1700V	.15	1.30	10.20
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All RMA color coded. Special \$1.29.

CRYSTALS 74c each

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International Short-Wave

(Continued from page 154)

larly around 0400-0500 on 9.54, 11.78, beamed to Australia. (Radio Australia) QRA is P.O. Box 3045, Wellington, New Zealand. (Cushen)

Nicaragua—YNEW, 8.190, Managua, heard several times lately testing with records and with regular Spanish programs; good level evenings. (Nankervis) HTX1, 8.320, Managua, is heard evenings through heavy CWQRM; the "HT" prefix is assigned to Nicaragua in addition to "YN" prefix. (Legge via NNRC)

Northern Rhodesia—ZQP, Lusaka, is scheduled week days 1000-1200 on 7.220, 3.900, 9.710; Sundays to Europeans at 0400-0530 (news at 0400). The stations also transmit on Sundays at 1030-1130, although official schedules do not list this transmission. The 9.710 channel is heard on the West Coast, best on Sundays around 1030-1115, using *English* and native, period includes religious services. (Dilg)

Norway—Our Norwegian monitor, Bjorn Sundby, lists Norwegian schedules as LKJ, 9.54, Oslo; LLS, 15.17, Tromsø; LKQ, 11.735, and LLJ, 6.185, Fredrikstad, at 1100-1700. These stations relay the Home Service.

LKV, 15.170, Tromsø, was recently logged in Pennsylvania on a Sunday at 1500-1600, in clear. (Kary)

Palestine—Roland Peddle, Newfoundland, reports JCKW, 7.22, "The British Forces Station" in Jerusalem heard well on Sundays (may be Saturdays) around 1700-1815 closedown with a "Midnight Special" program; announces as beamed to Western Europe, North Africa, and East Asia; has program summary at 1645 Sundays and Wednesdays; gives QRA as British Forces Radio, 1st Unit, British Forces, Jerusalem, Palestine. Schedule is 1400-1600 except Sundays (may

be Saturdays) and Wednesdays when runs to 1815.

Jaffa appears to have added 9.653 to its frequencies. (Pearce) Has been heard in California on this "new" channel.

Philippines—KZRH, 9.64, Manila, is heard in Sweden signing off at 1100. (Nilsson) Full official schedule is 1700-1100.

KZRC, about 6.13, is heard on the West Coast announcing at 0850, nice level. (Balbi) This station, listed officially as 6.140, is affiliated with KZRH, Manila, and is located at Cebu. Operators of these stations project another SW outlet, to radiate in the 25-meter band. Cebu leaves the air at 1000.

"The Voice of America in Manila," 11.84, appears to be scheduled 0400-1005; has late news at 1000. (Balbi)

Radio Australia reports that KZRM has returned to the air on its prewar channel of 9.570, heard at 0500. The Philippine outlet widely reported on 9.515 is KZFM (Dilg).

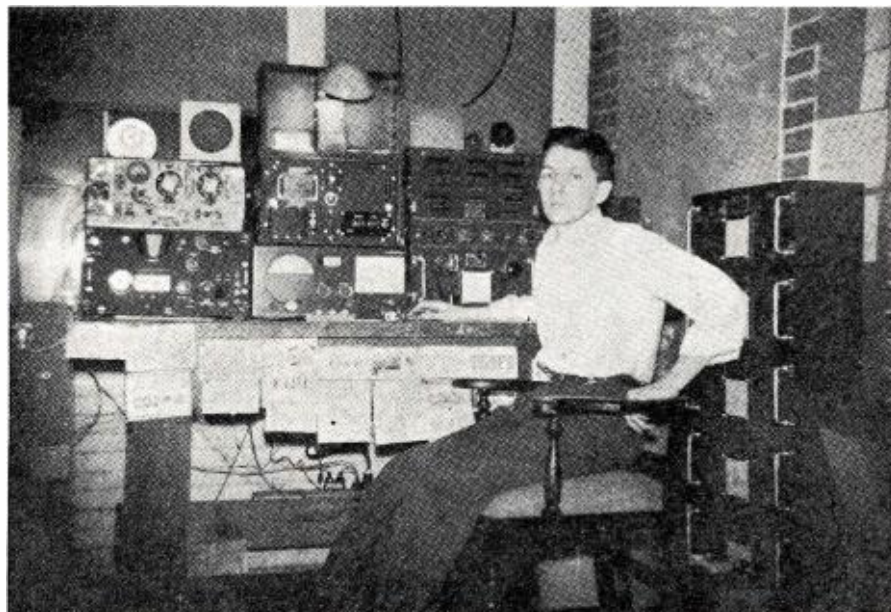
KZPI, 9.500, is on the air 1700-1100 daily and on Saturdays (in America) runs full 1100-1100 (Sundays). KZOK, 9.690, is scheduled 24 hours a day except 1100-1630 Saturdays when its transmitters are off the air for maintenance. (KZPI is on during those hours.) Frequencies of KZPI and KZOK appear to vary.

Poland—Warsaw, 6.115, at last report had news yet at 1450; at 1515 on Saturdays has news in Yiddish. (Miers) The *English* news may be changed by this time to 1550-1610, this being the schedule last winter.

Portuguese China—CR8AA, 9.248, Macao, wants more reports. (Cushen) Present schedule is not known but probably is mornings to around 0915 or 0930. Not reported lately in U.S.

Rumania—Bucharest, 9.253, now has news at 1315; announces, "This is Rumanian Short Wave Station Dekka-Rumania on 25 meters and 32.4

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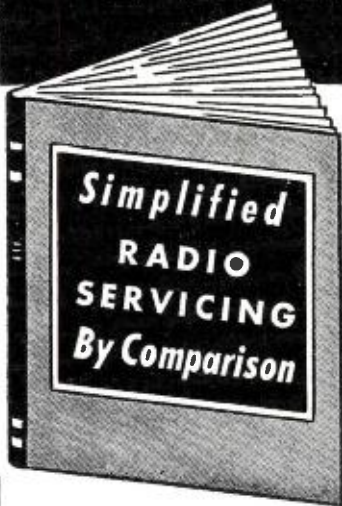
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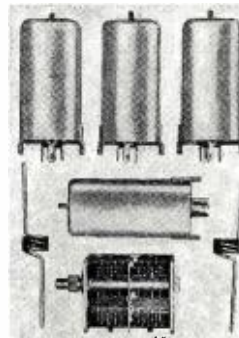
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meters." (Pearce) *Has anyone heard this one on 25 meters?*

South Africa—ZBB is the call sign of the new South African Air Force station heard testing on 7.445, leaving the air at 0140; asked for reports to O/C, 64 Air School, Waterkloof, District Pretoria, South Africa. ZBB is to be used primarily for providing reports on weather, ionospheric conditions, and other data useful to pilots. The proposed program calls for hourly weather reports and other data every two hours; music will be used to fill in the gaps. Major N. Thomas of the station informs that the transmitter is an AVT RCA, 5 kw., feeding into a Kraus antenna (three half-wave dipoles folded back on themselves). Reports from overseas are welcome, the Major stated, and will be acknowledged. *No IRC required.* According to South African newspapers, the station is actually operated by the Telecommunications Branch of the Department of Defense at Pretoria, using S.A.A.F. transmitting facilities at Waterkloof (about two miles outside Pretoria). (Laubscher)

SABC, Johannesburg, lists current schedules as follows:

Johannesburg—No. 3, 5 kw., 3,450, not operating; 4,895, daily, 1050-1605; 6,007, week days at 2345-0130, Sundays at 0055-0110; 9,523, week days at 0315-0710 and 0900-1040, Sundays at 0315-1040; 11,710, not operating. No. 4, 1 kw., 6,095, week days at 2345-0130, 1120-1605, Sundays at 0055-0130, 1120-1605; 9,870, week days at 0315-0710, 0900-1110, Sundays at 0315-1110. No. 5, 4,373, week days at 2345-0130, 0315-0710, 0900-1605, Sundays at 0055-0115, 0400-1605.

Cape Town—No. 3, 5 kw., 5,887, week days at 2345-0130, 1100-1605, Sundays at 0055-0110; 9,61, week days at 0315-0710, 0900-1045, Sundays at 0315-1045.

Pietermaritzburg—No. 2, 0.5 kw., 4,878, week days at 2345-0130, 0315-0710, 0900-1605, Sundays at 0055-0115, 0400-1605.

International regulation has caused SABC to change the 9.912 Johannesburg frequency to 9.870, as the former was outside the allocation. (Laubscher)

Surinam—PZR, Paramaribo, appears to have moved from 11.332 to about 10.970; good signals evenings but has bad CWQRM. Uses many U.S. popular recordings, announcements are in Dutch, signs off with Dutch National Anthem around 2035. *No English noted.*

Switzerland—Berne appears to be using 9.535 now in the 1730-1815 beam to North America. (Worris) Watch for United Nations Radio, Geneva, on 9.515; heard irregularly with news bulletin, sometimes at 1430; wants reports to European Office of United Nations, Geneva, Switzerland.

Syria—According to *Radio Australia*, "Houna Damaash" is identification of the Damascus station operating on 6,000; schedule is 0000-0030, 0530-0630, 1100-1600. Uses mostly

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RADIO NEWS

Arabic, but does play some French recordings.

U.S.S.R.—Tashkent (Usbek S.S.R.) is heard in Britain with news for India at 1200 on (announced) 6.825. (Pearce)

Moscow's 9.710 (announced) channel has excellent signal in beam to Britain mornings, including news at 1130. (Harrison) This is usually a good signal here in the East at 1500 with news.

Moscow's Home Service has been heard on West Coast lately on 8.100 at 0300-0425, poor quality. (Nankervis)

Vatican—HVJ, Vatican City, has moved from 5.968 to about 5.890, parallels 6.190 with German at 1445. (Nilsson)

The 15.095 outlet has been heard in Rhode Island at 0900 with news, good signal. (Pelland) If returned to winter schedule, this newscast may be at 1000 now.

Still has news at 1345 on 9.66 and 5.890. (Miers) Some list this for 1315.

Last Minute Tips

An Arabic-speaking station is heard well in Sweden at 1230-1500 on 12.000 and on approximately 7.500; some Swedish listeners believe this is Port Said; others give location as Medina; call sounds like "Hona Dimach." (Nilsson) Holmberg, Stockholm, gives call as "Hona Medina." Pearce, England, hears this one signing off at 1500 with military march; has news in Arabic at 1445; thinks call is "Huna Asmara." Very bad CWQRM at times.

Roster i Radio, Stockholm, reports a station called *Radio Venezia*, heard in Sweden at 1300 in the 49-m. band. (Nilsson)

ZYZH is the call of a ship, *Port of Beaumont*, of the Ronne Expedition, heard in Germany giving location as 1500 km. south of Cape Horn; frequency appears to be 8.2/8.33, heard at 2300. Also on 10- and 11-meters as W3LYK/MM. (Miers)

Swiss schedules to North America are listed as 1730-1815, 11.865, 9.535; 2030-2200, 9.535, 11.865, 15.315; 2200-2230 (to Pacific Coast), 9.535, 11.865, 15.315. (Cain) However, Beck, New York, just flashed us revised Swiss schedules for the winter which are to South America, 1830-2000 on 9.539, 7.21, 9.655; to North America, 2030-2230, 9.539, 9.655, 6.165.

Radio Makassar, Celebes, reports it will shortly utilize full normal power of 10 kw. (Beck)

Jaffa's 9.645 outlet has terrific signals in New York around 2330. (Beck)

Officials of XGOA, Nanking, China, have notified me that the 15.35 frequency is being replaced with 11.835 for the transmission to North America beginning at 1930. Wants reports from North America on the 11.835 channel. It was not stated whether the 9.73 XGOA outlet would be parallel, but this is likely.

AIR's outlet on 6.190 is being heard again on West Coast after 0900. (Balbi)

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HHCN, 5.660, Port-au-Prince, Haiti, has good signal in Eastern U.S. to closedown around 2032; frequency sometimes as high as 5.675. (Kary) Bad aircraft QRM noted. (Hankins)

PCJ, Hilversum, Holland, is sending out questionnaires to find out likes and dislikes of its listeners. (Pearce)

ZBW3, Hong Kong, has returned to 9.525 from 9.515; signs off at 0900. (Balbi) Sign-off seems to vary, 0845 to 0915. (Nankervis)

I recently picked up a station on 5.990 at 0545-0630 fade-out or closedown; had Chinese-like music at 0600-0615, then man reads news (seemed to be in English; probably is Bangkok, Siam. Usually, this spot has bad QRM.

Radio Malaya, Singapore, should be testing soon on 6.120 around 0230-0330, 0830-0930. (Radio Australia)

According to Radio Australia, the undercover station, "Radio Espana Independiente, Estacion Pyrenaica," purporting to be the Spanish Freedom Radio, transmitting from "somewhere in the Pyrenees," is heard at 1030-1100 on 15.390 and 11.640; at 1130-1200 on 17.690 and 15.400; at 1530-1545 on 15.400 and 10.280; at 1630-1645 on 11.640 and 10.300.

Radio Saigon has Listeners' Letter-box each Friday at 0855 on 11.78, 6.165; it is likely, however, that this may be changed soon to around 0515, as suggested by Arthur Cushen, New Zealand, to officials of the station, this being a more suitable reception time.

Radioelectrica Ushuaia, Tierra del Fuego, Argentina, sent a card with a view of the town, text in Spanish, signed by Vicente Rafael Guillem. (Holmberg, Sweden)

YHN, 11.001, Djokjakarta, Java, "Voice of Free Indonesia," is still heard in Britain signing on at 1200 with "Knightsbridge March"; news, commentary, music, more news and music from 1230 to sign-off of English program at 1800; afterwards often is heard in language that may be Arabic. (Pearce)

Rubens Villela, Brazil, reports call of Ushuaia, Tierra del Fuego, Argentina, is LPC on 5.250, 7.425, 10.330; lists schedule for commercial work as around 1915 to LQHE, 9.235, in Buenos Aires.

John Woodruff, California, has received this official list of Indonesian stations in Java, from "The Voice of Free Indonesia," Indonesian Broadcasting Centre, 10 Setjodiningratan, Jogjakarta, Java:

Jacarta I, 3.183; Jacarta II, 2.600; Jacarta III, 2.235; Bandung, 5.085; Garut, 4.000; Tjirebon, 1.525; Tegal, 4.120; Pekalongan, 3.532.5; Purwokerto I, 4.215; Purwokerto II, 2.888.6; Tjilatjap, 3.797.5; Kebumen, 2.335; Magelang, 3.630; Salatiga, 4.600; Djokja I, 5.620; Djokja II, 2.082; Solo I, 4.930; Solo II, 3.350; Madiun, 3.409.99; Pati, 3.986.25; Modjokerto, 4.724; Kediri, 3.750; Malang, 2.651; Djember, 4.630; Nusantera, 400 kcs.; and Indonesian Broadcasting Centre, 11 megacycles. Schedule of the main outlet, 11.001, Jogjawarta, is given as

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0400-0430 (in *English* to Australia); 0430-0530 (in Dutch to Australia, Indonesia, Malaya); 0530-0730 (in *English* to Australia, South East Asia); 0730-0800 (in Indonesian to Australia, South East Asia, Indonesia); 0800-0830 (in Chinese to China and Malaya); 0830-0900 (in French to Siam and French Indo-China); 0900-0930 (in *English* to India and Middle East); 0930-1000 (to same area but in Hindustani); 1000-1030 (in Arabic to India and Middle East); 1030-1130 (in Dutch to Holland); 1130-1230 (in *English* to Great Britain); and at 1730-1930 (in *English* to United States, news and commentary).

XGOA, Nanking, appears to be using 11.835 again in the transmission around 0300-0915; has very good signal in West Virginia at 0700-0745; is buried at 0800 due to interference from *Radio Australia's* VLC7, 11.84.

Java's 9.685 outlet has been replaced by 11.768; reported from Texas and California. It is presumed this is *Radio Batavia*.

Revised Moscow schedules to North America are announced for 0745-0815, 17.17, 15.17, 11.88, 11.75, 11.72, 9.56; 1820-1950, 15.17, 11.72, 9.78, 9.500, 5.95; 1820-1930 *only*, 15.23, 11.88. (Patterson)

YHN, 11.001, Djokjakarta, Java, recently announced that the present 2 kw. transmitter will soon increase power to 100 kw. (Anderson)

Graham Hutchins, DX editor of *Radio Australia*, flashes new schedules for the weekly DX sessions: To Western North America, Sundays, 0025, VLA5, 15.32, VLC7, 11.84; to South Africa, VLG6, 15.24. To Eastern North America, Sundays, 1800, VLA7, 17.800; to South America, VLC9, 17.84; to the Forces, VLB6, 15.200; to Europe, VLG7, 15.160. To the British Isles and Europe, Sundays, 1600, VLB9, 9.615, VLA8, 11.760, VLC11, 15.210. (Latter may change to Sundays, 0902.)

Engineer-in-Charge, Warrant-Officer Johnson of WLKS, the B.C.O.F. station in Kure, Japan, 6.065, has informed Graham Hutchins, *Radio Australia* DX editor, that he is interested in receiving reports from overseas listeners and that all *correct* reports will be confirmed by verification card. QRA is simply WLKS, B.C.O.F., Kure, Japan.

KZRC, Cebu, Philippines, is being heard on 6.130 (listed 6.140) to 1000, announcing as "The Voice of Cebu." KZFM, 9.515, Manila, runs to 0830. (Hutchins)

Rex G. Gillett, DX editor of "*Radio Call*," Adelaide, South Australia, sends these late tips: Tokyo is being heard in the Home Service on 15.235 at 1800, announcing as JOAK, which may be a medium-wave callsign since it is heard announced on various frequencies. Norway appears to be using the former frequency of 9.610, which had call of LLG, in relay with LKQ until both leave the air around 1705; has been heard as early as 1200; at sign-off has interference from ZYC-8 *Radio Romania Libera*, 6.120, Rumania, has been heard at 1430 using *English*; after a little recorded music, more *English* is heard; signs off at 1500 with vocal anthem; signal only fair in Australia. PCJ, Hilversum, Holland, has revised schedule to Pacific; the Tuesday beam is now heard at 0400-0630 on 15.22, 17.77. Schedules received from Brussels are listed 0600-0730 on 21.450; 1100-1200, 21.450; 1355-1500, 17.845. Officials of CR8AA, Macao Portuguese China, advise Mr. Gillett that the station is at present off the air awaiting the arrival of new equipment; former schedule was 0400-1930 on 9.248. KZRC, Cebu, Philippines, states power is 1 kw.; has news at 0730. KZFM, 9.515, uses the slogan, "The People's Station," and is heard in Australia from around 0500 with *English*.

VUD5, 15.19, Delhi, has improved signals evenings, news 213, 2230. VUD3, 11.85, heard at 0930 in native; AIR's 15.16, 9.59 heard in news at 0930, 1030. At 2200 Moscow uses 15.27, 15.40, 15.44, 11.74, 11.87, 11.89 in Home Service; after 2300, 15.17, 15.36 heard as late as 0430. The BBC's Pacific Service is now scheduled at 0100-0500. Paris is heard on 15.24 at 0200-0300; there is a separate program on 11.845. (Balbi)

Acknowledgment

Many thanks for the fine reports coming in. They should be mailed to reach your SW editor at 948 Stewartstown Road, Morgantown, West Virginia by the *sixth* of any month.....K. R. B.

December, 1947

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A splendid selection of rotary switches, ceramics, silver contacts, etc. Single and Multi deck; new; 7 asstd. for. 1.95

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TRADIO, Inc. ASBURY PARK
NEW JERSEY

196

What's New (Continued from page 124)

of d.c. and a.c. voltages, d.c. and resistance analyses.

The new instrument features greater scale readability on the 3" "Red-



Dot" lifetime guaranteed instrument with black and red scale markings; simplified switching to provide greater ease in changing ranges; lower jack contact resistance and trouble-free

plug-in connections by means of banana type jacks; greater stability on a.c.-d.c. voltage ranges 0 to 5000, at 1000 ohms/volt by means of special resistors, and on current ranges to 500 ma. d.c., by means of a 250 ma. instrument.

The entire unit measures only 3 1/16" x 5 5/8" x 2 9/16" and weighs 1 1/2 pounds. The Triplett Electrical Instrument Co., Bluffton, Ohio will provide complete details on request.

NEW OSCILLOSCOPE

Browning Laboratories, Inc. of Winchester, Massachusetts have developed a new all-purpose, 5" oscilloscope, their Model OL-15A.

Among the salient features of this new test unit is the response curve of the vertical amplifier which is linear and without positive slope from 10 cycles to 4 mc. Thus, the transient response is such that a 100 kc. square wave which rises or falls in the order of 500 v. per microsecond is faithfully reproduced, according to the company. The horizontal amplifier response extends linearly from 10 cycles to 1 mc. to accommodate any type of externally generated sweep voltage. The sawtooth sweep range is from 5 cycles to 500 kc. with synchronizing

REPORT ON LOS ANGELES TELEVISION SURVEY

THE results of the Los Angeles television survey made by "Television Research" reveal some interesting facts regarding the audience reaction to this new medium of entertainment.

In answer to the direct question "What do you think of television reception and programs at present?", 39% of the home audience voted "Very Good," 57% voted "Fair," and 4% voted "Poor." Those owning a set for more than six months were not more critical than those who purchased a set within the last six months.

Owning a television set seems to have two contrary effects on sports attendance. Sports fans in general go to events less frequently after purchasing a television receiver. Of all the set owners who frequented some sporting event at least once a month before owning a set, 55% attended less times after purchasing the set, 37% attended the same number of times, and 8% attended more times. On the other hand, owning a television set makes fans out of some persons who never attended. For that part of the audience who never went to a sporting event prior to owning a set, 20% have attended since purchasing a set and 80% still have not attended. The net effect for a specific sport can only be judged after an audience survey to determine the percentages applying to that sport and the number of fans among the set owners. For the Los Angeles area, and for all sports in general, the average attendance of set owners was reduced from 1.5 times per month to 1.3 times per month, or 13%.

Television will evidently give radio a run for its money because the survey showed that among 77% of the television audience, radio listening decreased after the installation of the TV receiver. Among the other 23%, radio listening remained the same.

Viewers were asked that if their

favorite radio program and favorite television program were on at the same time which would they tune in. 86% of the set owners replied that they would view their favorite television program while only 14% would pass up the TV show in favor of their favorite radio program.

Movie attendance will eventually be cut considerably by television, if the results of this survey are indicative. Movie attendance of the television audience surveyed averaged 3.6 times per month prior to owning a set, but now it only averages 2.3 times per month, or 36% less than before.

More than 90% of the audience would like to see first-run movies regularly on television. Newsreels are high on the audience "want" list. Most of the audience wants sports programs continued, with emphasis on football, wrestling, boxing, baseball, hockey, basketball, and horse races. Marked preference for musical comedies, and variety shows was indicated by the audiences.

This survey was taken in the Los Angeles area where there are approximately 3000 television receivers in use, about 1900 sets in homes and 1100 in places of business.

The average size of the families owning home television sets is 3.6 persons. Children under 10 years constitute 17% of the family audience and those between 10 and 19 years make up an additional 10%. The number of males and females in the families is approximately equal.

At home an average of 5 persons view a single TV program at the same time during an average evening. During the average morning there are 2.3 viewers and during an average afternoon there are 2.7 viewers for each set turned on. Approximately 36% of the home sets are never turned on in the mornings and 22% never turned on in the afternoons.

RADIO NEWS

sensitivity permitting synching and viewing 10 mc. r.f. sine waves.

Full details on the Model OL-15A



may be secured by writing *Browning Laboratories, Inc.*, Winchester, Massachusetts.

CHASSIS HOLDER

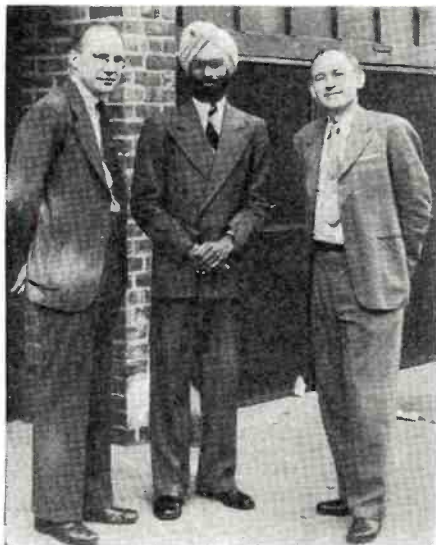
The *JFD Manufacturing Co., Inc.* of Brooklyn, New York has recently introduced a new service aid, the "Repairack," an all-purpose, cast aluminum radio chassis and phonograph turntable holder.

With this new stand, it is possible to rotate the chassis through 360 degrees in a horizontal plane, thus making it unnecessary to remove the set until the job is completed.

Special descriptive literature is available on this unit. Requests addressed to *JFD Manufacturing Co., Inc.*, 4117 Fort Hamilton Parkway, Brooklyn 19, New York should specify Bulletin No. 5479.

-30-

Amargit Singh, a native of Punjab Province, India (center), recently visited the research laboratories of Sylvania Electric Products, Inc., at Flushing, New York. At his right is R. K. McClintock, Field Engineer, International Division, and at his left, Dr. R. M. Bowie, Manager of the Research Laboratory. Mr. Singh plans to apply some of the techniques he saw at Sylvania in his own research laboratory on his return to India after completion of his studies at Harvard.



December, 1947

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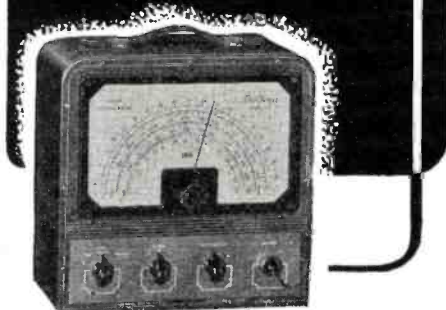


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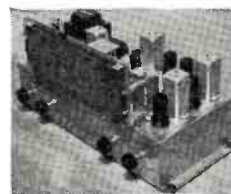


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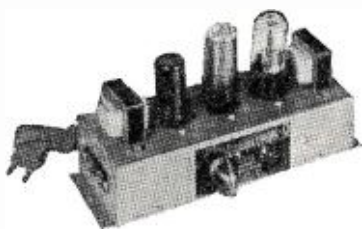
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FM TELEVISION antennas, ham parts, tubes. Bargain list. Wholesale Supply, 347 Lunenburg St., Fitchburg, Mass.

"FLASH-O-TEST." Probe light and continuity tester. Bulb, batteries, leads, complete \$1.00, postpaid. Special model also checks 2, 6, 110 volts, 50c additional. Stelco, Bowling Green, Kentucky.

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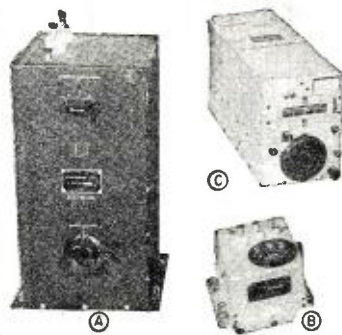
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43	Joe Tillotson
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INDEX OF ADVERTISERS December, 1947

Advertiser	Page	Advertiser	Page
A. M. Radio Sales Co.	170	Federal Telephone & Radio Corp.	17
Abell Distributing Company.....	140	Feiler Engineering Co.	185
Acme Electronics	148	Flanagan Radio Corporation.....	192
Adson Radio Co.	185	Fletcher Radio	176
Allied Radio Corp.	9, 74	Frontier Supply Co.	177
Almo Radio Company.....	186	G & G Genuine Majestic Radio Parts Service.....	137
Alvaradio Supply Co.	160	G & E Equipment Supply Co.	178
American Merchandise Mart, Inc.	148	General Cement Mfg. Co.	106
American Phenolic Corp.	155	General Electric	114
American Radio Institute	193	General Electronics Distributing Co.	89, 111, 163
American Sales Co.	144	General Research Laboratories.....	192
American Surplus Products Co.	169	General Test Equipment	188
American Television, Inc.	36	Greenlee Tool Co.	124
American Television & Radio Co.	195	Greenwich Sales Co.	196
Amplifier Corp. of America	114	Greylock Electronic Supply Co.	188
Apex Video Co.	189	Hallicrafters Radio	5
Arrow Sales, Inc.	90, 91	Hammarlund Mfg. Co., Inc., The.....	38
Ashe Radio Co., Walter.....	121	Harvey Radio Co., Inc.	18
Audel Publisher	188	Heath Company	112, 113
Audio Development Co.	175	Henry Radio Stores.....	167
Audiview Radio Parts Co.	172	Hershel Radio Company.....	73
Baltimore Technical Institute.....	182	Hollywood Sound Institute.....	170
Bardwell & McAlister, Inc.	124	Hoodwin Company, Charles.....	192
Beard, George F.	194	Illinois Condenser Co.	144
Bell Telephone Laboratories.....	26	Indiana Technical College.....	172
Belltone Radio & Television Corp.	77	Insuline Corp. of America.....	134
Berman Company Inc., Henry O.	198	Interstate Radio & Parts Co.	178
Bessemer Steel Co. of America.....	193	Instructograph Company	164
Bevitor Co., The.....	186	J.F.D. Manufacturing Co., Inc.	190
Bliss Electrical School.....	189	Jensen Industries, Inc.	152
Boland & Boyce, Inc., Publisher.....	71	Jensen Mfg. Co.	202
Bradshaw Instruments	178	Johnson Company, E. F.	100, 138
Brite-Ray Television Co.	189	Joseph, Irving	87
Brooks & Associates, George.....	184	Klein, Manuel	136
Brooks Radio Distributing Corp.	191	Lake Radio Sales Co.	152
Brush Development Co.	161	Langsam, Harry	170
Buffalo Radio Supply	108, 109	Lectrohm, Inc.	170
Burstein-Applebee Co.	72	Leeds Radio	130
Buyers Syndicate	126	Leotone Radio Co.	110
C-B Mfg. Co.	76	Long Island Radio Co.	192
Candler System Co.	178	Maquire Industries, Inc.	189
Cannon Electric Development Co.	171	Mallory & Co., Inc., P. R.	33, 3rd Cover
Capitol Radio Engineering Institute.....	32	Maritime Switchboard	116
Centralab, Division of Globe-Union, Inc.	15	Martin, Don, School of Radio Arts.....	166, 192
Certified Television Lab.	174	Melville Radio Institute.....	169
Chicago Industrial Instrument Co.	106	Merit Coil & Transformer Corp.	20
Chicago Transformer Co., Division of Essex Wire	6	Merit Products	178
Chief Electronics	194	Meter Master	188
Cleveland Institute of Radio Electronics.....	88, 105	Metropolitan Electronic & Instruments Co.	153
Clippard Instrument	142	Mid-America Co., Inc.	118
Coastwise Electronics Co., Inc.	197	Midwest Radio Corp.	123
Collins Audio Products Co.	138	Miles Reproducer Co., Inc.	188
Columbia Wire & Supply Co.	124	Milwaukee School of Engineering.....	150
Commercial Radio	182, 199	Morts Radio Shack.....	94
Commercial Radio Institute.....	164	Moss Electronic Distributing Co.	181, 195
Communications Equipment Co.	129	Murray Hill Books, Inc.	34, 149
Concord Radio Corp.	147	McGee Radio Company.....	78, 79, 80, 81
Constant Electric Company.....	182	McGraw-Hill Book Company.....	180
Coradio	200	McMurdo Silver Company, Inc.	30
Coyne Electrical School.....	93	National Company, Inc.	29
Coyne Electrical & Radio School.....	154	National Radio Institute	3
Crystal Devices Company.....	114	National Schools	25
D & H Distributing Co.	160	Newark Surplus Materials Co.	184
Davega Stores	10	Newcomb Audio Products Co.	179
Deer & Taylor Co.	104	Niagara Radio Supply Corp.	132, 133
DeForest's Training, Inc.	19	Oelrich Publications	136
Delco Radio	35	Offenbach & Reimus Co.	157
Delehanty School of Television.....	172	Ohmite Manufacturing Company.....	24
Dongene Laboratories	197	Olson Radio Warehouse, Inc.	82
Dow Radio	150	Opad & Green.....	164
Eastern Electronics Sales.....	156	Pa-Kette Radio	186
Editors & Engineers.....	12, 177	Peak Electronics Co.	156
Edwards F. M. Radio Corp.	134	Performance Radio	188
Electric Sweeper Service Co.	177	Permoflux Corporation.....	94
Electro-Parts Company	160	Philco Radio Corporation.....	27
Electro Products Laboratory.....	144	Photocon Sales.....	128
Electronic Distributors, Inc.	158	Pilot Radio.....	139
Electronic Instrument Company	201	Pittsburgh Coil Company.....	192
Electronic Marketers	162	Potter Radio Company.....	190
Electronic Products	142	Precision Apparatus.....	188
Electronic Supplies	168	Presto Recording Corp.	31
Electronic Technical Institute.....	100	Progressive Electronics Co.	193
Electronics of Staten Island, N. Y.	182	Quad Electrical Supply.....	200
Electronics Institute, Inc.	194	Quinn's Gadget Shop.....	160
Electronics Measurements	104		
Embry-Riddle School of Aviation.....	180		
Esege Sales Co.	199		
Espey Mfg. Co.	76		
Ese Radio Company.....	96, 97, 98, 99		
Etude Electronics Lab.	150		
Fahnestock Electric Company, Inc.	120		
Fair Radio Sales.....	178		

Advertiser	Page
RCA Institutes, Inc.	194
R-L Electronic Corp.	152
R & M Radio Company	84, 85
Radio Center	155
Radio Corporation of America	21, 75
Radio Development & Sales Co.	182
Radio Distributing Co.	164
Radio Electric Service Co.	183
Radio Equipment Co.	172
Radio Ham Shack Inc.	101
Radio Kits	201
Radio Maintenance Magazine	23
Radiomart, Inc.	185
Radio Parts Company	151
Radio Parts Distributors	106
Radio Parts Outlet, Inc.	43
Radio Press	193
Radio Supply & Engineering Co., Inc.	127
Radio Wire Television, Inc.	83
Radionic Equipment Co.	117
Radolek Company	199
Ravac Electronics Corp.	198
Ray-lectron Company	104
Raytone Electronics	194
Rectifier, J.C.P.	172
Reed Mfg. Co.	182
Rider Publisher, Inc., John F.	16, 131
Risco Electronic Wholesale Distributors	188
Rose Company	186
SNC Manufacturing Co., Inc.	11
S & R Coning Service	194
Salvage, Edmund, Co.	176
Sams Company, Howard W.	22
Scenic Radio	134
Schuh's Radio Parts	156
Senco Radio, Inc.	102
Shure Brothers, Inc.	159
Simwar Distributing Corp.	176
Singer Radio & Television Corp.	194
Snap-On-Tools Corporation	2nd Cover
Southeastern Radio Surplus	174
Sprague Products Company	103
Sprayberry Academy of Radio	7
Stahl, Michael	173
Standard Electronics Distributing Co., Inc.	172
Standard Parts Corp.	92
Standard Radio & Electronic Products	175
Standard Transformer Corp.	107
Stanton Radio Supply	187
Star Measurements	140
Sterling Electronic Company	177
Stevens-Walden, Inc.	86
St. Louis Microphone Co.	156
Sun Radio of Washington D.C.	119
Supreme Instruments Corp.	150
Supreme Publications	163, 191
Surplex Sales	186
Sutton's Wholesale Electronics, Bill	194
Sylvania Electric Products, Inc.	4th Cover
Symphony Radio & Television Corp.	176
TAB	125
Technical Radio Parts	138
Tek-Kit	182
Telectronics Service & Supply Corp.	122, 166, 194
Television Assembly Co.	115
Telex, Inc.	187
Trading News	160
Tradio, Inc.	196
Transvision, Inc.	8, 165
Tri-State College	183
Tyler Commercial College	145
U.S. Radio Supply	179
Ungar Tools	150
United Surplus Materials	88
Universal General Co.	186
Universal Recording Corp.	183
University Loudspeakers, Inc.	140, 158
Utica Drop Forge & Tool Corporation	187
Valparaiso Technical Institute	174
Van Norman Radio Supply Co.	160
Variety Electric Co.	46
Vision Research	142
War Assets Administration	141
Ward Products Corp.	197
Warner Radio Co.	148
Warrent Distributors	14
Webster Electric	13
Weller Manufacturing Co.	28
Wells Sales, Inc.	135, 136, 201
Western Electrical Instrument Corp.	37
Western Radio Communications Institute	188
World Radio Laboratories, Inc.	148
Wright, Inc.	183
YMCA Trade & Technical Schools	187

December, 1947



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