

RADIO & TELEVISION

AMATEUR RADIO

RADIO CONSTRUCTION

Department

TELEVISION NEWS

Department

EASY SET BUILDING

Department

RADIO HOOK-UPS

Department

ELECTRICAL EXPERIMENTS

Department

RADIO PATENTS

Department

RADIO KINKS

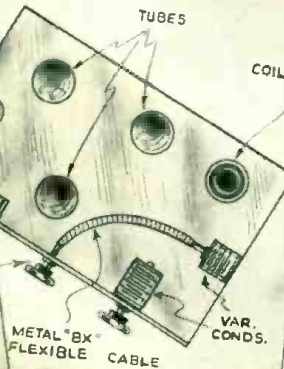
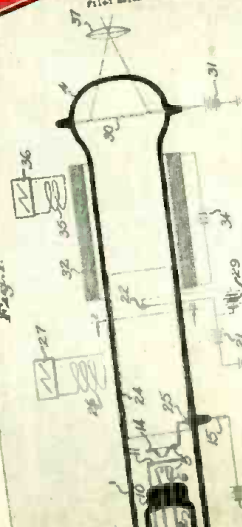
Department

MARCH OF RADIO

Department

2,216,266
Oct. 1, 1940.

WORTH
THREE STAGE OSCILLATORS
Filed March 22, 1937



25¢

CANADA 30¢

HUGO GERNSBACK
EDITOR

AMATEUR & EXPERIMENTAL RADIO

DEC.

CONSTRUCTIVE RADIO ARTICLES

1940

CELEBRATING NATIONAL'S SILVER ANNIVERSARY

A COMMUNICATION RECEIVER FOR AMATEUR USE



THE NEW NC-200 COMMUNICATION RECEIVER

The brand new NC-200 Communication Receiver appears this month. This twelve tube superheterodyne has features not found in any other receiver regardless of price. Six of the ten calibrated ranges are of the general coverage type tuning from 490 to 30,000 KC. (Note that this covers the 500 KC marine frequencies!) Four additional ranges cover amateur bands only, each with extreme band-spread. There is a new, wider range crystal filter and an improved noise limiter. Temperature compensating condensers in the RF and first detector circuits as well as in the high frequency oscillator reduce temperature drift to a minimum. A special socket and plug provides for either AC or Battery operation.

The NC-200, complete with tubes, crystal filter and speaker to match the receiver, costs only \$147.50 net. It's a lot of receiver for the money.

A descriptive folder will be sent free of charge to readers of Radio & Television.

NATIONAL COMPANY, INC.
MALDEN, MASS., U. S. A.



A FREE LESSON SHOWED BILL HOW HE COULD MAKE GOOD PAY IN RADIO

BILL, YOU'RE ALWAYS FOOLING WITH RADIO-- OUR SET WON'T WORK-- WILL YOU FIX IT?

I'LL TRY, MARY, I'LL TAKE IT HOME TONIGHT

I CAN'T FIND OUT WHAT'S WRONG-- GUESS I'LL MAKE A FOOL OF MYSELF WITH MARY

HELLO, BILL-- GOT A TOUGH ONE TO FIX? LET ME HELP YOU

HELLO JOE-- WHERE'VE YOU BEEN LATELY-- AND WHERE DID YOU LEARN ANYTHING ABOUT RADIO?

I'VE BEEN STUDYING RADIO AT HOME, BILL, WITH THE NATIONAL RADIO INSTITUTE. YOU OUGHT TO TAKE THEIR COURSE, I'VE GOT A GOOD RADIO JOB NOW. LET'S MAKE A CIRCUIT DISTURBANCE TEST-- STARTING WITH THE AUDIO OUTPUT STAGE AND TESTING EVERY STAGE RIGHT BACK TO THE ANTENNA. LISTEN FOR THE CLICKS WHEN I TAP THE GRID LEADS

SAY-- WHERE DID YOU LEARN THAT TEST? IT'S A GOOD ONE

HERE'S THE TROUBLE, BILL, IN THE FIRST I.F. AMPLIFICATION STAGE. I LEARNED THAT TEST EVEN BEFORE I STARTED TAKING THE COURSE, BILL. IT'S DESCRIBED IN A FREE LESSON WHICH THE NATIONAL RADIO INSTITUTE SENDS YOU WHEN YOU MAIL A COUPON FROM ONE OF THEIR ADS

I'VE SEEN THEIR ADS BUT I NEVER THOUGHT I COULD LEARN RADIO AT HOME-- I'LL MAIL THEIR COUPON RIGHT AWAY

I'M CONVINCED NOW THAT THIS COURSE IS PRACTICAL AND COMPLETE. I'LL ENROLL NOW

AND THEN I CAN MAKE REAL MONEY FIXING RADIO SETS

OR INSTALL AND SERVICE LOUD SPEAKER SYSTEMS

OR GET A JOB WITH A RADIO BROADCASTING OR TRANSMITTING STATION

AVIATION RADIO, POLICE RADIO, TELEVISION, ELECTRONIC CONTROLS-- RADIO IS SURELY GOING PLACES. AND THE NATIONAL RADIO INSTITUTE HAS TRAINED HUNDREDS OF MEN FOR JOBS IN RADIO

I will send you a Lesson on Radio Servicing Tips FREE TO SHOW HOW PRACTICAL IT IS TO TRAIN AT HOME FOR GOOD JOBS IN RADIO

Clip the coupon and mail it. I'm so certain I can train you at home in your spare time to be a Radio Technician that I will send you a sample lesson free. Examine it, read it, see how clear and easy it is to understand. See how my Course is planned to help you get a good job in Radio, a young, growing field with a future. You needn't give up your present job, or spend a lot of money to become a Radio Technician. I train you at home in your spare time.

Jobs Like These Go to Men Who Know Radio

Radio broadcasting stations employ Technicians as operators and maintenance men and pay well. Radio manufacturers employ testers, inspectors, servicemen in good-pay jobs with opportunities for advancement. Radio jobbers and dealers employ installation and servicemen. Many Radio Technicians open their own Radio sales and repair businesses and make \$30, \$40, \$50 a week. Others hold their regular jobs and make \$5 to \$10 a week fixing Radios in spare time. Automobile, police, aviation, commercial Radio; loudspeaker systems, electronic devices, are newer fields offering good opportunities to qualified men. And my Course includes Television, which promises to open many good jobs soon.

Many Make \$5 to \$10 a Week Extra In Spare Time While Learning

The day you enroll. In addition to my regular Course, I start sending you Extra Money Job Sheets which start showing you how to do Radio repair jobs. Throughout your Course I send plans and directions which have helped many make \$5 to \$10 a week in spare time while learning.

I send special Radio equipment; show you how to conduct experiments, build circuits. This 50-50 training method makes learning at home interesting, fascinating, practical. I devote more than 10 Lesson Texts exclusively to Television, and cover Television fundamentals thoroughly in my Course.



You Get This Professional Servicing Instrument

This instrument makes practically any test you will be called upon to make in Radio service work on both spare time and full time jobs. It can be used on the test bench, or carried along when out on calls. It measures A.C. and D.C. voltages and currents; tests resistances; has a multi-band oscillator for aligning any set, old or new. You get this instrument to keep as part of your N. R. I. Course.

Get Sample Lesson and 64-page Book Free--Mail Coupon

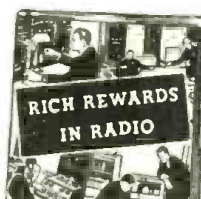
Act today. Mail coupon now for Sample Lesson and 64-page Book. They're FREE. They point out Radio's spare time and full time opportunities and those coming in Television; tell about my course in Radio and Television; show many letters from men I trained, telling what they are doing and earning. Read my money back agreement. Find out what Radio offers you. Mail coupon in envelope or paste on penny postcard--NOW!

J. E. SMITH, President
Dept. ONB3, National Radio Institute
Washington, D. C.



J. E. SMITH, President National Radio Institute Established 25 years

He has directed the training of more men for the Radio Industry than any one else.



YOU CERTAINLY KNOW RADIO SOUNDS AS GOOD AS THE DAY I BOUGHT IT.

THANKS! IT CERTAINLY IS EASY TO LEARN RADIO THE N. R. I. WAY. I STARTED ONLY A FEW MONTHS AGO, AND I'M ALREADY MAKING GOOD MONEY.

THIS SPARE TIME WORK IS GREAT FUN AND PRETTY SOON I'LL BE READY FOR A FULL TIME JOB

OH BILL-- I'M SO GLAD I ASKED YOU TO FIX OUR RADIO. IT GOT YOU STARTED THINKING ABOUT RADIO AS A CAREER, AND NOW YOU'RE GOING AHEAD SO FAST

OUR WORRIES ARE OVER. I HAVE A GOOD JOB NOW, AND THERE'S A BIG FUTURE AHEAD FOR US IN RADIO

J. E. SMITH, President, Dept. ONB3 National Radio Institute, Washington, D. C.

Dear Mr. Smith: Mail me FREE, without obligation, your Sample Lesson and 64-page book "Rich Rewards in Radio" which tells about Radio's spare time and full-time opportunities and explains your 50-50 method of training men at home to be Radio Technicians. (No salesman will call. Write Plainly.)

Age.....

Name

Address

City State

14X-1

RADIO & TELEVISION

The Popular Radio Magazine

December — 1940
Vol. XI No. 8

HUGO GERNSBACK, Editor
H. WINFIELD SECOR, Manag. Editor
ROBERT EICHBERG, Television and Digest Editor

In January Issue

A Receiver for Beginners—In Which 3 Tubes Equal 5
Radio Beam Indicator
A New 7-Tube Superhet. of Interest to Set Builders—Emmett Brightwell
A Semi-Portable Television Receiver—R. H. Horn
The R. & T. Videophone, Part 3—Ricardo Muniz, E.E., and S. Morton Decker

In This Issue

GENERAL FEATURES

Amateur Intolerance, Editorial by Hugo Gernsback ..	453
MARCH OF RADIO	
WOR's New F-M Antenna	454
Shortwave Messages to Europe and South America	454
Radio Pioneer Honored	455
G.E. Takes Over WGY	455
Amateurs Adopt Television!	455
Du Mont Erects Television Antenna	456
Radio "Hospital" Gives Super Service	456
50 K.W. Frequency Modulation Station	456
Television Shows Signs of Life ..	457
Wins \$4,000 Scholarship!	457
Grooming Big Radio Station for Day's Work	458
International Radio Review	460
Frequency Modulation Tuner—How to Build It—Herman Yellin, W2AJL	462
Cathode Modulator Construction—Harry D. Hooton, W8KPX ..	476
How to Build the R. & T. Videophone—Ricardo Muniz, E.E., and S. Morton Decker	490

RADIO CONSTRUCTION

A Frequency Modulation Tuner—Herman Yellin, W2AJL	462
Construction and Operating Notes on the TRF-2—Fred W. Smith, Jr.	466
A General Purpose Audio Amplifier—Bert Kelley	468



Certified Circuits

When you see this seal on a set it is a guarantee that it has been tested and certified in our laboratories, as well as privately in different parts of the country. Only constructional—experimental sets are certified. You need not hesitate to spend money on parts because the set and circuit are bona fide. This is the only magazine that renders such a service.

3-Tube Phono Amplifier—L. M. Dezettel, W9SFW	470
Novel Midget 3-Tube Receiver—Homer L. Davidson	472
Low-Cost High-Power Transmitter—Larry LeKashman, W2IOP	473
Cathode Modulator for the W8KPX Transmitter, Harry D. Hooton, W8KPX	476
An A.C.-D.C. Beginner's Transmitter—Wm. D. Hayes, W6MNU	482
Constructing the R. & T. Videophone	490

AMATEUR RADIO

A Low-Cost, High-Power Transmitter—Larry LeKashman, W2IOP	473
Cathode Modulator for W8KPX Transmitter	476
A.C.-D.C. Beginner's Transmitter	482
"CQ"—News of the Hams—Larry LeKashman, W2IOP	484
Plaque Award for Best "Ham Station" Photo	486

APPLIED RADIO

A Review of Radio Transformer Applications—Leland S. Hicks ..	487
---	-----

NEW FEATURES

Radio Hookups	496
Easy Set Building—2-Tube Push-Pull Regenerative Receiver—Robert Boyne	500
How to Make Your Own Photo-Electric Cell	502
Radio Patents	504

TELEVISION NEWS

Amateurs Adopt Television	455
Du Mont Erects Television Antenna	456
Television Shows Signs of Life	457
How to Build the R. & T. Videophone	490
Television Patents	504

ELECTRICAL EXPERIMENTS

How to Make Photo-Electric Cells	502
Talking Condensers—Cover Feature	503

MISCELLANEOUS

Can YOU Answer These Radio Questions	461
Book Reviews	465
"CQ"—Larry LeKashman, W2IOP	484
Plaque Award for Best "Ham Station" Photo	486
Radio Transformer Applications—Leland S. Hicks	487
Radio Kinks	494
Radio Hookups	496
Question Box	498
Easy Set Building	500
Electrical Experiments	502
Radio Patent Review	504
New Radio Apparatus	506
New Catalogs	508
What Do YOU Think	510

Cover Composition by Hugo Gernsback and Thomas D. Pentz

RADIO & TELEVISION—Published monthly on the tenth of the month. Entered as second-class matter Feb. 15, 1938, at the post office at Springfield, Mass., under the act of March 3, 1879. Trademarks and copyrights by permission of H. Gernsback. Text and illustrations are copyright and may not be reproduced without permission. Subscription price \$2.00 a year in the United States and possessions and Canada, \$2.50 in foreign countries. Make all subscription checks payable to Popular Book Corporation.

Published by Popular Book Corporation. Publication Office—29 Worthington St., Springfield, Mass. Editorial and Executive Offices—20 Vesey St., New York, N. Y. HUGO GERNSBACK, President; EMLL GROSSMAN, Director of Advertising. European Agents: Atlas Publishing and Distributing Co., Ltd., 18 Bride Lane, Fleet St., London, England; Brentano's—London and Paris. Australian Agents: McGill's Agency, 179 Elizabeth St., Melbourne.

Copyright 1940 by H. Gernsback

Performance IS THE WORD!

HOWARD COMMUNICATION RECEIVERS

—Acclaimed By Short Wave Listeners and Amateur Operators Alike!



MODEL "490"
The world's finest communication receiver. 14 tubes, 2 RF stages, calibrated band spread, 9 position variable IF selectivity, air-tuned IF transformers, temperature compensated oscillator, automatic noise limiter, crystal filter, variable audio fidelity, 8 watt push-pull output.

Model 490 has many exclusive and desirable features. Complete with crystal filter and 10" speaker to match. **\$14950**

(Export Prices Slightly Higher)



MODEL "437"
9 tubes. Provides RF preselection, 2 IF stages, crystal filter, noise limiter, electrical band spread, built-in speaker and other important features. A top performer. **\$5450**
(With Crystal \$62.00)



MODEL "436"
7 tubes. Contains all features of Model 435 but adds noise limiter, flywheel inertia tuning controls and micrometer band spread dial. **\$3995**



MODEL "435"
An outstanding performer on all bands. 6 tubes, electrical band spread, ceramic coil forms, BFO, AVC, built-in 6 1/2 inch speaker and iron core IF's. Tunes 540 KC to 43 MC in four bands. The finest low priced receiver available. **\$2995**

Four Great Receivers! ...from the Beginner's Favorite to the WORLD'S FINEST

Quality at a price that isn't "loaded" will always command a buyer's attention. That's why HOWARD Communication Receivers sell in steadily growing volume. Every HOWARD Receiver is truly a triumph of design, performance, beauty and engineering craftsmanship—each developed to meet the exacting demands of today and tomorrow.

Owners everywhere have been literally amazed by the abundance of exclusive features found in the 1941 HOWARD Communication Receivers. Dollar for dollar, the outstanding performance of these great receivers is unsurpassed—they represent America's finest values. Be sure to see the brilliant new HOWARD Models before you buy any receiver.

See these HOWARD Receivers at Your Dealer Today!

PROGRESSIVE SERIES PLAN

Howard's revolutionary direct factory conversion set-up enables you to own at all times the finest receiving equipment — without loss or unfavorable trade-in deals. It is the most flexible and all-in-your-favor purchase plan in existence. Inquire today!

HOWARD RADIO CO.

1731-35 Belmont Ave., Chicago, Ill. Cable Address: HOWARDCO., U.S.A.

America's Oldest Radio Manufacturer

NOW READY FOR DELIVERY!

With \$1.00 subscription to **RADIO & TELEVISION**
FREE TO YOU!—1940-41 Radio-Television Reference Annual

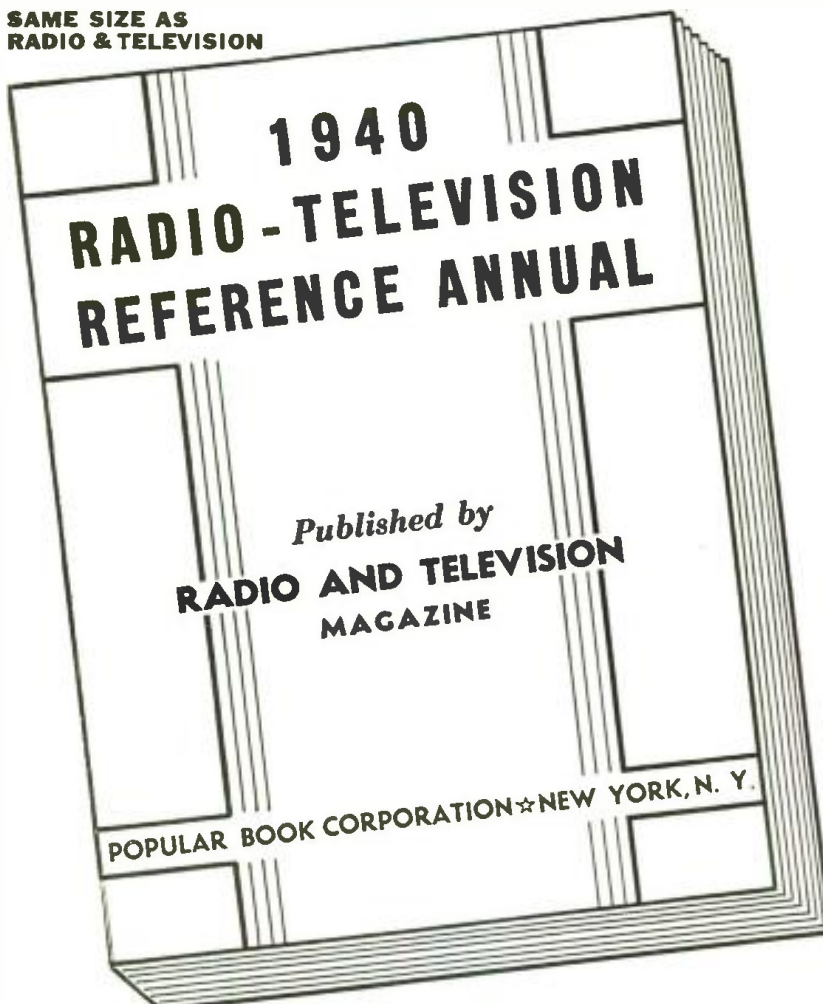
WITH our compliments, we want to send a copy of the 1940 RADIO-TELEVISION REFERENCE ANNUAL to you FREE, if you will simply take advantage of RADIO & TELEVISION magazine's special subscription offer NOW. This offer is being made for a limited time only.

The 1940 RADIO-TELEVISION REFERENCE ANNUAL has 68 pages, large size 8½ x 11½, with over 170 illustrations. The contents of this book has never appeared before in handy book form. Its pages cover practically every branch of radio sound, public address, servicing, television, construction articles for advanced radio men and technicians, time and money-saving kinks, wrinkles, useful circuit information, "ham" transmitters and receivers, and a host of other data.

The Annuals have always been regarded as a standard reference work for every practical branch of radio operation and service. This 1940 edition ably sustains this reputation. Every radio man wants a copy of this valuable book. Just as this book will be of unquestionable value to you, so, too, will every monthly issue of RADIO & TELEVISION. This magazine brings you big value every month. It keeps you intelligently informed about new developments in radio and television. You want the news, want it fully but concisely, want it first—that is why you should read RADIO & TELEVISION regularly.

This very special offer is made for just one purpose—we want you as a regular subscriber. The Annual, whose contents appears at the right, is not sold, but a copy is FREE to you if you subscribe now.

**SAME SIZE AS
 RADIO & TELEVISION**



THIS COUPON BRINGS YOU THE ANNUAL

RADIO & TELEVISION • 20 VESEY STREET • NEW YORK, N. Y.

Gentlemen: Enclosed you will find One Dollar for which enter my subscription to **RADIO & TELEVISION** Magazine for Eight Months. Send me **ABSOLUTELY FREE** and **POSTPAID**, my copy of 1940 RADIO-TELEVISION REFERENCE ANNUAL.

This is a new order Extend My Present Subscription

NAME ADDRESS

CITY STATE

DON'T DELAY — MAIL TODAY!

RT-1240

Read the summary of contents in this FREE BOOK!

THE 1940 RADIO-TELEVISION REFERENCE ANNUAL contains a collection of the best and most important articles. Covering as they do nearly every branch of radio, they form a handy reference works. In addition, many time and labor-saving kinks, circuits and wrinkles, tried and tested by practicing Servicemen, experimenters and radio fans have been included. This book cannot be bought anywhere at any price. Yet it is yours by merely subscribing. Use the convenient coupon below.

BEGINNER'S SIMPLE INEXPENSIVE CONSTRUCTION ARTICLES

Beginner's Breadboard Special—A 1-Tube High-Gain All-Wave Receiver—Wiring Pointers for Radio Beginners—A Watch Charm Size 1-Tube Set—Beginner's Simple Volt-Milliammeter—Making a 1-Tube Broadcast Loop Receiver—A.C.-D.C. Power Supply for Battery Portables—A 1-Tube Short-Waver with Band Coll Switching.

MORE ADVANCED SET CONSTRUCTION

The "High-Seas 4" Broadcast Lamp Radio—How to Build a 6-Tube 1.4-Volt Short-Wave Superhet for the "Ham" or Short-Wave Fan—Build the "Lunch Box 5" Super Set—a Broadcast Battery Portable—How to Build a Plug-Together 8 Tube Broadcast Set—The "5-in-4" All-Wave Radio for A.C. Operation—An Easily-Built 3-Tube Midset Broadcast Superheterodyne Receiver.

THE SERVICEMEN'S SECTION

Bass Tone Control—Simplified Variable Selectivity—Practical Servicing Pointers—Servicing Universal A.C.-D.C. Receivers—Killing the "Intermittent" Bug—A Service Shop A.C. to D.C. Power Supply—Sideline Money for Servicemen—Adding A.V.C. to any Screen-Grid T.R.F. Receiver—Iron Particles in Speaker Air Gap.

TEST INSTRUMENTS

A Useful Neon Lamp Tester—An Inexpensive Output Meter—Making Milliammeter Multipliers—Home-Made Frequency Modulator—The Busy Servicemen's V.T. Volt-Meter.

PUBLIC ADDRESS AND AMPLIFIERS

Build this Combination A.C.-D.C. Radio and Inter-Communicator—Speaker Placement in P.A. Work—The Design and Construction of an Inexpensive All-Push-Pull 10-Watt Amplifier—Obscure Sources of Hum in High-Gain Amplifiers—How to Build a High-Fidelity 5-Watt Versatile Amplifier.

"HAM" SECTION

Ultra-High Frequency Antennae—The Beginner's Low-Cost Xmitter—Modulator Meter—Phone Monitor—The Beginner's "Ham" Receiver—2½ Meter Acorn Transceiver.

TELEVISION

How to Build a 441 Line T.R.F. Television Receiver—Useful Notes on Television Antennae.

MISCELLANEOUS

Simple Photo-Cell Relay Set Up—Making a Burslar Alarm—How to Build A.C.-D.C. Capacity Relay—How to Make a Modern Radio Treasure Locator.

USEFUL KINKS, CIRCUITS AND WRINKLES

Making a Flexible Coupler—Two-Timing Chime—A Simple Portable Aerial—An Improvised Non-Slip Screw-Driver. NOTE: The book contains numerous other useful Kinks, Circuits and Wrinkles, not listed here.

(approximately)

45 ARTICLES

(approximately)

170 ILLUSTRATIONS

68 BIG PAGES

**RADIO & TELEVISION
 20 VESEY STREET
 NEW YORK, N. Y.**



—*Editorial*—

AMATEUR INTOLERANCE

By HUGO GERNSBACK, Editor

PERHAPS it would be in order to title this editorial *Human Intolerance*, because what I am going to say does not pertain wholly to the Radio Amateur, but in a large degree to the human race.

It is a failing of human beings that once they have learned a thing well, they immediately begin to look down upon others who have as yet to climb to the top, or part way up the ladder. Not only that, but frequently we find that those in a profession, or in many other human endeavors, look with disfavor upon the newcomer.

The majority of automobile owners, even though they only have owned or driven a car for a year, look askance upon the new driver. The thought here is as expressed by most of these individuals—"there are already too many cars on the road, so what is the sense of having more cars piled on us." It does not occur to these people that they were once newcomers themselves, and they certainly would have strenuously objected if anyone had even remotely suggested that no more car licenses should be issued.

Most of the professions, whether they be doctors, lawyers, or engineers, once they have "arrived," have similar feelings regarding the newcomer. In all endeavors we have what may be called a professional jealousy.

This brings me to the Radio Amateur, where the conditions are similar to those I have just described. Week after week the editors of *RADIO & TELEVISION* magazine are in receipt of letters from "would-be" amateurs, who have as yet not made the grade and who complain bitterly of the lack of co-operation which they get from licensed amateurs. For twenty years past, many radio amateurs have been accused of being excessively clannish. Many of these amateurs resent the beginner bitterly, claiming that he takes up valuable space and time on the restricted amateur waves, and that it becomes more difficult for present amateurs to transmit intelligible messages. As a rule, most of these individuals refuse point-blank to co-operate with the newcomer and do not wish to be of any help whatsoever to him.

Let it be understood that there are many licensed amateurs who do not belong in this class of intolerance. Nevertheless, it seems that the percentage of those who do not favor new amateurs is quite large. Indeed, the percentage seems to be sufficiently great to make for a continuous stream of complaints from embryo amateurs.

If the amateur would stop and reason for a few minutes, he would of course arrive at the conclusion that his attitude is foolish in the extreme and, indeed, will hurt him in the long run. In radio amateurism as in every other endeavor unity makes strength and the more amateurs there are, the more their voices can make themselves felt. No radio amateur in his right senses, could deny that it would be far better for the entire cause to have 200,000 licensed amateurs, than merely 55,000. The reason is obvious. The greater the size of the amateur body the more

attention the government, through the Federal Communications Commission, will pay to radio amateurs. The smaller they are the less important becomes our cause.

Leaving out the human angle entirely for a moment we might properly consider the scientific angle. Over a stretch of many years, it has been found that in every technical development, ways and means are always found to solve existing technical problems. And while the present-day amateur may not believe it, I for one, do believe that twenty-five years hence it will be simpler to accommodate 200,000 amateurs on the same wave bands than it is to accommodate 55,000 today. The answer is *technical progress!* There is nothing quite so insane as the man who wishes to stop progress. The more intense the competition, the quicker a given problem will be solved. A simple illustration will show this. For about thirty years before the advent of the automobile and airplane, the railroads were content to rest on their laurels. When the automobile and the airplane finally became big enough to threaten the very existence of the railroads something was done about it. The result was faster and better railroads, new types of engines, electrification, new types of roadbeds, and many other improvements. These have stepped up railroad progress tremendously and the end is not in sight.

Exactly the same with radio amateurism. New means will be found to accommodate four or five times as many amateurs, even on existing wavelengths, than is possible today. How this will come about I do not profess to know now. *But that it will come about I have no reason to doubt.*

More important than all of this at the moment, is that amateur intolerance right now becomes a serious menace; indeed, the intolerant amateur becomes downright unpatriotic.

Our country and our present mode of living are threatened as they have never been threatened before. During the next few years our armed forces will need several hundred thousand young men, who might be called *amateurs* or *radio technicians*. Most of them will require a knowledge of the code, and all of them certainly should be trained as radio operators under actual conditions.

And it behooves every patriotic American radio amateur to do his utmost to bring into life *new* radio amateurs, who will be of incalculable help to their country. Whether this newcomer will later on become an active amateur, is beside the point. No licensed amateur should put obstacles in the way of would-be amateurs, but to the contrary *he should go out of his way to teach them all that is to be known about radio.*

The danger at the present time to our country is still very serious, far greater than most people realize. Time is of vital essence.

For this reason I urge every red-blooded American radio amateur to do his part, and what is more important, go out of his way and do it.

GOVERNMENT SEEKS RADIOSONDE TECHNICIANS

In connection with the National Defense Program the United States Civil Service Commission has announced an examination to secure radiosonde technicians for Government service. The salary of the position is \$2000 a year, less a retirement deduction of 3½%.

Persons appointed will have responsibility for the installation, inspection, and maintenance of radiosonde ground equipment at new stations in Alaska, the continental United States, and the Caribbean area. Applicants will be rated

on their experience as shown in their applications, and on corroborative evidence. While experience in the installation, maintenance and repair of radio equipment forms the greater part of the requirement, applicants must have had at least 6 months of experience in the installation, maintenance and repair of radiosonde ground receiving and recording equipment. It is anticipated that it may be difficult to secure sufficient qualified eligibles because of this specialized requirement and the fact that this field

of activity is new. The Commission will, therefore, rate applications as they are received at the Washington office until further notice. Applicants must not have passed their sixtieth birthday.

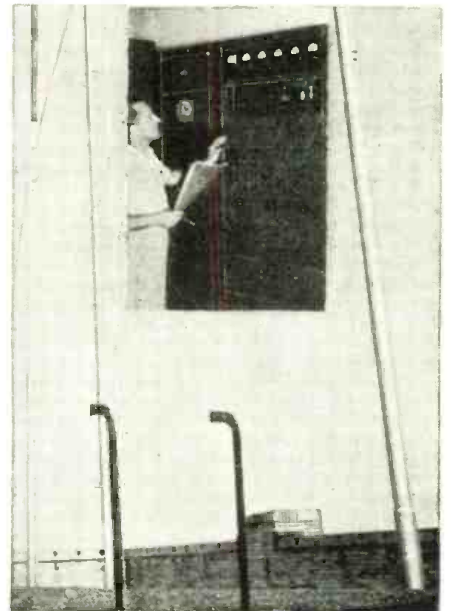
Further information regarding the examination is contained in the formal announcement, which, with the proper application forms, may be obtained from the Secretary of the Board of U. S. Civil Service Examiners at any first- or second-class post office, or from the U. S. Civil Service Commission, Washington, D. C.

WOR'S NEW FM ANTENNA COVERS METROPOLITAN AREA

Towering above the roof of a midtown Manhattan skyscraper is the antenna of W2XOR, the FM station which carries

WOR programs throughout the metropolitan (New York) area. The transmitting antenna at the left of the picture extends nearly 50 ft. above the roof of the 42 story building on which it is mounted. The two other aerials shown are receiving antennas. All were manufactured by the Western Electric Co., for the broadcasting station. Inset shows Charles Singer, technical supervisor of WOR transmitters, making some final adjustments on the new FM job.

The other illustration shows J. R. Pople, chief engineer of WOR, demonstrating the "innards" of the new Western Electric speech input, used in WOR Studio No. 1, to Alfred Wallenstein, orchestra conductor, who stands in the foreground. The new input is designed to give the station's frequency modulation broadcasts a range and fidelity of tone hitherto unmatched in radio broadcasting. WOR was the pioneer commercial station to use high fidelity on the standard broadcast band in the New York district.



MESSAGES FROM HERE GO TO EUROPE AND SOUTH AMERICA

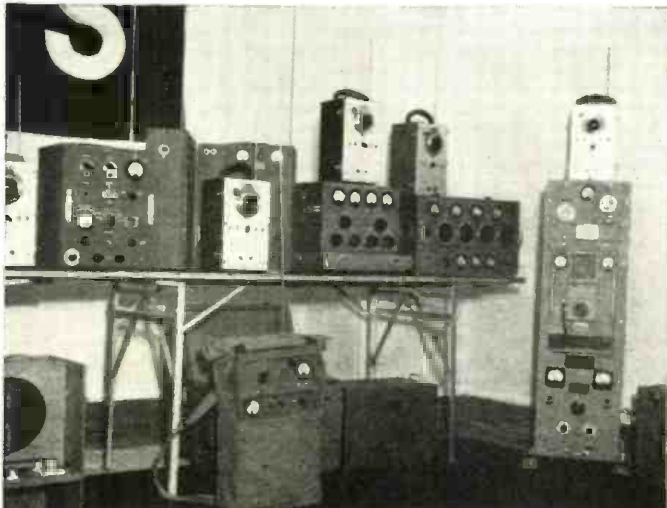
Since March 7, 1929, CBS has been sending short wave programs to Europe and South America for approximately 16 hours a day over its experimental station W2XE operating on 5 kw. In May, 1937, the station increased its power to 10 kw. and installed a directional antenna, greatly increasing its effective strength. In the summer of 1939, it received a regular license and was assigned the new call letters

WCBX. Less than half of its programs are from the CBS network, the remainder being specially prepared for European and South American audiences.

Since January of 1939 this station and WCAB, owned and operated by WCAU in Philadelphia, have been operating on a coordinated schedule.

Columbia's budget for 1940-41 will make its own short wave investment total \$400,000

—four times its total as of today. Part of the money will be spent to increase the power of WCBX to 50 kw. Other new features will include an improved antenna and augmented program service. The accompanying illustrations show part of the amplifying and measuring equipment used at WCBX, and its station shack at Freeport, L. I., whence its waves are directed across the Atlantic Ocean.



PIONEER HONORED

Dr. Frank Conrad, left, "Father of Radio Broadcasting," was awarded a diamond-studded gold emblem in recognition of 50 years' service with the Westinghouse Electric & Mfg. Co., of which he is Assistant Chief Engineer. Dr. Conrad, who was technically responsible for the world's first regularly scheduled radio broadcast on November 2, 1920, over Station KDKA at Pittsburgh, is seen receiving his service emblem from Dr. R. E. Hellmund, Chief Engineer of Westinghouse.



G.E. TAKES OVER WGY

General Electric has taken over the complete operation of WGY, 50-kilowatt broadcasting station established in Schenectady more than 18 years ago. Since 1931 this station has been operated by NBC.

Kolin Hager, manager of the station since its inauguration in February, 1922, with the exception of two years when he was associated with radio work in Buffalo, will continue as manager. Under the new arrangement WGY will be affiliated with NBC and will continue to utilize the red network.

The technical operation of the station will continue under the direction of another pioneer in the art, W. J. Purcell. At the time WGY went on the air, Mr. Purcell was named station engineer and he has been associated with its operation during the 18 years that have followed. Before entering the employ of General Electric, he was a "ham" operator in Cobleskill, his native town.

When WGY was started in 1922 it used but 1500 watts of power. This was soon increased to 5000 watts. In 1924 G.E. completed the construction of a great transmitter laboratory on a 54-acre plot at South Schenectady and the WGY transmitter was moved from within the Schenectady factory to the new location.

BRITAIN'S NEW COLOR CODE

According to *Wireless World*, color coding of resistors and condensers has recently been altered by the Radio Manufacturers' Association in Great Britain. Newly recommended "War Standards" cover a wider range of values and include markings to indicate percentage tolerations above and below the previously accepted standard of 10%. This latter feature is considered excellent by many American users of radio parts, who would like to know instantly by inspection, whether a resistor is within one or two per cent of its rated value—or perhaps 15% off.

THE BYRDS FLY HOME

The 59 members of the U. S. Antarctic Expedition commanded by Rear Admiral Richard E. Byrd will leave Little America about January 15, 1941, and will arrive in this country sometime in May. This statement is made by Clyde D. Wagoner of General Electric who has arranged and directed a series of biweekly broadcasts to the expedition since its departure last year. The programs are sent to the expedition over 100 kw. shortwave station WGEO and also carried on NBC from 11:30 to midnight on alternate Fridays.

AMATEURS ADOPT TELEVISION FOR 2-WAY PHONE TALKS

Two-way television using amateur equipment was demonstrated at the late lamented New York World's Fair by the W2USA Radio Club operating between the Communication Building at the World's Fair and their New York station. The large illustration shows Arthur H. Lynch, Managing Director of the W2USA Club, as he sat before the apparatus talking to Fred Cusick who was eight miles away but none the less visible and audible at Mr. Lynch's position. The television pick-up at the extreme left is being operated by Bill Meissner, W2AYJ. Lynch is observing Cusick in the receiver at the extreme right. The inserted picture is Lola Lane, film star, as she appeared over the television circuit.

Commenting on the two-way system Mr. Lynch said: "The picture circuit is operating in the 112-116 megacycle amateur band having one transmitter near the lower end, the other near the upper end. This band, if expressed in the more commonly used terms, would be said to be on 2½ meters.

"The system which we are using can never be made to compare in clarity with commercial television. We use a system which gives us but 120 lines, while the commercial standards are in the vicinity of five hundred lines. The difference in the result may be likened to the difference in printing between picture reproduction where a coarse screen is compared to a fine screen. The detail of the reproduction made with the finer screen is, of course, better. Then, too, the amount of power we use at our transmitters is only a very small fraction of the power used by the commercials. The cost of our equipment is extremely low, in comparison. A complete transmitter and receiver, of the type we are using on each end of our circuit, can be duplicated by any amateur for less than three hundred dollars. That includes all the tubes, but it

does not take the voice channel into consideration.

"Our voice circuit operates on two frequencies in the 56-60 megacycle band, which is the equivalent of approximately 5 meters. The equipment used for that portion of our layout is of an ultra-modern form and both the receivers and transmitters are the engineering achievements of the National Company, of Malden, Mass. The transmitter is equipped with several crystals, so

that one of several voice channels may be selected at will, while the receiver is made with an automatic noise-gate, which prevents any sound coming from the loud-speaker until the voice of the operator, on the other end of the circuit, is heard.

"It is doubtful that anyone would give much consideration to building equipment such as ours, even now, since the Director of Research of the American Radio Relay League, Mr. James Lamb, has just published the description of a new television camera, which puts this apparatus to shame. It employs the same principles and the same circuits, but it is streamlined."



DU MONT ERECTS ANTENNA FOR TELEVISION

In midtown Manhattan the Du Mont Labs have erected a steel frame-work rising



100 feet from the roof of a 42-story skyscraper in the midtown area. Atop this structure is a 50-foot mast, bringing the television aerial 650 feet above sea level. A winch permits the steel mast to be raised and lowered.

The company's engineers plan to experiment with various types of aerials for both horizontal and vertical polarization. These aerials will be provided with internal electric heating elements to prevent the formation of ice (and consequently reduced efficiency) in the winter time.

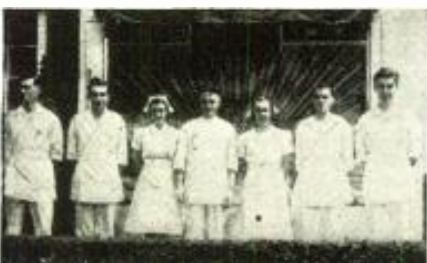
For several weeks a temporary 50-watt transmitter has been fed into a small dipole laid directly on the brick roof. Company engineers claim that test signals have reached most of the metropolitan district with satisfactory strength despite this highly inefficient test equipment. They believe that splendid signal strength will be had over a 35-mile service area when the station is completed. The program director is said to have lined up many film programs and outside pickups for use when the station is put into operation "sometime before the end of the year." The accompanying picture shows the tower and mast.

RADIO HOSPITAL GIVES SUPER SERVICE

If you see an ambulance with men and women clad as doctors and nurses draw up at the house next door, don't immediately dash around with a mess of calves' foot jelly—it may be the service wagon of Ernest C. Augsten, who runs a "radio hospital" at Hartford, Conn. Mr. Augsten got the idea back in 1935 and, during the first year, repaired 4653 receivers and installed 2861 auto radios with the aid of an assistant, and his wife who acted as bookkeeper. The company now occupies larger quarters and employs five "doctors" and two "nurses." When a call comes in to pick up



a "radio patient," a uniformed interne driving a white radio ambulance, as pictured herewith, speeds from the "hospital" to the location and takes out the "sick" set on a stretcher. The entire personnel wears white doctors' and nurses' uniforms and we'll bet they have more darn fun!—Photos Courtesy R.C.A.



AMERICAN PROGRAMS CHEER IN BLACKOUT

Swing music from American short-wave radio stations is cheering Londoners as they huddle in darkness to escape the bombs of aerial raiders.

English radio stations either go off the air or turn to record programs during blackouts, and listeners prefer the American entertainment, explained Peter J. Sallis of Southgate, England, in a letter to WGEA, General Electric short-wave station.

"We have had continuous attempts to upset our mode of life by air raids," wrote Sallis. "Apart from purely material damage, one of their drawbacks is that they have caused our wireless programs either to go off the air altogether or else we have had to listen to numerous record recitals.

"I tune in my receiver to the 19-meter band and listen to WGEA, and although I've done it plenty of times in the past, I must say that these days it's a boon."

Sallis praised normal English broadcasting but said "the instinct of self-preservation forces our officials to cut it off just when we need it most."

Broadcasting stations in both England and Germany have gone off the air often in recent weeks to prevent raiding planes using their signals as guides to bombing objectives.

50 KW. F-M STATION PLANNED

The application for permission to increase the power of F-M station W2XOY from 2500 to 50,000 watts has been made by the General Electric Co. The station operates on 43.9 mc. and is located on the Helderberg Mts., 1200 feet above the valley floor overlooking Albany, Schenectady, and Troy, and serving an area of 16,030 square miles with 1,560,000 potential listeners. The new transmitter will be

LET'S READ THE FCC'S MAIL

The war has brought a new crop of complaints from radio listeners. Unfortunately the replies to all of the first eight following are that the commission has no jurisdiction in the cases.

A Toronto, Canada, woman objects to radio commentators who "spread terror by innuendo."

A San Francisco man dislikes the "hysterical broadcasting" of war news by a particular commentator.

A Macon, Ga., man would prohibit networks from carrying news reports originating in Germany.

A Philadelphia man suggests censorship of news and comment by radio and press during "continuation of the present unsettled world conditions."

A New Yorker asks the Commission to make radio stations broadcast a song he has written.

A Bismarck, N. Dak., man wants the Commission to require a network to carry a particular religious broadcast.

An Asheville, N. C., man would require newspapers owning radio stations to publish the programs of competing broadcast stations.

A Philadelphia man thinks he is entitled to a prize from one of the radio contest programs.

A New Jersey amateur wants to know if he is permitted to listen to foreign stations and whether he may exchange post cards with European Hams.

For your information—Yes, Yes.

By the way, Jimmy Stewart, the movie star, has been assigned the call letters KH/IM for his transmitter on his private plane in Santa Monica.

A few harsh words were told by the FCC to a Pacific Coast ship captain who, in discussing position and weather by radio with another ship, could not refrain from giving his opinion of the weather in language which would set fire to a stone bridge.

Several people have complained about neighbors' radios playing too loudly. The Commission cannot act in these cases and suggests that the persons whose ears are thus afflicted put up a squawk to the local cops.

A gentleman in Ohio objects to certain programs he hears coming direct from Berlin. Of course the FCC has no authority over foreign stations and it might be that Hitler would not give heed to a complaint.

Somebody else wants stations prohibited from giving swing versions of the classics—and his only recourse is to complain to the station or to turn off his set.

And now aren't you glad that you're not a member of the FCC?

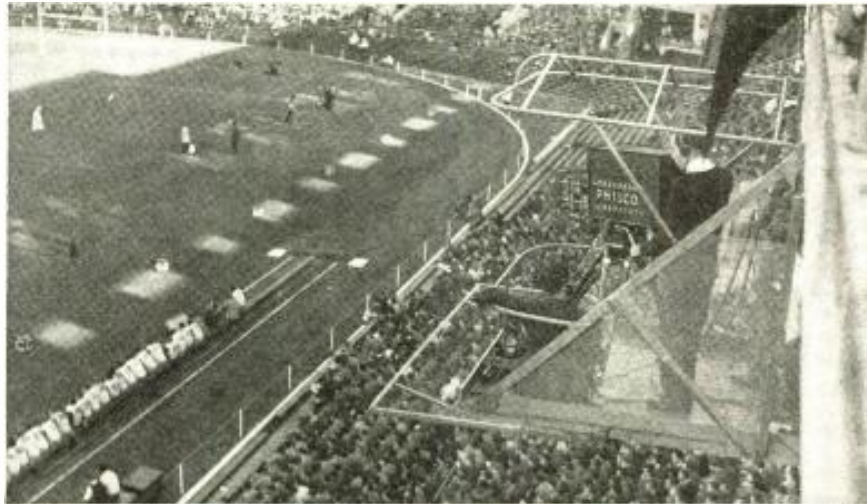
a standard G.E. commercial unit, using a 250 watt and a 3 kw. transmitter as the exciter for the high power amplifier. Both the 3 kw. and 50 kw. units will employ new type transmitting tubes especially developed for F-M and television transmission. A special 3-bay turnstile antenna will be employed. The programs will include material relayed from Schenectady studios, electrical transcriptions and relayed F-M programs.

TELEVISION SHOWS SIGNS OF LIFE IN THREE CENTERS

The Philco television experts recently televised the Pennsylvania-Maryland football game from Franklin Field. The play-by-play description which accompanied the fleeting images was picked up from the regular broadcast of the game made by Bill Slater, popular commentator. Two pickups were used to follow the play at all times. These pickups were located on the two 20-yard lines and it was possible to telecast closeups and long shots by switching from one pickup to the other alternately. Ten engineers were required to operate the equipment.

Co-axial cable carried the television images and sound from the field to relay transmitter W3XP located on the roof of Convention Hall, 235 feet above ground. It was from this hall that Philco and NBC put on their history-making transmission of the Republican National Convention. From this point, waves were relayed over ultra-high frequencies to W3XE, Philco's experimental station, which operated on Channel No. 3 using 10 kw. and detail of 525 lines. The accompanying illustration shows the special "television box" in which one of the pick-ups was located for covering this game.

It is interesting to note that NBC, which shut down its New York station, W2XBS, on August 1, to make the change from 441 lines to the higher definition standard, had returned to the air on Oct. 27 at the old standard. This station, W2XBS, announced plans to televise the Democratic and Republican final rallies. Further, NBC has signed a lease for a television station and studio in the Wardman Park Hotel, Washington, D. C. The company has announced plans



to broadcast television programs throughout the Washington area and eventually to transmit programs and other television scenes originating at that point to New York.

Niles Trammell, president of NBC, stated: "We hope also to make Washington the originating point of a television service that will link the national capital with Philadelphia and New York City. An automatic relay developed by the Radio Corporation of America promises to provide a satisfactory means for interconnection. When such relays are established, we will be able to experiment with the problems of television program syndication. Then it will be possible for televiewers in Washington, Philadelphia and New York to see events from any of the three cities.

"For the immediate future, however, we must content ourselves with carrying forward a broad program of experimental work here in Washington, laying particular emphasis on the artistic and technical problems involved in television programs of governmental and national affairs."

According to present plans a 1000 watt station will be erected at the hotel. The main studio will be in the Wardman Park theatre which has a stage about 30 by 50 feet and seating arrangements for 500 persons. A film scanning studio is also to be used.

Meanwhile owners of television receivers eagerly await the often delayed opening of the CBS station now promised for January. Du Mont has made successful field tests and Mutual has received its license.

DEAF-MUTES "TALK" VIA NEW AMATEUR TELEVISION SYSTEM

Two deaf-mutes have held the first sign language "conversation" by radio in New York by means of the pioneering two-way television circuit set up by radio amateurs between a Manhattan skyscraper and the World's Fair, eight miles away.

Miss Bertha O'Donnell, of the Bronx,

N.Y., and Miss Adele Costa, of Manhattan, carried on the conversation in the sign language while interpreters stood by to unfold the talk to bystanders in both studios. The image definition was very good, viewers asserted, and the women "talked" with as much ease as if in the same room.

Another remarkable television "first" was achieved during this broadcast when Dana A. Griffin (W2AOE), long-time radio enthusiast, received the sign-language images 17 miles away in Williston, L. I. He claims to have set a new "DX" record for amateur television reception.

WINS \$4,000 SCHOLARSHIP

George Warner Swenson, Jr., of Houghton, Mich., is the winner of this year's \$4,000 RCA scholarship competition, winning over approximately 2500 other science students from every state



G. W. Swenson, Jr.

and territory. Young Swenson, who graduated from Houghton High School last June, was one of eleven finalists to pass with highest marks a difficult examination in mathematics, physics, and radio principles. Three others were so close behind him that it was veritably a photo finish. Swenson, pictured herewith, is the son of a college professor. He is also an amateur radio operator, an Eagle Scout, and a singer. He will use his \$4,000 scholarship for tuition and maintenance for four years at Michigan College of Mining and Technology, located in his home town.

FINCH'S AERIAL JUNKET TAKES REPORTERS ALOFT

Members of the press were invited to witness a dynamic demonstration of Finch facsimile in use between a flying airplane and a ground station. At Bendix Airport, in Jersey, the Finch "flying laboratory," an eight-place Fokker plane, was used to carry the newspaper men aloft in relays. They took turns in writing messages which were transmitted to the company's field laboratory.

When the newspaper men were returned to earth, they were shown facsimiles of messages in their own handwriting. When they arrived at the company's plant 15 miles away, they again were shown their chirography as it was transmitted over telephone lines from the trailer to the factory.

The instrument used in the plane measures slightly under 13x14x15 inches and weighs less than 50 pounds complete with power supply. Light beam scanning is used at the transmitter and an electro-chemical system is employed for recording at the receiver. The fact that the images are carried over phone lines with negligible loss

of detail is considered an extremely important point by the inventor. The accompanying photograph shows the apparatus as installed in the plane.

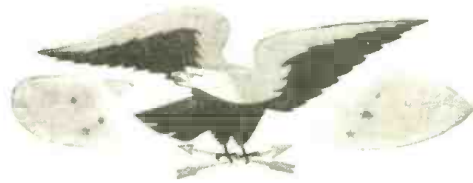


"Grooming" Big Radio Station for Day's Work

A picturized story of the daily routine at WOR, one of the nation's large broadcast stations



● The accompanying photos, reading across from left to right and following the time labels on the pictures, show the daily routine followed by the engineers at WOR, one of the nation's large broadcast stations. Those who have often wondered what happens in the early morning hours at a typical broadcasting station, will find their answer in this picturized story. Some of the engineers have to get on the job bright and early; in the case of WOR, they have to be at the station by 5 o'clock, in order to close the switches to the tube filaments so that the tubes may warm up gradually and be ready for the first broadcast at 6:00 a.m. The second photo marked 5:20 shows engineer Edmund Franke checking the big tubes. The upper right-hand photo marked 5:25 shows Alexander Stanford, one of the engineers at station WOR, looking over the hydraulic pump which circulates cooling water through the large power tubes. The photo marked 5:30 shows us once again Edmund Franke, checking the control circuit switches to see that they are in working order. At 5:45 a.m. we see one of the engineers closing the handle on the oil switch which feeds high voltage to the power tube. The high voltage meter often reads 17,000. Photo marked 5:55 a.m. shows engineer checking with studio. The picture marked 5:59 shows the moment when all the engineers' checks have been finished, the station's carrier is on the air and supervisor Charles Singer, sitting at the main control board, will directly flash an "O.K." signal to the studio. 6:00 a.m. and WOR is "on the air" with the early morning broadcast. (The news announcer is finishing his last bite of breakfast prior to going on the air.) Cover photo shows one of the giant tuning inductances in the transmitter.



Radio Enlists for National Defense

THE RADIO INDUSTRY has answered the call to national defense with an "all out" acceleration of creative activities. In research, in operation, in production—from blueprint to wavelength—the watchword is Service for the Needs of Uncle Sam!

For radio today has attained front-line rank in the national defense program. Its magic voice keeps our citizens informed, unites our nation as a vast community for free discussion. It links together the 21 republics of our hemisphere in bonds of friendship and mutual interest. It enables us to communicate around the world, to reach out to ships at sea, and to guide our aviators through fog and night.

Whole-hearted Response

As a leader in radio research, as the only company that makes and does everything in radio, the Radio Corporation of America is proud of its call to duty. It eagerly enlists its facilities and personnel in the service of the American people.

The emergency finds RCA fully prepared. Months ago the "must" orders went to every subsidiary of the company, with the result that at the present

moment it is making daily contributions through its great laboratories, ceaselessly active in research—through its manufacturing company, in the production of radio apparatus—through communications, flashing message traffic around the earth—through radiomarine, in all-round communication service at sea—and through the National Broadcasting Company, in nationwide, world-wide broadcasting. To fill the need for men with technical skill, RCA Institutes is training radio operators.

Accepting the Challenge

Using all the resources at its command, the Radio Corporation of America is meeting every demand for service—with expanded facilities, increased production, with smooth functioning speed.

In assuming its vital share in national defense, RCA realizes it opportunity to help preserve the unity and integrity of our national life. Each of its thousands of employees pledges his energies and enthusiasm to producing all needed equipment on schedule, to making America's radio communication system the most efficient on earth.



RADIO CORPORATION OF AMERICA
RADIO CITY • NEW YORK

RCA Manufacturing Co., Inc.
National Broadcasting Company

Radiomarine Corporation of America
R.C.A. Communications, Inc.

RCA Laboratories
RCA Institutes, Inc.

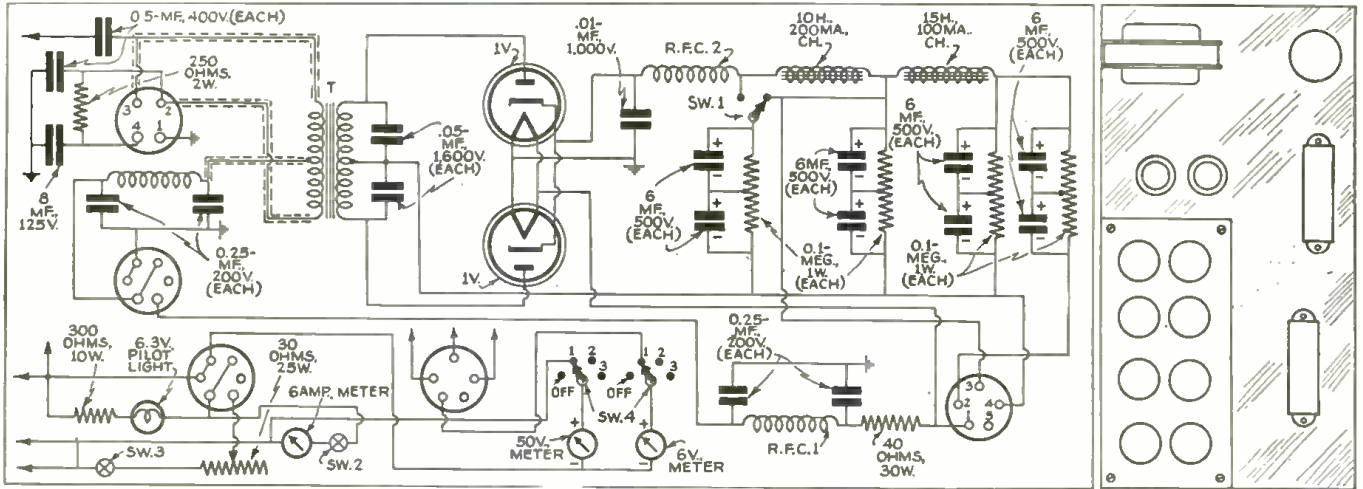


Power-Supply for 32 Volts

● WITH so many farm power plants supplying 32 volts for house lighting, the 32 volt input high voltage output power supply described in *Radio Revista* of the Argentine, should be of especial interest to those in rural areas. According to the author, this piece of apparatus has numerous highly desirable features, not the least of which is its small size, for it can be built on a chassis

no more than 12 x 7 x 2½". The suggested layout, also published herewith, shows the 8 electrolytic condensers may be grouped in one corner to add to its neat appearance. These are all of 4 mf. capacity. A panel approximately 3 x 6 inches carries the control switch and the meters. This control panel may be mounted on the chassis or at a remote point, so that the power-supply

can be located at a point where the vibrator will not be heard. If it is desired to wind the transformer at home, the primary consists of 110 turns of #18 d.c.c. wire and the secondary of 4800 turns of fine (No. 33 to 34) enamel wire, tapped at 2400 turns. The choke (RFC) consists of 100 turns of #18 d.c.c. wire wound on ¼" form. All parts are commercially available.



Hookup for 32 volt power-supply for operating a radio receiver.

Portable All-Wave Set

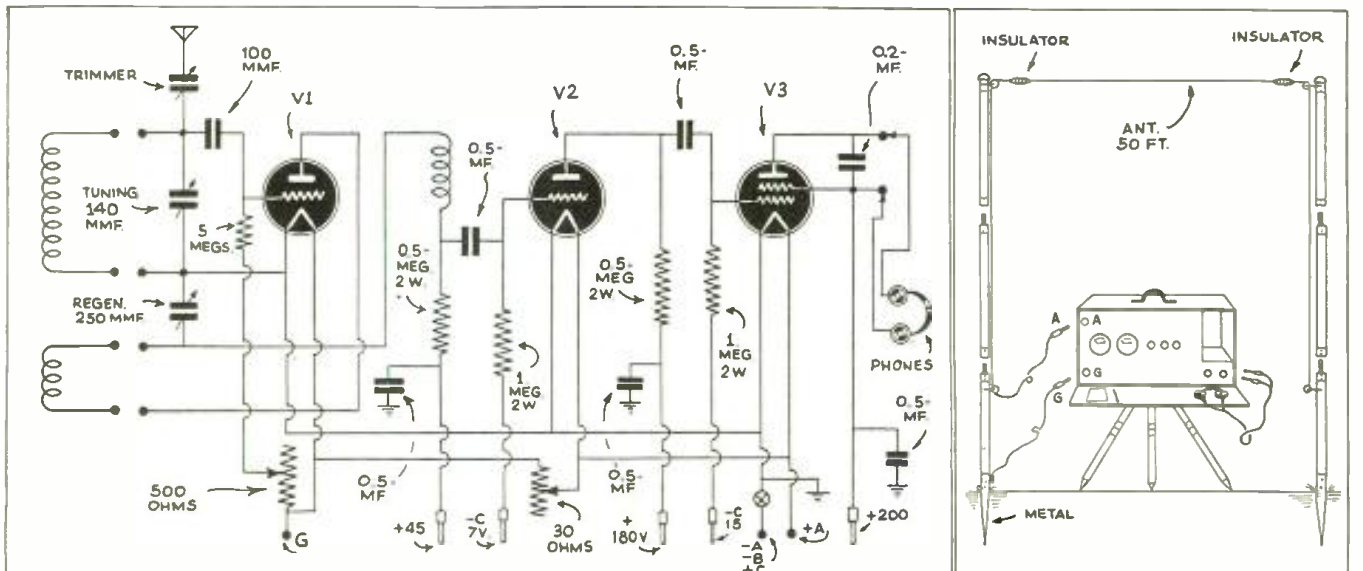
● A PORTABLE receiver for use on both long and short waves is described in *Radio Revista* of the Argentine. According to the author, this set is extremely sensitive and efficient; it employs a simple plug-in system to cover the various frequencies desired, and makes use of the old but efficient regenerative circuit. While the tubes shown are not of American construction, any tubes desired can be used, depending upon the battery supply considered most convenient.

Extremely interesting in this receiver is the means of supporting the antenna. As the illustration shows, this antenna is supported on sectional rods which can be taken apart and carried in the case. One of these supports is provided with a metal point at the bottom, which forms an excellent ground when driven in the earth. It is suggested that aluminum tubing or hard wood be used for the supports. Also provided are three demountable legs and a collapsible stool for use in supporting the

set and permitting the operator to work in comfort.

The main tuning condenser has a capacity of approximately .00014 mf. and the regeneration condenser about .00025 mf. One refinement on this set is the variable resistor used to control the bias on the grid of the detector tube. By moving the arm on this 500 ohm unit, either a positive or negative bias may be applied to the grid. The filament rheostat or the regeneration control may be used to regulate the volume.

A portable all-wave radio receiver, in which battery tubes of any desired type may be employed.



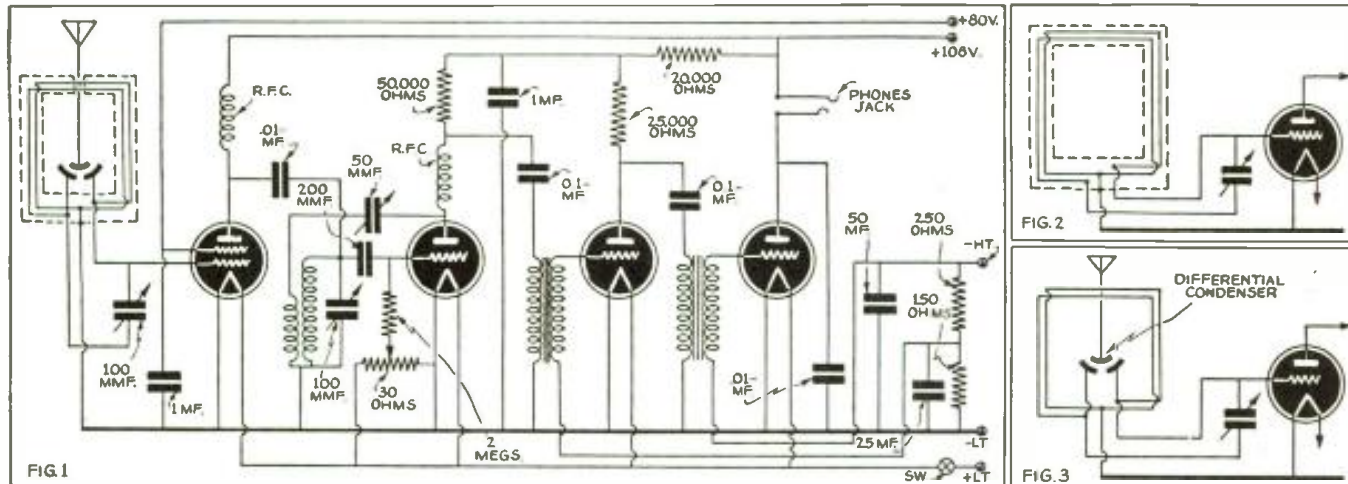
Amateur Direction Finding

● A SIMPLE direction finder, for use by the amateur who is interested in tracking down sources of radio interference or even in finding illegally operated transmitters, is described in *Wireless World* of Great Britain. Fig. 1 shows a circuit diagram of the receiver as used by the author of the article, Alexander Black. Fig. 2 illustrates a method of overcoming "vertical effect" by means of using a center-tapped shielded

loop antenna. Fig. 3 shows the use of a differential condenser in balancing out this unwanted effect. The so-called vertical effect is due to the fact that a loop aerial acts as an ordinary aerial in many instances, due to its capacity to ground.

In use, the loop of the direction finder is rotated until it receives the signal from the station to be located at a minimum intensity. (This is known as the null point.) The loca-

tion of the direction finder is plotted on a map, and this instrument is moved to another point as far distant as convenient, when the procedure is again repeated. Lines drawn on the map at right-angles to the plane of the loop will intersect at a point, and this point is the approximate location of the source which is sending out the signal to be traced. Further tests localize the signal source definitely.

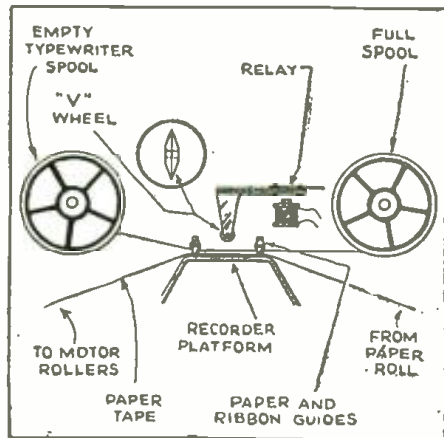


Diagrams above show how an English experimenter constructed an excellent radio direction-finder.

Two Useful Ideas from Abroad

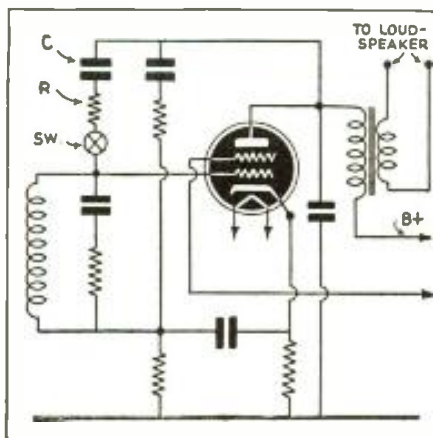
INKLESS CODE RECORDER

● A SIMPLE, clean code recorder is described in *Wireless World* of Britain by F. W. Smith, radio operator. Mr. Smith, objecting to "messy inks and very careful adjustment of stylus", has built a simple gadget, as shown in the accompanying illus-



tration. In his apparatus, the paper tape of the recorder is fitted across a platform over which is a "V" wheel operated by a relay. When the windings of the relay are activated, the "V" wheel will press the typewriter ribbon against the paper tape on which the signal is to be recorded. Mr. Smith says that an R6 signal received on a 2-tube set provides sufficient output to actuate the relay.

of a screen-grid tetrode through the condenser C. The resistance R and the switch S, while the set is being tuned. This switch is automatically closed by a rather tricky leaf spring contact on the shaft of the variable condenser. The contact is held closed only while the condenser is being rotated.



NOISE SILENCER

● A NEW muting circuit to make a radio receiver silent when it is being tuned from one station to another has recently been patented by N. H. B. Brown of England and is reported in *Wireless World* (London). This circuit uses negative feedback which, in effect, paralyzes one of the amplifier stages. It is suggested that it be used on the last A.F. stage although it will also work on the R.F., or I.F. As the diagram shows, negative feedback is automatically applied from the plate to the grid

Can YOU Answer These Radio Questions?

1. What famous football game was recently televised and in what city? (See Page 457)
2. How long do the high power tubes in a modern broadcast station have to be turned on to warm them up, before the station goes on the air? (See Page 458)
3. Why is it desirable to connect resistors across both the primary and secondary windings of the I.F. transformers in a "frequency modulation" receiver? (See Page 463)
4. What effect does the power transformer have on the chassis of an audio amplifier? (See Page 469)
5. Name at least three advantages of "inverse feedback" in an audio amplifier. (See Page 470)
6. What is the advantage of a half-wave rectifier circuit over a voltage-doubling circuit in a transmitter? (See Page 482)
7. What is a simple rule for choosing the size of a choke to use in a filter circuit, so as to obtain adequate filtering? (See Page 487)
8. In designing the video amplifier for an amateur type television receiver, what band-pass at constant gain should the amplifier be built for? (See Page 490)
9. How may a simple Neon lamp be used for the purpose of talking over a light beam? (See Page 498)
10. What is the principle of the talking condenser and how is it made? (Front Cover Feature) (See Page 503)

A Frequency

Herman Yellin,
W2AJL

Frequency modulation transmitters are increasing very rapidly across the country and more and more interest is being aroused in this static-free, high-fidelity transmission. The demand for receiver construction data grows apace.

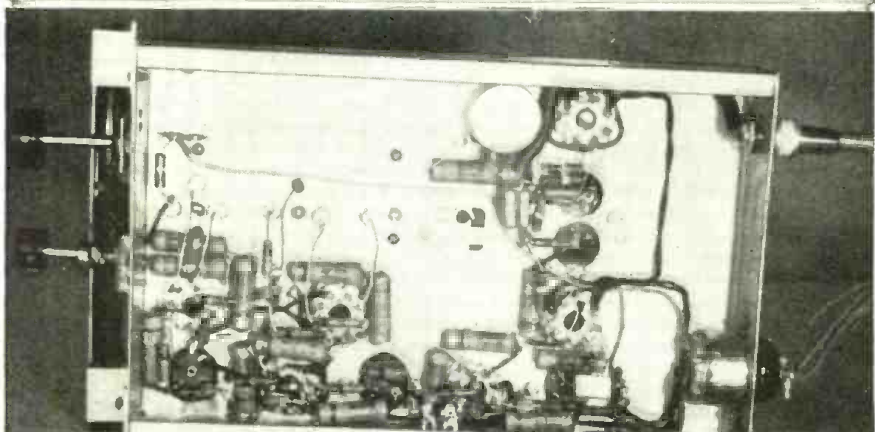
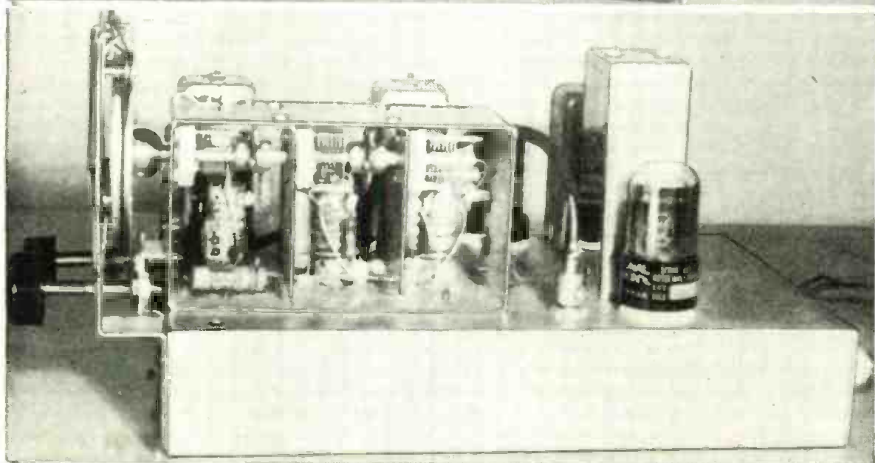
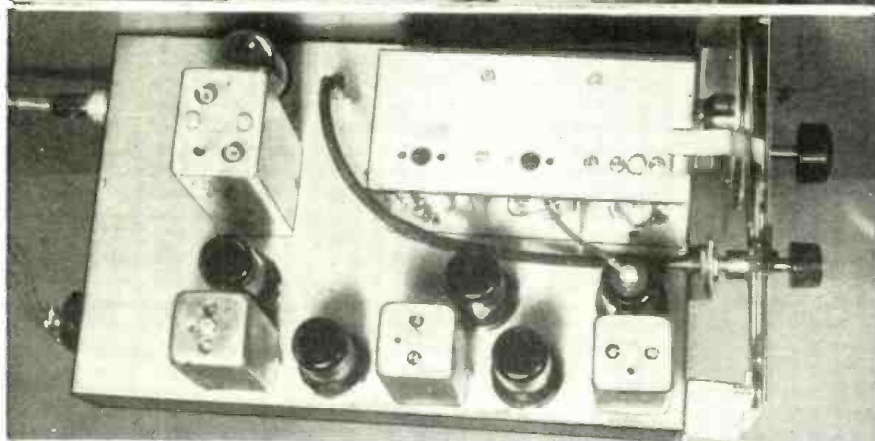
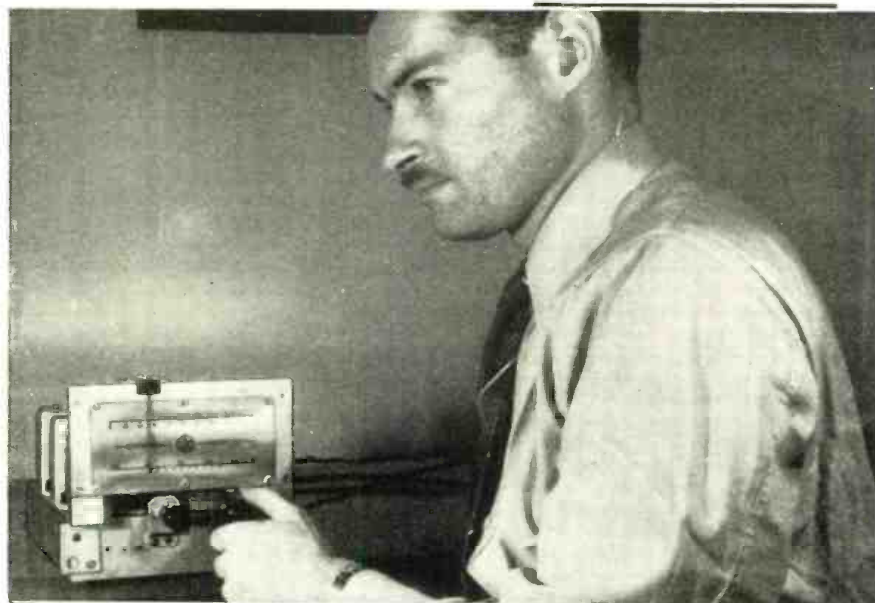
From the economy viewpoint, a *converter* that will make use of a portion of the radio listener's existing equipment, namely the *audio amplifier* and *power-supply*, should be the best choice. Most F-M converters described heretofore have included a built-in power supply, but there is no reason for not using the power-supply of the existing receiver.

Pre-Selection Stage Used

A total of six tubes was used in the writer's converter, including a stage of R.F. *pre-selection*, using an 1852 tube. With the omission of the power-supply, the addition of this R.F. stage involves no great financial difficulty. Where the constructor lives within a short distance of the F-M stations, this stage can be omitted. However, the additional gain furnished by it makes it a worthwhile addition. For one thing, it will help make up for some of the deficiencies of the antenna system. The wide frequency range (42-50 mc.) makes it inevitable that stations near the frequency for which the antenna was cut, will have a greater signal strength than stations whose nominal frequency is far removed from that of the antenna's.

The R.F. stage is fed into a 6K8, acting as a combined detector and oscillator. The writer used a completely pre-assembled tuning unit, containing the three sets of coils, a three-gang tuning condenser and its trimmers. (See parts list.) Use of this tuning assembly greatly simplifies the construction of the converter, and since the coils are precision wound to very close tolerances, there is no difficulty in getting the coils to tune to the required frequency range. However, for those constructors who might care to try their hand at winding their own, complete coil information is appended. The R.F. and detector trimmers are ordinary isolantite-based mica trimmers, while the oscillator trimmer is an air-tuned unit, since oscillator *drift* would be highly objectionable. The oscillator padder is of the silver-plated mica type,

The photos in the group at the left show the frequency modulation tuner, designed and constructed very successfully by Mr. Yellin. The cost of building this tuner is very moderate and it may be connected to any "high quality" audio amplifier and loudspeaker.



Modulation Tuner

The author of the present article, Mr. Yellin, told the editor that he certainly was sold on the idea of frequency modulation programs after he had listened for awhile with the FM tuner here described. "The F-M quality is superb," he said.

which has a zero temperature co-efficient, eliminating any frequency drift from this source.

I.F. Amplifier

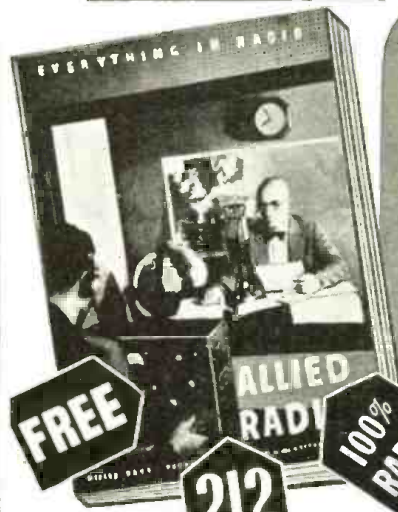
The I.F. amplifier consists of a pair of 1852 tubes and a 6SJ7. While the 1852 tubes can be replaced with 6SK7's at the sacrifice of some gain, the slight additional expense occasioned by the 1852's will amply repay the constructor in the ability to pull-in some weak station just over the horizon. Plenty of gain is desirable here in order to achieve effective limiting, without which noise-free reception is impossible.

With the recent introduction of I.F. transformers specially designed for F-M service, it is no longer necessary to rebuild standard units. Note the use of resistors across the primary and secondary of the transformers. These are used to broaden the frequency response as the I.F. channel must pass a band of frequencies about 180 kc. wide. The fourth transformer is the discriminator unit and is somewhat unlike the usual type of transformer. Those acquainted with broadcast band automatic frequency control however will readily recognize it.

Layout on Small Chassis

The converter was completely assembled on an 11"x7"x2" chassis which could have been a little smaller, but since this was the nearest stock size available, it was used in preference to having one specially made up. Careful attention should be paid to laying out the various components so that the shortest R.F. leads will result. The single-ended tubes have their grid and plate terminals at opposite points of the socket and the socket is so positioned that these terminals are just opposite the proper terminals on the I.F. transformers. *The constructor is earnestly advised to follow closely the writer's chassis layout.* Several photos clearly show the relative positions of all the parts. Deviations from this layout may cause regeneration or oscillation.

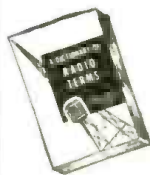
While the volume control could have been mounted on the front of the chassis, the two controls would have been unsymmetrical, so the volume control was placed at the rear of the chassis near the 6H6, and flexible shafting used to bring the knob to the front. This had the added virtue of



RADIO'S GREATEST CATALOG

FOR SERVICEMEN, DEALERS, SOUNDMEN, AMATEURS

If you're in Radio, you can't afford to be without the new 1941 ALLIED Radio Catalog! It's the biggest ever—212 value-packed pages—and the best ever. Shows everything in Radio. Send for your copy now.



New! Radio Dictionary! Just out—compiled by leading authorities. Gives easy-to-understand definitions of all commonly-used radio terms. Biggest dime's worth in Radio. Order by 10c coupon below

15,000 PARTS



• Radio's most complete Catalog—with everything for everyone in Radio. Don't miss the special Builders' and Experimenters' section and the complete Amateur selection of communications sets, etc.

ALLIED RADIO
CHICAGO, ILLINOIS

GET THIS BOOK OF
RADIO VALUES NOW!
THE ALLIED CATALOG SHOWS
EVERYTHING IN RADIO



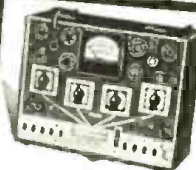
83 NEW MODELS

• 1941 Radio Hits! New style plastic and wood table models; world-wide sets; "Camera" and 3-way Portables; 3-way Radio-Recorders, Combinations, Auto Sets, etc.—all at amazingly low prices—in a big special 40-page radio set section!



NEW P.A. SYSTEMS

• 1941 P.A. design—for every Sound application. 24 new Systems—7 to 75 watts—new features throughout! Lowest prices! Attractive Time Payment Plan and 15 Day Trial Offer. Complete P.A. accessory line—big special 35-page section!



BIG SERVICE SECTION

• More than 120 pages, all value-packed—devoted to new Test Equipment, tools, Service books, etc. More than 15,000 quality parts for every radio purpose—all at prices that save you money!

FREE SEND COUPON

Depend on ALLIED—the World's Largest Exclusive Radio House!

ALLIED RADIO CORP.

833 Jackson Blvd., Dept. 3-M-1, Chicago, Ill.

Send me your FREE 1941 Fall Radio Catalog.

I enclose 10c for New Radio Dictionary.

Name

Address

City State

CHANGE TO CERAMIC-BASE BANTAMS FOR BETTER RECEPTION

HYTRON ceramic-base Bantams improve signal strength at higher frequencies and increase circuit stability. They are laboratory selected tubes, specially tested for use in communications receivers. Use them to take full advantage of the expensive low-loss sockets in your set. These tubes replace metal and "G" series.

6A8GTX	....	\$0.95
6J5GTX	....	0.95
6J7GTX	....	0.95
6K7GTX	....	0.95
6K8GTX	....	1.30
6SA7GTX	....	1.05
6SJ7GTX	....	1.05
6SK7GTX	....	1.05

CERAMIC BASE
Metal base ring grounded to No. 1 pin. Supplied with shield.



HYTRONIC LABORATORIES, 80 Lafayette St., Salem, Mass.

keeping the output leads at a minimum. By mounting the R.F. tuning unit further back on the chassis (about one inch) sufficient space could be made available for a symmetrical mounting of the controls. Use shielded wire in hooking up the volume control, preferably the low capacity type of wire.

Lining Up

Lining up this converter requires a somewhat different technique from lining up an ordinary amplitude modulated receiver. First, a signal generator—accurately calibrated at 2900, 3000 and 3100 kc.—will be necessary. If one is not available, a small bread-board oscillator can be built up and calibrated at the three frequencies. For aligning the discriminator, a high impedance indicator will be needed. Although a vacuum tube voltmeter would be ideal, an oscilloscope or high resistance voltmeter having a resistance of at least 5000 ohms per volt, can be used. With the indicator connected from cathode to cathode of the 6H6, feed a 3000 kc. signal into the grid of the 6SJ7 limiter tube. Adjust the secondary trimmer of the discriminator transformer for zero output, as shown on the indicator. Now

change the signal generator frequency to 2900 kc. and note the magnitude of voltage shown on the scope or meter—the exact value is unimportant. Change the signal generator frequency to 3100 kc. and again note the voltage across the 6H6 cathodes. The two voltages will be of opposite polarity and for proper alignment should be of equal magnitude. Now the trimmer across the primary of the discriminator should be adjusted so that the voltage output will be equal for input frequencies of 2900 and 3100 kc. Several runs will have to be made until this condition exists. Incidentally an insulated screw-driver containing absolutely no metal must be used for these adjustments, as the slightest bit of metal will cause hand-capacity effects. After properly adjusting the primary trimmer, the secondary trimmer may have to be readjusted so that a 3000 kc. frequency will produce zero output. Then recheck the output again for equal amplitude on the 2900 and 3100 kc. signals.

With the discriminator aligned, the other I.F. transformers can be lined up. For this we should use a 500 microampere (or 1 milliamper) meter connected at the point

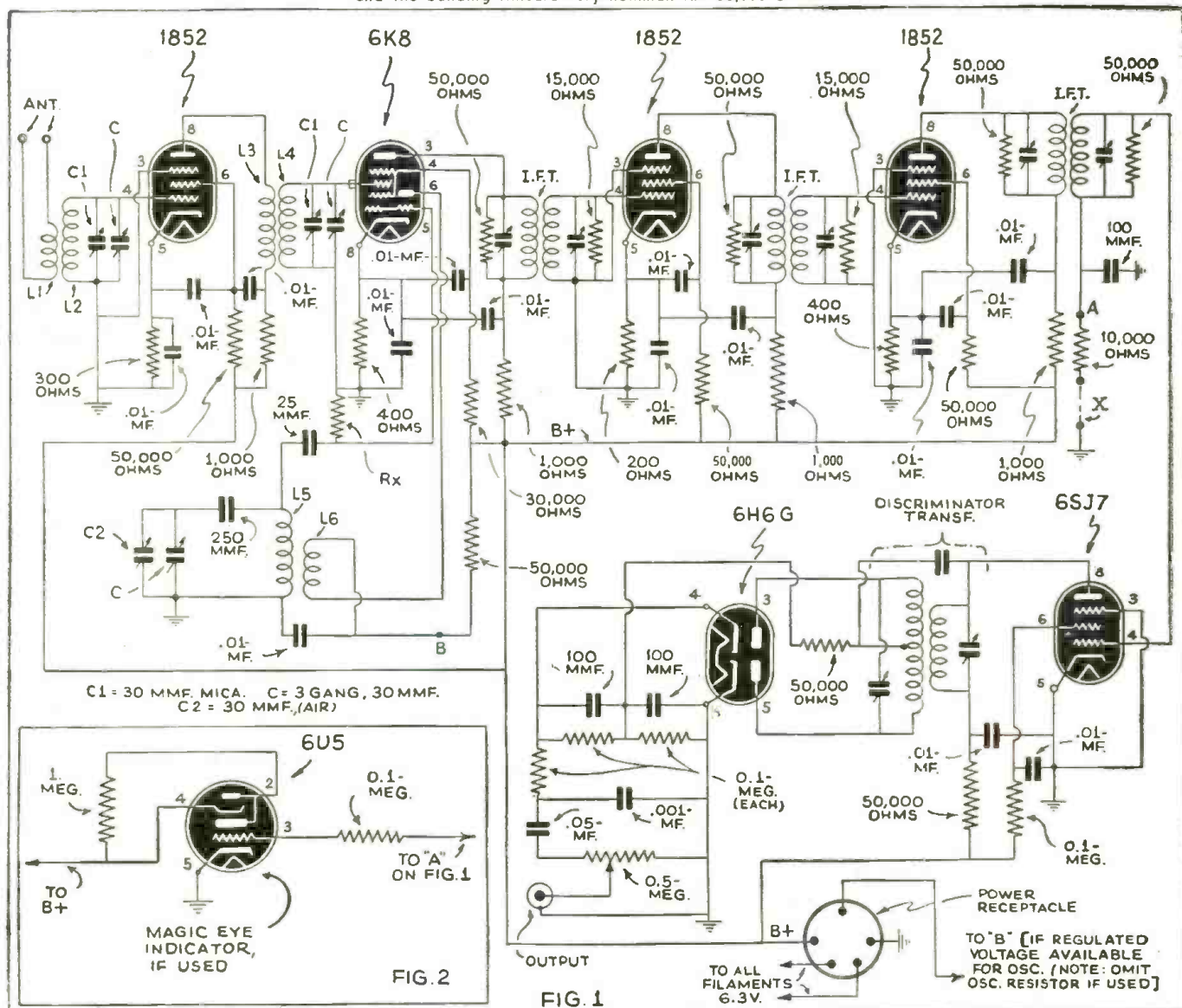
marked "X" on the diagram. A 3000 kc. signal is fed into the grid of the 1852 nearest the limiter and the two I.F. trimmers of the limiter transformer adjusted for maximum current indication. The other two I.F. transformers are similarly aligned by connecting the signal generator first to the grid of the other 1852 and then to the control grid of the 6K8 tube. Before starting the alignment, the converter should of course have been allowed to warm up for about 15 minutes.

With the I.F. system aligned, the R.F. section can be aligned by tuning in an F-M signal and peaking up the detector and R.F. trimmers. The oscillator trimmer is used for spotting the F-M band on the proper portion of the dial.

Power Supply Considerations

Returning now to the subject of the power supply: about 45 milliamperes at 250 volts and 6.3 volts at 2.25 amperes will be required. Of course, the power-supply of most radio sets is insufficient to furnish power to both receiver and converter. But since the R.F. portion of the receiver is not needed when the F-M converter is used, power can be switched from the R.F. por-

The drawing below shows the connection of the various parts used in constructing the "frequency modulation" tuner. The cost of the parts and the building time are very nominal. $r_x=50,000$ ohms.



tion of the receiver to the converter. This is not as difficult as it sounds; it is merely necessary to place a double-throw switch in the 6.3 volt line to the receiver R.F. tubes. Switching off the filament voltage will also stop the plate current flow to these tubes, making that plate current available for the converter. In some cases, a little R.F. filament circuit rewiring may be necessary so that only all the R.F. tube filaments are switched off. However, anyone capable of building this converter should have no difficulty at all in performing this operation.

F-M stations must be tuned-in right on the nose! Turning the tuning dial to either side of resonance will result in marked distortion and a very high noise level. While stations can be tuned-in by tuning for the point of zero noise, the best method is to use some sort of indicator. The best and most accurate type would be some device operating from the output of the discriminator tube but this becomes somewhat complex. Second best method is to measure limiter current or voltage across the limiter resistor. A 6U5 magic-eye tube can be used to good advantage here and can be hooked up as shown in Fig. 2. The grid of the 6U5 is run through a .1 megohm resistor to point "A" on Fig. 1. Maximum closing of the eye will be indicative of having properly tuned in the station. If the discriminator and other I.F. transformers are not correctly aligned, the tuning dial position for maximum eye closing will not coincide with the position for minimum noise level. If this happens, then get ready for another session at alignment.

The Antenna to Use

The simplest and at the same time the most effective type of antenna would be a horizontal half-wave doublet. The writer is at present using one, each arm being

5 feet 3 inches long and with twisted-pair feeders. Where the lead-in will have to be very long, some form of spaced feeders should be used in order to minimize line losses. Incidentally this antenna length favors the stations at the low frequency end of the band, but in the New York area, all the F-M stations are located at this end. Direct the antenna for best pickup of the weakest stations where stations from several directions can be received.

Parts List

BROWNING LABS.

- 1—BL-40T tuner
- 1—BL-6D dial
- 3—BL-3M I.F. transformers
- 1—BL-3D discriminator transformer

BUD RADIO, INC.

- 1—11"x7"x2" chassis, No. 1193
- I.R.C.
- 1—200 ohm, type BT $\frac{1}{2}$
- 1—300 ohm, type BT $\frac{1}{2}$
- 2—400 ohm, type BT $\frac{1}{2}$
- 4—1,000 ohm, type BT $\frac{1}{2}$
- 2—15,000 ohm, type BT $\frac{1}{2}$
- 1—20,000 ohm, type BT $\frac{1}{2}$
- 9—50,000 ohm, type BT $\frac{1}{2}$
- 3—100,000 ohm, type BT $\frac{1}{2}$
- 1—10,000 ohm, type BT $\frac{1}{2}$
- 1—500,000 ohm potentiometer, type 134

NATIONAL UNION (Tubes)

- 1—6K8
- 3—1852
- 1—6SJ7
- 1—6116G

Frequency Modulation Tuner—Coil Data

- L-1—2 turns No. 18 interwound with L-2
- L-2—5 turns No. 16 spaced to $\frac{1}{8}$ " long
- L-3—2 turns No. 18 interwound with L-4
- L-4—5 turns No. 16 spaced to $\frac{1}{8}$ " long
- L-5—5 turns No. 16 spaced to $\frac{1}{8}$ " long
- L-6—3 turns No. 18 interwound with L-5

AMPHENOL

- 6—Octal statite sockets, Type S88
- 1—5-prong receptacle in flush shell, No. PM5-11T (power receptacle)
- 1—5-prong plug, No. PF5-11T
- 1—Output chassis receptacle, type No. PC 1M
- 1—Female plug, No. MC-1F

CORNELL-DUBILIER

- 14—.01 mf., 400 volt condensers, No. DT-481
- 1—.05 mf., 400 volt condenser, No. DT-185
- 3—.0001 mf. mica condensers, No. 5WL-5T1
- 1—.001 mf. mica condenser, No. 1WL-5D1

BOOK REVIEWS

AMATEUR RADIO—A BEGINNER'S GUIDE. by J. Douglas Fortune. Stiff cloth covers, size 6 $\frac{1}{4}$ "x9 $\frac{1}{4}$ ". 158 pages, published by the Thordarson Electric Manufacturing Company, Chicago, Illinois.

An excellent book for the radio beginner who is intent upon obtaining an amateur operating station license. The book opens with an introduction on amateur radio, and then takes up the details of how to learn the code. Other preliminary subjects cover the elements of electric circuits, diode and triode vacuum tubes, receiver theory and construction, with some very nice drawings and pictures, etc. Later chapters deal with the why and wherefore of the crystal oscillator-transmitter, a 2-stage transmitter and finally a 3-stage transmitter. Other chapters cover the construction details with drawings and photos of a well-designed modulator for the 3-stage transmitter; the closing section covers transformer principles, action of condensers, regeneration, types of tubes, different classes of amplifiers, a table of Q-symbols and abbreviations, a table of radio diagram symbols, etc.

TELEVISION BROADCASTING. by Lenox R. Lohr, President of the National Broadcasting Co., with a foreword by David Sarnoff (President of RCA.) size 6 $\frac{1}{4}$ "x9 $\frac{1}{4}$ ". 274 pages; illustrated with diagrams and photos of actual television broadcasting. published by McGraw Hill Book Co., Inc., New York, 1940.

This is a very valuable book to the general student of television and it covers such interesting and vital subjects as the legal aspects of television service, the rôle of the sponsor in television, basic economic factors, the problem of network broadcasting for television, general aspects of outdoor television pickups, etc. Other topics discussed at length, in an authoritative manner, are motion picture film television, with diagrams showing how the images from the films are picked up by the lens-cope, etc., and a valuable section covers the production of studio programs, while an appendix contains a typical television script, with production directions. To round out the book the author has included a chapter on the

technical elements of television systems, with diagrams and photos.

THE ART OF MODERN WARFARE. by Herman Foertsch, (Col. of the German General Staff) with introduction by Major Geo. S. Elliott. Size 6"x8 $\frac{3}{4}$ ", 274 pages, published by Veritas Press, New York.

This book, written as it is by an outstanding expert on military matters, should be "must" reading for every student of the science of war. Those interested in radio and wire communication as applied to modern military maneuvers, will find some very interesting reading in this excellent work. In several places Col. Foertsch discusses the values of radio and also wire connection, the methods of catching and interpreting enemy messages, the rôle of the engineer in war, the importance of radio propaganda, etc.

TELEVISION TODAY AND TOMORROW. by Sydney A. Moseley & H. J. Barton-Chapple. Stiff cloth covers; size 5 $\frac{3}{4}$ "x8 $\frac{1}{2}$ " inches; 180 pages; with numerous illustrations. Published by Pitman Publishing Co., New York, N. Y.

This is the new fifth edition of this very useful television handbook. Every student of television should have a copy of this book on his reference shelf, and the young student of television will find many interesting and instructive chapters therein. This book will appeal to the general reader as it explains how a subject is scanned, how large television images have been produced, the interesting method of photographing a "live" scene on motion picture film, which is rapidly developed, dried and then passed through a television transmitter, etc. The method of synchronizing is described, together with circuits of a typical television receiver, the method of using interlaced scanning, different types of deflection for cathode-ray tubes, ultra-short wave aerials, etc. Stereoscopic and color television are also discussed. A valuable appendix of television terms is provided, as well as an index to all of the subjects covered in the book.

(Continued on page 509)







FREE!

196 PAGE
Lafayette
**BOOK OF
BUYS!**



What a book to have! Just open it to the section you are interested in—there's your radio, sound system, your choice of nationally advertised parts. Everything's here—everything that's new in radio and a lot of needed equipment no longer made. But that's only the start of the story! Lafayette prices are the lowest—saving you money on everything you buy, while you save time by ordering at home. Send for FREE copy of the Lafayette Radio Catalog today.

LOOK what's in it!

 <p>RADIOS</p> <p>64 brilliant new models for home, farm, camp and car. Voted "Best Buy" consistently by Consumer Test laboratories. 30 day home trial. Portables, mantels, consoles, phono-radios.</p>	 <p>TEST EQUIPMENT</p> <p>The leading lines, the newest "wrinkles", the biggest values. Pocket and portable testers, combinations, all-purpose models—easy to own on Lafayette's pay-as-you-earn plan.</p>
 <p>RADIO PARTS</p> <p>All the famous names at rock-bottom low prices. Complete stocks include latest type tubes. Special section of super values.</p>	 <p>SOUND SYSTEMS</p> <p>Three complete ranges. Years ahead in engineering, and styling—here's P.A. for every purpose, priced for every purse.</p>
 <p>HAM EQUIPMENT</p> <p>The latest developments in your favorite line. Big savings. New Easy Pay Plan. Now you can enjoy the rig you've always wanted.</p>	 <p>HOME BUILDERS KITS</p> <p>See these Kits for experiment and thrifty fun at home, building radio and television receivers. New! Build-it-yourself kit for FM.</p>

THIS BOOK SAVES YOU — TIME. If it isn't in the catalog, Lafayette can get it for you. Famous fast service. MONEY. Lafayette will NOT be undersold. Mail coupon at once for FREE copy of Radio's latest, greatest buying guide!

FREE FOR CHRISTMAS! Lafayette's special gift catalog. Packed with suggestions for family and friends. Ready now — get your FREE copy at once.

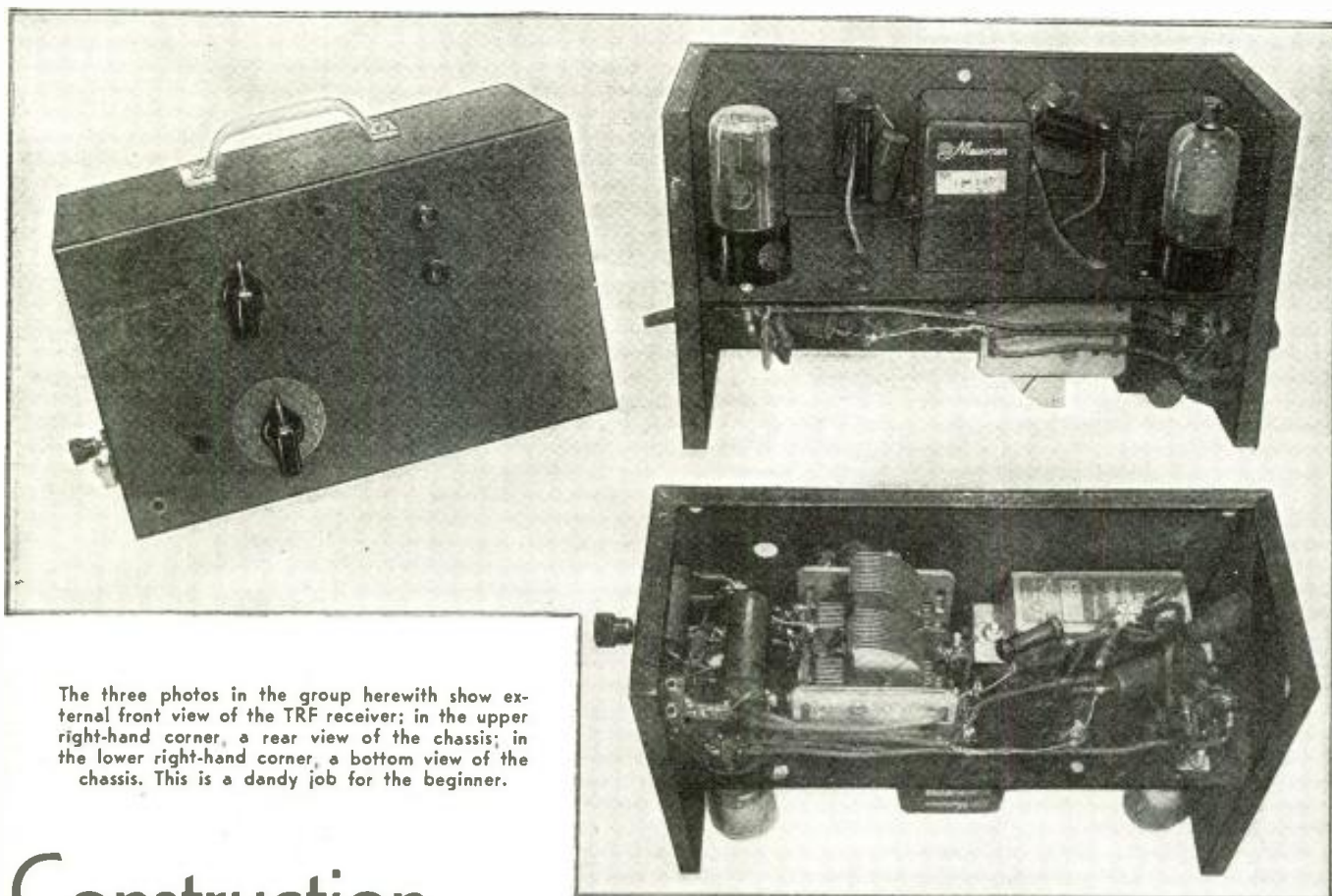
Lafayette Radio

NEW YORK, N. Y., 100 Sixth Ave.
CHICAGO, ILL., 901 W. Jackson Blvd.
ATLANTA, GA., 245 Peachtree Street
BOSTON, MASS., BRONX, N. Y., NEWARK, N. J., JAMAICA, L. I.

LAFAYETTE RADIO CORP.
Dept. 4M—901 W. Jackson Blvd., Chicago, Ill.
or 100 Sixth Ave., New York, N. Y.

Rush FREE Catalog No. 82.
 Rush FREE Gift Catalog No. 83.

NAME.....
ADDRESS.....
CITY..... STATE.....



The three photos in the group herewith show external front view of the TRF receiver; in the upper right-hand corner, a rear view of the chassis; in the lower right-hand corner, a bottom view of the chassis. This is a dandy job for the beginner.

Construction and Operating Notes on the TRF-2

Fred W. Smith, Jr.

● RECENTLY, among the multitudes of GT "Bantam" type tubes being released, there appeared the 3A8GT, which includes within one glass envelope several elements capable of doing four operations at one time. These include R.F. amplification, diode detection, A.V.C., and audio amplification. The R.F. section consists of a remote cut-off pentode and the audio triode is a high mu unit. (Amplification factor: 65).

Following this lead the circuit shown here was designed to utilize the above tube's features. To complete the circuit a beam-power tetrode of similar type, the 3Q5GT, was employed in the power amplifier stage. This tube with 90 volts on the plate and screen is capable of delivering 250 mw. (milliwatts) output, which is comparable to the output of any modern commercial "portable."

The filaments of these tubes operate on 2.8 volts each and as they are wired in series in this circuit, they can be supplied by a small 6 volt dry battery, the drain on which is only 50 ma. The filaments also have center-taps which allow the tubes to be used with 1.4 volt dry cells, but in those applications the battery drain is doubled for each tube.

As may be seen from the circuit diagram,

This very simple and efficient receiver employs a 3A8GT and a 3Q5GT. The circuit employed is a tuned radio frequency hook-up, with diode detector, AVC, etc.

iron core antenna and R.F. transformers are used. These are absolutely essential if the circuit is to perform effectively. The circuit is a simple T.R.F. with diode detection and A.V.C. No loop was used as more gain is realized with the "ferrocart" antenna coil. 90 volts of "B" are used and the current requirement is only 9 ma. Bias for the 3Q5GT is obtained by the use of a 600 ohm resistor in series with the B-battery lead and the chassis, which acts as a common ground. The 1000 ohm resistor and the .1 mf. paper condenser in the plate circuit of the R.F. stage act as an R.F. filter to prevent parasitic oscillations. Either phones or a P.M. speaker may be used. In case a speaker is used, an output transformer having an 8,000 ohm primary should be used for a correct load impedance.

To align the circuit, attach an aerial to the antenna terminal, connect the batteries and a pair of headphones and tune in a station. Reduce the trimmer on the diode section of the tuning condenser to its minimum capacity and then adjust the trimmer on the R.F. section of the condenser for maximum volume.

No details are given here as to the position of the parts on the chassis as this is left to the discretion of the set builder. The receiver, as originally built, consisted of the circuit wired into a small, cracked finish cabinet 9"x5½"x3½", connected by a 4-wire cable to the batteries, which were strapped into a refinished cheese box. If the constructor so desires, he may place the batteries and the receiver circuit in the same cabinet.

The only precautions necessary in wiring this receiver are in keeping the R.F. leads as short as possible and the solder flux from dripping on wires and shorting them. To wire the R.F. pentode grid lead the antenna coil must be removed from its shield and a wire attached to the grid terminal of the coil. Then it should be brought through the hole punched in the top of the can, and finally, the grid cap should be attached to the lead.

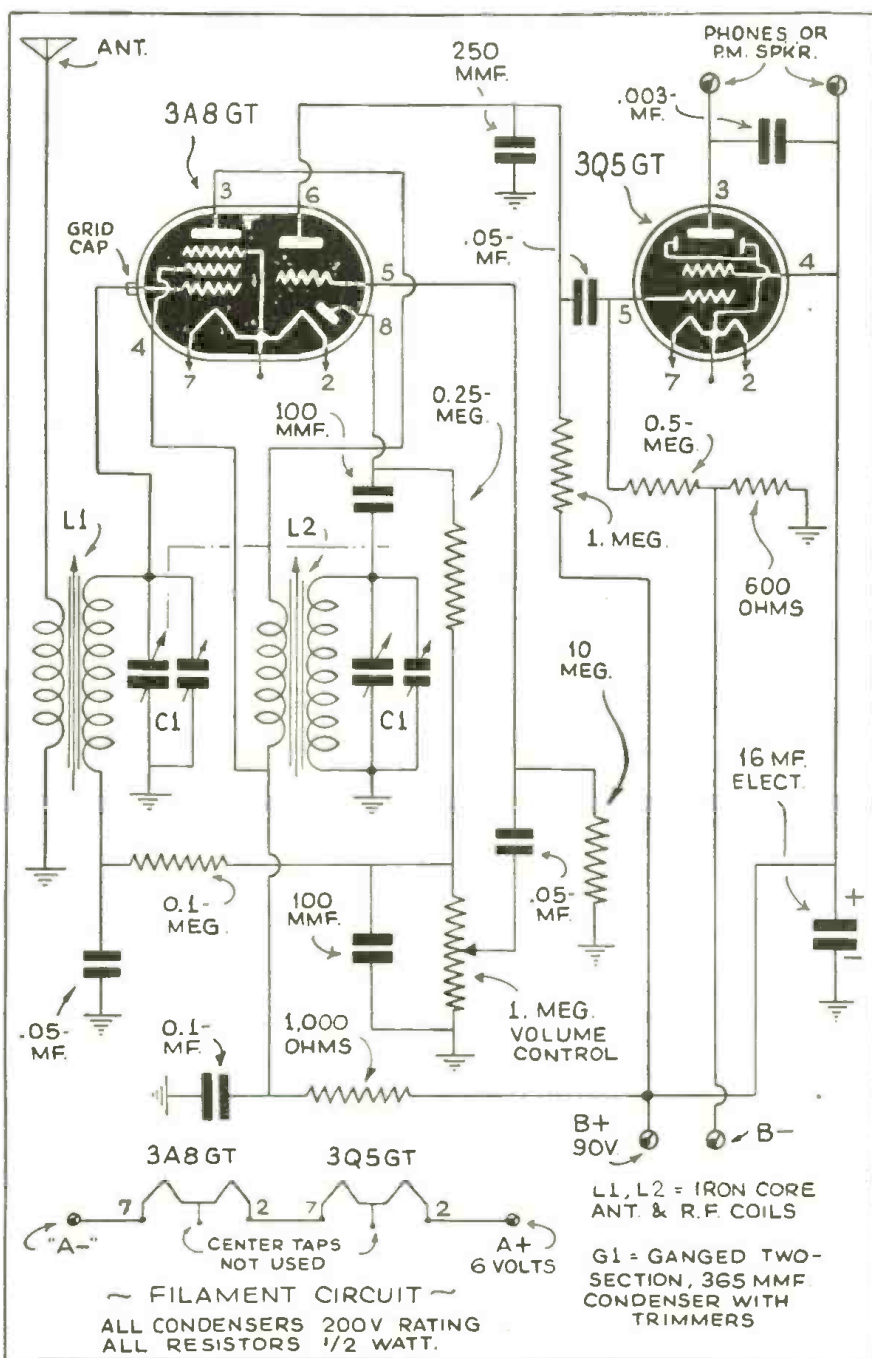


Diagram of TRF-2 Receiver.

Results: By merely placing a hand on the antenna terminal, good reception of "locals" can be obtained. With a 50-foot aerial and a ground, considerable DX is obtained and the receiver is driven to full output. In all cases a ground connection improves the volume immensely.

The "A" and "B" batteries will last about 200 hours with moderate use. The secret of long battery life with this receiver, as with all battery-operated equipment, is intermittent use of the equipment—with long and frequent rest periods for the batteries.

Parts List

MEISSNER

- 1—Ferrocart antenna coil, 14-1496
- 1—Ferrocart R.F. coil, 14-1497
- 1—2-gang 365 mmf. variable (with trimmers), 21-5214

RCA (Tubes)

- 1—3A8GT
- 1—3Q5GT

CONDENSERS

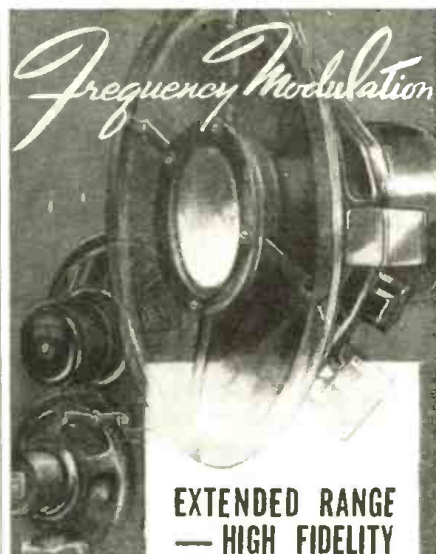
- 1—16 mf. dry electrolytic, 200 volts
- 3—.05 mf. paper condensers, 200 volts
- 1—.1 mf. paper condenser, 200 volts
- 2—100 mmf. mica condensers
- 1—250 mmf. mica condenser
- 1—.003 mt. mica or paper, 200 volts

RESISTORS

- 1—1000 ohm, 1/2 watt resistor
- 1—1 megohm volume control (potentiometer)
- 1—600 ohm, 1/2 watt resistor
- 1—1 megohm, 1/2 watt resistor
- 1—500,000 ohm, 1/2 watt resistor
- 1—10 megohm, 1/2 watt resistor
- 1—250,000 ohm, 1/2 watt resistor
- 1—100,000 ohm, 1/2 watt resistor

MISCELLANEOUS

- 2—AMPHENOL octal wafer sockets
- 2—EVEREADY 45-volt "Minimax" No. 482
- 1—BURGESS 6 volt "A"—F4PI
- Hardware, binding posts, cabinet, solder, jacks, headphones, dial scale, knobs, hook-up wire, grid cap, etc.



EXTENDED RANGE
— HIGH FIDELITY

There is now available a complete family of special Jensen products for Frequency Modulation and Television receivers as well as for monitoring and studio work. The new 15" dual-unit model in Permanent Magnet design has a built-in filter network—shows an extended high frequency response up to 14,000 cps. The 8" and 12" PM models are extended to 10,000 cycles. All three available in the standard "MT" type Bass Reflex enclosure—the two larger also available in the new Walnut "CA" type Bass Reflex enclosure. All extremely modestly priced.

Jensen Radio Mfg. Co.

6601 S. LARAMIE
CHICAGO, ILL.



Jensen
Bass Reflex
REPRODUCERS

A General Purpose

AUDIO AMPLIFIER

Bert Kelley

● THERE are no doubt, many experimenters who wish for a low cost, high gain, high fidelity amplifier but think that it is impossible to obtain satisfactory results with a low price unit. The uses for a good amplifier are legion. It may be used for public address in small auditoriums, as an amplifier for a radio tuner, phonograph reproduction, for testing radio circuits, as a call system, and for experimental uses, such as talking on a light beam, etc. For those with limited bank-rolls, this amplifier is dedicated.

It features flexible design. Inputs may be from one to four in number, depending upon the constructor's desires. The system has plenty of output for experimental and entertainment purposes, as it is rated at ten watts output, undistorted. The amplifier has high enough gain for any common crystal, velocity, or capacity mike, but in spite of its high gain it is as stable as the Rock of Gibraltar. By using the low gain input from a radio tuner or pickup, there is enough sock to overdrive the final stage. Last but not least, the output is of very good quality.

The tube lineup is a 6J7 pre-amplifier, resistance-coupled into a 6N7 mixer transformer-coupled to a 6F8 which drives the push-pull 6AC5's. These 6AC5's were

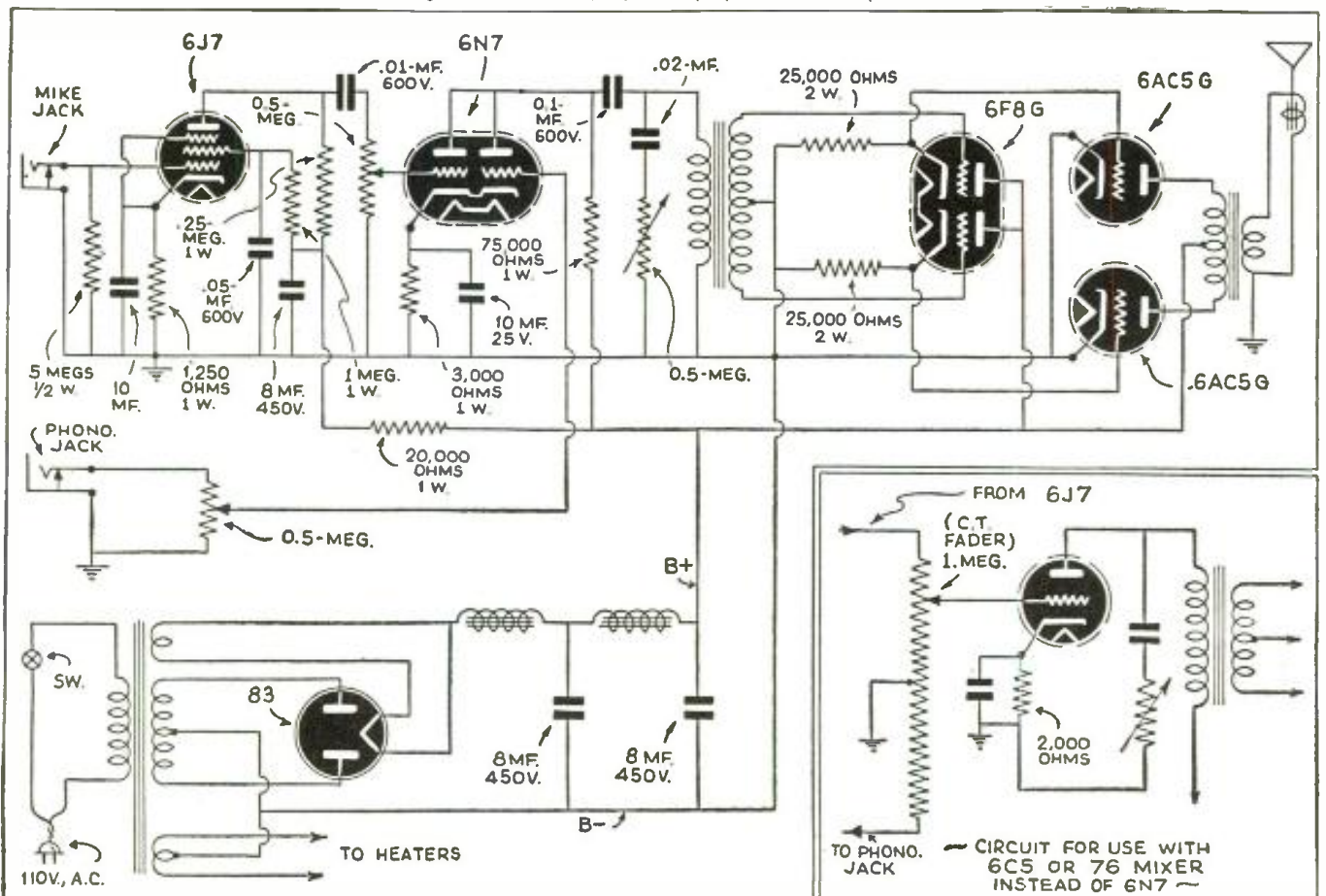
originally designed to operate in a direct coupled circuit using 76's as drivers. As the 76's supplied 13.5 volts positive bias to the output tubes grids, it was important that if different type drivers were substituted, that they have the same characteristics as the drivers which were originally meant to operate in this position. It was thought desirable to eliminate one tube from the lineup by using a dual triode here. A search through the tube manual showed that the 6F8 was the closest approach that was possible, with the tubes now available.

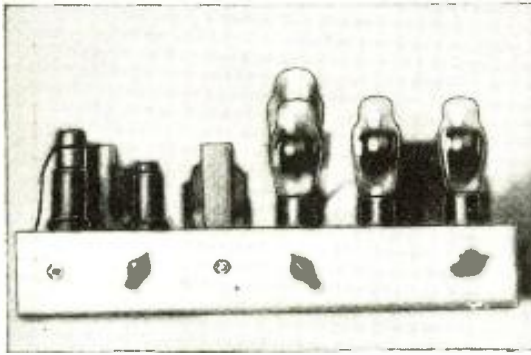
The 6N7 mixer provides the hub on which the flexibility of the amplifier centers. It provides for mixing the microphone input with one, or possibly two, inputs. If the mixing feature is not wanted, a 6L5, 6J5, 6C5, 76 or other triode of similar type, may be used and a center-tapped control substituted for the straight gain control, following the 6J7 pre-amplifier. In this hook-up, high gain or low gain input may be selected by turning the control knob to the correct position. The 6N7 could be used as shown and center-tapped controls substituted for the two straight gain controls. In this manner one high gain input and 3 low gain inputs can be had. It will be noticed that no plate current can flow through the

primary of the input transformer because of the blocking condenser. It is important that the 6N7 be connected in this way. It results in higher output and better tone than the other method, because there is no D.C. polarization. If a single triode is used, it may be connected in the usual manner, using the transformer primary to carry the plate current without too much loss in quality. A tone control is shown so the operator can adjust the tone to suit his taste. The input transformer should be of high quality because it is in an important circuit position. Good tubes should be used in the amplifier to minimize microphonics.

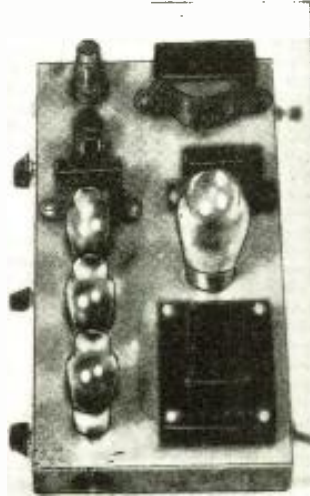
The complete amplifier was built upon a 7X13X2 inch steel chassis. This size provides enough room to mount the parts without crowding. In laying out the circuit, it is perhaps best to mount the tubes in a line across the front of the chassis. In this manner, the controls and jacks are very near to the circuit positions they affect. This makes wiring easier and, more important, it enables short leads to be run from the controls which keeps hum and feed-back down. The power transformer should be mounted at a remote corner of the chassis to prevent a low-level inductive hum from being picked up in the input transformer.

Diagram of Mr. Kelley's general purpose Audio Amplifier.





Front and top views of audio amplifier.



Fair power-supply regulation is desirable in any amplifier circuit. For this reason, choke input from a mercury vapor rectifier is used in a conventional hookup. Layout of the chokes is not so critical; mount them at the rear, wherever there is room. The two-section filter does a splendid job of smoothing out the plate voltage. This is proved by the fact that the gain control may be turned way up, with no hum evident in the speaker. The 83 shown should be replaced with an 80 if the system is to be used with a radio tuner. The 83 puts out a "hash" that is very annoying. Good quality filter condensers should be used. In the event that the amplifier "motorboats", the trouble may be remedied by doubling the size of the output condenser. The decoupling resistor in series with the plate lead to the 6J7 should not be left out. Its use tends to stabilize the system and filter the plate voltage even more. If the constructor intends to use the amplifier as a power-supply, he should use oversize transformers and chokes. Also it would do no harm to increase the capacity of the filter condensers. A socket on the end or rear of the chassis would be a very convenient method of connection. A voltage divider across the output would enable one to take off different voltage values. Each tap should be bypassed with a one or two microfarad condenser.

Now for pointers on wiring the unit. Shielding should be used on all signal leads as far as the 6N7 grids. The lengths of leads are not so critical as in a receiver, but they should not be excessively long. Make sure they are well insulated. Shielding to the 6J7 grid should extend to within 1/8 inch of the grid cap and a shield cap should be placed across the top of the tube to prevent hum. It is well to make sure that there is positive contact between this shield and the shell of the tube. While we are on the subject of grounding, it is well that we observe a few rules that are important. The first is that the constructor use only one common ground to the chassis. The reason for this is that the power transformer induces eddy currents in the chassis, just as it induces voltages in the transformer windings. These eddy currents are small, it is true, but they have a way of showing up and causing trouble with hum in an amplifier, that is unpredictable and mystifying. The best point to make the common ground to is the 6J7 input jack. In this way it is not necessary to insulate the jack from the chassis. From the jack run a wire to one lug on each octal socket and run wires from these lugs to the various other components that are grounded. The point is—do not

use the chassis as a ground conductor. Its only electrical purpose is for shielding. The second rule is to ground the bypass condensers at the end marked outside foil or black ring. This lends more stability.

The filaments should be wired first. It is not necessary to transpose the wires, but it is well to keep them close to the chassis. The amplifier should have a "ground" binding post mounted on the rear.

The output transformer should be 10,000 ohm push-pull—voice coil secondary to the speaker.

Get a speaker that can handle the output easily. A larger speaker generally has better tone than a small one. To make it easy to set up the amplifier, sockets and plugs should be used instead of terminal strips.

This amplifier has been thoroughly tested and came through these tests well.

Parts List for Amplifier

- RCA (Tubes)
 2—6AC5G
 1—6F8G
 1—6N7
 1—6J7 (or 6C5)
 1—83

THORDARSON

- 1—Push-pull input transformer
 1—Output transformer
 1—Power transformer, Type 13R14
 2—Filter chokes—for rectifier

I.R.C. (Resistors)

- 1—5 megohm, 1/2 watt resistor
 1—1250 ohm, 1 watt resistor
 1—3000 ohm, 1 watt resistor
 1—75,000 ohm, 1 watt resistor
 1—.5 meg, variable resistor
 1—1 megohm, 1/2 watt resistor
 1—.25 megohm, 1 watt resistor
 1—20,000 ohm, 1 watt resistor (decoupling)
 2—25,000 ohm, 2 watt resistors
 2—.5 meg, potentiometer

AMPHENOL

- 5—Octal sockets
 1—4-prong socket

SOLAR

- 1—.02 mf. 600 volt condenser
 1—.1 mf. 600 volt condenser
 2—10 mf. 25 volt condensers
 1—.01 mf. 600 volt condenser
 1—.05 mf. 600 volt condenser
 1—3-section (8 mf. each) 450 volt condenser

CENTRALAB

- 1—1 meg. ohm center-tap fader resistor

MISCELLANEOUS

- 2—Grid caps and shield cap
 1—Metal chassis, 2x13x13 inches
 2—Shorting jacks
 1—A.C. switch and line cord
 1—Fuse and holder
 3—Knobs and plates
 Nut, bolt and washer assortment

H. G. CISIN'S NEWEST
SPACE EXPLORER

MODEL 7-B (7-BAND)

SHORT WAVE—B'CAST—LONG WAVE
 ALL ELECTRIC DUAL BEAM POWER
 COMMUNICATIONS RECEIVER

SEVEN OVERLAPPING BANDS—8 1/4 to 2000 meters.
 Professional Band Spread, Dual Beam Power,
 Communications Set.

POWERFUL, SENSITIVE, SELECTIVE—Ultra-Modern Features include: Dual Beam Power Output, Built-in Full Toned Electro-Dynamic Speaker, Patented Cisin A.C.-D.C. Circuit, Low-loss Air Dielectric Band Spread on all bands, Self-Contained Power Supply, Precision Filtered to eliminate hum, Full Vision Dial, Antenna Control, Headphone Jacks, Dual Re-generation Control, Each Beam Power tube furnished with 2 wave unit, rectified power to dynamic speaker giving Full Loud Speaker Volume, Studio Tone Quality, Sturdy drilled metal chassis. Verified long distance reception reported by many owners. Gives professional results, but plans are so clear anyone, even a novice, can build this set successfully.
 Uses 100% Metal Tubes rather than low-priced "germ" type tubes in carefully engineered patented circuit. Designed to operate two or more speakers.

Complete assembled kit
 Find-All chassis parts incl.
 drilled chassis (unwired,
 less tubes, co. speaker)

\$6.95

Newly Developed Circuit
 requires neither Ballast
 Tube nor Heater Cord.

Set of Following Matched Metal Tubes
 1—6J7: 1—6C5: 2—251A: 2—5Z0
 Four's. W. Coils, 8 1/4 to 200 m. \$1; two 'b' cast coils,
 200-600 m. Long Wave Coil and L. W. Unit \$1;
 Wired and Tested \$2.50 extra; Dynamic Speakers, each
 \$1.95. Shpg. wt. 7 lbs. No circulars available.



SPECIAL-SPACE EXPLORER 7-B, wired, laboratory
 tested, all coils, except long wave, set
 matched tubes, one speaker, ready to use **\$17.45**

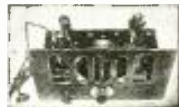
NEW—Pre-selector attachment permits Space Explorer to
 be used as Pre-Selector—\$1 additional

H. G. CISIN'S Air Scout Jr. Radios

MODEL 3AE
 ALL ELECTRIC
 SHORT WAVE SET

\$20
 WITH PHONE
 Less
 Tubes
 Unwired

A powerful sensitive short-wave set. Holds wonderful records for distant reception. Also brings in police Transatlantic phone and broadcast on long wave volume. Works from any A.C. or D.C. house current. Easiest set to build. Speaker mounts on attractive panel. Range 9 1/2 to 610 meters or to 1500 meters with special long wave coil. Complete Kit includes: Earphone, broadcast coil, 70 to 200 meter coil, Panel, Chassis, High Grade Variable Condenser, Potentiometer, Antenna Trimmer, Dial, Sockets, Knobs, Wire, Resistors, Condensers, and all other required parts including instructions \$3.20 tubes, unwired



MODEL 3AE
 Pat. No. 2,086,258

parts including instructions \$3.20 tubes, unwired

THREE-TUBE DE LUXE BATTERY S.W. SET—Model 3B. Complete kit including all parts in the 1-tube model plus parts for extra audio attachment including two 31-type tubes and 33 With Three Tubes power output tube. \$3.45 & phone (unwired)

Following Auxiliary Parts are available: 9 1/2 to 20 meter coil 25c; 15 to 45 meter coil (foreign) 25c; 40 to 80 meter coil (foreign) 25c; 2 1/2 volt 'B' battery 75c; Two flashlight 'A' batteries 10c each; 5" Find-All Loud Speaker \$1.50; Complete Antenna Kit 50c; Wood Screw Kit 10c. Three tubes for Model 3A-E each 25c. Long Wave Unit and coil for any model \$1. Double Earphones \$1.30. Bandspread Attachment 75c. Any Air Scout Jr. model wired extra \$1.00.
 NOTE: If you already have earphones, two extra foreign coils may be substituted in any model.

WIRELESS TRANSCASTER

This wonderful new device has hundreds of practical applications. Broadcasts voice or music from any room or floor in home, office or store to any radio in same building WITHOUT CONNECTING WIRES! Works from any lighting socket, a.c. or d.c. Transmits your favorite recordings from electric phonograph through any radio WITHOUT CONNECTIONS between radio and phonograph. Transforms your radio into an efficient public address system. Acts as an interoffice communication system. Simplifies home broadcasting. Great fun for parties, entertainments, etc. Ideal for auditions. If your neighbor's radio in same building annoys you, you can tell him so THRU HIS RADIO. Can be used as a radio burglar alarm to warn of trouble in nursery. No need to go upstairs. Merely tune your radio to a predetermined point on dial and listen in. If baby is crying, you'll hear him clearly through the radio. Also permits use of radio as a telephone. Listen to secret conversations. Impossible to enumerate many other uses in this limited space.

DE LUXE MODEL TRANSCASTER-TRANSMITTER

Powerful, high-gain device engineered so that it will transmit high-fidelity music without connection to remote radio set. No sacrifice of quality or power. Uses separate rectifier tube, 6J7 screen grid mike amplifier, and dual purpose 6A7 modulator and oscillator. Price, complete, ready to operate. . . (less tubes and mike) **\$4.95**

Set of 3 Matched Tubes \$1.95
 Order Transcasters direct from this ad. No circulars available, but complete directions and full list of applications with every Transcaster.

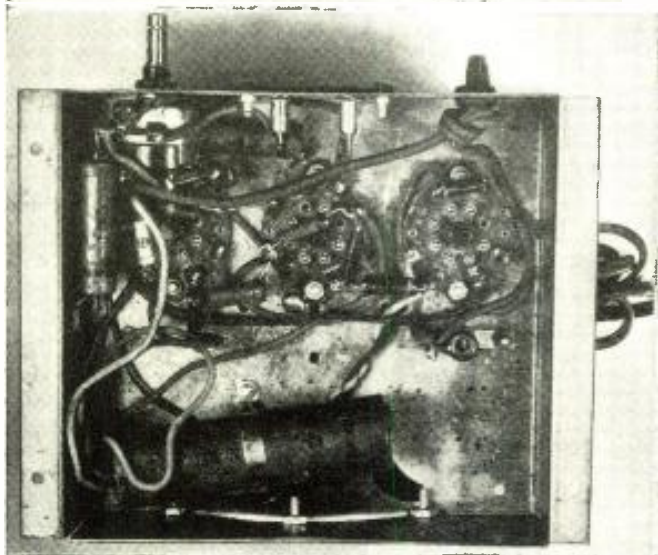
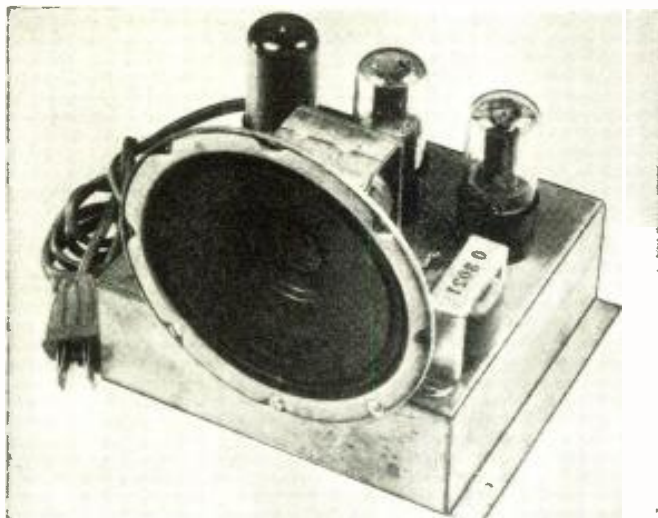
H. G. CISIN, CHIEF ENGINEER

ALLIED ENG. INSTITUTE, DEPT. 5-70
 85 Warren St., NEW YORK, N. Y.

A 3-Tube

PHONO-AMPLIFIER

L. M. Dezettel, W9SFW*



Here's a low-cost, highly-efficient phono-amplifier—it can be used for many other purposes. Will work with any type electrical phono pick-up. A type 50L6GT beam power amplifier drives a 5-inch permanent magnet speaker. Three tubes used in all.

upon the input signal. "Inverse feed-back" has many beneficial effects. It reduces hum, extends the frequency response of the amplifier, and above all, decreases substantially the amount of distortion present.

This unit is designed to operate from either an alternating or direct current supply. Although we speak of the input voltage being 110 volts, any voltage from 105 to 125 volts may be employed. The filter circuit is designed to operate from a 60-cycle supply with very low hum. The amplifier may also be operated from a 25-cycle supply, but a slight amount of hum may be heard. By adding a small, tubular, dual 20 mf. electrolytic condenser to the filter circuit, quiet operation from a 25-cycle supply will result.

Assembly and wiring are extremely simple. Mount all of the parts securely on a punched and drilled chassis, as shown in the pictorial diagram. To protect the cone of the speaker during handling, it is a good idea to cover the face of it with a piece of cardboard cut into a circle 5 inches in diameter. Fasten the cardboard to the speaker with a few strips of tape.

Obviously, you may make your own chassis, following the general layout indicated in the pictorial diagram. But if a punched and drilled chassis, which may be purchased, is used, the only tools required for the entire job are a screw-driver, a side-cutting long-nosed plier, and a soldering iron.

Wiring is straight-forward, and placement of leads is not critical. You may follow either the schematic diagram or the pictorial diagram. In either case, it is a good idea to use a colored pencil to check off each lead on the diagram as connections are made in the amplifier. In this way you will avoid overlooking one or more connections. Be sure to observe the proper color-coding of the leads from the filter condenser. It is very important that all joints be properly soldered. With a hot iron, the tip of which has been properly tinned, apply heat to the joints. Use a good grade of rosin core solder, and apply it to the hot joints, not to the soldering iron. When soldering is done in this way, very little solder is required, and the bond between wires or between wire and terminals is stronger. Do not use so much solder that it will flow over to another terminal or down to the chassis. Be especially careful when soldering wires to terminals at the sockets.

The two photos at the left show front and bottom views of the three-tube phono-amplifier, here described by Mr. Dezettel. This makes a very compact amplifier at a reasonable cost.

AFTER many years of comparative dormancy, the interest in phonograph recordings has in recent times reawakened with renewed enthusiasm. New improvements and inventions in recording and playback equipment have stimulated this popularity. Most of the reproductions of recordings is done by electrical means. Electrically driven turntables are available now which will operate from almost any type of voltage which you may have. Tremendous sales of the 110-volt 60-cycle type has made it possible to produce turntables to sell for as low as \$2.45. The same low price prevails for crystal-type pickups.

The amplifier we are about to describe is one of the latest additions to the amplifier family of circuits; and because of its many features, it is one of the most outstanding circuits ever designed from the standpoint of economy of construction. Greater power

output and increased amplification are obtained by using separate tubes for each function. A type 12J5GT tube is used as an audio amplifier. Sufficient amplification is realized so that any type of electrical pickup, regardless of how low its output may be, will drive the power tube to full output. A type 50L6GT beam-power amplifier tube drives a five-inch permanent magnet speaker. A full two watts of output, which is more than enough for average room volume, is obtained with negligible distortion. A type 35Z5GT tube is used as a separate rectifier, delivering approximately 135 volts of rectified plate supply to the other two tubes.

The most outstanding feature of this amplifier is the use of the modern technique called "inverse feed-back." This is accomplished electrically by feeding some of the energy of the speaker voice coil leads back to the cathode of the first tube. A resistor network takes a portion of this voltage, about 10%, and superimposes it

*Engineer, Allied Radio Corporation.

Now you are all set to go. Connect your leads from the pickup arm to the input jack of the amplifier, turn on the amplifier, and get your phonograph unit going. If the hum seems a little excessive, reverse the leads on the input jack. This applies also to the power plug of the 110-volt outlet. Use the position which gives the least amount of hum. In d.c. operation there is only one plug polarity which will operate at all. A trial will determine the position of the plug.

Just a word or two about electrical pick-ups and their use. Electrical pick-ups fall into two classes: the crystal type and the magnetic type. Both types give excellent results, but the crystal pick-up represents the greater value among the lower-priced units. Crystal pick-ups over-emphasize the bass notes, which most people seem to prefer. Whichever type is used, its weight should not exceed $2\frac{3}{4}$ ounces; otherwise excessive needle and record wear will result. Do not use needles for more playings than are recommended on the package. Needles are inexpensive; and for minimum record wear and faithful reproduction, change them often.

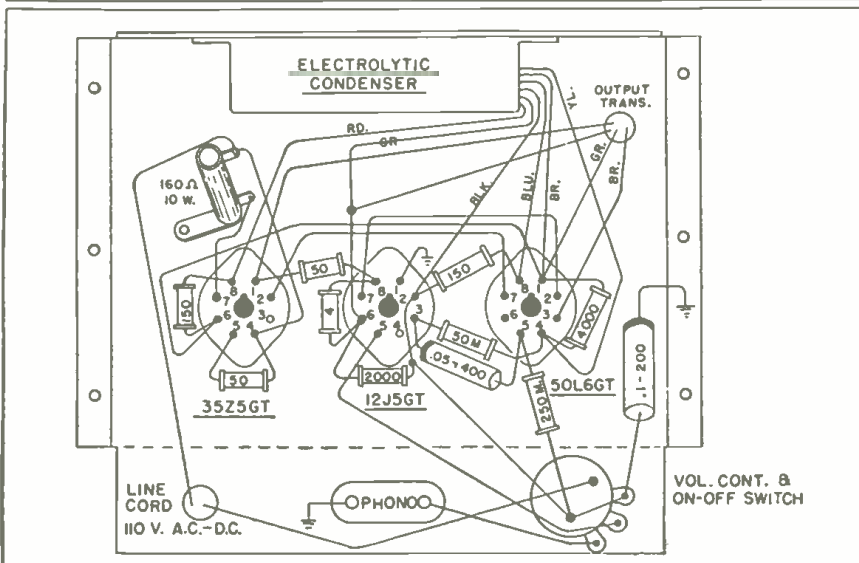
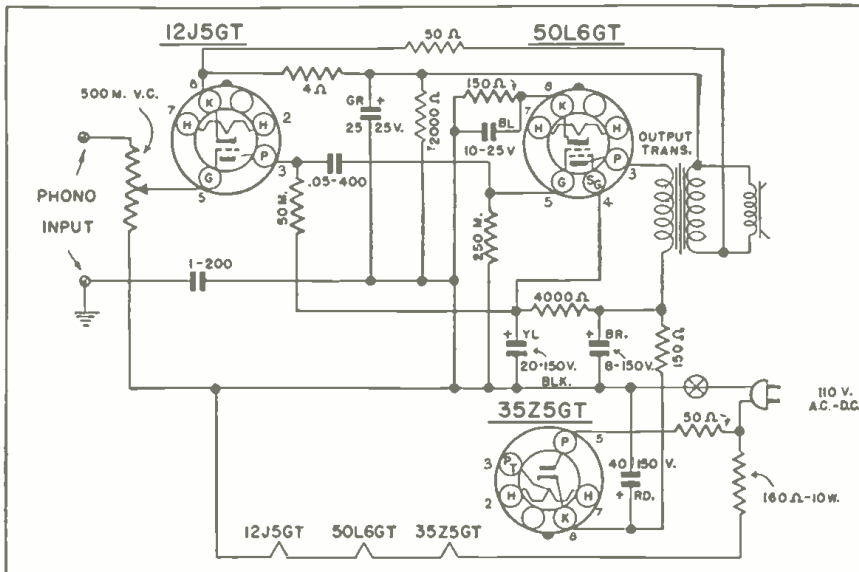
It is not absolutely necessary to use an electrical turntable. If you still have an old

phonograph with the wind-up type of motor, it will do the job very well, if you don't mind "cranking" it. The speed of the turntable must be exactly 78 revolutions per minute; otherwise reproduced music will not sound right. A large number of the synchronous or semi-synchronous turntables are available at very reasonable prices today. This type of motor does not require regulating. Be sure they are rated to operate on the frequency of voltage you have available.

3-Tube Phono-Amplifier Parts List

- 3—Octal wafer sockets
- 1—500,000 ohm volume control and switch
- 1—5-in. P.M. speaker
- 1—Speaker matching transformer
- 1—Phono input jack strip
- 1—Line cord and plug
- 1—Special Knight punched and drilled chassis
- 1—5-section filter condenser
- 1—160 ohm, 10 watt resistor
- 2—50 ohm, $\frac{1}{4}$ watt resistors
- 1—4 ohm, $\frac{1}{4}$ watt resistor
- 1—2000 ohm, $\frac{1}{4}$ watt resistor
- 1—250,000 ohm, $\frac{1}{4}$ watt resistor
- 1—50,000 ohm, $\frac{1}{4}$ watt resistor
- 1—4,000 ohm, $\frac{1}{2}$ watt resistor
- 1—150 ohm, $\frac{1}{4}$ watt resistor
- 1—150 ohm, 1 watt resistor
- 1—.1 mf., 200 volt condenser
- 1—.05 mf., 400 volt condenser
- Hardware and hook-up wire
- 1—Volume control knob
- 1—12J5GT tube
- 1—50L6GT tube
- 1—35Z5GT tube

Below—The hookup for the three-tube phono-amplifier.



LINE FILTER

No. 7818 **\$ 4.00**

This sensational new Miller Line Filter positively eliminates all line noises. Use it to prevent crackling and sizzling in your radio not removed by "noiseless" antenna systems which is due to household appliances, motors and high-frequency disturbance pickup from power lines. Requires no adjustment or attention.

Exclusively combines both inductive and capacitive filtering, with the famous Miller duo-lateral wound choke, and impregnated paper dielectric condensers.

More efficient than any filter on the market and built to the Miller standard, the price is doubly sensational...\$4.00 complete in handsome chromium and black Kem-Art metal case with approved rubber cord and unbreakable plug. Shipping weight 16 ozs.

Beat the demand. Order now from your dealer.



Underwriters Laboratories Approved

J. W. MILLER CO.
5917 So. Main St., LOS ANGELES, CAL.

VERNIER DIALS



Bud Vernier Dials are ideal for receivers, transmitters, monitors, etc. Polished chrome dial plates are made in 2 $\frac{3}{4}$ " and 4" plate sizes and are rim driven with smooth acting vernier drive. Net prices are 90 cents and \$1.20.



Your free copy of the new BUD catalog describes these and many other items. Write for it.

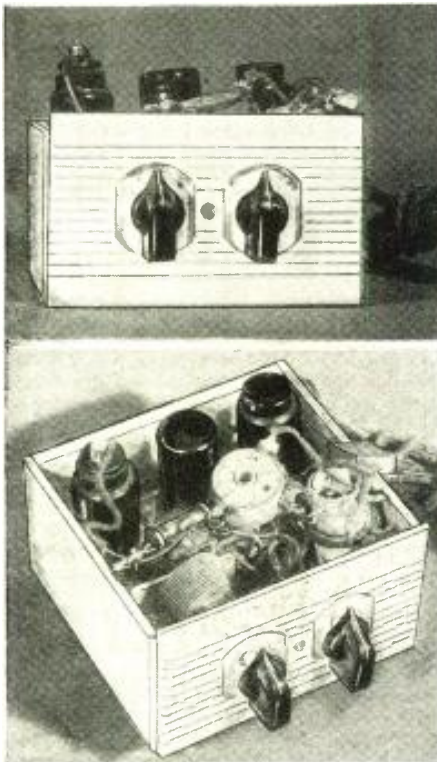
BUD RADIO, INC.

CLEVELAND, OHIO

NOVEL MIDGET 3-TUBE RECEIVER

Homer L. Davidson

The radio dabbler who would like a "personal" receiver for his own use, will welcome this 3-tuber. It will prove ideal for listening in on the broadcast band with a pair of headphones. The set can be made very attractive by mounting it in a colored molded cabinet.



Above—Two views of the Midget 3-tube "broadcast" receiver.

● THIS set is ideal for the beginner and can be used for "silent listening" on the broadcast band. The set uses three tubes, 6J7 as detector, 6J5 as amplifier and last stage, and 6C5 as a low-powered rectifier. Filament heating for the 6.3 volt tubes is connected in series with a 330 ohm resistor in the line cord.

The little set has a novel idea in which an ordinary receptacle outlet plate, used in every home and which can be purchased at any dime store, is used for the front panel. The two holes in the receptacle are used for dials of the tuning condenser and volume control. A piece of cardboard was used as the dial itself, and was marked out with pen and ink mounted between panel and receptacle plate.

A small chassis is employed about 2½ inches wide by 4¼ inches long. All three tubes are mounted in a line and condensers and resistors are mounted beneath the chassis. The entire receiver measures 4½" wide by 5" long.

The coil is an antenna coil, of the type now used in commercial midget receivers, in which 35 turns of 28 D.C.C. are wound over the secondary coil. In testing the set, turn on switch and a click is heard in the headphones. By feeling the line cord, you can tell by its warmth if the tubes are heating up. Turn up the volume control and a pop will occur. Then rotate tuning condensers and every squeal heard in the phones will indicate a station. Readjust the volume control until the whistling noise has stopped and the station can be tuned in without a squeal.

The set itself can be wired in a few hours. In the case of the receptacle plate, which was ivory, the cabinet was also painted ivory to match. The top panel was cut with tube holes in it, and the tubes project slightly above the panel.

This receiver has sufficient pick-up so

that an ordinary short aerial strung around the picture molding, or laid on the floor behind furniture or under a rug, will bring in "local" stations with sufficient volume. The stronger stations will operate a sensitive loudspeaker, but it is presumed that the average builder of this set will probably want to use it with a pair of headphones.

Parts List

CONDENSERS

- 1—.0001 mf.
- 1—.0005 mf.
- 2—.01 mf.

- 1—.02 mf.
- 2—.1 mf.

- 1—Dual atm type elec. cond. 20-20 mf.
- 1—Variable .00036 mf. cond.

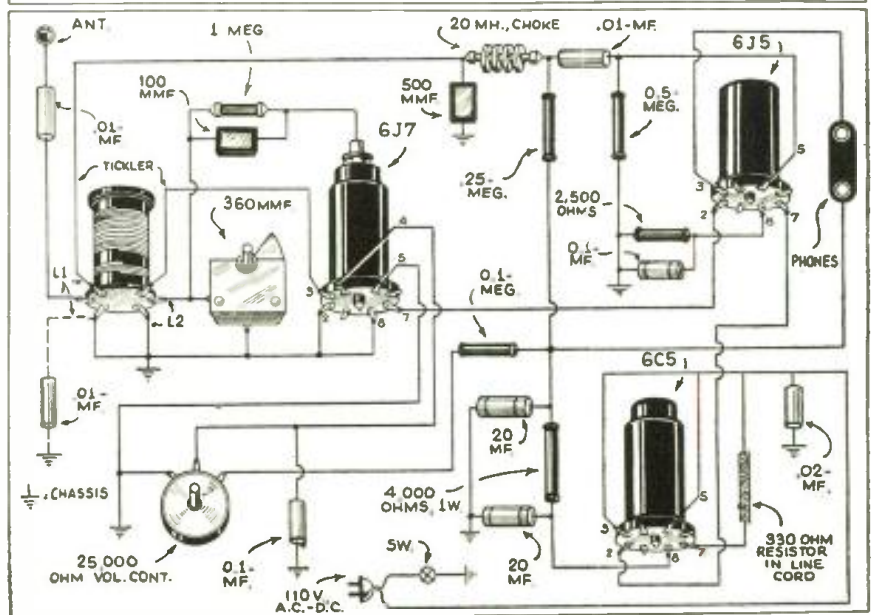
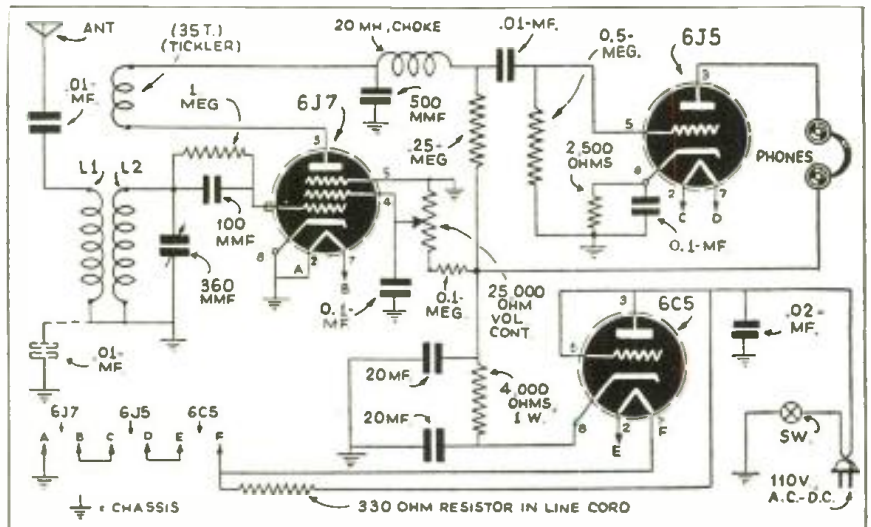
RESISTORS

- 1—1 megohm
- 1—100,000 ohm ½ watt
- 1—.25 meg. ½ watt
- 1—500,000 ohm. ½ watt
- 1—4000 ohm, 1 watt
- 1—Volume control 25,000 ohms, without S.W.-baby control
- 1—2,500 ohm. ½ watt
- 1—330 ohm resistor cord

MISCELLANEOUS

- Tubes—6J7, 6J5, 6C5; sockets, screws, bolts, wire, etc.

Wiring diagrams for the 3-tube receiver are given below and smooth operation is obtained.





A Low-Cost High-Power Transmitter

Larry LeKashman, W2IOP

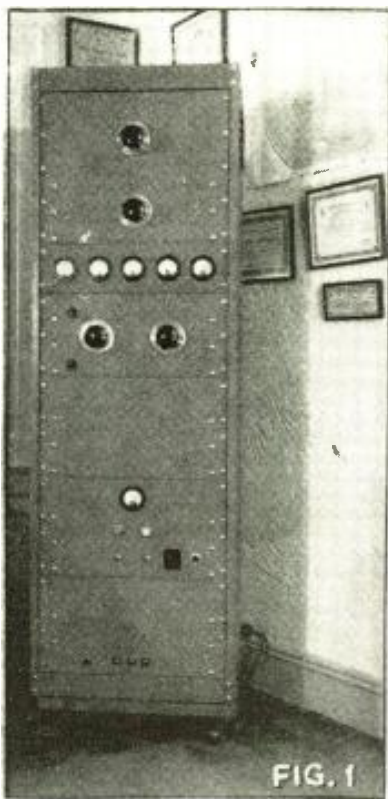


FIG. 1



FIG. 2

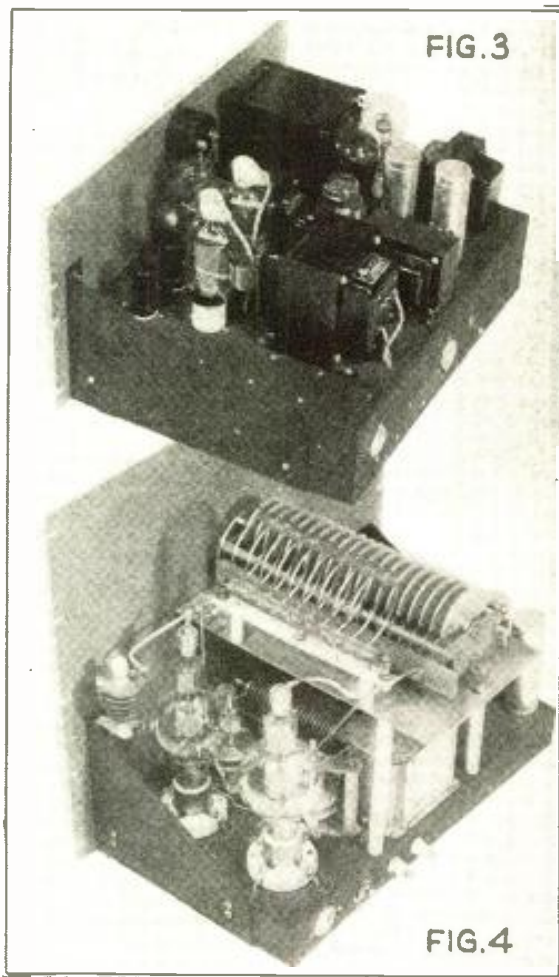


FIG. 3

FIG. 4

● HIGH power is never really inexpensive and when we say *low cost*, it is in comparison with other transmitters of similar ratings. Really cheap high-power rigs are seldom anything to flaunt in the parlor and rarely deliver maximum performance of all components. Expensive kilowatts which include all the "gingerbread" we are familiar with, usually means a second mortgage on the old homestead.

Not having the homestead and being fond of showing off the rig, high power at W2IOP developed into this example of "kitchen" construction. For a transmitter that can be completely assembled for well under \$200 it leaves little to be desired. The only power tool involved in its construction was an inexpensive hand-drill. The rig, from feed-throughs on top to the high voltage supply, was built with hand tools in the kitchen and parlor of the house. As a point of interest to shuddering XYL's, the total damage to furniture was nil—the only destruction being the OW's nerves.

Reasonably conventional, the lineup consists of a 6L6 crystal oscillator-buffer driving an 814, which in turn pushes a pair of Eimac 100TH's. A not-so-conventional modulator utilizes a 6SJ7-6SF5-6B4G and PP TZ40's. Running an input between 400 and 500 watts the TZ40's supply ample audio, and what you can't work with a half kilowatt you won't work at all, 866's supply the high voltage for the P.A.; 866JR's

- 1—Low-Cost High-Power transmitter in its completed stage. Note the control cable which operates the relay for single-switch operation.
- 2—Looking behind the panels. The control relay may be seen in the lower left-hand corner.
- 3—"Ultra-compact" hardly describes the complete modulator unit. The balance of the transformers not shown are mounted below the chassis deck.
- 4—"Two-deck" construction in the final gives short leads and a symmetrical layout.

supply B plus for the 814 and TZ40's; while 83's take care of all the remaining voltages.

The exciter using the 814 has already been treated in detail in the past issue of RADIO & TELEVISION. The success of the 814 as a transmitter made it an obvious choice as the buffer in my high-power transmitter, since it is often used as the final without the 100TH's. In order that the 814 may be utilized as a transmitter with a mini-

A high-class transmitter well within the spending power of the average Ham beginner. Rating—about 1/2 KW. The line-up consists of a 6L6 oscillator—buffer driving an 814, which pushes a pair of 100TH's. Modulator uses 6SJ7—6SF5—6B4G and PP TZ40's.

num of effort there are individual switches for turning off the 100TH's; modulators; and high voltage supply. In each case the switches are interlocked with the control relay, so that one switch can operate all stages.

For reasons of economy, involving both space and cash, the entire modulator was built on one large chassis. Surprisingly little R.F. feed-back was experienced, and after some experimenting with *grounds* it was possible to turn the gain completely up on all bands, *without feed-back*. An unusual situation was encountered at this stage, when it was discovered that leaving the common side ground off the modulator removed all feed-back. In this modulator, despite the lack of A.M.C., I.F., etc., quality was excellent and far superior to average amateur phone band speech. W2IHS—a neighbor and excellent audio man—doctored the rig, which absolves me of all blame or credit, in so far as phone performance is concerned. It is obvious that the next increase in audio equipment would require at least twice as much space as this modulator and would not be practical in this rig.

HENRY RADIO SHOP

BUTLER, MISSOURI

We have in stock all models of National, Hallicrafters, Hammarlund, RME, Howard and other makes of receivers at lowest net wholesale prices.

Our long experience selling all short wave receivers and apparatus, of all makes, enables us to help you get the proper equipment for your use. Whether you pay cash, buy on terms, or trade-in equipment, it pays you to write me. I will cooperate with you to see that you are satisfied.

You get best trade-in for your receiver. Get my offer.

I finance all terms myself so that I can give you better terms with less cost—less red tape—quicker shipment. Write me for terms.

You get ten day free trial of any receiver. Immediate shipment from our world's largest stock or shipment from the factory if you prefer.

Write to me for any amateur equipment in any catalog or ad. I guarantee you can't buy for less or on better terms elsewhere. Write me about your needs and wishes. Tell me what you want and how you want everything handled.

73,

Bob Henry
W9ARA

P.S.: We have Reconditioned Guaranteed Receivers of nearly all models cheap. Terms and ten day free trial on these, too. Write for free list.

ARMY, NAVY OR COMMERCIAL RADIO COMMUNICATIONS OFFER INTERESTING CAREER!

Begin now to prepare yourself through Candler System Training, even if you know nothing of code or radio fundamentals. Or if you know code but copy "letter-for-letter" and send jerkily, Candler High-Speed training will soon have you reading code as easily as you read print and copying behind at high speeds. You may be practicing wrong—following old fashioned methods that are slow and hard. Why not send today for

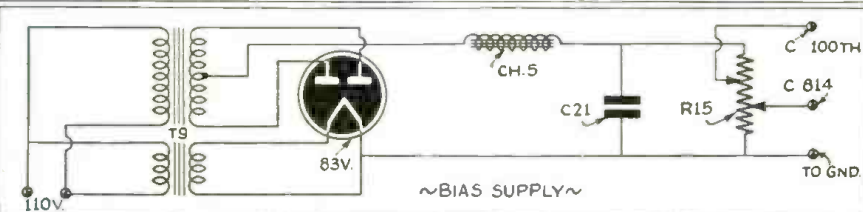
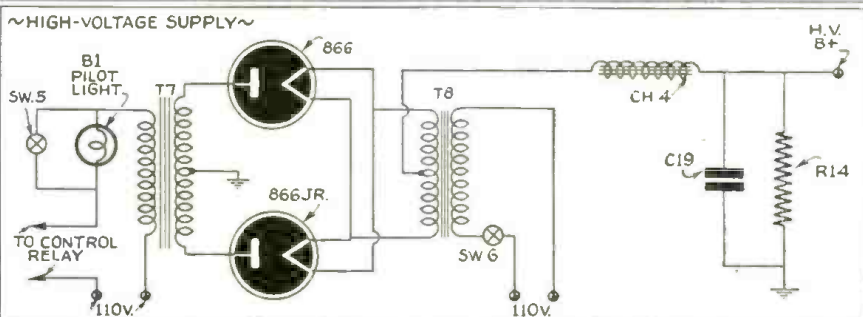
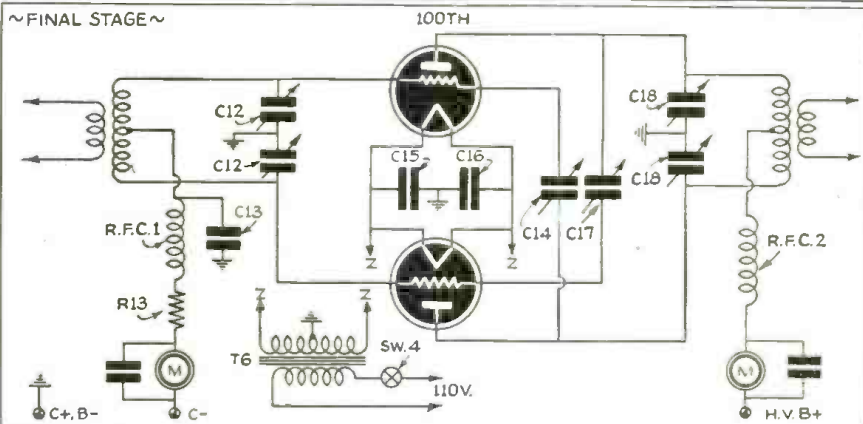
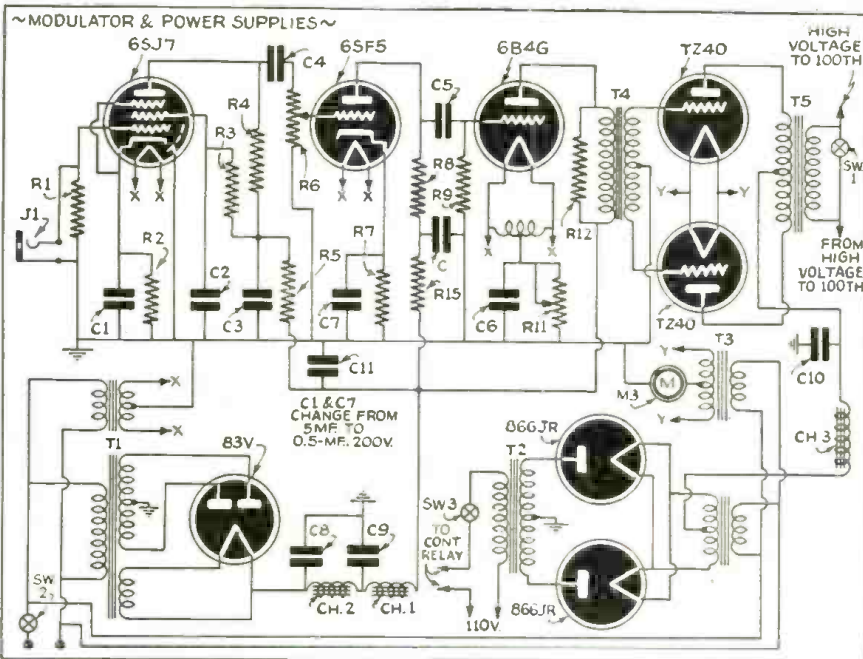
Candler's New 1940 BOOK OF FACTS

It gives you many helpful tips and points the way to success as an amateur or commercial operator. In the light of 28 years' experience in training operators in the Army, Navy, Commercial and Amateur Communications, we will be glad to give you expert advice which does not obligate you. Write today. You will receive a personal reply and the Book of Facts, free.



CANDLER SYSTEM CO.
Dept. S-12 ASHEVILLE, N. C., U.S.A.

BLILEY CRYSTALS
10-20-40-80-160 Meter Bands
Now \$3.35 up.
Bliley Electric Co., Erie, Pa.



Wiring diagram for the LeKashman transmitter is shown above.

For 80 and 160 meter operation a padder was necessary on the 100TH's grid coils. The large electric bulb in series with the primary may be switched in and out of the circuit at will. It serves the dual purpose of giving instant Q.R.P. operation and prevents excessive off-resonance currents for tuning. However, the Guardian overload relay is a priceless investment in "mind

ease" and certainly represents cheap insurance for high power-high cost gear. Experiments carried out with various inputs using the bulb and light loads produced conflicting, but conclusive evidence that high power *does* make a difference.

Resistor 15 in the bias supply is equal to—

E is equal to the bias deficiency, if there is any. I is the rated grid current. From this formula the exact value of R13 may be determined in each individual case. The bias supply bleeder should be adjusted to deliver 200 volts for the 100th's, then the 814 should be adjusted. Total bias in each case should be at least twice "cut off"—preferably more.

No dimensions are critical, the general layout being of prime importance. This transmitter has been "air-tested" with most satisfactory results. Forty-six states on phone in 15 days, using a 14 mc. quarter wave; and 3.5 mc. half wave is a good performance for any rig. On CW similar results were experienced with some excellent reports from outlying Pacific possessions.

I.R.C. (Resistors)

(For Modulator, unless otherwise marked)

- R1—5 meg. BT1
- R2—1700 ohms BT1
- R3—2.5 meg. BT1
- R4—500,000 ohms BT1
- R5—50,000 ohms BT1
- R6—1/4 meg. potent. type C
- R14—25,000 ohms, 150 watt
- R13—Optional, dependent upon bias voltage used
- R7—4500 ohm. BT1
- R8—1/2 meg. BT1
- R9—1 meg. BT1
- R10—50 ohm. CT, 1 watt
- R11—800 ohm. var. type EP
- R12—50,000 ohm BT1
- R15—25,000 ohm, 75 watt, tapped and adjusted with voltmeter—under load (bias supply)

NATIONAL

- RFC1—R1001*
- RFC2—400 ma. RFC

TRIPLETT

- M1—221 0-150 ma. 1, bypassed with .002 600 volt mica*
- M2—221 0-500 ma. bypassed with .002 600 volt mica**
- M3—221 0-300 ma. (modulator)

ALLIED

Control relay, type K4

STANCOR (Transformers and Chokes)

- CH1—C2305 20H 100 ma. mod.
- CH2—C2303 10H 130 ma. mod.
- CH3—C1404 5-25H 400 ma. m. d.
- T1—P6335 mod.
- T2—P3535 mod.
- T3—P6138 mod.
- T4—A4762 mod.
- T5—A3829 mod.
- T9—P6335 bias supply
- CH5—C2303 bias supply

CORNELL-DUBILIER (Condensers)

- C21—8 mf./450 EY9080
- C19—TQ30020
- C13—250 mf. 600 volt
- C15, C16—01 600 volt tubular
- C6—25 mf./50 volt, type BR†
- C7—5 mf./25 volt, type BR†
- C8—8/500 elect. EY11080†
- C9—8/500 elect. EY11080†
- C1—5 mf./25 volt, type BR†
- C2—05/600 volt, tubular†
- C3—8/450 elect. type EY†
- C4—01/400 volt, tubular†
- C5—01/400 volt, tubular†
- C10—2 mf. 1500 volt, TJJ15020†
- C11—8 mf. 600 volt, EY11080†

U.T.C. (Transformers)

- T7—S50*
- T8—S57*
- CH4—S35*
- T6—S59**

CARDWELL

- C12—MT 100 GD
- C14—17 type ADN**
- C18—XG 110 XD†

GUARDIAN

X—Model X100 relay*

MALLORY

J1—Microphone jack

MISCELLANEOUS

- S1—H.D. SPST, for 100TH fil.**
- B1—300 watt bulb (lamp)*
- S6—H.D. SPST for 800 fil.*
- S5—H.D. SPST for 800 fil.*
- S1—H.P.D. SPST—to cut modulator out for CW-mounted on chassis rear (modulator unit)†
- S2—H.D. SPST—modulator fil.†
- S3—Modulator plate—H.D. SPST† (H.D.—Heavy duty)

†Modulator
*High voltage supply.
**Final amplifier.

Now better than ever!

THE Radio Amateur's Handbook

By A. FREDERICK COLLINS, Revised by E. L. BRAGDON, Radio Editor of the N. Y. Sun

8TH REVISED EDITION JUST OUT

How to make, operate, and repair your own radio... Full instructions for home workshop activities. The answers to hundreds of questions about everything in radio, including:

- Vacuum Tubes • Ultra High Frequencies
- Power Supplies • Television & Facsimile
- Noise Elimination • FCC Regulations
- Receivers & Transmitters

DOZENS OF CIRCUITS, WORKING DRAWINGS, PHOTOGRAPHS!

Fully indexed, with Glossary of technical terms, Tables of Electrical Values, International Call Letters and Code Symbols, Abbreviations, etc.



341 PAGES
134 ILLUSTRATIONS... ONLY

\$2.00

Your money refunded if not satisfied

Tear out, sign and mail to
THOMAS Y. CROWELL COMPANY
432 Fourth Ave., New York, N. Y.

Send me *The Radio Amateur's Handbook*, 8th Revised Edition, for FREE examination. I will deposit \$2.00 plus postage, with mailman on delivery. I understand that I may return book within 5 days for full refund if I am in any way dissatisfied with it.

Name.....
Address.....
City & State..... R.&T.
Check here if you enclose remittance with order. In which case book will be mailed post free.

Be a Champion with a

Genuine **VIBROPLEX "CHAMPION"**



only \$9.95

At Your Dealer's

A "STAR" Performer |

Standard size black base. Chromium finished top parts. Equipped with 3/16" diameter contact points. Furnished without circuit closer, cord and wedge. Like all true champions, this new Vibroplex "CHAMPION" defies competition. Handsome in design, sturdily built and a "STAR" performer... the "CHAMPION" is our answer to the demand for a BUG of established quality, proved sending ability and assured ease of operation at a price within the reach of everyone. Designed primarily for the amateur, professional operator, will find the "CHAMPION" simply qualified to give an expert account of itself on any assignment. See the "CHAMPION" at your dealer's to-day. If he cannot supply you, write or order direct from us. Money order or registered mail. Write for Illustrated catalog.

THE VIBROPLEX CO., Inc.

832 Broadway New York, N. Y.

Headset Headquarters



CANNON-BALL

Circular T-18 covers complete line of sensitive, clear-tone, dependable Headsets. Get it. Choose the super-quality Headset you like best. Twenty years headset specialization insures satisfaction. Write

C. F. CANNON COMPANY
SPRINGWATER, N. Y.

So Many "Hams" are "Photo Fans"

In fact, we've had so many calls from our radio customers for cameras and photo equipment, that we've added a complete CAMERA DEPARTMENT.

With it, we are in an excellent position to make "trades". We'll accept camera equipment for credit against the purchase of radio gear... or if you prefer, camera for radio...

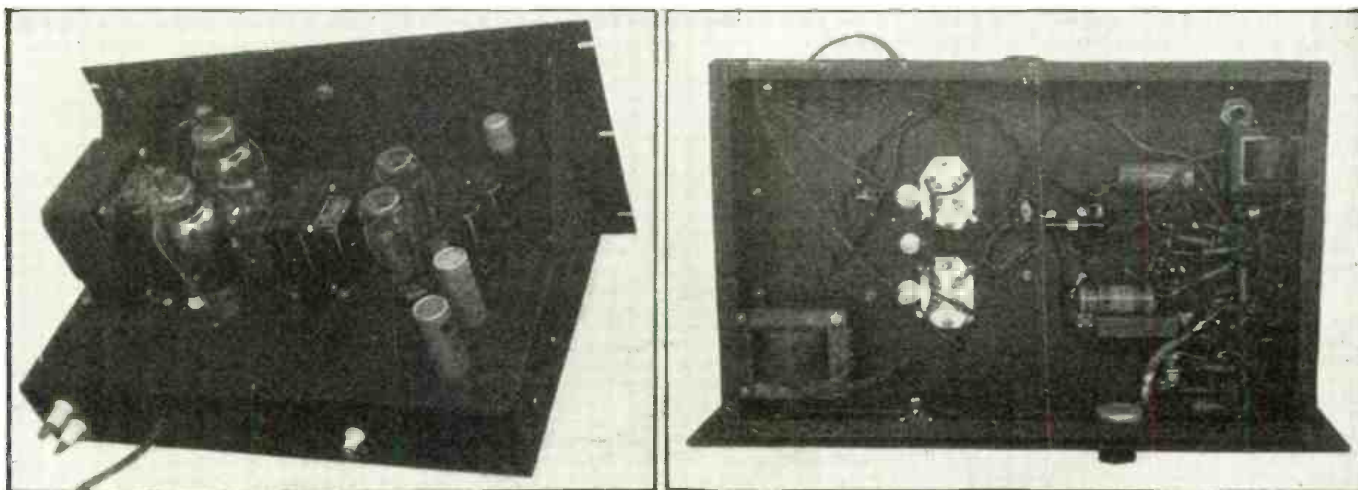
WHAT HAVE YOU?

W2JL W2LJA W2KWY

OUR Best VALUE IS OUR RECORD OF LOYAL SERVICE

HARVEY
Radio Company of New York

103 WEST 43rd STREET - NEW YORK, N. Y.
CABLE ADDRESS: "HARADIO"



Rear and bottom views of the cathode modulator.

CATHODE MODULATOR for the W8KPX XMITTER



● THE radio frequency portion of the new W8KPX 5, 10 and 20 meter transmitter and the power-supply units were described in the October issue of RADIO & TELEVISION. This month we describe the 60 watt audio unit and give complete data for making the proper adjustments to the cathode-modulated phone transmitter.

A cathode modulation unit, basically, is not very much different from any other modulator or audio frequency amplifier. The only radical change in a cathode modulator is in the output or modulation transformer; most cathode modulators have an output impedance of from 500 to 3,000 ohms, while the plate modulator may have an impedance of from 2,000 to 10,000 ohms or higher. Otherwise, the circuit arrangement is the same.

In our original design we had planned to use a pair of 6L6G's in Class B as the modulator tubes. In fact, we did build a modulator using the 6L6G's. Various experiments with both the beam power tetrodes and triodes, however, soon convinced us that for our own particular purpose some of the low power triodes such as the HK-24, TZ-20 or 809 types as Class B modulators would be ideal. We finally selected a pair of 809's with 600 volts on the plates, giving 60 watts audio output, as modulators for the push-pull HK-54 final amplifier.

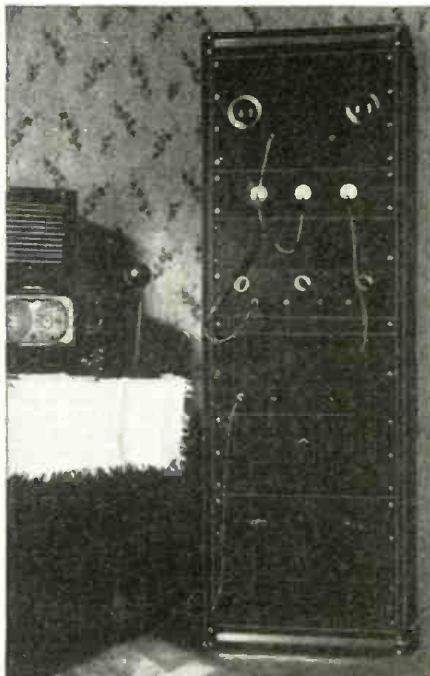
Modulator Tube Line-up

As shown in Fig. 1, the modulator tube line-up is as follows: A 6J7 or 6SJ7 input from a crystal or dynamic microphone, a 6C5 second speech amplifier, a 6N7 or 6SC7 phase inverter and a pair of 45's in push-pull driving the Class B 809's. All stages up to and including the 45's are resistance-capacity coupled. All plate circuits are carefully filtered with decoupling resistors and condensers to insure good stability and to prevent any stray A.C. hum from reaching

Harry D. Hooton, W8KPX

A 60-watt audio (modulator) speech amplifier. Also complete data for making the proper adjustments to the cathode-modulated phone transmitter. A pair of 45's in push-pull drive the Class B 809's.

Front panel view of the transmitter, complete with modulator.



the high-gain grid circuits. The *phase inverter* is the new self-balancing degenerative type, developed in the R.C.A. laboratories and used in many up-to-date amplifier and public address systems. The gain developed up to the 45's is entirely sufficient for use of the lowest level crystal microphones on the market. When using high level microphones, such as the Brush "HL" type shown in the photograph, the 6C5 stage may be eliminated altogether if desired. In this case the *gain control* must be turned nearly all of the way on in order to drive the 809's to full output. The quality of the audio, however, will be very good.

The construction of the modulator is not at all difficult. The wiring must be kept *short and direct*, mount the various bypass and coupling condensers and resistors as close as possible to the socket terminals and use copper braided shielding on all of the wire leads indicated by the dotted lines in Fig. 1. Ground the shielding to the chassis at regular intervals of two or three inches. Do not depend upon the metal chassis as a common ground return conductor; run a piece of No. 14 tinned copper bus wire around to the shell or grounding lug on the tube sockets, making all negative connections to the wire. The bus wire should be grounded to the chassis at one point only. This method of construction prevents stray audio frequency currents from circulating in the chassis keeping down noise and instability. The voltage applied to the plates of the tubes in the speech amplifier portion of the modulator is taken from the 400 volt oscillator power supply and is adjusted to approximately 350 volts, measuring from the B-plus end of the decoupling filter resistors.

45's in Push-Pull Ideal Drivers

The 45's in push-pull make ideal drivers for the 809 Class B modulators. The driver

transformer must be adjusted for a ratio of 4:1 primary to 1/2 secondary winding. Both the driver and modulation transformers shown in the photographs are of the *universal* type, which will operate with any tubes in any type audio circuit. Bias for the 45 drivers is obtained from the voltage drop across the 780 ohm, 10 watt resistor in the B-minus lead between the center tap of the 2.5 volt filament winding and ground (chassis). This resistor may or may not be by-passed by a 10 mf., 50 working volts electrolytic. In the original model the condenser had very little effect, so far as voice range operation was concerned, but may be used if a greater bass response is desired.

Class B Output Stage

The Class B output stage is extremely simple, as shown in Fig. 1 "b." Fixed bias for the 809's is obtained from a small 4.5 volt dry cell "C" battery. A voltage of 4.5 volts is indicated on the diagram. This value is correct for a plate supply of 750 volts, but probably will have to be reduced to 3 volts for the 500 volt supply. The plate-to-plate load impedance of the 809's, with 500 volts on the plates, is 5,000 ohms. The secondary impedance of the modulation transformer will be in the order of from 500 to 1,000 ohms, according to the adjustment of the final r.f. amplifier. This adjustment will be treated in detail later on in this article.

The adjustments for *cathode modulation* are no more critical than for plate modulation—and far less critical than for grid modulation. The power output from a cathode-modulated radio frequency amplifier is nearly *three times as great* as that obtained from the same tubes in a grid-modulated circuit, operated with practically the same d.c. plate voltage. The carrier output will be from 10 to 50 per cent less, according to the amount of grid modulation used, than when using plate modulation and operating with the same plate dissipation. Cathode modulation, however, when properly adjusted, will give nearly as high efficiency as that obtained by plate modulation in the average amateur transmitter.

Adjustment of R.F. Amplifier

Briefly, for proper cathode modulation, the r.f. amplifier must be adjusted as follows:

(1) Make absolutely certain that the final amplifier is *perfectly neutralized*. You can check this by swinging the final tank tuning condenser through resonance *with the plate voltage removed* and with excitation applied to the HK-54 grids. If the amplifier is *not neutralized*, the grid current *will fluctuate sharply* when the resonant point is reached. Another method is to check for r.f. voltage on the final tank circuit with a neon lamp at resonance. Adjust the neutralizing condensers for minimum glow in the neon. This method, while satisfactory in some respects, is not very accurate because the lamp must be placed very close to the coil or condenser, in order to obtain any indication whatever, and the removal of the lamp may upset the distributed capacity sufficiently to make accurate neutralization impossible. Rough adjustments can be made with the neon

It's "HARRISON" for RECEIVERS!

That's what all the boys are saying!

Harrison gives you Lowest Prices—
Latest Models—Easy Payment Terms
—Best Trade-in Allowances—100% Satisfaction—

The best deal all around!

A \$5.00 deposit will bring any Halli-crafters, Hammarlund, National, RME, etc., receiver to your home for a **TEN DAY FREE TRIAL**. With *Harrison* you try before you buy!

Send for your new Receiver today!

Also for Transmitters, Kits, Code practice equipment, Keys, Parts, etc.—no matter what you need—

EASIER TIME PAYMENT TERMS

Tell us approximately what terms suit you—We'll do the rest!

"HARRISON HAS IT!"

HARRISON RADIO CO.
12 WEST BROADWAY - NEW YORK CITY

YOUR OLD SET

is probably worth more than you think! Harrison gives you the very best trade-in allowances!

BEGINNERS!



Model 3TE

LEARN RADIO CONSTRUCTION..

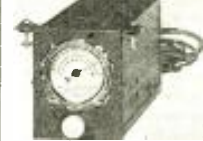
by building your own electric short wave receiver. We furnish kit of all parts for **\$3.25** only

NOT A TOY but A REAL RADIO SET

Uses type 76G tube as regenerative detector, type 76G tube as audio amplifier and type 76G tube as rectifier. No ballast tube is used, as the line cord does the same work without giving the appearance of an extra tube. Operates from any 110 volt AC or DC house lighting current. Covers the shortwave bands from 91 1/2 to 200 meter with four plug-in coils, supplied with kit. For those who desire broadcast reception, we will supply a set of two coils for \$0.95 extra. Kit includes all parts mounted on a black crackle finish metal cabinet, ready to wire. Instruction sheet included with all kits. (Kits do not include tubes or broadcast coils). If tubes are desired add \$1.50 for three tubes. Wired and tested, complete and ready to use including all coils from 91 1/2 to 550 meters and three type 76G tubes, less carphones, **\$6.50**. A pair of high grade double carphones, \$1.95 extra. Battery operated models at same prices. When ordering specify if electric or battery operated model is desired.

ACME S-W RADIO COMPANY
101 Henry St., Dept. 121, Brooklyn, N. Y. C.

SHORT WAVE CONVERTERS for CAR RADIOS



Models 600-A & 500-A shown.

Can be attached to any car radio.

MODEL 600-A covers 49-31-25-20-19 and 16 meter bands. Designed for American and Foreign short wave broadcast. Distance range 5,000 to 10,000 miles. List Price **\$24.95**

MODEL 700 long wave covers 135 to 410 kc. Receives Gov. weather reports, etc. List Price **\$24.95**

POLICE UNITS
MODEL 100 100-A with fixed condensers, covers 1600 to 2600 kilocycles. List Price **\$22.50**
MODEL 800 Super Sensitive police converter with fixed condenser. Covers 1500 to 2600 kc. Two metal tubes, exceptional distance range. List Price **\$13.95**
MODEL 200 with variable condenser, covers 1550 to 6000 kilocycles. List Price **\$17.95**
MODEL 500-A with variable condenser and illuminated dial covers 1600 to 6000 kc. Very sensitive, has two metal tubes. Exceptional distance range. List Price **\$21.95**
Jobbers and Dealers Wanted

ABC RADIO LABORATORIES 334 N. New Jersey St., Dept. RT-12, Indianapolis, Ind., U.S.A.

READ SEND CODE LIKE AN EXPERT

Learn Quickly at Home—Real Speed

It's easy, fascinating, to become a good op. with the **NEW ALL ELECTRIC MASTER TELEPLEX CODE TEACHER** to help you. Only instrument ever produced which records your sending in visible dots and dashes—then sends back to you at any speed you desire. Also sends practice work, recorded by an expert. That is why so many schools teaching code prefer Master Teleplex, why thousands agree this method is surest and quickest—has taught more ops in the past few years than all other methods.

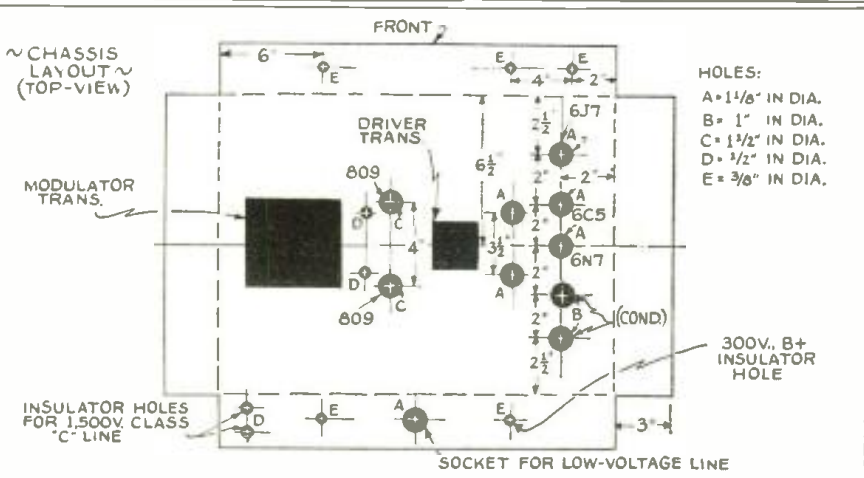
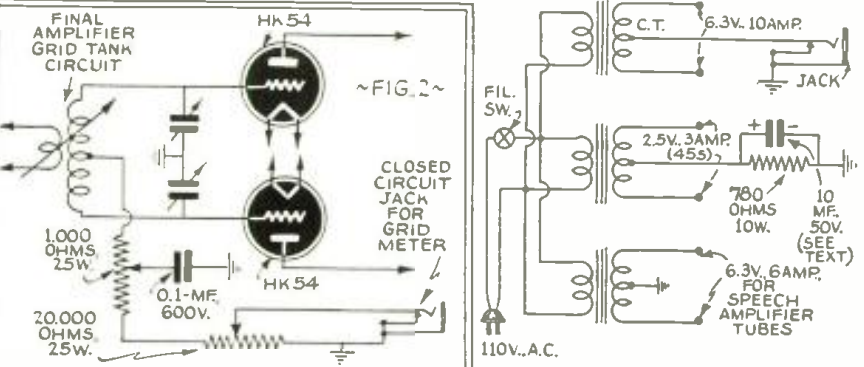
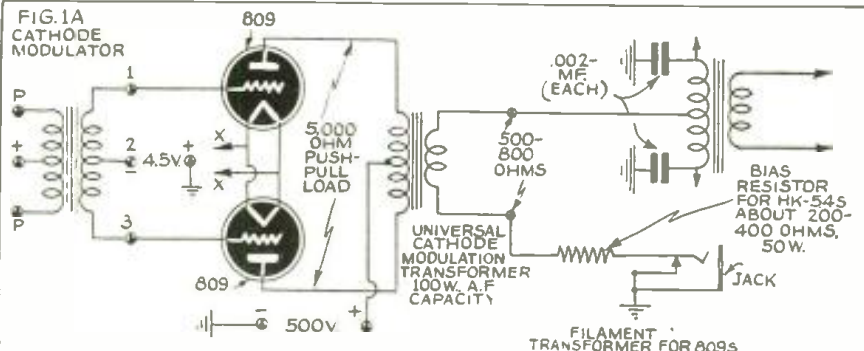
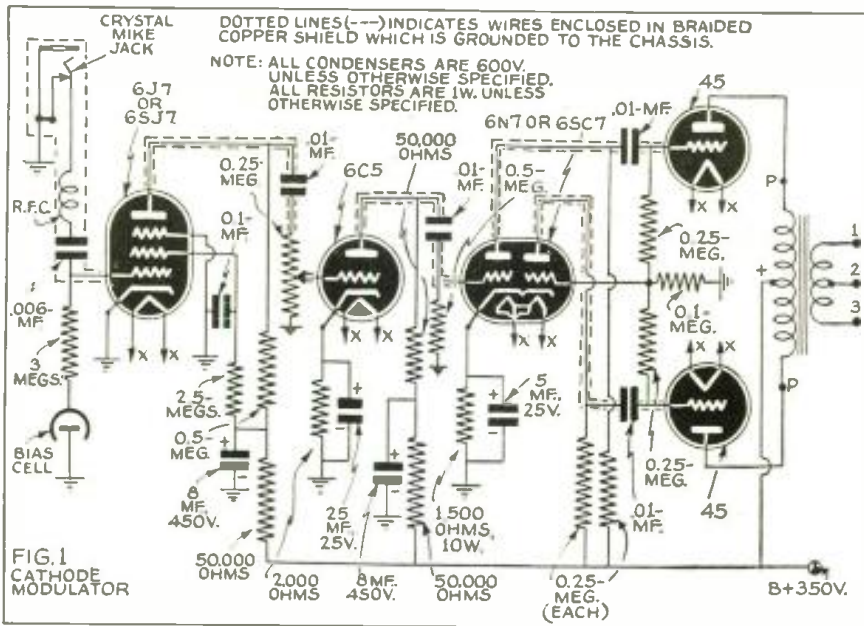
FREE BOOK
We furnish Complete Course, lend you Master Teleplex, give you personal instruction with a **MONEY-BACK GUARANTEE**. Low cost. Send today for booklet \$12, no obligation.

TELEPLEX CO., 67-69 Park Place, New York

In Canada write: **CANADIAN ELECTRONIC INST., TORONTO, ONT.**

AMATEUR RADIO LICENSES

Day and evening classes in code and theory
Home Study Courses
Hundreds of students now on the air. Results guaranteed. Reasonable, efficient and thorough.
AMERICAN RADIO INSTITUTE
1123 BROADWAY NEW YORK, N. Y.



The drawings above show the connections for the cathode modulator here described by Mr. Hooton. This apparatus was built by the author and tried out extensively "on the air," in connection with the W8KPX 5, 10, and 20 meter transmitter, illustrated and described in detail in the October issue of this magazine. This modulator will be found of interest to all Hams.

lamp but always check results with the grid meter for the final adjustment.

(2) Adjust the grid current to each HK-54 to a value of about 7 to 20 milliamperes *per tube*. This can be readily accomplished by loosening the coupling between the buffer plate tank circuit and the final amplifier grid tank circuit. It may also be necessary to change the value of the HK-54 grid leak resistor or the fixed bias.

(3) "Load" the antenna to a point slightly beyond that which gives the greatest antenna or R.F. feeder current. A satisfactory indicator for this adjustment will be the usual 6-volt pilot or automobile head-light bulb, clipped across a portion of the antenna or feeder line.

(4) Check the modulation quality with a phone monitor and some kind of carrier-shift or over-modulation indicator, in exactly the same manner as when using conventional plate modulation.

(5) Finally, with the transmitter in operation, carefully adjust the grid bias of the final amplifier to the point which will permit upward variation of the antenna current with modulation. Again the pilot or auto lamp is a very satisfactory indicator. A steady tone, such as that supplied by an audio oscillator, is best for making accurate adjustments.

It will be noticed that we have omitted any discussion of methods of adjustment using the cathode ray oscilloscope. While the oscilloscope is an excellent instrument in the hands of an expert, who understands the meaning of the various patterns obtained, it is advisable for the beginner or inexperienced phone ham to make the initial adjustments as outlined above. If you do possess an oscilloscope, the author suggests a thorough study of the chapters in the standard amateur manuals dealing with radiotelephone adjustment using this instrument. Although very little actual information on the adjustment of the cathode-modulated amplifier is presented, many of the patterns shown for different degrees of bias adjustment, etc., are exactly those required for cathode modulation.

The cathode impedance of a pair of HK-54's, operated with 1,500 volts on the plates, is about 600-800 ohms, depending upon the antenna load and the bias adjustment. Since a considerable mismatch between a cathode modulator and the R.F. amplifier can be tolerated without appreciable loss in efficiency, the taps on the output transformer may be permanently set to 700 ohms. The by-pass condensers across the filaments of the HK-54's to ground should be kept to the lowest capacity consistent with satisfactory R.F. by-passing, otherwise considerable audio power may be by-passed to ground and lost. The paper dielectric, 0.1 mf. condenser, attached to the sliding tap on the HK-54 grid-leak resistor, should be adjusted to the point where the least amount of grid modulation takes place. The use of an oscilloscope is desirable for an extremely accurate adjustment, but quite satisfactory results can be obtained by simply connecting the by-pass condenser from the junction of the 1,000 and 20,000 grid bias resistors to ground as shown in Fig. 2.

The author will be very much interested in hearing from those who build or con-

template building this transmitter. All letters will be answered if a three-cent stamp is enclosed for return postage. Address all correspondence to the author in care of RADIO & TELEVISION.

List of Parts

- PAR METAL (Cabinet, Chassis and Panel)**
 1—Black crackle finished steel chassis, 13x17x3 in.
 1—Pair small chassis supporting brackets
 1—Black crackle finished steel panel, 8 3/4 x 19 in.
 1—"De luxe" black crackle finished steel cabinet, overall height 66 1/2 in., panel space 61 1/4 in.

STANCOR (Transformers)

- 1—Filament transformer, 2.5 volts, 5 amperes, Type P-6133
 1—Filament transformer, 6.3 volts, 10 amperes, Type P-6308
 1—Universal modulation transformer, "Polypedance" type A-3894
 1—Universal driver transformer, "Polypedance" type A-4762

RCA (Tubes)

- 2—809 tubes
 2—45 tubes
 1—6N7 or 6SC7 tube
 1—6C5 or 7A4 tube
 1—6J7 or 6SJ7 tube

HAMMARLUND

- 2—Isolantite sockets, 4-prongs (for 809's)
 1—Midget r.f. choke, Type CHX

AMPHENOL (Sockets)

- 3—Chassis-mounting sockets, "octal," 8-prong type
 2—Chassis-mounting sockets, "octal," 4-prong type
 1—Chassis-mounting socket, "octal," 5-prong type
 1—Microphone connector, short-circuiting type

CORNELL-DUBILIER (Condensers for Filter and By-pass)

- 2—Can type electrolytic condensers, 8 mf., 450 volts, Type "KR" compact
 1—Tubular electrolytic condenser, 25 mf., 25 volts, Type BR
 1—Tubular electrolytic condenser, 10 mf., 50 volts, Type BR
 1—Tubular electrolytic condenser, 5 mf., 25 volts, Type BR
 4—Tubular paper condensers, 0.01 mf., 600 w.v., Type DT
 2—Tubular paper condensers, 0.1 mf., 600 w.v., Type DT
 1—Tubular paper condenser, 0.006 mf., 600 w.v., Type DT
 2—Mica condensers, 0.002 mf., 5,000 volts

I.R.C. (Resistors)

- 1—Fixed resistor, 3 megohms, 1 watt
 1—Fixed resistor, 2.5 megohms, 1 watt
 2—Fixed resistors, 500,000 ohms, 1 watt
 3—Fixed resistors, 50,000 ohms, 1 watt
 4—Fixed resistors, 250,000 ohms, 1 watt
 1—Fixed resistor, 2,000 ohms, 2 watts
 1—Fixed resistor, 1,500 ohms, 10 watts (wire-wound)
 1—Fixed resistor, 200 ohms, 50 watts (wire-wound)
 1—Fixed resistor, 780 ohms, 10 watts (wire-wound)
 1—Variable potentiometer (gain control), 250,000 ohms
 4—Large feed-through insulators
 2—Small feed-through insulators
 1—Lot hookup wire, knobs, screws, etc.

In the
December, 1940
 Number of
RADIO-CRAFT

Circuit Applications for the
 Miniature Tubes

The ABC of Frequency Modulation

25-Range A.C.-D.C. Test Meter

Build This Practical Vibrator Tester
 Lucrative Sideline for Servicemen—
 in Electroplating

Building a Modern Miniature-Tube
 Metal-Treasure Locator

A New A.F.-Drift Correcting, Signal-
 Balancing Direct-Coupled F.M.
 Audio Amplifier—Part I

COMPLETE RADIO COURSE \$1.95

AMAZING OFFER
 Your chance to get exact reprint of regular \$39.00 Radio Technical Institute course for only \$1.95, the full price. This is the latest Radio and Television Course, complete in every way, and exactly the same as the much higher priced original lessons. Complete with supplementary material.

EVERYTHING ABOUT RADIO
 The training is remarkably complete. You quickly learn radio servicing from simple circuits to signal tracing. From the very start you are introduced to real radio methods and equipment. After finishing this course you will be able to expertly service every radio set. Take advantage of this unusual bargain in radio education.

Guarantee
 You must be satisfied or your money will be refunded immediately.

GOOD REVIEW COURSE
 Learn new speed-tricks of radio fault finding, servicing short-cuts, case histories of common troubles, extra profit ideas. Many large lessons on use of regular test equipment, explanation of signal tracing test methods, television to the minute, recording dope. With this information you will save enough time on one radio job to pay the special \$1.95 price for the complete course.

NEW LIMITED EDITION
 Rush your order to us today. You may not have another opportunity like this. Only a small number of courses reprinted to sell at the reduced price. You are protected with our money-back guarantee. Catch up with your radio education. Begin studying this course this very week.

FREE EXAMINATION COUPON

SUPREME PUBLICATIONS, Room 336
 3727 W. 13th St., Chicago, Illinois

Ship the complete Radio Course at the special reduced price. I must be pleased, or will get my money back.

I am enclosing \$1.95, the full price, sent postpaid.

Ship C.O.D. I will pay postman \$1.95 and a few cents for postage.

Name

Address

City State

TELLS HOW TO USE INSTRUMENTS
 Many active servicemen have found this reduced-price course excellent for brush up and study of new servicing methods. Reprinted in 1940, with added information on signal tracing, television, visual alignment, P.A. application, photo-cells, etc. All about A.V.C., how to use an oscilloscope, what is feedback, resonance action, and every other fact you must know to be the best serviceman. 43 radio manufacturers helped to prepare this course.

PREPARED FOR HOME-STUDY
 This complete, low-priced course will give you all the training needed to get ahead in the growing field of Radio. No special education or previous experience required. The lessons are clear, interesting, easy to master and use. A final examination and diploma available after course is finished. Special \$1.95 price for the entire course can be earned the first hour of radio work.

PARTIAL LIST OF LESSONS
 Elementary Electricity, Radio Parts, Batteries, Circuits, Magnesium, Electromagnets, Ohm's Law, Radio Mathematics, Wattage Calculation, Induction, R.F. Coils, I.F. Transformers, Condensers, A.C. Filters, Reactance, Mixed Circuits, Vacuum Tubes, Stage Gain, Detectors, R.F. Amplifiers, Superhet Principle, A.V.C. Ballast Tubes, Meters, Testing Methods, Instruments, Service Fundamentals, V.T. Voltmeter, Using the Oscilloscope, Alignment, Sound and Hearing, Pub. Address, Amplifiers, Loudspeaker Placement, Microphones, Inverse Feedback Methods, Recording, Power Supplies, Auto Sets, Servicing Short-Cuts, Case Histories, Radio Transmission, Modulation, Crystal Oscillators, Photocells, Sound Movies, Television Principles, Setting Up a Radio Business, Extra Profit Ideas, And many others.

SHORT WAVE COIL DATA BOOK

Every experimenter knows that the difference between a good and a poor radio set is usually found in the construction of short-wave coils. Coil winding information is vitally important and in the new coil book all "dope" appears. There're illustrations which give instructions on how to wind coils, dimensions, sizes of wire, curves and how to plot them. Every experimenter needs this book—it also contains complete data on all types of receiving coils, together with many suitable circuits using these coils. Also complete data on various types of transmitting coils with many transmitting circuits such as exciters and amplifiers using the various coils described.

Contents Briefly Outlined
 S-W Tuning Inductance Charts • Coil Data for T. R. F. Receivers • One Tube Oscillodyne • Two Tube Bandspreeder • The Mono-Coil • 2-Tube "Die Stable" • 2-Tube Globe Trotter • 2 Winding Coils—10-500 Meters • Doolie 3-Tube "Signal Gripper" Electrified • 3-Tube Bandspreeder for the Ham • General Coverage Coils on Ribbed Forms • Coil Data for Superhet or S-W Converter • Ultra S-W Coils • Switch Coils for S-W Superhets • Experimental Coils • S-W Antenna Tuner • Most Popular S-W Tuning Circuits • Self-Supporting Transmitting Circuits Employing Coils Described • All Band Antenna Tuner for transmitting • Plug-in Coils for Exciters • Frequency-Wavelength Conversion Chart.

PRICE 25c PREPAID
 For a copy of this handy book send 25c in U.S. Coin or stamps to

RADIO PUBLICATIONS
 20 VESEY STREET NEW YORK, N. Y.

EVERYTHING IN RADIO

BURSTEIN-APPLEBEE COMPANY

1012-14 McGEE STREET, KANSAS CITY, MISSOURI

HAS IT?

This big book serves your entire needs. It includes sets, parts and supplies, public address, amateur equipment, test-ers, kits, fluorescent lighting. Nationally known favorites at lowest possible prices. Write today for your copy of this

BIG FREE CATALOG

RADIO OPERATOR'S LICENSE GUIDE

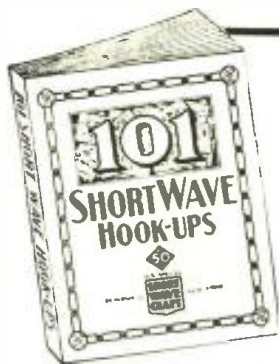
By **WAYNE MILLER**

Here's a new Guide Book that contains over 1250 questions and answers which will help you pass the new six element examinations for a commercial radio operator's license. It correctly answers all questions contained in the study guide that was recently released by the Federal Communications Commission for the use of those proposing to take its examination. It will not only see you through your examination, but will also serve as a valuable future reference book. \$3.00 postpaid. Refunded if not satisfactory.

R. A. COWELL
 PUBLISHERS' REPRESENTATIVE
 411 7TH STREET, BELLE PLAINE, IOWA

... THESE OUTSTANDING SHORT WAVE BOOKS ARE Now Available AT YOUR DEALER!

YOU buy parts, tubes, kits, accessories from your local radio dealer—that's what countless thousands of short-wave fans do. Now through a nation-wide distribution service our numerous books are available at your favorite radio dealer—right where you buy other radio equipment. It's more convenient, saves time and you can inspect the books before you buy. Ask your dealer to show you all the books advertised on this page—they're always in stock.



101 SHORT WAVE HOOK-UPS

Compiled by the Editors of RADIO & TELEVISION

Here is a worthwhile book that every short wave listener, every short wave fan, and every short wave amateur has wanted for a long time. It gives you the 101 best short wave hook-ups which have appeared heretofore.

100 Illustrations 72 Pages 50c

HOW TO BUILD AND OPERATE SHORT WAVE RECEIVERS

This is the best and most up to date book on the subject. It is edited and prepared by the editors of RADIO & TELEVISION and contains a wealth of material on the building and operation, not only of typical short wave receivers, but short wave converters as well.

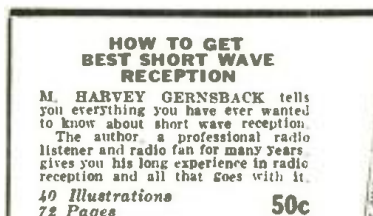
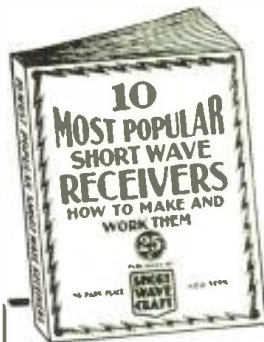
150 Illustrations 72 Pages 50c



TEN MOST POPULAR SHORT WAVE RECEIVERS

HOW TO MAKE AND WORK THEM
The editors of RADIO & TELEVISION have selected ten outstanding short wave receivers and these are described in the new volume. Each receiver is fully illustrated with a complete layout, pictorial representation, photographs of the set complete, hook-up and all worthwhile specifications.

75 Illustrations 40 Pages 25c



M. HARVEY GERNSBACK tells you everything you have ever wanted to know about short wave reception. The author, a professional radio listener and radio fan for many years, gives you his long experience in radio reception and all that goes with it.

40 Illustrations 72 Pages 50c



HOW TO BECOME AN AMATEUR RADIO OPERATOR

By Lieut. Myron F. Eddy, whose experience in the amateur field has made him pre-eminent in this line.

If you intend to become a licensed code operator, if you wish to take up phone work eventually—this is the book you must get.

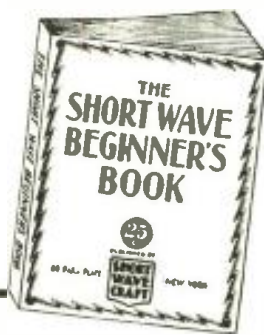
150 Illustrations 72 Pages 50c



THE SHORT WAVE BEGINNER'S BOOK

Here is a book that solves your short wave problems—leading you in easy stages from the simplest fundamentals to the present stage of the art as it is known today. It is the only low-priced reference book on short waves for the beginner.

75 Illustrations 40 Pages 25c



LOOK FOR YOUR NEAREST DEALER

For convenience the publishers list below dealers in all parts of the world where our books are available. On your next shopping trip be certain to examine these volumes. You're sure to want them for your technical library.

- ALABAMA**
Walther Bros., Montgomery
- ARIZONA**
Sam's Cigar Store, Phoenix
- CALIFORNIA**
Electric Supply Co., Oakland
Radio Supply Company, Los Angeles
Radio Television Supply Co., Los Angeles
Pacific Radio Exchange, Inc., Los Angeles
Western Auto Supply, Los Angeles
Zack Radio Supply Co., Los Angeles
Womans Book Store, Pasadena
Western Radio & Elec. Co., San Diego
Scott Wholesale Radio Co., Long Beach
Offenbach Electric Co., San Francisco
Technical Book Co., San Francisco
Zack Radio Supply Co., San Francisco
Radio Specialties Co., San Jose
- COLORADO**
Interstate Radio Supply, Denver
- CONNECTICUT**
The Edward P. Judd Co., New Haven
- DELAWARE**
Wilmington Elec. & Elec. Co., Inc., Wilmington
- FLORIDA**
Radio Accessories Co., Orlando
- GEORGIA**
Radio Wire Television, Inc., Atlanta
- ILLINOIS**
Allied Radio Corporation, Chicago
Walter C. Braun, Inc., Chicago
Chicago Radio Apparatus Co., Chicago
A. C. McClurg & Co., Chicago
Midwest Radio Mart, Chicago
Newark Electric Co., Chicago
Sears, Roebuck & Co., Chicago
Max Stein & Co., Chicago
Montgomery Ward & Co., Chicago
Radio Wire Television, Inc., Chicago
- INDIANA**
Van Sickle Radio, Indianapolis
- MASSACHUSETTS**
DeWolfe & Fiske Co., Boston

- The Personal Book Shop, Boston
Radio Wire Television, Inc., Boston
Library Book House, Springfield
Tremont Elec. Supply Co., Boston
- MICHIGAN**
Rissl Brothers, Detroit
- MINNESOTA**
St. Paul Book & Stat. Co., St. Paul
- MISSOURI**
Bursteln-Applebee Co., Kansas City
Radio Labs., Kansas City
Walter Ashé Radio Co., St. Louis
Van Sickle Radio Co., St. Louis
- NEBRASKA**
Radio Accessories Company, Omaha
- NEW JERSEY**
Radio Apparatus Co., Newark
United Radio Co., Newark
Radio Wire Television, Inc., Newark
- NEW YORK**
Port Orange Radio Dist. Co., Albany
Radio Wire Television, Inc., Bronx
Radio Wire Television, Inc., Jamaica, L. I.
Harrison Radio Co., New York City
Baker & Taylor Co., New York City
Blan, the Radio Man, New York City
David Rosen & Co., New York City
Eagle Radio Co., New York City
Federated Purchaser, Inc., New York City
Sun Radio Co., New York City
Terminal Radio Corp., New York City
Thor Radio Corp., New York City
Try-Mo Radio Co., New York City
Van Riemdsdyck Book Stores, New York City
Radio Wire Television, Inc., New York City
H. W. Wilson Co., New York City
Radio Paris & Equipment Co., Rochester
M. Schwartz & Son, Schenectady
- OHIO**
News Exchange, Akron
United Radio, Inc., Cincinnati
College Book Exchange, Toledo

- OREGON**
J. K. Gill Co., Portland
- PENNSYLVANIA**
The 437 Store, Philadelphia
M & H Sporting Goods Co., Philadelphia
Radio Electric Service Co., Philadelphia
Cameradio Co., Pittsburgh
- UTAH**
Radio Supply, Inc., Salt Lake City.
- WASHINGTON**
Seattle Radio Supply Co., Seattle
Wedel Co., Inc., Seattle
- ARGENTINA**
Radio Revista, Buenos Aires
- AUSTRALIA**
McGill's Authorized Agency, Melbourne
- BELGIUM**
Emil Arens, Brussels
- CANADA**
T. Eaton & Co., Winnipeg, Man.
Electrical Supplies, Ltd., Winnipeg, Man.
Wholesale Radio Supply, Winnipeg, Man.
Canadian Electrical Supply Co., Ltd., Toronto, Ont.
Radio Trade Supply Co., Ltd., Toronto, Ont.
Canadian Electrical Supply Co., Ltd., Montreal, P. Q.
- BRAZIL**
Agencia Soave, Sao Paulo
- CHINA**
China News Co., Shanghai
International Booksellers, Ltd., Shanghai
- ENGLAND**
Gorrings's Amer. News Agency, London
- FRANCE**
Toute La Radio, Paris
- GERMANY**
Rehr G.M.B.H. SW15, Berlin NW No. 7
- HOLLAND**
Radio Peeters, Amsterdam, Z.

- INDIA**
Bombay
Empire Book Mart, Bombay
- MEXICO**
American Book store, Mexico, D. F.
Central De Publicaciones, S. A., Mexico, D. F.
Jaques Salvo, Mexico, D. F.
- NEW ZEALAND**
Johns. Ltd., Auckland
James Johnston, Ltd., Dunedin
Te Aro Book Depot, Ltd., Wellington
- SOUTH AFRICA**
Technical Book Co., Cape Town
Central News Agency, Johannesburg
International House, Johannesburg
South African Radio Publications, Johannesburg

IF YOUR DEALER DOES NOT CARRY THESE BOOKS, ORDER DIRECT FROM US. FILL OUT COUPON BELOW. SHIPMENT WILL BE MADE IMMEDIATELY.

POPULAR BOOK CORP. R&T-12-40
20 Vesey Street, New York City.

Gentlemen: I enclose herewith my remittance for _____ for which please send me the following books:

.....

Name

Address

City

State

(Send remittance in form of check or money order. If letter contains cash or unused U. S. postage stamps, register it.)

APPENDIX 11- Courtesy Federal Communications Commission
 TABLE 1.—Abbreviations to be used in radio communications—Q code. Abbreviations to be used in all services^{1, 2}

Abbreviation	Question	Answer or statement
QRA	What is the name of your station?	The name of my station is . . .
QRB	At what approximate distance are you from my station?	The approximate distance between our stations is . . . nautical miles (or . . . kilometers).
QRC	By what private operating enterprise (or government administration) are the accounts for charges of your station settled?	The accounts for charges of my station are settled by the . . . private operating enterprise (or by the government administration of . . .).
QRD	Where are you going and where do you come from?	I am going to . . . and I come from . . .
QRG	Will you tell me what my exact frequency (wave length) is in kilocycles (or meters)?	Your exact frequency (wave length) is . . . kilocycles (or . . . meters).
QRH	Does my frequency (wave length) vary?	Your frequency (wave length) varies.
QRI	Is the tone of my transmission regular?	The tone of your transmission varies.
QRJ	Are you receiving me badly? Are my signals weak?	I cannot receive you. Your signals are too weak.
QRK	What is the legibility of my signals (1 to 5)?	The legibility of your signals is . . . (1 to 5).
QRL	Are you busy?	I am busy (or I am busy with . . .). Please do not interfere.
QRM	Are you being interfered with?	I am being interfered with.
QRN	Are you troubled by static?	I am troubled by static.
QRO	Must I increase the power?	Increase the power.
QRP	Must I decrease the power?	Decrease the power.
QRQ	Must I transmit faster?	Transmit faster (. . . words per minute).
QRS	Must I transmit more slowly?	Transmit more slowly (. . . words per minute).
QRT	Must I stop transmission?	Stop transmission.
QRU	Have you anything for me?	I have nothing for you.
QRV	Are you ready?	I am ready.
QRW	Must I advise . . . that you are calling him on . . . kilocycles (or . . . meters)?	Please advise . . . that I am calling him on . . . kilocycles (or . . . meters).
QRX	Must I wait? When will you call me again?	Wait (or Wait until I have finished communicating with . . .). I shall call you again at . . . o'clock (or immediately).
QRY	Which is my turn?	Your turn is number . . . (or according to any other indication).
QRZ	By whom am I being called?	You are being called by . . .
QSA	What is the strength of my signal (1 to 5)?	The strength of your signals is (1 to 5).
QSB	Does the strength of my signals vary? . . .	The strength of your signals varies.
QSD	Is my keying correct; are my signals distinct?	Your keying is incorrect; your signals are bad.
QSG	Must I transmit . . . telegrams (or one telegram) at a time?	Transmit . . . telegrams (or one telegram) at a time.
QSH	What is the charge to be collected per word to . . . including your internal telegraph charge?	The charge to be collected per word to . . . is . . . francs, including my internal telegraph charge.
QSK	Must I continue the transmission of all my traffic; I can hear you between my signals?	Continue the transmission of all your traffic; I shall interrupt you if necessary.
QSL	Can you acknowledge receipt?	I am acknowledging receipt.
QSM	Must I repeat the last telegram which I transmitted to you?	Repeat the last telegram which you transmitted to me.
QSO	Can you communicate with . . . directly (or through . . .)?	I can communicate with . . . directly (or through . . .).
QSP	Will you relay to . . . free of charge? . . .	I will relay to . . . free of charge.
QSR	Has the distress call received from . . . been attended to?	The distress call received from . . . has been attended to by . . .
QSU	Must I transmit (or answer) on . . . kilocycles (or meters) and/or on waves of type A1, A2, A3, or B?	Transmit (or answer) on . . . kilocycles (or . . . meters) and/or on waves of type A1, A2, A3, or B.
QSV	Must I transmit a series of V's?	Transmit a series of V's.
QSW	Do you wish to transmit on . . . kilocycles (or . . . meter-), and/or on waves of type A1, A2, A3, or B?	I am going to transmit (or I shall transmit) on . . . kilocycles (or . . . meters), and/or on waves of type A1, A2, A3, or B.
QSN	Will you listen to . . . (call signal) on . . . kilocycles (or . . . meter-)?	I am listening to . . . (call signal) on . . . kilocycles (or . . . meters).
QSY	Must I shift to transmission on . . . kilocycles (or . . . meters), without changing the type of wave? . . . or Must I shift to transmission on another wave?	Shift to transmission on . . . kilocycles (or . . . meters) without changing the type of wave. Shift to transmission on another wave.
QSZ	Must I transmit each word on group twice?	Transmit each word or group twice.
QTA	Must I cancel telegram to . . . as if it had not been transmitted?	Cancel telegram to . . . as if it had not been transmitted.
QTB	Do you agree with my word count?	I do not agree with your word count; I shall repeat the first letter of each word and the first figure of each number.
QTC	How many telegrams have you to transmit?	I have . . . telegrams for you (or for . . .).
QTE ³	What is my true bearing in relation to you? What is my true bearing in relation to . . . (call signal)? . . . or What is the true bearing of . . . (call signal) in relation to . . . (call signal)?	Your true bearing in relation to me is . . . degrees. Your true bearing in relation to . . . (call signal) is . . . degrees at . . . (time) or The true bearing of . . . (call signal) in relation to . . . (call signal) is . . . degrees at . . . (time).

¹ Abbreviations take the form of questions when they are followed by a question mark.
² The series of signals QA to QD and QF to QN are reserved for the special code of the aeronautical service.
³ In certain aeronautical services, "true course" and "true bearing" are called "geographic course" and "geographic bearing."
 (To be continued)

"Ham Ramblings"

Frank Courtney, W4FDX

● WE wonder how many fellows carefully read the very fine editorial by Mr. Hugo Gernsback in the August issue of RADIO & TELEVISION. Mr. Gernsback certainly hit the proverbial "nail on the head," for during this critical period in the affairs of our country, we Hams do not know when Uncle Sam will call on us to do our part. Those of us who have been working *phone*, and thereby allowing our C.W. to get somewhat rusty, should put "ye old mike" on the shelf for awhile and dust off that "bug," and bring our C.W. back to the point where we can copy at least 25 W.P.M. *without error!* We should all be ready, when, and if, the call to duty comes.

* * *

Well, it seems as though the much debated Ham vs. S.W.L. QSL controversy continues to hold the limelight. The S.W.L. continues to complain that only a small percentage of the Hams sent reports or S.W.L. cards, condescend to send a card, while most of the Hams counter with the fact that they do not care for reports from the S.W.L.'s, as they receive an abundance of reports from other Hams "worked." True, it is about all that most Hams can do to reply to the QSL cards received from actual QSO's. However, personally, we are of the opinion, that a fellow who wants one of our cards bad enough to write for it, certainly is entitled to the courtesy of an acknowledgment, if not a card. We are just completing three years on the air here, and to our knowledge we have never failed to send a card to any who requested it, and that shall continue to be our policy.

* * *

When your receiver is improperly operating, and you have no testing equipment on hand to locate the defective stage, have you tried the simple tube-pulling process? Simply pull out tubes one at a time, starting at the receiver input and working toward the speaker. The first stage that stops the trouble is, of course, the defective stage.

If you are dissatisfied with the present frequency of your crystal, you can change it several kilocycles by painting its faces with black India drawing ink. Use a cheap water color brush.

When our "bug" insisted on walking all over the table, and would not stay where we wanted it while in use, we solved the problem by touching the rubber feet with our soldering iron. The feet get sticky and the bug stays put!

We were recently called over to a neighbor's house to endeavor to find out why their new (self-installed) radio set refused to play. Upon questioning friend neighbor, we learned that he had tightened up several screws on the chassis that "had evidently become loose when the set was delivered." Result, an alignment job, as said screws happened to be *padders* and *trimmers!*

An A.C.-D.C. Beginner's Transmitter

William D. Hayes, W6MNU

This simple transmitter for the fellow just entering the HAM game, is easily built and puts to work a trio of the new 35 volt tubes.

used in the power supply rather than a voltage-doubler. An advantage of the half-wave circuit over the voltage-doubling circuit is that it permits the set to be used on a D.C. line. The high capacity input filter condenser maintains the plate voltage of the 35L6GT's at about 100 volts under full load with seven watts input to the oscillator. Needless to say, the note is absolutely T9x.

A 0-100 D.C. milliammeter measures the plate current to the 35L6GT's, and with the oscillator loaded, this meter should read about 70 ma. A toggle switch is provided for shorting out the meter while keying. In the tank circuit is a small air-wound plug-in coil with an adjustable link (Bud OLS), and the coupling to the load can be conveniently adjusted by merely bending the link into or out of the coil proper. A receiving type midget variable is used as the tank condenser.

The design of the antenna tank circuit will, of course, depend entirely on the type of antenna available, and reference should be made to the various handbooks which cover the subject quite thoroughly.

Construction

The transmitter is constructed on Macolite, which is not only very inexpensive, but also extremely easy to work with. To convince yourself of this fact it is only necessary to try drilling a few holes in a steel panel and then to try the same thing on a piece of Macolite (or Masonite). Of course, steel has the advantage of providing shielding, but in this case no shielding is necessary.

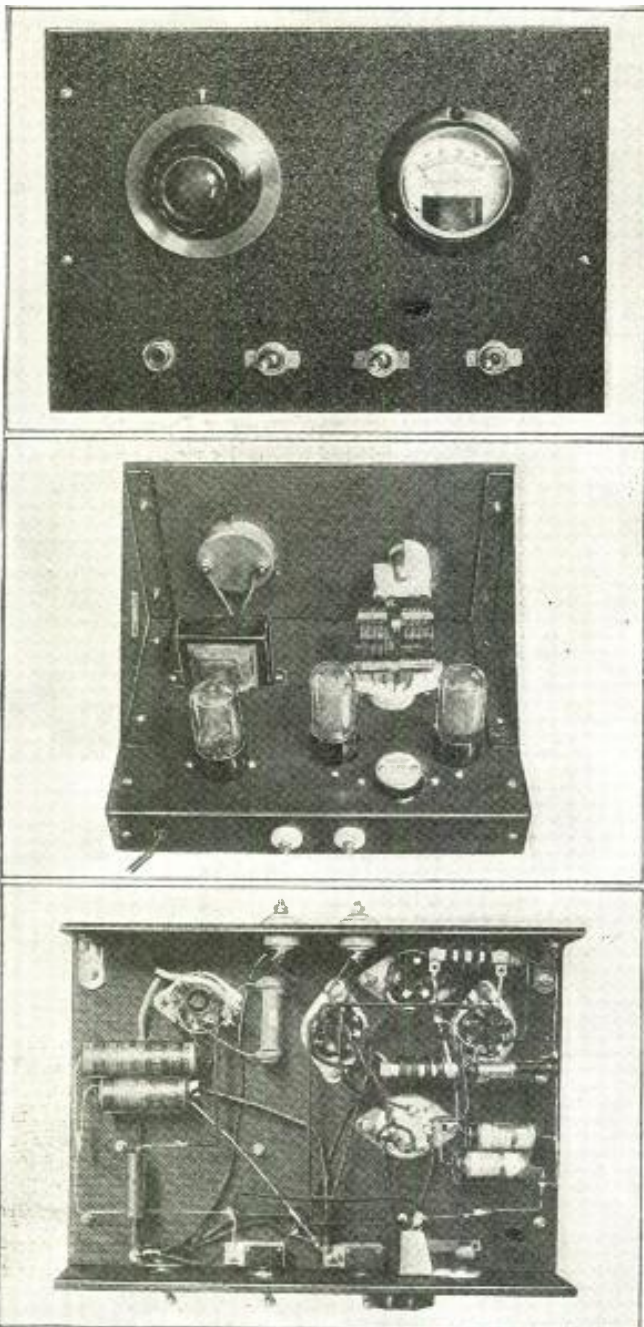
The Macolite used both in the front panel and in the chassis is 3/16 inch thick; the panel measures 7" x 10", and the chassis is 7" x 10" x 1 1/2". The panel is attractively finished in black crackle and is attached to the chassis by means of a pair of staunch and sturdy black crackled steel angle brackets. (That's a mouthful!) Incidentally, the brackets are Bud No. 1266.

Referring to the front panel, the tuning dial and meter are self-evident. Across the bottom, from left to right, are the keying jack, meter shorting switch, stand-by switch, and line switch. The R.F. output is fed through two small Alsimag insulators at the rear of the chassis.

Operation

As in tuning any crystal oscillator, the tank condenser should be tuned to resonance as indicated by minimum plate current, and then rotated about one degree in the minimum capacity direction. If this is not done, there will be a tendency to chirp, and the rig will not key properly.

It cannot be over-emphasized that a reasonably good antenna system is essential for satisfactory results with a low-power transmitter. However, given a good antenna, the little outfit will provide the Ham beginner with many enjoyable QSO's. Perhaps by the time this article is published, the ban on portable operation will have been lifted, in which case I might suggest that the rig



Front, rear and bottom views of the transmitter.

● LARGELY responsible for the recent increase in the number of receiving tube types has been the development and introduction of tubes employing a relatively high voltage heater designed for economical service in A.C.-D.C. circuits. These tubes require a heater current of only .15 ampere as compared with .3 ampere drawn by the older types. This means that in many cases line cord resistors and ballast tubes can be entirely eliminated.

For instance, the dropping resistor in the heater circuit of the transmitter described in this article dissipates only 1.7 watts, which is more than adequately handled by a small 10 watt resistor. The rig draws 17.5 watts from the line with the key up and 25 watts with the key down, whereas with the older type tubes the key up power would be 35 watts and the key down power 42 watts.

All this may be disheartening to those who depend on line cord resistors and ballast tubes for heating up the shack, but such a big improvement in efficiency is worth a mild case of cold feet. Besides, you can always buy an electric heater.

Circuit

A pair of 35L6GT's is used in a conventional push-pull crystal oscillator circuit. These tubes are designed to operate efficiently with 110 volts on the plate so a half wave rectifier, a 35Z4GT, is

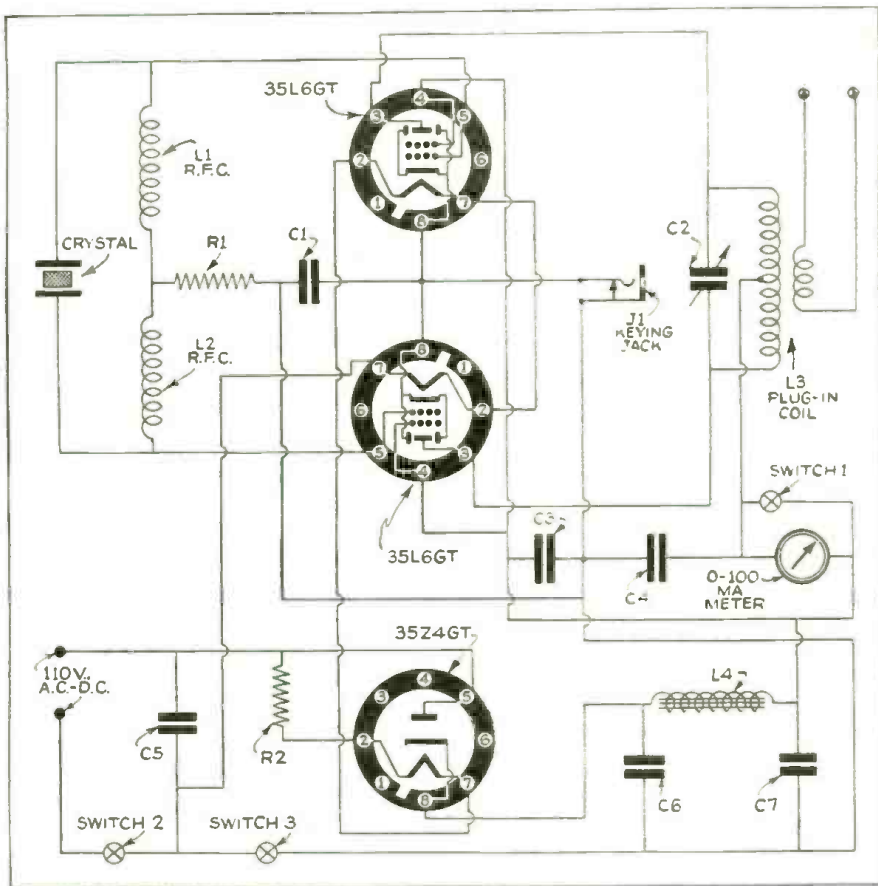


Diagram of the Transmitter.

is well suited for portable use. The elimination of a power transformer as well as the use of Macolite in construction puts it in the featherweight class.

While the rig can be used on any band for which a coil and crystal are available, forty and eighty meters are recommended. A glance at the list of parts and a little mental arithmetic will show that this little transmitter is very inexpensive to construct. For instance, a set of three tubes can be purchased for under \$2.00 and, except for the crystal, that is the largest item.

In conclusion, here's a reminder: Do not ground the "B" negative.

Parts List

- SPRAGUE**
C₁, C₃, C₄, C₅, .01 mfd. 600 v. paper
HAMMARLUND
C₂, 100 mmfd. midget variable (SM-100)

- AEROVOX**
C₆, 24 mfd., 150 v. electro (Dandee)
C₇, 12 mfd., 150 v. electro (Dandee)
CONTINENTAL
R₁, 15,000 ohms, 1 watt (Carbon)
IRC
R₂, 75 ohms, 50 watts
MILLER
L₁, L₂, R.F. choke 2.5 mh.
BUD
L₃, Air-wound plug-in coil with adjustable link
STANCOR
L₄, 30 hys., 50 ma. (C-1003)
YAXLEY
J₁, Closed circuit keying jack
ARROW
S₁, S₂, S₃, S.P.S.T. toggle switch
BLILEY
X, Crystal for the band in use
READRITE
M₁, 0-100 milliammeter
RCA
Two 35L6GT's, one 35Z4GT
JOHNSON
Alsmag feed-through insulators
ICA
Dia!

F.C.C. - Guide Questions

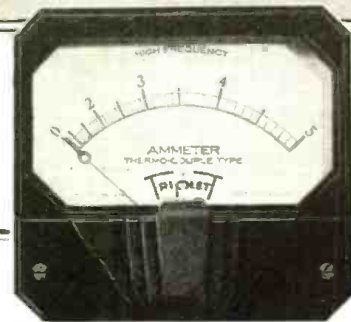
60. On what amateur bands is portable operation permitted only when prior notification has been given to the F.C.C. inspector in charge of the district in which such operation is contemplated?
61. On what amateur bands is adequately filtered direct-current plate power supply required for operation of an amateur transmitter?
62. On what amateur bands is adequately filtered d.c. plate power supply *not* required for operation of an amateur transmitter?
63. What is the maximum permissible plate power input to the final stage of an amateur transmitter and under what circumstances may it be used?
64. How would a short circuited turn of

FOR AMATEUR LICENSE

- the coil affect the resonance frequency of a tuned circuit and why?
65. What is meant by the harmonic of a fundamental frequency?
 66. What operating characteristics distinguish the electron-coupled type oscillator with regard to frequency stability?
 67. What circuit conditions will minimize the harmonic components in the output circuit of a given radio-frequency amplifier stage?
 68. Give the meanings of the following "Q" signals:

QRK	QRN
QRM	QSA
QRT	QSY
QSZ	
- (See previous issues for other "Guide" questions.)

TRIPLET
THERMO AMMETERS
FROM *\$4.50 UP



Model 446 . . .

● EVERY circuit is capable of improvement when reduced to engineering standards by measuring with precision instruments. Use Triplet Thermo Ammeters to give you a truly efficient antenna circuit. (Accuracy to 2%.) Available in 2", 3", 4", 5" and 7" sizes in popular ranges. Internal or external couples.

SPECIAL PRICE REDUCTION
Dealer Prices from \$4.50. (For Model 341 internal couple 0-5 to 0-5 amp. ranges.) Model 446, as shown above, less front illumination attachment with external couple, \$7.84 net.

WRITE FOR CATALOG
Section 2812 Harmon Drive

TRIPLET ELECTRICAL INSTRUMENT CO.
Bluffton, Ohio

EASY TO LEARN CODE

It is easy to learn or increase speed with an Instructograph Code Teacher. Affords the quickest and most practical method yet developed. Available tapes from beginner's alphabet to typical messages on all subjects. Speed range 5 to 40 WPM. Always ready—no QRM.



MACHINES FOR RENT OR SALE

The Instructograph Code Teacher literally takes the place of an operator-instructor and enables anyone to learn and master code without further assistance. Thousands have used and endorse the Instructograph System. Write today for full particulars and convenient payment and rental plans.

INSTRUCTOGRAPH COMPANY

Dept. RT, 4701 Sheridan Rd., Chicago, Ill.
Representatives for Canada
Radio College of Canada, 54 Bloor St. West, Toronto.

BUTTON! BUTTON!

— WHO'S GOT THE BUTTON? —

There's no need for such aimless searching if you will only come to SUN, for here we have EVERYTHING! No in the way of buttons, perhaps, but we do have anything and everything in RADIO!

ALL THE LATEST RECEIVERS
TRANSMITTERS • TUBES • PARTS
TEST INSTRUMENTS • P. A. SYSTEMS
RECORDERS • HI-FIDELITY EQUIPMENT
and SERVICE!

Especially the latter, for that's what we're noted for. We offer lots of it gratis. Just write us about any of your requirements. Full information, data and prices will be forthcoming upon request.

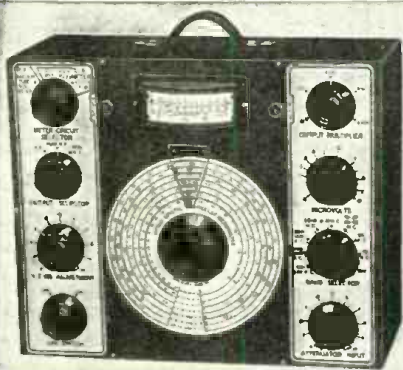
"You'll Find It's SUN SERVICE that's Best!"
New York's Oldest "Ham" House
W2JEH—W2DXC—W2LFV—W2CLH

SUN RADIO CO.

212 FULTON ST.—Dept. RTD—NEW YORK CITY
CABLE ADDRESS—"SUNRADIO"

For more measurements
use a **HICKOK**
CRYSTAL CONTROLLED
MICROVOLT GENERATOR

Model 19X



Over 250 Crystal Controlled,
modulated or unmodulated,
outputs—to 15,000 KC.

Self-contained vacuum tube voltmeter, power level meter and crystal give more measurements than any other signal generator. Gain per Stage—Selectivity—Sensitivity—all standardized by self-contained vacuum tube voltmeter. One hundred inches of direct reading frequency scales.

This instrument and all Hickok Radio Testing Instruments are described in Catalog No. 120. Send for a copy today.

HICKOK
ELECTRICAL INSTRUMENT CO.
10317 Dupont Avenue Cleveland, Ohio

HICKOK ELECTRICAL INST. CO.,
10317 Dupont Ave.,
Cleveland, Ohio

Gentlemen:
Please send Catalog No. 120

NAME
ADDRESS
CITY STATE

BUILD THE
BROWNING AUTODYNE
CONVERTER AND PRESELECTOR

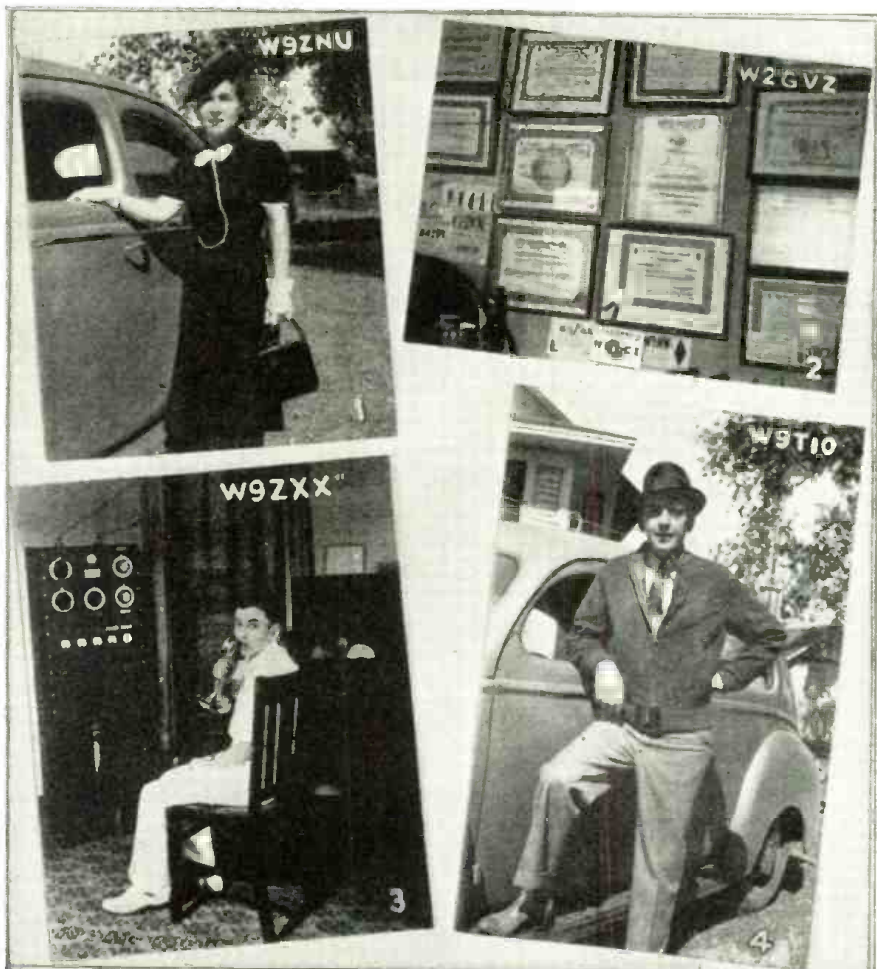


Make any receiver a short-wave set, tuning from 5 to 185 meters. (less 1852 tube) **\$16.50**
Available in kit form
Laboratory wired and tested, \$19.80 (less 1852 tube)
Cabinet: Black or Grey crackle finish.

BROWNING LABORATORIES, INC.
750 MAIN STREET WINCHESTER, MASS.

"CQ"

Larry LeKashman, W2IOP



1—W9ZNU—better half of W9TIO. 2—Some month we'll devote a full page to W2GVZ. This is one wall of NNJ's SCM's station. Not much Pat hasn't got here, and wait 'till you see the rest. 3—Exclusive 20 meter operation has made W9ZXX well known throughout the U.S. 4—W9TIO—the man who pays the bills.

● I CAN'T honestly say that we're swamped with material yet. You boys and gals must have lots of worth-while information to pass around and surely we don't all agree on everything. Don't forget this column is open to impartial discussions of anything that might benefit *amateur radio*. I thought we had pretty well defined the aims of CQ in the opening column, but it would seem that unless it's a YL affair you can't stir the gang.

Speaking of YL's reminds us that we have a little preaching to do about QSL's. Unfortunately no one wrote in with good negative reasons on the QSL situation, although many of our brethren added an "amen" to the plea for the revival of QSL'ing. The amateur who won't QSL because of the expense is standing on pretty thin ice, since the ham who can afford to run a station and not the price of QSL cards, is few and far between. On the other hand many amateurs consider it too much of a bother. To them we can only say think back at the thrills and pleasure you got when you received your first cards. If you *never* QSL'd, then, brother, you just

haven't been a ham and there's no use trying to speak this lingo to you. There is many a DX man who is now realizing what a mistake he made in not swapping cards when it could be done—don't you make the same mistake again.

By the way someone wrote in and asked us how we felt about the ARRL. It's a great thing in my opinion. League members elect the officials, so if there is any particular feature they object to it is their privilege to exercise the vote given them upon joining. In other words it's just like QSL cards. The boys find the energy to kick about different League activities, but not to do anything about them. Elect officials carefully; take an active part in ARRL affairs; and most important of all—keep in touch with your local SCM. The League is as good as its members—do your share and don't worry about the next bird.

W4FSE. Jim Harrison, of Asheville, N. C., isn't leaving anything to the other fellow. As editor of *The Arc*, W4FSE deserves a great deal of credit. Neat, interesting, and only fifty cents a year *The Arc* is now well into its second successful sea-

son. We don't dare lift too much of his material, so if you're interested in seeing a copy get in touch with W4FSE.

One thing has been bothering me for two years now—maybe one of our readers knows the answer. Why does the Manchester, N. H., R.C. emergency headquarters sport 10 and 20 meter rotary, with no low frequency antennas in sight? W2KOK is rebuilding for 10 meter phone with a pair of RK37's. W2KBH rebuilt his 10 mobile into a fixed station and is working the W1's on 2½ with his RK34-J feed antenna.

W2LFL, using a portable pedestrian transmitter consisting of a 1G4G and 1T5GT, running 1 watt input, has had many successful 2½ meter contacts. The complete station is housed in a camera case 5x6x4 inches with the B batteries in a separate pack around the waist. Best mobile DX has been about 6 miles. W4ECW has a similar outfit and when he walks down the main drag, according to *The Arc*, people follow him like a parade.

W2KDC is going to work for Westinghouse in Pittsburgh at the close of the NYWF. W2DSF is so busy developing his ping-pong game he never gets on the air any more. What are the SWL's doing with themselves now? It's a cinch the International Reply Coupon business is shot to pieces, along with most of Europe.

Long before the FCC banned foreign contacts many wisecracks knew it was due. The reason? Well, W5EGA can relate one story where a certain W6 was heard working a D. When asked to desist by another W6, the offender forgot his manners in no uncertain terms and all this on the air! After giving the well meaning interventionist a bawling out, he even had the nerve to write him an insulting letter. This belligerent and selfish attitude was all too evident long before the close-down and certainly didn't help our cause one bit. In fact, failure to heed the ARRL's neutrality code probably forced the FCC action in banning foreign contacts. Don't forget that, the next time the ARRL has a good suggestion to offer. By the way boys—how is your CW speed?

W9RFA is now married and more in-



THE great popularity of the "HQ-120-X" among leading amateurs and engineers is the direct result of its superb performance. When Alan Eurich selected the "HQ" for the Morrissey's main receiver, he was playing safe. The enviable reputation of Hammarlund receivers accounts for their use by many expeditions and in many important government services. The Byrd Expedition, for example, with which the Morrissey communicated on a more or less schedule basis, uses Hammarlund receivers entirely. There is little we can say about the "HQ" that would be as convincing as an actual demon-

stration. Visit your local jobber—there you can see and operate the "HQ-120-X." Take particular notice how effectively each control functions. Its accurately calibrated band spread dial, antenna compensator, and variable crystal filter are just a few of the features which make the "HQ" an outstanding amateur receiver.

MAIL COUPON TODAY!

HAMMARLUND MFG. CO., INC. RT-12
424 W. 33rd St., New York City
Please send "HQ-120-X" booklet

Name
Address
City State



Canadian Office:
41 West Ave. No., Hamilton

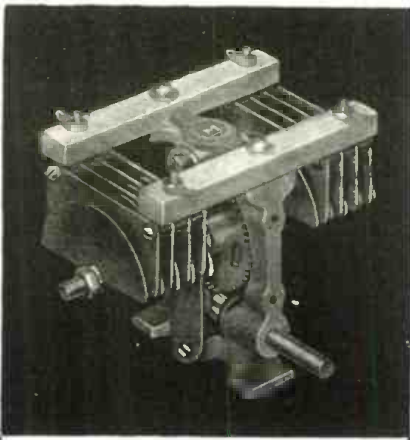
HAMMARLUND

EXPORT DEPARTMENT 100 VARICK STREET NEW YORK CITY

active, in ham radio particularly, than ever. We met the new XYL and fully understand the situation. Murray is excused—at least for the time being. W6QD is having all kinds of competition working W9's now. Tibet Workers of America have closed their club rooms for the duration of the war. W2KNA is on the air with a Halli-crafter 100 watt rig. W2MMV reports his best DX as Montana on 10 meter phone. W2HNS has temporarily forsaken his radio come-back in favor of more recording work. W1DOB, W3GXB, W3HTE, and K6AMF

are four of the boys with PAA in New York. W2NAX has a 25-watt CC rig perking on 56MC. W2AVA has CQ 173 for a license plate.

So far this column reminds me of a second district clam bake. If this keeps up I'm going to be writing this column all alone; which will make me a virtual dictator; which will put me on equal footing with Europe's "Terrible 3" and who knows what that'll lead to. All because you folks won't cooperate. Don't say I didn't warn you!



Designed for Application

Outstanding features of the MILLEN transmitting condensers include: rugged cast aluminum frame, right angle self locking worm drive, center fed rotors and stators, heavy round-edge polished aluminum plates, and genuine Isolantite dielectric. Available in capacities of 35, 50, and 70 mmfd per section with peak break down voltage rating of 3000.

Catalogue Upon Request

JAMES MILLEN MFG. CO. INC.
150 EXCHANGE ST. MALDEN, MASS.

EAGLE Minuteman

2 1/4-5-10 METERS
Amateur Band Receiver
for Consistent reception
on the loudspeaker.

MINUTEMAN KIT

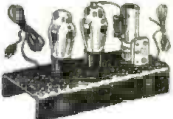
Complete with 3 Coils \$4.75

2 Tubes 6C5 & 42 \$1.25

WIRING CHARGE \$1.25
OPTIONAL

Just the receiver for duplex work. The most sensitive and selective super regenerator receiver known, uses metal and glass tubes. The last word in performance and simplicity of design. The first 2 1/4 to 10 meter receiver ever offered to the amateur at such ridiculously low price. No license necessary to operate it.

THE EAGLE WIRELESS PHONO CONTROL



Will play your records or transmit your voice through your broadcast receiver from distances up to 500 ft., without wires or any attachments to your radio. No aerial required. Your transmission will be received clearly and with ample volume. No Government license necessary. Mystify your friends with this amazing invention.

Complete Phono Kit \$1.95

Self powered A.C.-O.C. 2 Tubes—50c each
Wiring \$1.00 extra

MAIL ORDERS FILLED PROMPTLY.
\$1.00 Deposit, Check or Money Order. Balance C.O.D.

EAGLE RADIO CO.

84 Cortlandt Street, Dept. 12, New York City

EXPERIMENTERS NEW FREE CATALOG

Back Panel Mounted Vernier Dial. Roto-buffered, 4" nickel silver disc, non-slip friction drive. Cut your viewing hole to match meters, etc. Dial can be hand-calibrated. Only 99c less knob. Other styles, 27c up.

Universal cabinet Kit—6"x6"x9". Can be reshaped, punched or drilled easily. Made of masonite and aluminum. Strong. Light weight. Only \$1.20 net. Extra 6"x9" masonite panels only 10c. Extra 6"x6" aluminum ends, 39c.

DISTRIBUTORS—Get New Agency Plan.

RADIOCRAFTERS

1156 COMMONWEALTH BOSTON, MASS.

FACTORY AND IN-DESIGNING YOUR EQUIPMENT. SEND US GRAM MAIL TODAY AND YOUR DEALER'S NAME.



"Honor" Plaque Awarded To Merl T. Reynolds, W90KB

For Best HAM Station Photo

The station's main transmitter line-up is: a 6L6 as pentode or tritrit crystal oscillator, or as buffer or doubler with a 59 ECO; HY-40Z buffer, and push-pull 852's running from 100 to 500 watts input. All circuits are metered, from light lines to antenna. Four 866's are used in two plate supplies and a 5Z3 in the bias supply.

The receiver is a five tube T.R.F. job using 58, 57, 56, 2A5, and 5Z3 tubes with 9 to 200 meter coverage. One switch controls both

transmitter and receiver, giving "break-in" operation. From left to right on top of the desk are—a combination diode field-strength meter and volt-ohm-milliammeter; a wave-meter; an emergency transmitter.

Most contacts are made on 40 meters with some on 20 and 10 meters. The DX worked is 26 countries on 4 continents, all on 40.

Merl T. Reynolds, W90KB,
322 W. 12 St., Anderson, Ind.

Here is the new "Award of Honor" Plaque which measures 5"x7" in size. It is handsomely executed in colors on metal, and is framed, ready to hang on the wall. The name of the winner will be suitably inscribed.

Note These Important Rules

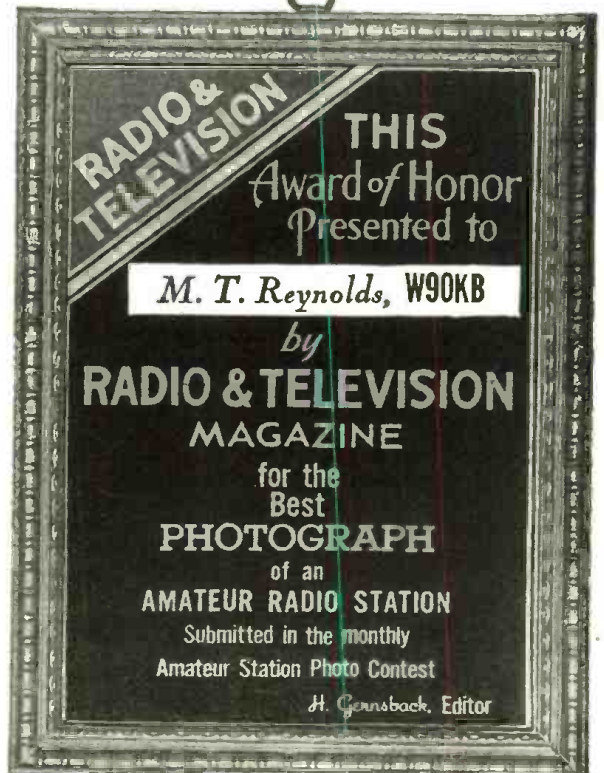
Attach a brief description not longer than 300 words, describing the general line-up of the apparatus employed, the size, type and number of tubes, the type of circuit used, name of commercial transmitter—if not home-made, watts rating of the station, whether for c.w. or phone or both, etc., also name of receiver.

State briefly the number of continents worked, the total number of stations logged or contacted, and other features of general interest. Mention the type of aerial system and what type of break-in relay system, if any.

Important—Enclose a good photograph of yourself, if your likeness does not appear in the picture!

You do not have to be a reader of RADIO & TELEVISION in order to enter the contest.

Address all photos and station descriptions to Editor, Ham Station Photo Contest, c/o RADIO & TELEVISION, 20 Vesey Street, New York, N. Y.





Representative types of audio transformers.

A Review of Radio TRANSFORMER

Leland S. Hicks*

Applications

● HOW easy it is to forget fundamental circuits and ideas. Reviews are always worth while and often bring ideas to mind at exactly the right moment. Here are a few standard circuits using transformers and chokes.

Fundamental Circuits

Figure 1: This simple circuit using triodes, 45's, 2A3's, 6A3's, etc., in the output stage will give unusually good frequency response. It is ideal for a radio tuner or phone pickup amplifier. T-1 may be any interstage audio with a ratio of about 3:1. The better the transformer the better the frequency response. T-2 will depend upon the output tubes used. Again a high quality transformer is necessary for the best response.

The circuit of Figure 2 is better where more power is required using 6V6's. This circuit will deliver 15 watts with very good response. T-1 must have a split secondary, as shown, to permit inverse feed-back to be used. See Figure 4 for an alternative inverse feed-back circuit.

Figure 3 shows a battery operated Class B amplifier using the new 1.4 volt tubes. The two triode sections marked 1G6G are really contained in a single glass envelope. The 1G6G is a zero bias tube; bias for the

*Thorndarson Electric & Manufacturing Company.

1H4G is secured from the voltage drop across a resistor in the B-circuit. Its value is determined by the total I_p drain of the entire receiver, usually about 800 ohms.

Inverse Feed-back

Two methods of securing inverse feed-back are shown in Figures 4 and 5. Figure 4 shows the ordinary method of obtaining inverse feed-back with the resistor-condenser method. The amount of inverse feed-

back is equal to $\frac{R_1}{R_1 + R_2}$, assuming that the

reactance of condenser C_1 is negligible over the operating frequencies. However, this assumption is not necessarily true, especially at the lower frequencies. The circuit of Figure 5 is much more efficient from this standpoint. In Figure 5 the feed-back voltage is obtained from a tertiary winding on the output transformer. This method also provides a much better overload characteristic since the resistance in the grid circuit is negligible and it is quite possible to operate the tubes in the grid current region.

Power Supplies

At times a source of very pure D.C. is required. The brute force twin choke circuit shown in Figure 6, using an 80 or 5Z3 or equivalent rectifier is ideal. Choice of power

transformer will depend upon the D.C. voltage required from the filter. Transformers are available to deliver from 250 volts D.C. at 40 ma. to practically any desired voltage, within the rating of such tubes. Choice of filter chokes will depend upon the current drain of the load. The actual inductance is not too important for most applications. Any choke catalogued as being capable of carrying a given current will have sufficient inductance for adequate filtering.

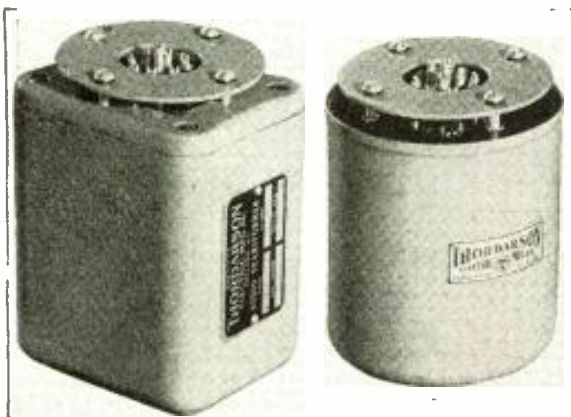
Universal Output Transformers

In choosing a Universal Output Transformer, be certain that the primary winding is designed to carry the plate current of the tubes you are using. The new beam power outputs draw from 50 ma. to 55 ma. plate current per tube. The older Universal outputs were designed to carry but 35 ma. to 40 ma.

Universal outputs with secondary leads, instead of lugs, are now available. These types are proving very popular as they permit the serviceman to cut off the unwanted leads and thus give the repair job a more finished appearance.

Copper Oxide Rectifiers

Model train builders often need a source of direct current that will be more convenient than a storage battery. This can be easily procured by using a simple transformer-copper oxide rectifier hookup as shown in Figure 7 or Figure 8. Figure 7 is a single-phase full-wave center-tapped circuit. Figure 8 is a single-phase full-wave bridge circuit. The former is most often



Two representative types of Broadcast quality audio transformers with mounting rings.

Various types of transformers are discussed by the author—what type to use for various circuit requirements—what to expect in a good filter choke—uses of auto-transformers—transformers for Vibrator power-supplies—what constitutes a good transformer—why effective shielding is necessary, etc.



36 Volumes in 1 Big Book!

1. Broadcasting System
2. S o u n d Speech, Music
3. E l e c t r o n Theory; Electric Current, Elec. Units; Ohm's Law
4. Elec. Circuits; Batteries
5. Magnetism
6. Electromagnetism
7. Electromagnetic Induction
8. Inductance
9. Capacitance; Condensers
10. A.C. Circuits
11. Filters
12. Measuring Instruments
13. Radio Waves
14. Broadcasting
15. Receiving
16. Vacuum Tube Principles
17. V. T. Characteristics
18. Vacuum Tube Construction
19. V. T. Detector and Amplifier Action
20. Radio Frequency Amplification
21. "Superhets."
22. R.F. Amplifiers; Tuning Coils
23. Audio Amplifiers
24. Loudspeakers
25. Battery Receivers
26. Power-Supply Units
27. Elec. Receivers
28. Auto and Aircraft Radio
29. Photoelectric Cells; Cathode-Ray
30. Television
31. Antennas and Grounds
32. R e p a i r i n g Servicing
33. Sound Pictures

Ghirardi's COMPLETE Course will train you QUICKLY

Here's your BIG CHANCE to get a thorough training in RADIO FUNDAMENTALS—quickly, easily, without previous experience or study. Today there are lots more jobs for men with radio training—in national defense industries and in all branches of the Army, where radio knowledge means a boost in pay and rank!

RADIO, SOUND, TELEVISION —MADE EASY AS A, B, C.

The Ghirardi course is the quickest short-cut to radio training you can find. The most complete and most economical too! Ghirardi's clear explanations, graphic illustrations, and 856 self-testing Review Questions make it as easy to understand as a primer. Thousands of successful radio men got their start with this book, and it's used by more radio schools and students than any other radio text in the world! Get the whole 972-page course today for \$4—and get started on your own radio career!

Use It 5 Days —OUR RISK!

Your money immediately refunded if not fully satisfied. Don't delay—mail this coupon at once!

972 Pages
508 Illus.

\$4
Only

RUSH COUPON TODAY!

Radio & Tech. Publ. Co., Dept. RET-120, 48 Astor Pl., N. Y.
 Enclosed and \$4. (\$4.50 foreign) for my copy of "RADIO PHYSICS COURSE," with your 5-day Money-Back Guarantee.
 Name
 Address
 City State
 Send me free descriptive literature.

FREE! GIVEN TO YOU THIS SUPER MAGNET

LIFTS MORE THAN 20 TIMES ITS OWN WEIGHT
 LITTLE GIANT MAGNET—The world's most powerful. Lifts 5 lbs. easily. Weighs 4 oz. Made of ALNICO, new high-magnetic steel. The experimenter and hobbyist will find hundreds of excellent uses for this high quality permanent magnet. Measures 1 3/4" x 1 3/8". Complete with keeper. Value \$2.00.

YOURS, AS A GIFT, FOR SELLING ONLY 16 "CASH IN" BOOKS!

No investment needed. We trust you. You simply order the books from us, sell them for 15¢ each, and when you collect \$2.40, remit to us (within 30 days) and we will send you the LITTLE GIANT MAGNET absolutely FREE! Or you may prefer one of the many other gifts we offer. Fill out and return the coupon today. Be the first in your neighborhood to sell "CASH IN."



40,000 Words of Text
 "CASH IN" contains 300 tested mail order plans, business secrets, formulas, schemes—real money makers. 68 pages.
 This book will sell itself to all of your friends, relatives and neighbors.

—SEND NO MONEY—
 National Plans Institute,
 246-T Fifth Ave., New York City
 Gentlemen: Please send me 16 books "CASH IN," which I will sell at 15¢ each. I will pay for the books in 30 days. Then you will send me FREE your LITTLE GIANT MAGNET. Also send me immediately your list of other free premiums.
 Name
 Address
 City St.
PASTE COUPON ON 1¢ POST-CARD AND MAIL TODAY.

USED Correspondence Courses
 COMPLETE HOME-STUDY COURSES and educational books, slightly used. Sold, rented, exchanged. All subjects. Money-back guarantee. Cash paid for used courses. Full details and illustrated 72-page bargain catalog FREE. Write today.
 NELSON COMPANY, 500 Sherman, Dept. M-210, Chicago

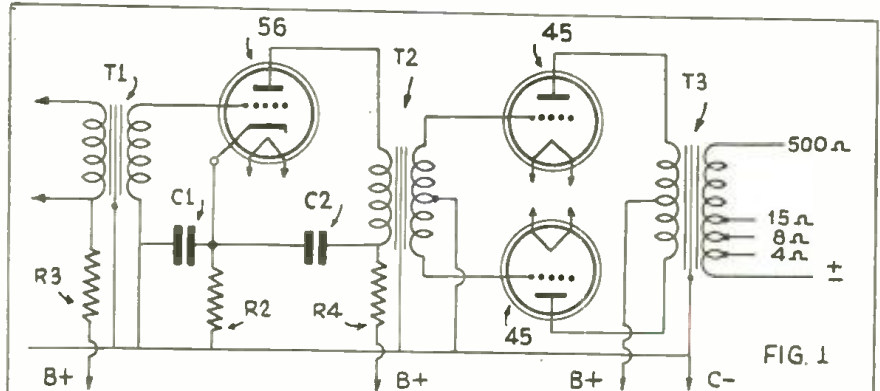


FIG. 1

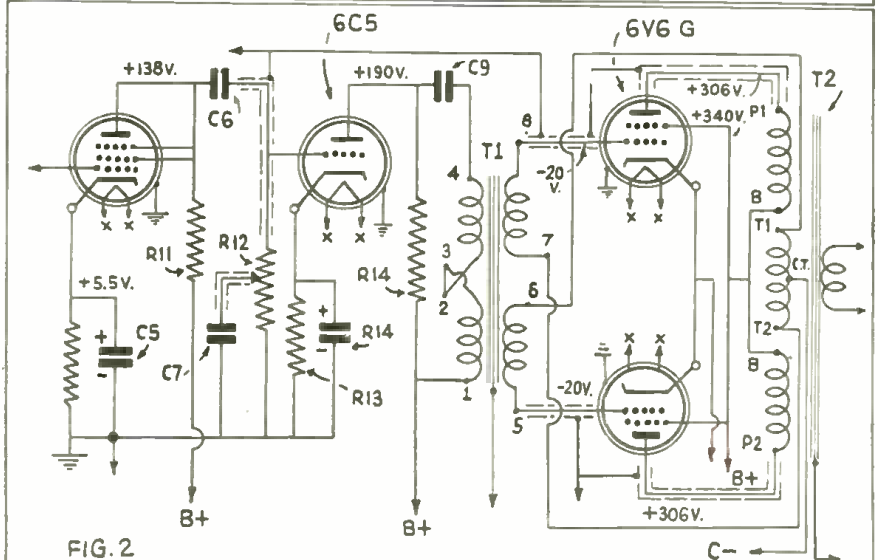


FIG. 2

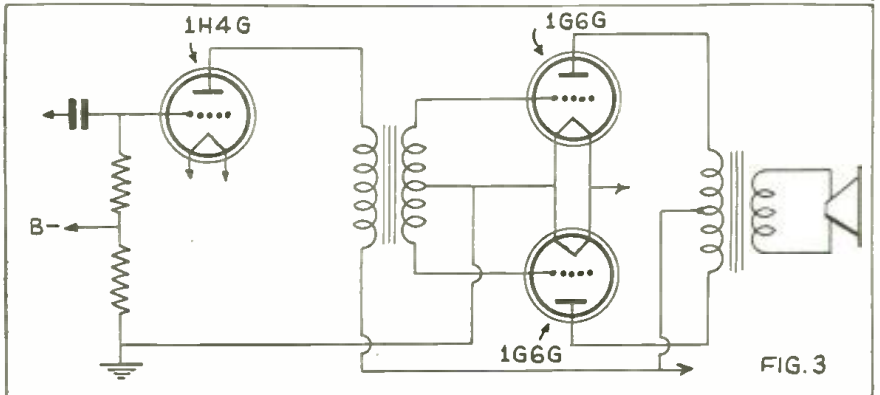


FIG. 3

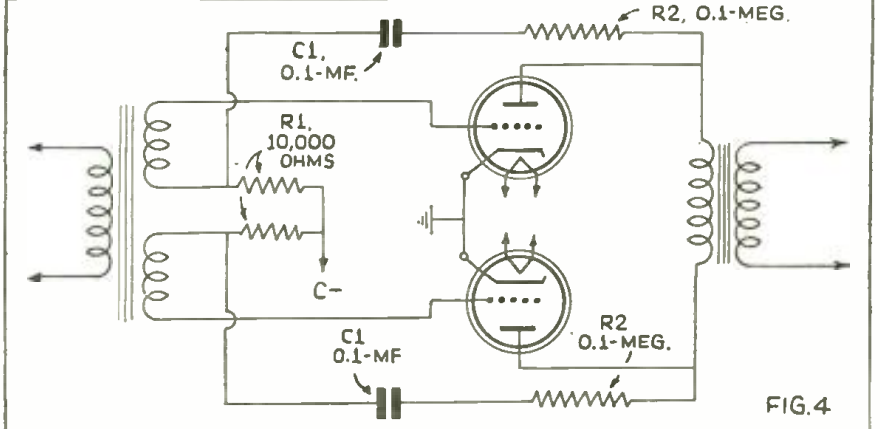


FIG. 4

Audio amplifier circuits—from simple to more complex types. Fig. 2—shows a 15-watt audio amplifier with inverse feed-back. (Fig. 4 optional feed-back circuit.) Fig. 3—A battery-operated class-B amplifier, using the new 1.4 volt tubes. Bias for the 1H4G is supplied by the voltage drop across the resistor in the B minus circuit.

Price Considerations

used. The transformer must deliver approximately 13 volts A.C. to the rectifier to secure 6 volts D.C. from the output. Connecting two filament windings of a multiple secondary filament transformer in series will give this value, or near enough for ordinary use. Model trains do not have to have exactly 6 volts D.C. Rectifiers to deliver 1 or 2.5 amperes are easily available from most radio parts distributors and larger sizes can be ordered as specials from any of the several rectifier manufacturers. The larger sizes are stock types with the manufacturer but they are so seldom called for that it does not pay the distributor to stock them.

Auto-transformers

An important variation from the basic transformer having a separate primary and secondary is the auto-transformer. This device consists of a continuous winding upon a common iron core, with taps to provide needed step up or step down ratios. Since the primary and secondary is common in all the winding except the ratio portion, large current values (heavy loads) can be handled on a much smaller iron core, thus making a smaller and less expensive design possible. Auto-transformers are used especially to change the line voltage. Units are available to reduce 230 volts to 115 volts or vice versa. Others have taps to correct high or low line voltage. Still others will give varying secondary voltages from zero to 115 volts from the 115 volts line in 5-volt steps, through the use of available taps and appropriate switches. Figure 9 shows the fundamental idea of a typical auto-transformer.

In choosing an auto-transformer the VA or secondary load rating is as important as the ratio rating. It is common practice to catalogue such ratings in terms of VA instead of watts since the manufacturer cannot know the power factor of the load with which the transformer is to be used. It is well known that certain types of motors, arc welders, neon signs, luminous tube illumination, etc., do not have 100% power factor; some loads are as low as 50% P.F. A VA rating is correct in all cases. If the wattage is known, the VA can be determined from the formula

$$VA \text{ equals } \frac{\text{Watts}}{\text{Power Factor}}$$

Vibrator Power-Supplies

Many amateurs are using battery-vibrator power supplies for mobile transmitter operation. The circuit of Figure 10 will deliver approximately 320 volts D.C. at 100 ma. from the filter. This power-supply uses a vibrator having accessible actuating coil terminals. With such a vibrator it is possible to avoid switching the high current which flows in the primary of the vibrator transformer, and consequently, the control of the vibrator may be done at a distance without the necessity of using connections of high current carrying capacity. Note that closing switch SW-1 lights the filament and SW-2 starts the vibrator. SW-2 can thus be used as a stand-by switch. It is important that SW-1 be closed and the filaments heated before SW-2 is closed, for the premature closing of SW-2 is almost certain to ruin the 6W5G rectifier.

Parts distributors are often asked, "why spend \$10.00 for an audio transformer performing the same function and having approximately the same ratio as one selling for \$0.90"? A brief review of audio transformer characteristics will quickly answer this question.

Servicemen are primarily interested in replacement type audios having approximately the same physical and electrical characteristics as the one they are removing from the receiver. They are concerned more with stability, size and cost than anything else. Transformers designed for their use are furnished in strap mountings and are made as small, physically, as possible. The frequency response of such units is naturally poor as compared with those built for use by broadcast stations. Still the response is more than adequate for the use to which they are put, in use in midget and ordinary broadcast receivers.

The amateur, who often is trying for something better than usual, demands a better transformer. Amateur speech input equipment makes transformers with *hum-bucking* coil construction a necessity. A transformer with good frequency response is also demanded. Transformers such as the Thordarson CHT types are typical of those designed especially for advanced amateur use.

Broadcast stations naturally demand the best, regardless of price. The frequency response must be flat within ± 1 db. from 30 to 15,000 cycles per second. The transformer must have *hum-bucking* coil construction and the best possible shielding. Special "triple shielding" sometimes is needed for specialized applications where the transformer must operate within a strong magnetic or hum field. This "triple shielding" will eliminate all trace of hum pickup by the transformer except in a very few "impossible" cases.

Broadcast type interstage transformers sell for as high as \$18.50 list, and they are worth it. Amateur types sell for around \$6.50 list and again they are worth it. Replacement types sell for as little as \$1.50 list with the buyer getting just what he pays for. Quantity production plus the latest production methods keep transformer prices at an absolute minimum. The customer is certainly getting his money's worth today.

Parts List for Vibrator Power-Supply

T-1 Thordarson T-14R38 or equivalent
 CH-1 Thordarson T-57C53 or equivalent
 C-1, C-2 Double 8 mf. 450 volt electrolytic
 C-3, C-4 .05 mf. oil impregnated condensers
 C-5 .1 mf. 400 volt
 R-1 200 ohm 1 watt
 Vibrator—Electronic No. 427 or equivalent
 Rectifier 6W5G

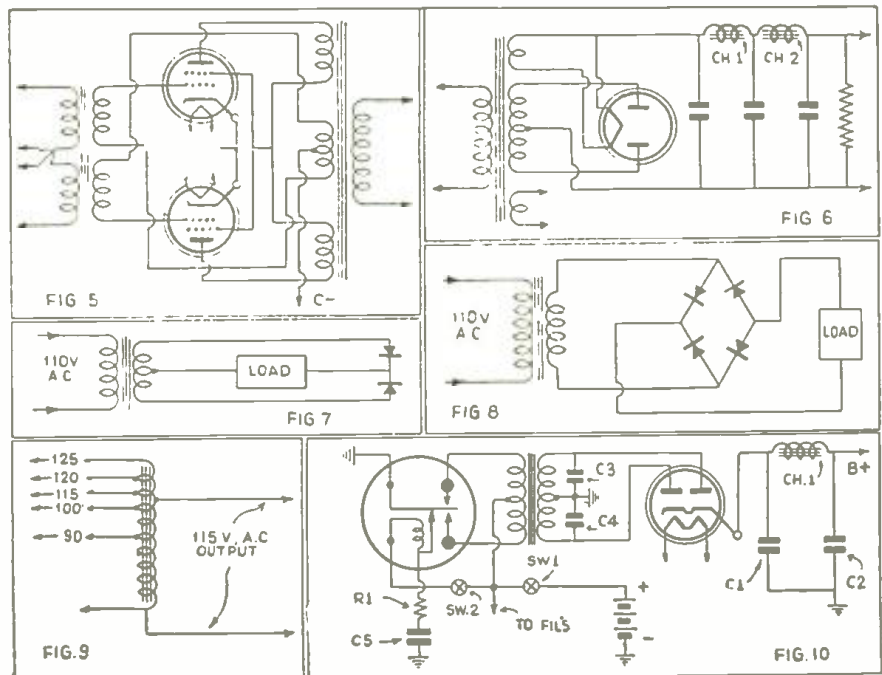
So many factors are involved in the design, construction and use of transformers that an entire library would be necessary to cover the subject completely.

We Will Pay

regular space rates for good construction articles giving novel and original ideas for building such simple radio apparatus as short wave converters, receiving sets, television and frequency modulation receivers, recording equipment, power supplies, simple set and tube testers, facsimile recorders, etc.

Address all contributions to Editor, RADIO & TELEVISION, 20 Vesey Street, New York, N. Y. Enclose stamped, self-addressed envelope if return of rejected material is desired.

Fig. 5—One form of inverse feed-back circuit. Fig. 6—Power-supply circuit. Figs. 7 and 8—Low-voltage D.C. supply from transformer and copper-oxide rectifiers. Fig. 9—Auto-transformer. Fig. 10—Transformers and filter choke in vibrator plate-supply.





The R. & T. Videophone

Ricardo Muniz, E.E.,* and Saul Morton Decker**

Part 2

● IN this month's article on the "R&T" Videophone we present the circuit diagrams of the complete unit. The parts lists are so drawn up that the constructor can build either a "two-way" television telephone, or a "one-way" television telephone; either of the units can also be used as a modulator for an amateur television transmitter.

It was found possible, after extensive experimentation, to reduce the number of stages of video amplification from the original five to three. These were found to have ample gain to take care of all practical conditions met. It will be noted that the number of tubes and the number of parts is very materially less than have been required on any similar unit as yet published. We feel that this is the simplest and cheapest television camera yet described.

The Video Amplifier: Probably the most

*Engineer WNYE, Radio Instructor, B'klyn Technical H. S., Faculty adviser Television Club at B. T. H. S.

**President Television Club and student B. T. H. S.

If you are interested in an experimental Videophone, by means of which you can see over a wire, be sure to read the first part of this article which appeared in last month's issue. A third article will give more pointers on the operation of the Videophone.

critical part of the entire construction project is the *video amplifier*. Since the picture signal of the iconoscope tube is very minute a very high gain amplifier is required; moreover the "ike" works best into an exceedingly high impedance (in the order of 5 megohms) which introduces a number of additional problems. The video amplifiers must have a band-pass at constant gain and phase shift of from 30 cycles to 0.5 megacycle.

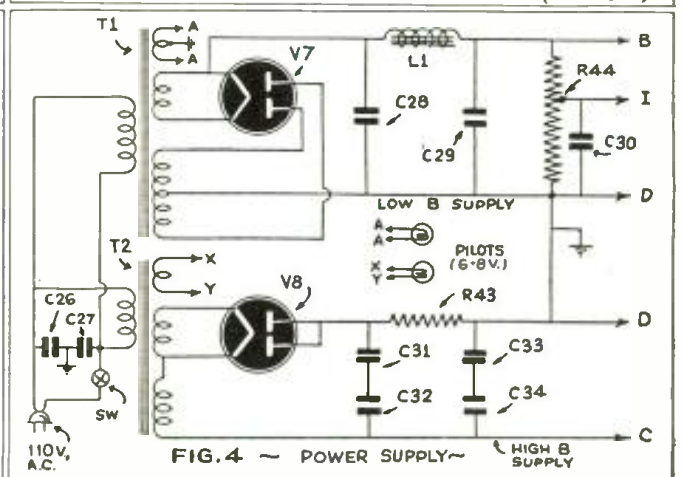
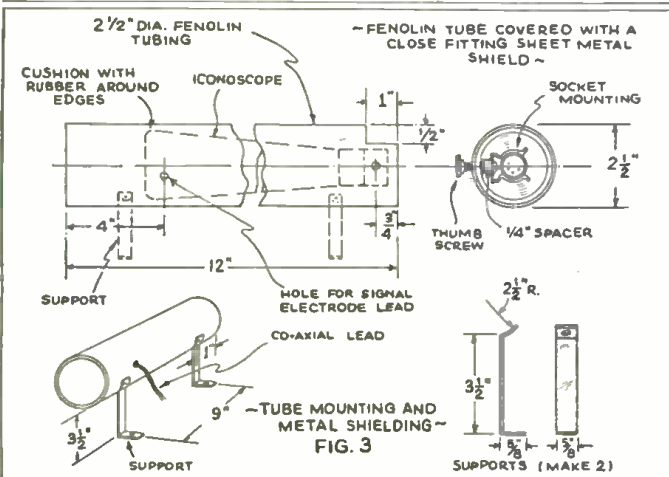
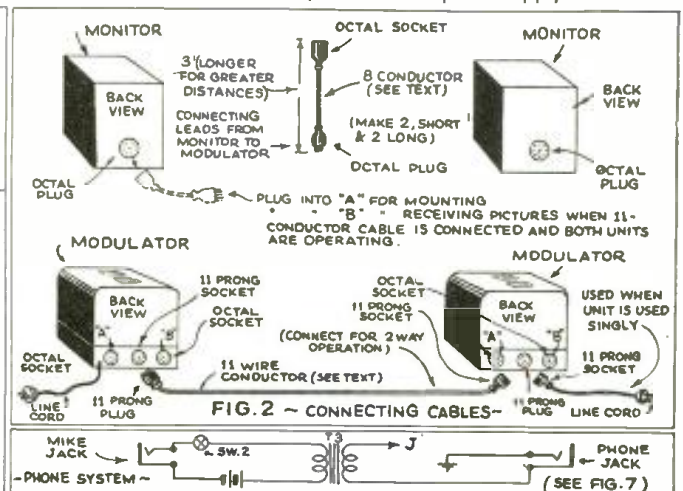
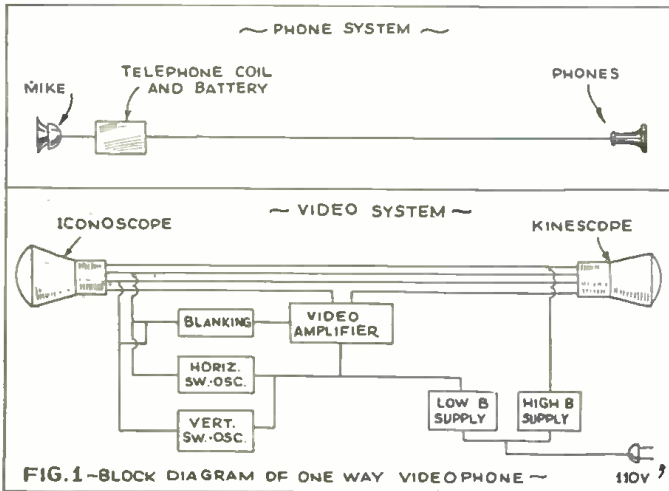
From the outset the problem of *shielding* was a foremost one. Interstage shielding

was not found necessary. It was necessary to shield all the signal carrying leads, however. This is shown in the circuit diagram so that the constructor will not find it necessary to experiment on this point. Since the tubes used in the video amplifiers were all high impedance input and output there was a pronounced tendency to oscillation in the amplifier when first tested out, without the shielded wires. There was also a tendency to hum pickup by these leads. This hum showed up on the screen of the monitor and was very annoying.

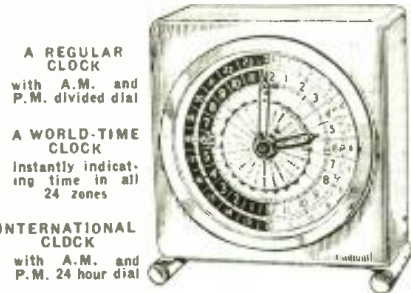
The shielding problem was finally licked, however, in the videos, and the circuit as shown has the necessary gain and other characteristics without a trace of oscillation or hum pick-up.

It will be noted that 1852-6AC7 type tubes were chosen for the first two video stages. These tubes have an extremely high transconductance and consequently lend themselves to the construction of very high gain amplifiers. A type 6AG7 tube is used in the final stage because it is a beam-

Diagrams below show simple "wire circuit" Videophone, also details of shield for the iconoscope tube and power-supply circuit.



LAST CALL at this LOW PRICE.
Makes a wonderful HOLIDAY GIFT.
Short-Wave fans need this
WORLD-TIME CLOCK
The Only Clock for Universal Use
Throughout the Entire World!



A REGULAR CLOCK with A.M. and P.M. divided dial
A WORLD-TIME CLOCK Instantly indicating time in all 24 zones
INTERNATIONAL CLDCK with A.M. and P.M. 24 hour dial

Indispensable for Short Wave Fans.
Electric (for A.C. 110-120 volts, 60 cycles) **\$5.95**
Springs Model **\$4.95**

Prepaid in U.S.A. Remit by check or money order; register letter if you send cash or unmet U. S. postage stamps.
GOLD SHIELD PRODUCTS
350 Greenwich St., Dept. RT-12-40, New York City

Do YOU want to be a Government radio operator?
Additional operators are needed NOW.



Why not learn to be an operator quickly and easily with the Ayers Automatic Code Machine? 30,000 words practice tapes available, low monthly rental.

Write AYERS AUTOMATIC CODE MACHINES
711 Boylston St., Boston, Mass.

LEARN RADIO TELEVISION

500 LICENSED graduates placed in past 7 years in shipping, broadcasting, aviation, police, etc.; we also teach radio servicing and repairing; new beginners' class now forming; 60-page catalog free; oldest, largest and best equipped.

MASS. RADIO SCHOOL
18 BOYLSTON ST., BOSTON, Mass., Est. 1899

RADIO-TELEVISION

Oldest, largest Radio-Television school in West trains you for good pay job. Complete instruction including Radio Construction and Service, Broadcast Operating, Sound, Talking Pictures, Television, Public Address, etc. Flexible plan to meet specific needs of those with or without jobs. Transportation allowed to L.A. Earn room and board while learning. Request Free Catalog.

NATIONAL SCHOOLS, Dept. RT-12
Los Angeles

RADIO TECHNOLOGY

RCA Institutes offer an intensive course of high standard embracing all phases of Radio and Television. Practical training with modern equipment at New York and Chicago schools. Also specialized courses in Aviation Communications, Radio Servicing and Commercial Operating. Catalog Dept. RT-40.

RCA INSTITUTES, INC.
A Radio Corporation of America Service
75 Varick St., New York. 1154 Merchandise Mart, Chicago

RADIO ENGINEERING

broadcasting, aviation and police radio, servicing, marine radio telegraphy and telephony, Morse telegraphy and railway accounting taught thoroughly. 48 weeks' Engineering course equivalent to 3 years of college radio work. All expenses low. Catalog free. School established 1874
Dodge's Institute, Turner St., Valparaiso, Ind.

power amplifier of unusually high trans-conductance. The total voltage gain in the amplifier is extremely high and the power output several watts.

In the next issue of RADIO & TELEVISION we will publish the complete socket terminal voltage readings, as taken with a Triplet 1200 E 25,000 ohm per volt multimeter.

The Sweep Oscillators: The sweep oscillators are of the multivibrator type. A 6C8-G twin triode was used in each oscillator circuit. The constants specified in the circuits bring within the range of the sweep frequency controls the proper operating frequencies for the amateur television standard namely: 30 frames per second and 120 lines per picture. The actual operating frequencies are 30 per second for the vertical sweep and 3600 per second for the horizontal sweep. The output voltage of the sweeps as specified is just right to provide deflection of the beam to the edges of the proper sized picture on both the "ike" and the C-R viewing tube. The 902 type monitor C-R viewing tube was chosen because its deflection sensitivity matches the 1847 "ike," and thus the same saw-toothed waves can be applied to both for deflection purposes.

The linearity of the sawtooth waves generated by the multivibrators is quite good. That is to say the lines produced in the picture are fairly evenly spaced in a vertical direction, and the picture detail is not crammed at either edge of the picture in the horizontal direction.

The multivibrator type of sweep circuit was chosen because its voltage output is ample, with only one tube in each sweep. Blanking impulses are easily taken from this type of sweep as shown—employing a diode tube. When the unit is to be used as a television modulator, it is equally easy to get synchronizing impulses using a highly biased tube connected to each sweep. The highly biased tube allows only the peaks of the sawtoothed waves to cause plate current to flow. These amplified peaks are superimposed on the picture output signal from the ike and go to the video amplifiers. They go to the television transmitter, along with the picture signal and blanking impulses, and are used at the receiver to "trigger" the sweep oscillators there. This will be taken up in detail in a later article describing the use of the unit in conjunction with a Ham transmitter on the 2½ meter band.

The Power Supplies: Two power supplies are needed. A low voltage supply for the Videos and Sweeps; a high voltage supply for the beam voltage on the ike and monitor.

The power supply circuits for the unit used in the "two-way" Videophone are shown in Figure 4 (Fig. 4). Next month, a power supply unit for operating the second Videophone alone, will be published. The small filament transformer shown in the parts lists and marked "for 2nd Unit Only" is used when the voltage drop for the filaments is high, due to line losses. (Two must be ordered, one for video amplifiers, and a second for the ike and monitor tubes.)

In the two-way Videophone the power supplies must supply two sets of Videos, one set of sweeps, two ikes, and two monitor tubes.

The voltages and filtering indicated were found ample for proper operation of unit.

Interconnection and Use: Multi-wire cables with plugs are supplied to admit of utmost flexibility of operation. In the "two-way" unit it is possible to plug in the

SPRAYBERRY TRAINS YOU for GOOD PAY! STEADY WORK! ADVANCEMENT! in RADIO and TELEVISION

DON'T WAIT! START NOW!
You Can Make Money Almost At Once
You'll be quickly shown how to get and do neighborhood Radio Service Jobs for practice and profits. You easily learn Television, Frequency Modulation, Signal Tracing, Mobile Radio (Auto-Tanks), Aviation Radio, Electronics, Facsimile Radio, Radio Set Repair and Installation Work.

Prepare You Quickly in Spare Time
At Home Or At Camp

SPRAYBERRY Training does not interfere with your present work. You will receive personal coaching service all the way. You'll be fitted to hold down a good paying job in Radio or to have a Radio business of your own.
You Get Professional Test Equipment Plus Experimental Outfits (includes 146 RADIO PARTS to build complete Radio Receiver), RADIO TOOLS and a TESTER-ANALYZER. MY EXPERIMENTAL OUTFITS enable you to conduct actual experiments with your own hands.

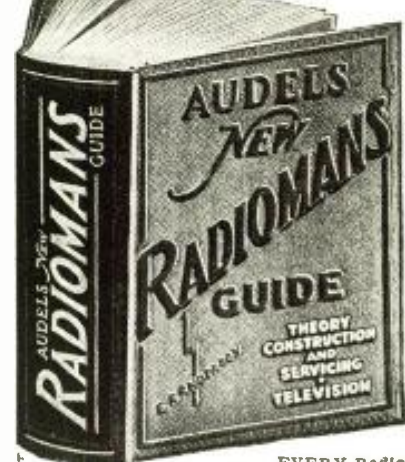
NO EXPERIENCE NEEDED
It makes no difference what your education has been. I can fit you to become a real RADIO TECHNICIAN. Your success is my full responsibility.
THE SPRAYBERRY COURSE IS SOLD UNDER MONEY-BACK AGREEMENT

RUSH COUPON for BIG FREE BOOK

SPRAYBERRY ACADEMY OF RADIO
F. L. Sprayberry, President
545-M University Place, N. W.
Washington, D. C.
Please rush my FREE copy of "HOW TO MAKE MONEY IN RADIO".

Name _____ Age _____
Address _____
City _____ State _____ (Mail in envelope or paste coupon on penny postcard)

An Ideal Christmas Gift! JUST OUT!



RADIO

EVERY Radio Mechanic—Service Man & Student Needs "Audels Radiomans Guide"—Just Out!

The whole subject of Modern Radio—covering the Basic Principles—Construction & Operation—Service—Repairs—Troubles—All Easily Understood. Over 750 Pages—400 Illustrations, Parts & Diagrams—LATE TELEVISION DATA—Valuable for REFERENCE AND HOME STUDY.

To get this practical information in handy form for yourself fill in and mail coupon today.
4 COMPLETE • PAY ONLY \$1 A MO.

AUDEL, Publishers, 49 W. 23rd St., N. Y.
Mail AUDELS NEW RADIOMANS GUIDE for free examination. If O. K. I will send you \$1 in 7 days; then remit \$1 monthly until price of \$4 is paid. Otherwise, I will return it.

Name _____
Address _____
Occupation _____
Reference _____

nearer monitor to the camera, and so make preliminary adjustments. It is then possible to plug in the distant monitor, with the assurance that a good picture is being sent out to it.

In these cables it was found necessary to use shielded leads for the sweep voltages. The sawtoothed waves which these constitute, are composed of a large number of harmonics (in order to obtain a sharp peak to the sawtooth). These harmonics tend to play hob with the picture signal in the tight cable. For optimum operation it is best, if transmitting the picture more than a few feet, to use a separate co-axial line for the video signal. Type No. 72-12 Amphenol flexible co-axial was found to give very fine results over distances of 100 feet. No doubt much greater distance is possible—but this was not tried. For short distances, however, a single cable was found O.K. The entire cable is encased in a shield to prevent stray pickup or radiation.

Small cables 3 feet long are provided to connect monitor to camera. A longer cable of the same type is provided for "one-way" Videophone operation. A large 11-conductor cable is used for connecting together the two sets of units for "two-way" Videophone operation. The use of Amphenol plugs and sockets with these cables made it very easy to change connections rapidly. The length of this latter cable is optional and may be quite short (8 or 10 feet) for "table top" demonstrations, or much longer for operation over longer distances. One of the fine points of the system is the flexibility provided by these cables and connectors.

Optical System: It was decided by the authors that since the picture resolution ability of the system is inherently limited, by the nature of the ike, to well below camera standards, it was foolish to make use of expensive lenses. Various lenses have been tried with varying success; many are yet to be tried. It was found that any lens having a 3" or so focal length and a large diameter gave satisfactory pictures. Even a double convex magnifier lens worked O.K. A lens of the type used in photographic enlargers is ideal. A projection lens from a 35 mm. movie machine is very fine too. In the next issue, specific recommendations as to a lens will be made. In the meantime it is recommended that the constructor use a cheap double-convex lens having 3" focus and large aperture.

The important thing to bear in mind concerning the optical system is that it must be *light-tight!* You are making a camera; stray light falling on the ike will cause "fogged" pictures just the same as in a camera using film. It is desirable to make the lens mount a tube which will slip into the ike support tubing. In this way no stray light can enter. The tubing keeps the light from hitting the ike except from in front. The lens mount restricts all light except that coming through the lens. A cap must be provided to keep light from the ike screen when the unit is not in use, as bright light focused on it by the lens can damage it.

The amount of light required for proper operation of the ike is about 3000 foot-candles. This may be obtained from sunlight or from two 200 watt bulbs, placed two feet from the subject. Flood lamps

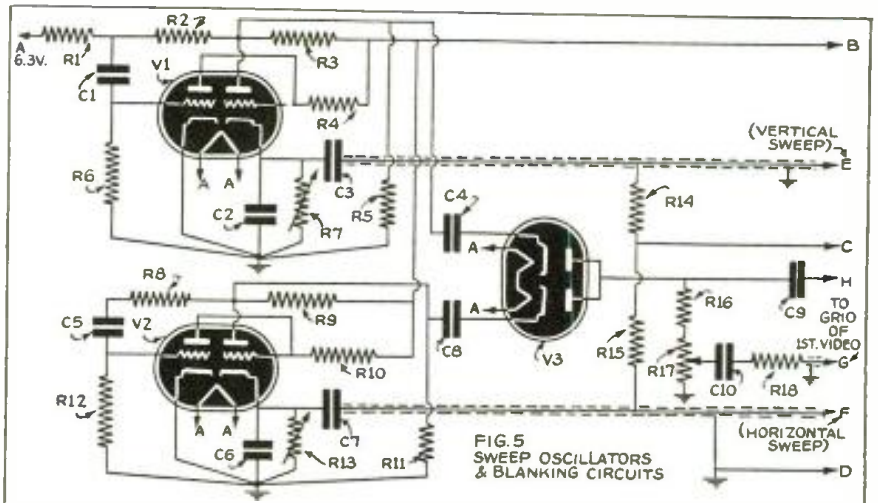


FIG. 5 SWEEP OSCILLATORS & BLANKING CIRCUITS

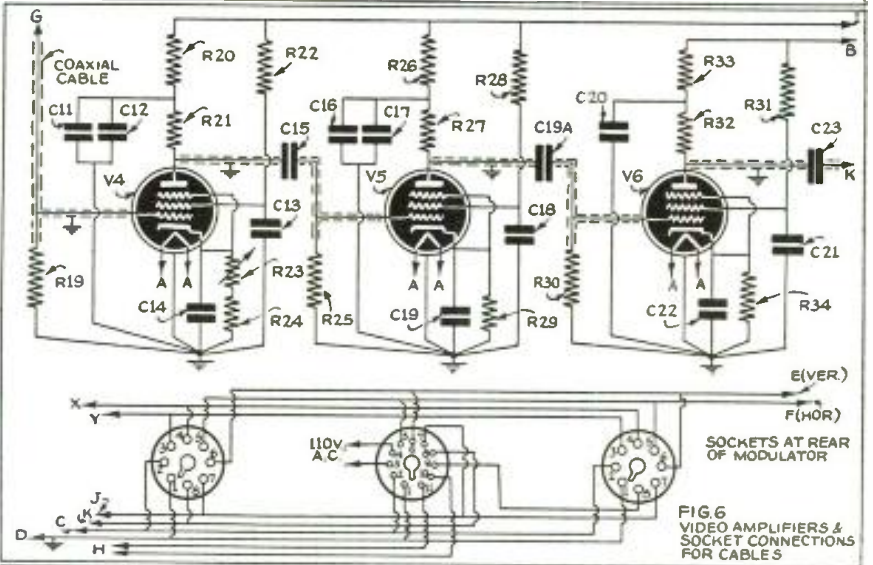
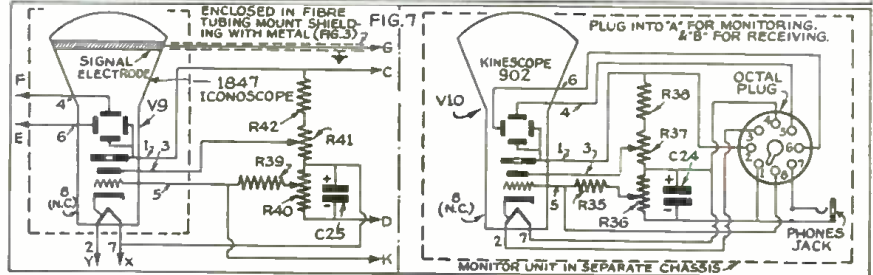


FIG. 6 VIDEO AMPLIFIERS & SOCKET CONNECTIONS FOR CABLES



Circuit diagrams above show how to connect up various resistors and condensers for the sweep oscillator and blanking circuits. Fig. 6 (center) shows video amplifier connections. Fig. 7—Connections to the kinescope tube.

may be used. If a lens having an aperture smaller than $f/2.3$ is used, the illumination must be proportionally increased.

Operating and Adjusting: Hints on adjusting and operating the units will be published next month. In the meantime the constructor will not find any great difficulty in getting the units assembled and running.

The R. & T. Videophone Parts List

- RCA (Tubes)**
 1—1847 Iconoscope # —V9
 1—902 Cathode Ray Tube # —V10
 1—6AG7—V6 #

NATIONAL UNION (Tubes)

- 1—5U4 G—V7
 1—80—V8
 2—6C8 G—V1, V2
 1—6H6—V3
 2—18S2—V4, V5 #

CORNELL-DUBILIER (Condensers)

- C1—.002 mf., type 1W, Cat. No. 5D2
 C2—.1 mf., type DT, Cat. No. 6P1

- C3—.5 mf., type DT, Cat. No. 6P5
 C4—.01 mf., type DT, Cat. No. 4S1
 C5—.002 mf., type 1W, Cat. No. 5D2
 C6—.002 mf., type 1W, Cat. No. 5D2
 C7—.5 mf., type DT, Cat. No. 6P5
 C8—.01 mf., type DT, Cat. No. 4S1
 C9—.5 mf., type DT, Cat. No. 6P5
 C10—.25 mf., type DT, Cat. No. 4P25
 C11—4 mf., type BR, Cat. No. 435 #
 C12—.002 mf., type 1W, Cat. No. 5D2 #
 C13—4 mf., type BR, Cat. No. 435 #
 C14—50 mf., type BR, Cat. No. 502 #
 C15—.1 mf., type DT, Cat. No. 6P1 #
 C16—4 mf., type BR, Cat. No. 435 #
 C17—.002 mf., type 1W, Cat. No. 5D2 #
 C18—4 mf., type BR, Cat. No. 435 #
 C19—50 mf., type BR, Cat. No. 502 #
 C19a—.1 mf., type DT, Cat. No. 6P1 #
 C20—8 mf., type BR, Cat. No. 845 #
 C21—8 mf., type BR, Cat. No. 835 #
 C22—50 mf., type BR, Cat. No. 502 #
 C23—.1 mf., type DT, Cat. No. 6P1 #
 C24—8 mf., type BR, Cat. No. 845
 C25—8 mf., type BR, Cat. No. 845
 C26—.1 mf., type DT, Cat. No. 4P1
 C27—.1 mf., type DT, Cat. No. 4P1
 C28—8 mf., type KR, Cat. No. 5888-A
 C29—8 mf., type KR, Cat. No. 5888-A
 C30—8 mf., type KR, Cat. No. 5888-A

RADIO AMATEUR COURSE

RADIO AMATEUR COURSE

By G.W. Shuart
"W2AMN"

SHORT WAVE TELEVISION

PRICE 50¢

PUBLISHED BY
SHORT WAVE and TELEVISION MAGAZINE, NEW YORK

Your Money Back—

If the RADIO AMATEUR COURSE does not represent the greatest book value ever offered to the radio "fans" **50c** for

To convince you that there isn't a better book buy today, the publishers of the RADIO AMATEUR COURSE make the sensational offer of a money-back guarantee on such a low-priced book. Stop in at any of the many dealers handling this book and examine it. See for yourself if the RADIO AMATEUR COURSE isn't just the book you've always wanted.

Printed on the finest coated paper—well illustrated attractive 4-color cover—complete with radio information you must have. It contains a step-by-step program for obtaining a short-wave radio education.

Written by GEORGE W. SHUART, W2AMN, foremost short-wave authority

148 PAGES

6 1/4 x 9 1/2 INCHES

OVER 150 RADIO DIAGRAMS and TECHNICAL PHOTOGRAPHS

RADIO AND TELEVISION
20 Vesey Street New York, N. Y.

See Page 480 for list of our dealers.

RADIO AND TELEVISION
20 Vesey Street, New York, N. Y.

Gentlemen: I enclose herewith my remittance of Fifty Cents (50c) for which please send me POST-PAID, my copy of the RADIO AMATEUR COURSE. (Remit by check or money order; register letter if you send cash or unused U. S. Postage stamps.)

Name

Address

City State R&T-12-40

C31—4 mf., type KR, Cat. No. 504
C32—4 mf., type KR, Cat. No. 504
C33—16 mf., type KR, Cat. No. 516A
C34—16 mf., type KR., Cat. No. 516A

INTERNATIONAL RESISTANCE CO.
(All resistors are type BT-1 unless otherwise specified)

- | | |
|----------------------|--------------------|
| R1—1 megohm | R29—1500 ohms # |
| R2—4000 ohms | R30—250,000 ohms # |
| R3—2000 ohms | R31—50,000 ohms # |
| R4—100,000 ohms | Type BT-2 (2—25 |
| R5—1 megohm | M (25,000 ohms) |
| R6—1 megohm | in series) |
| R7—150 M # ohm | R32—2000 ohms # |
| (150,000 ohm) pot. | Type HT-2 |
| Type VC 8376 | R33—5000 ohms # |
| R8—4000 ohms | Type AB |
| R9—2000 ohms | R34—300 ohms # |
| R10—100,000 ohms | R35—50,000 ohms # |
| R11—1 megohm | R36—100 M ohm |
| R12—1 megohm | (100,000 ohm) |
| R13—50 M ohm (50,000 | pot. # |
| ohm) pot. | Type 11-128 |
| Type VC 8375 | R37—250 M ohm |
| R14—1 megohm | (250,000 ohm) |
| R15—1 megohm | pot. # |
| R16—200,000 ohms | Type D-11-130 |
| R17—10 M ohm (10,000 | R38—200,000 ohms # |
| ohm) pot. | R39—50,000 ohms # |
| Type 11-116 | R40—100 M ohm |
| R18—1 megohm | (100,000 ohm) |
| R19—5 megohms # | pot. # |
| R20—4000 ohms # | Type 11-128 |
| R21—10,000 ohms # | R41—250 M ohm |
| R22—100,000 ohms # | (250,000 ohm) |
| R23—5000 ohm pot. # | pot. # |
| Type 11-114 | Type D-11-130 |
| R24—160 ohms # | R42—200,000 ohms # |
| R25—250,000 ohms # | R43—50,000 ohms # |
| R26—10,000 ohms # | R44—20,000 ohms # |
| R27—10,000 ohms # | Type ES |
| R28—250,000 ohms # | |
- (M=thousand)

AMERICAN PHENOLIC CORP.

- (Co-Ax. Cable, Sockets, etc.)
100 feet co-axial cable No. 72-12
1—4-prong tube socket No. SS4
4—No. SS8 sockets
3—No. SS8 sockets #
2—No. PF8 connectors #
2—No. PM8 connectors #
1—No. ACP8 plug # #
2—No. RS8 sockets #
1—No. RS11 socket
1—No. PM11 plug
1—No. PF11 socket #
7—No. RPH rubber handles #
1—No. ACP11 (only for 2nd unit)
1—No. 61-M4 #
2—No. 913 C.R. assembly #
1—No. LD-1 die for punching socket holes, with keyway
1—No. 51-1 retainer ring hand tool for setting sockets

PAR METAL PRODUCTS CORPORATION

- 1—Cat. No. F-717 foundation chassis (7x17x3") #
1—Cat. No. BP-4515 bottom plate for above #
INSULINE CORPORATION OF AMERICA
1—No. 3801 metal cabinet (monitor chassis) #
1 foot No. 140 2 1/2" fenolite tubing #
2—No. 1233 toggle switches
2—No. 1551 grid caps
2—No. 1720 tube shield for 6C8 Gs
8—No. 1127 bakelite bar knobs (only 5 more for 2nd)

- Spaghetti tubing—Nos. 182, 186 and 201
5—No. 2437 terminal tie points
1 Can No. 2801 crystalline paint for touch-up work

AMERICAN MICROPHONE CO., INC.

- 1—AT2 carbon microphone

AMERICAN RADIO HARDWARE CO., INC.

- 2—No. 128 phone plugs #
3—No. 89 phone jacks #
2—No. 39 panel indicator brackets
Miscellaneous hardware, grommets, brackets, etc.

THORDARSON ELECTRIC MFG. CO.

- T1—Type No. T-17R30 power transformer
T2—Type No. T-13R12 high voltage power trans.
T3—Type No. T-72A59 mike transformer #
 Type No. T-61F85 filament trans. (for 2nd unit only)
L1—Type No. T-17C00-B filter choke

MISCELLANEOUS

- Solid conductor tinned push-back wire (various colors.)
Rosin core radio solder
No. 14 tinned bus wire
Line cord
Tape (rubber and friction)
Small flashlight cells for mike battery
Shielded conductor
Shielding braid
Battery cable
Pilot lights
Sheet metal
- [The parts marked # are to be ordered twice if 2-way communication is desired. That is, one complete camera, one camera with videos, ike and fil. transformer only, and two identical monitors.—Ed.]

SAVE UP TO 50%

15-TUBE MIDWEST RADIO

WITH **FREQUENCY MODULATION** AND **TELEVISION ADAPTATION**

FACTORY-TO-YOU

ONLY \$19.95

COMPLETE CHASSIS WITH TUBES AND SPEAKER

PUSH-BUTTON TUNING

PUT THIS CHASSIS IN YOUR PRESENT CABINET

Thrilling World-Wide Reception

EASY TERMS

UP TO \$2500 TRADE-IN ALLOWANCE

Liberal trade-in allowance on many new models shown in FREE catalog—from 6 to 18 tubes—up to 5 bands—including automatic record-changing radio-phonos... Home Recorder, etc. Write for FREE catalog.

15-TUBE CABINET MODEL

ONLY \$29.95

COMPLETE

MIDWEST RADIO CORPORATION
DEPT. 14-FF CINCINNATI, OHIO USER AGENTS WANTED

Select Your Christmas Gifts

GREATEST SLIDE RULE VALUES EVER OFFERED

10 inch enameled slide rule, made of kiln dried seasoned hardwood, has auxiliary removable magnifier with pins to fit (cursor) runner. This rule has inch, millimeter, sine log and tangent scales. Packed in individual carrying case. This rule is equal in performance to a \$10.00 rule. Our special price, P.P. **\$1.00**

Lawrence ASTROLOGICAL slide rule, with large 84 page book of rules, illustrated. **\$1.00**

8" Slide Rule **25c**

36 Page Illustrated Book of Instructions **10c**

36 Page Book Stanley's Slide Rule Practice, 300 Fascinating Examples and Answers ... **10c**

All Three Items Prepaid for **40c**

Secret Code slide rule, with 16-page book, 2 for 50c **30c**

"ADCO" Calculator, adds and subtracts in 6 figures **30c**

Postage Prepaid

GOLD SHIELD PRODUCTS
Dept. RT-12-40, 350 Greenwich St., New York City

WARSHIP MODEL PRINTS

56—10,000 ton U.S. Navy 37" Cruiser. Model blueprints **\$3.25** (Complete Kit, all fittings **\$28.00**; Hull Kit **\$7.75**)

54—U.S. Destroyer; 30" exact model; Blueprints **\$1.60** (Hull constr. Kit **\$5.60**; complete Kit **\$33.50**)

53—"Constitution" (Old Ironsides) 25" Model. Blueprints **\$2.20** (Complete Kit **\$35.00**; Hull Kit. **\$6.50**)

57—"Robt. E. Lee"—Mississippi River Steamboat; 28" long. Blueprints **\$2.60** (Complete Kit **\$22.00**; Hull Kit **\$8.50**)

52—"Clermont"—first steamboat (blueprints) **\$1.10** (Complete Kit for 18" Model—**\$7.00** prepaid)

DATAPRINT CO.
Box 322, Ramsey, New Jersey

GOLDENTONE .. 50% OFF

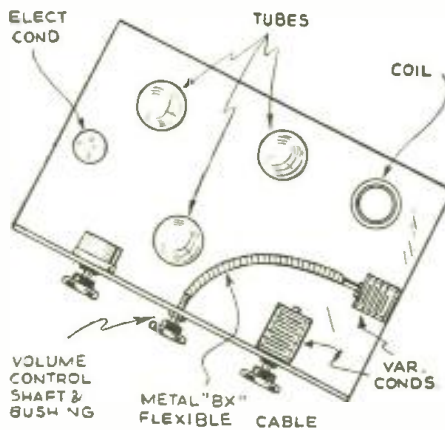
DEAL DIRECT FACTORY PRICES — Over 60 models in choice from—4 to 15 tubes. Portables \$8.99 up. Farm sets \$8.99 up. Car sets \$8.99 up. Foreign band sets \$8.08 up. Samples 50% off. Quantity discounts. Free 1941 Bargain catalog gives details of 10-day FREE trial, agent's proposition and discounts. Mail postcard.

GOLDENTONE RADIO CO., DEPT. RT, DEARBORN, MICH.

The Cover Kink First Prize Winner

Flexible Condenser Drive

I recently needed an additional condenser mounted on the front panel of my set, but there was no space for it; therefore I resorted to the stunt here illustrated. I mounted the variable condenser on the chassis and arranged to turn it with a flexible shaft. For this purpose I used a piece of $\frac{3}{8}$ " BX cable and soldered one end of it to the shaft of the variable condenser. The other end of the cable I soldered to an old variable resistor knob and this was mounted on the panel.—*Homers L. Davidson.*

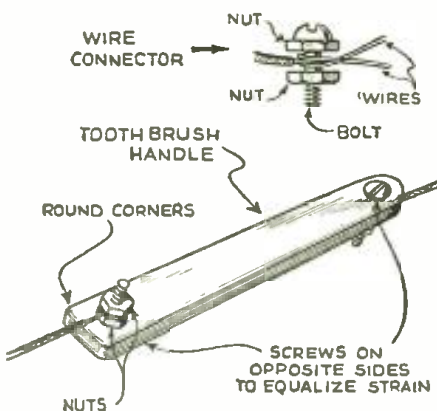


A piece of flexible cable or shaft, used in the manner shown above, often proves useful to the radio set-builder as the control knob may be mounted at right-angles to a condenser or other apparatus.

Two Useful Kinks

When a low-resistance temporary connection is desired, thread two nuts on a screw; any size will do, twist the two or more wires desired for the connection between the two nuts, and tighten.

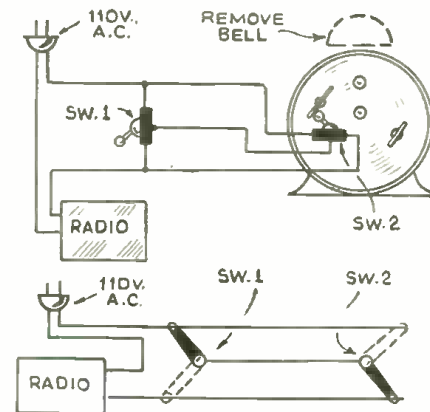
An excellent four-inch insulator can be made by sawing off the plastic handle of a discarded toothbrush at the base, inserting a nut and bolt through the hole at one end and drilling a small hole in the other end for the same purpose. The wires are attached by threading another nut on the screw at each end, fastening the wire to this.—*Franklin Williams.*



The illustrations above show how to make a temporary connection between two or more wires, by using a stove bolt and a couple of nuts. The second picture shows an improvised insulator made from a piece of old toothbrush handle.

Automatic Timer

As I have the common habit of falling asleep with my radio still playing, I devised the outfit described at very little expense.



The automatic alarm clock circuit shown here will provide a very pleasant and sure-fire alarm.

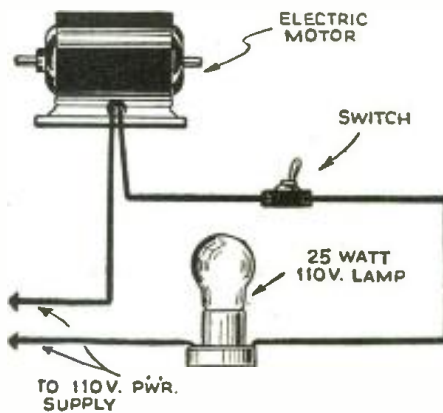
After buying two single-pole, double-throw toggle switches, I rummaged an old alarm clock from the attic. After removing the bell, I soldered one of the switches to the back, in such a position that when the alarm went off, the winding key snapped the switch to its opposite position.

The second switch, which I mounted on my radio cabinet, when wired up as shown in the accompanying diagram, determines whether the clock mechanism opens or closes the circuit.

This automatic timer, when completed, may be used to turn on or off, radio sets, electric signs, motors, etc. But you'll have to get back into the habit of winding the clock!—*R. L. Hawks.*

Reducing Motor Speed

I recently found that my electric phonograph motor ran at too high a speed. Here is the way I leveled the speed to 78 revs.

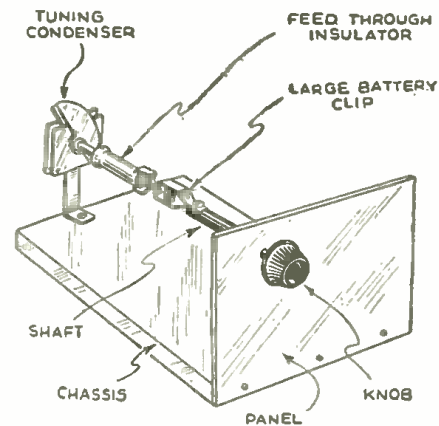


A 110 volt lamp connected in series with a motor will lower its speed; the larger the lamp the faster the motor will run.

per minute. I connected a 25 watt, 110 volt lamp in series with the motor, as the diagram shows. The size of the lamp may vary, depending on the line voltage and the design of the motor.—*Ensign Courier.*

U. H. F. Coupling

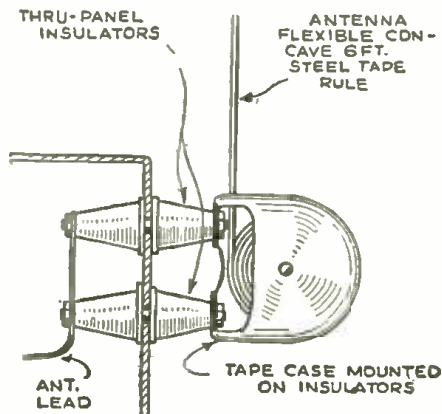
Take a porcelain feed-through insulator and connect one end of it to the tuning condenser by forcing it on with the use of small wooden chips. Clamp a large battery clamp on the other end of the insulator and solder a small piece of shaft to the clip. Put the shaft through the panel, mount a knob, and you have a good coupling unit.—*Alfred Letcher.*



A good coupling for ultra-high frequency circuits is shown above. It is made from a section of insulator and a large battery clip.

Steel Rule Antenna

A six-foot steel rule, of the concave type, makes an excellent antenna for portable

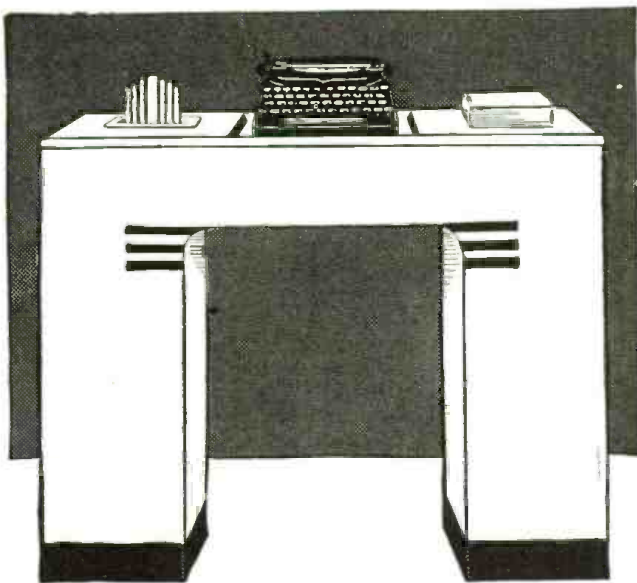


The familiar steel pocket rule of the concave type can be used as a variable length antenna as here shown.

radio sets. It is especially convenient for transmitters, since the radiating portion can be adjusted quickly to the exact length desired. Two midget-size feed-through insulators make an excellent support.—*Robert Young.*

RADIO KINKS

published on these pages will win their senders 8 months' subscription to RADIO & TELEVISION. The best kink published each month will win a 2 years' subscription. Read these kinks; they will be of real use to you, besides indicating what is wanted. Send a typewritten or ink description with sketch of your favorite to the Kink Editor



**THIS
BEAUTIFUL DESK
for only \$1.00 EXTRA**

**WITH ANY
REMINGTON
PORTABLE TYPEWRITER**

The
COMBINATION
FOR AS LITTLE AS
10¢ A DAY

How easy it is to pay for this combination of desk and Remington Deluxe Noiseless Portable Typewriter! Just imagine, a small good will deposit with terms as low as 10c a day to get this combination at once! You will never miss 10c a day. Yet this small sum can actually make you immediately the possessor of this amazing office at home combination. You assume no obligations by sending the coupon.

A beautiful desk in a neutral blue-green which will fit into the decorations of any home—trimmed in black and silver—and made of sturdy fibre board—is now available for only one dollar (\$1.00 extra) to purchasers of a Remington Noiseless Portable Typewriter. The desk is so light that it can be moved anywhere without trouble—it is so strong that it will hold six hundred (600) pounds. With this combination of desk and Noiseless Deluxe Portable Typewriter, you will have a miniature office at home. Learn the complete details of this offer. Mail the coupon today.

THESE TWO EXTRA FOR YOU

LEARN TYPING FREE

To help you even further, you get free with this special offer a 32-page booklet, prepared by experts, to teach you quickly how to typewrite by the touch method. When you buy a Noiseless you get this free Remington Rand gift that increases the pleasure of using your Remington Noiseless Deluxe Portable. Remember, the touch typing book is sent free while this offer holds.



SPECIAL CARRYING CASE

The Remington Deluxe Noiseless Portable is light in weight, easily carried about. With this offer Remington supplies a sturdy, beautiful carrying case which rivals in beauty and utility the most attractive luggage you can buy.



SPECIFICATIONS

ALL ESSENTIAL FEATURES of large standard office machines appear in the Noiseless Portable—standard 4-row keyboard; back spacer; margin stops and margin release; double shift key and shift lock; two color ribbon and automatic ribbon reverse; variable line spacer; paper fingers; makes as many as seven carbons; takes paper 9.5" wide; writes lines 8.2" wide. There are also extra features like the card writing attachment, black key cards and white letters, touch regulator, rubber cushioned feet. These make typing on a Remington Deluxe Noiseless Portable a distinct pleasure. Thousands of families now using the Remington Deluxe Noiseless Portable know from experience how wonderful it is!



**MAIL
COUPON
NOW!**

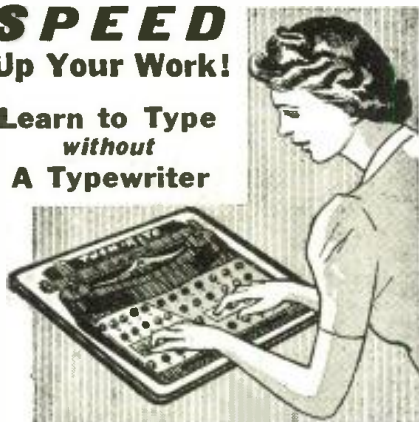
Remington Rand Inc., Dept. 300-12
465 Washington St., Buffalo, N. Y.

Tell me, without obligation, how to get a Free Trial of a new Remington Deluxe Noiseless Portable, including Carrying Case and Free 32-page Typing Instruction Booklet on terms as low as 10c a day. Send Catalogue.

Name.....
Address.....
City..... State.....

A PRACTICAL GIFT SPEED Up Your Work!

Learn to Type
without
A Typewriter



Master the Touch System—Quickly— Accurately Get the "Feel" of Typing Before Investing Your Money

Now, you don't have to own a typewriter to learn how to type. The ingenious, patented "Touch-Rite" board gives you all the practice you need for speedy, accurate typing. It teaches you the touch system—the real, professional way universally used in business. You may have been a "hunt-and-peck" typist for the longest time or you may never have used a typewriter before—it doesn't matter, because the "Touch-Rite" teacher will soon permit you to master it. "Touch-Rite" is a scientific substitute for a typewriter. It is a life-size counterpart of a standard keyboard, which is real as to size, position, and "feel". Each key has a depression in the 1/4" thick board, in which the black plastic buttons slide. Printed under each key is a number which indicates the finger of each hand which strikes it—simple as A B C.

"Touch-Rite" is highly recommended by the Principal of Horace Mann School; Director, Bureau of College Research, Columbia College; American Foundation for the Blind; Professor of Experimental Education, New York University; Director of Scarborough School, Scarborough-on-Hudson.

Read what the U. S. Office of Education
thinks of
TUCH-RITE

FEDERAL SECURITY AGENCY
U. S. OFFICE OF EDUCATION
WASHINGTON

August 10, 1940

Mr. Philip S. Gross
609 East 53rd Street, Brooklyn, New York
Dear Mr. Gross:

You asked me if I would be willing to state exactly what I observed during your demonstration here in the Office of Education on last Saturday, August 3.

You gave instructions through two phonograph records, supplemented with verbal explanations by you, to an employee of the Office of Education selected by me—a young woman who is employed as a file clerk and with no previous experience whatever on a typewriter. Within 45 minutes, as a result of your instruction, using the "Touch-Rite" device, she not only knew how to place and hold her hands on the typewriter keyboard, but she knew the location of each letter of the alphabet on the keyboard and was able to write the alphabet and simple sentences on an actual machine without looking at the keyboard.

At the same time that you were giving her the instructions, I followed along on another device, but was not able to pick up the instructions as rapidly as the young woman due to the fact that I have been a "hunt and peck" typist for my own personal purposes for over a period of the past 20 years. While you were giving the instructions, I was also attempting to evaluate and analyze the procedure followed. However, since you left a copy of the device and your instruction book with me, I took it home the next day and, with a half hour's additional practice, I was able to write on the machine by touch only—a thing I have never been able to do in the past.

I am glad to be able to give you this statement of the actual facts as I observed them. If the rest of your lessons are of like efficiency, there is no doubt in my mind but that your method of teaching the typewriter will result in shortening the learning period a great deal. In summing up, I would say that the superiority of your initial lesson is due to the fact that you have succeeded in concentrating the three senses of sight, hearing, and touch on a single learning difficulty at a time.

Sincerely yours, C. F. Klinefelter,
Assistant to the Commissioner

An 8-page illustrated book of instructions will show you how best to use the "Touch-Rite" teacher. Weight 3 lbs. Add postage **\$2.00**

GOLD SHIELD PRODUCTS

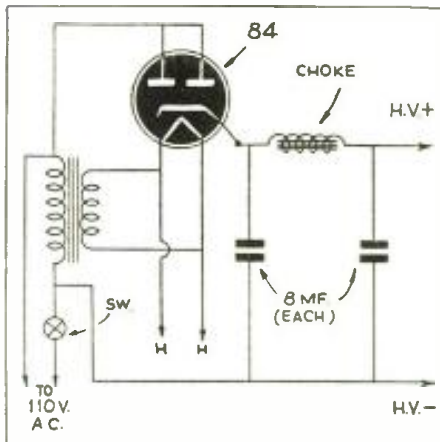
350 Greenwich St. Dept. RT-1240 New York, N. Y.

Diagrams of Interest

This is a new department. If you have a new Hook-Up, send it along; a pencil diagram will do. Be sure to include a brief description.

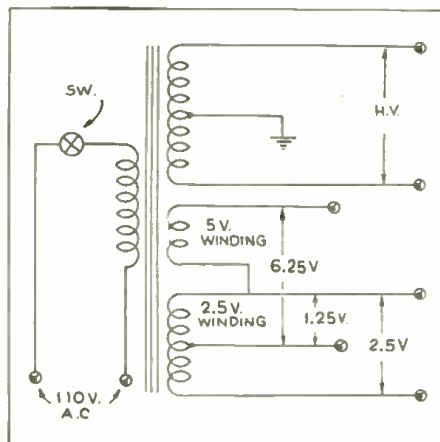
All diagrams and descriptions accepted and published will be paid for at regular space rates. Diagrams may be for receivers, adapters, amplifiers, etc. Send them to Hook-Up Editor, RADIO & TELEVISION, 20 Vesey St., New York City.

COVER FEATURE

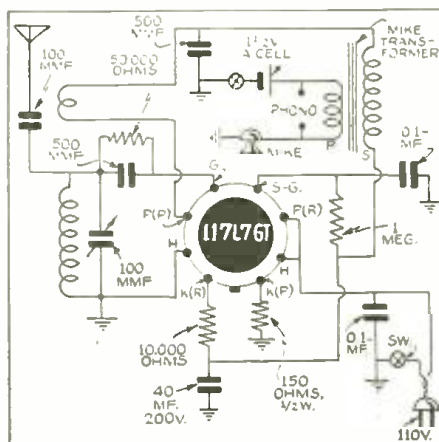


This power-supply circuit, contributed by Bernard Cross, is intended for a one- or two-tube receiver. Transformer is a bell-ringing type, with output of 6 to 8 volts. Connect to ground through condenser only.

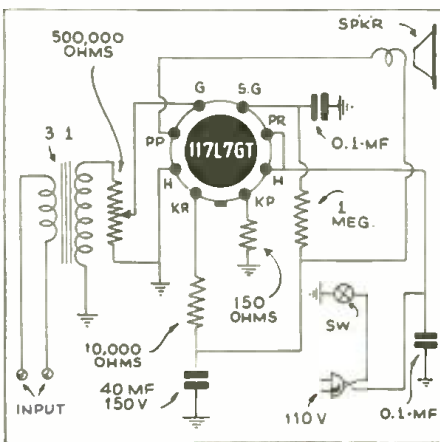
HOW TO OBTAIN 6.25 VOLTS



Circuit above sent to us by Jacob P. Frankel, shows how to connect the 5 volt and 2.5 volt windings of a transformer, so as to obtain 6.25 volts. Be sure the two windings are connected in phase.

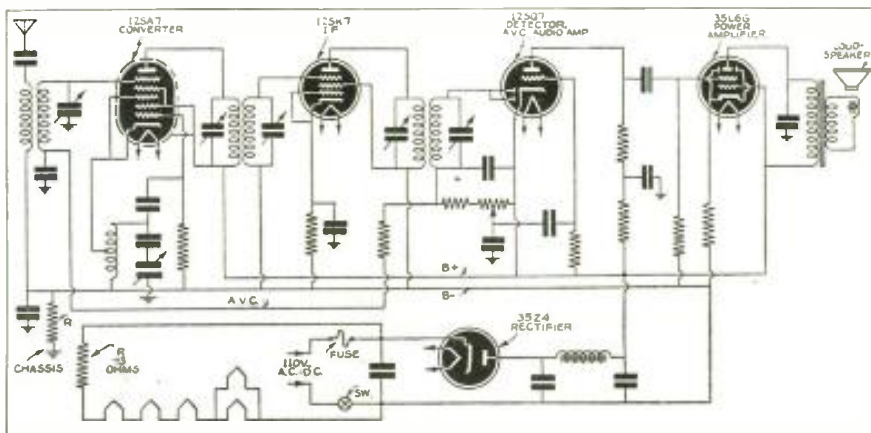


Electrified parlor transmitter (after original battery circuit by H. McEntee) uses 117L7GT tube. Coil may be a midget BC oscillator coil. Will talk through BC receiver without direct connection.—R. Jones.



1-tube electric amplifier. This circuit also contributed by Robert Jones, shows how to rig up a handy 1-tube amplifier, which will operate from 110 volts A.C. or D.C. Half of the tube operates as rectifier.

WHAT'S WRONG WITH THIS DIAGRAM?



Be honest with yourself and study the diagram above for at least 3 minutes before turning to the answers on page 501.

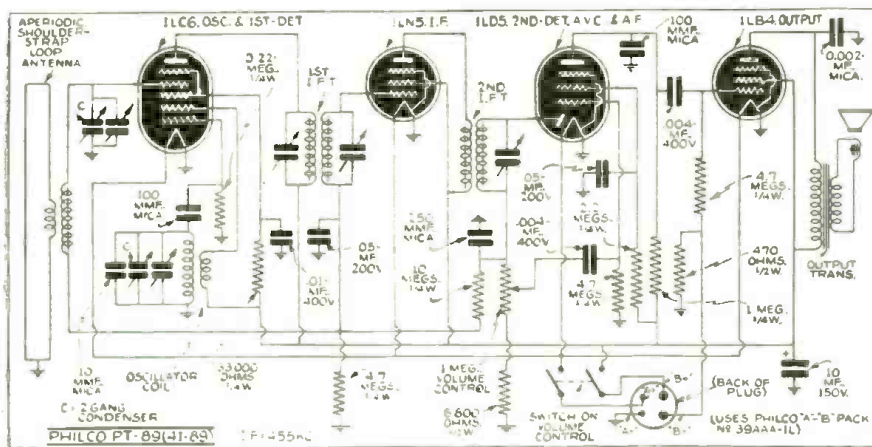
to the Radio Experimenter

CIRCUIT OF NEW PHILCO PORTABLE RECEIVER



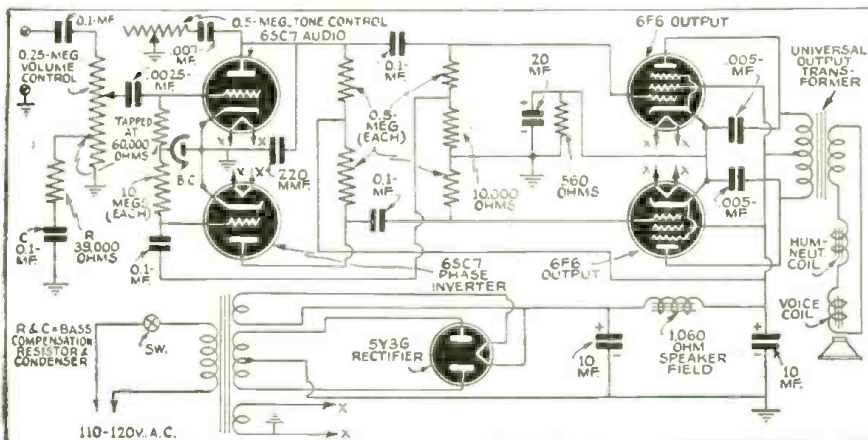
● THE new Philco portable receiver, which can be strapped over the shoulder like a camera, is shown herewith. This receiver is very interesting and especially its circuit, which is given below. The set itself measures less than 5" high, 10" wide, and 4" deep. The aerial is self-shielding and it is braided and woven within the carrying strap. The circuit employs four of the newest type, low drain battery tubes, and a self-contained battery block.

A new type lightweight permanent-magnet loudspeaker makes possible a clear tone, and the sound issues through slots in the side of the case. The radio experimenter will find this circuit very interesting, and since some of the latest type battery tubes may be employed, many valuable experiments may be carried out with it.



Wiring diagram of the new Philco 4-tube portable receiver; the aerial is in the form of an aperiodic loop, built into the shoulder strap supplied with the set.

HIGH QUALITY AUDIO AMPLIFIER



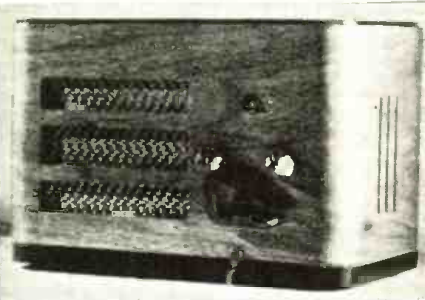
This amplifier circuit, contributed by Stanley Dowgiala, shows how to build up a powerful amplifier which can be used in connection with a radio set, or a phono pickup, etc. This circuit includes a phase inverter, a tone control and a bass compensator circuit. By using a universal output transformer, practically any loudspeaker may be matched to the amplifier.

NOTICE TO CIRCUIT HOUNDS!!

● Come on fellows, send us along some of your interesting 1- 2- and 3-tube hookups, whether they are Parlor-Transmitters, Receivers or what not—just so long as they are good "working" circuits which you have tried out. The diagrams should be drawn in ink but do not have to be finished drawings as we redraw all circuits for publication purposes. Be sure to include a brief description, giving the good points about the circuit and what it does—100 to 150 words is usually sufficient, including your name, address, and in the event that it is not published please include a 3c stamp for return.—Editor

CROSLEY CHATTABOX

INTERCOMMUNICATION SYSTEM COMPLETE TWO UNITS FOR **\$12.95** PAIR
LIST PRICE—\$59.50 A PAIR



Complete two-way wireless loud speaking system. Perfect performance. Plug into any 110 volt house socket A.C. or D.C. Equipped with Call-Listen-Talk switch and volume control. No installation charges. Modulated carrier signal travels over the electric light lines. Ideal for offices, stores, factories, schools, libraries, homes and wherever intercommunication is desired.

WEBSTER RECORD CHANGER



List Price \$44.50. Plays 10" or 12" Records. Push Button Controls — 110 AC — 60 Cy. Packed in Air Cushioned Cartons Wt. 35 lbs.

\$16.95 COMPLETE

ARROW RADIO, INC.
82 CORTLANDT ST. N. Y. C. N. Y.

RADIO DIAGRAMS

MOST-OFTEN-NEEDED



ALL MAKES 1926-1938

In this one low-priced manual you have all the circuits you really need. 427 diagrams of most-often serviced radios is the help you want for easier, faster, and better repairs. You will find 4 out of 5 diagrams needed in this manual. 214 pages, large 8 1/2 x 11 in. size. Special price **\$1.95**

HOW TO SAVE TIME

Service hints, diagrams, alignment data, test charts, and parts lists included will prove time-savers and money-makers for you. Get these handy "on-the-job" handbooks. No need to work blind-folded. The time saved in two days will more than pay for these manuals.

1939-1940 DIAGRAMS

This single manual will give you over 80% of all 1939-40 circuits ever needed, acquaint you with recent radio developments, and teach you how to service quickly millions of sets sold last year. Models of 43 manufacturers. 212 large pages. 8 1/2 x 11 inches. Limited quantity at **\$1.50**



FREE EXAMINATION

● SUPREME PUBLICATIONS, Room 346
3727 W. 13th St., Chicago, Illinois
● Ship the manuals checked. I must be satisfied or you will refund my money in full.
□ Most Often-Needed Diagrams, 1926-1938, @ \$1.95
□ Most Popular 1940 Radio Diagrams, @ \$1.50
□ I am enclosing \$..... send postpaid
□ Send C.O.D. I will pay the mailman.
● NAME _____
(Write address below and send this corner)

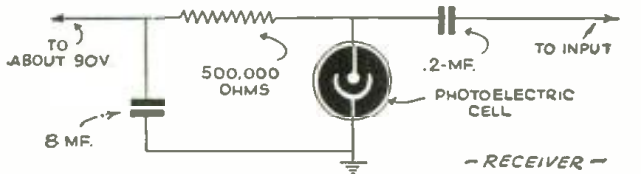
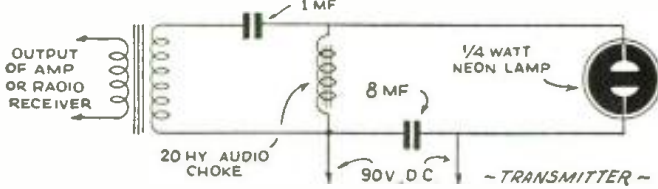
Edited by Herman Yellin, W2AJL

Talking Over a Light Beam

I would like to experiment with transmission of voice over a light beam. Can you furnish me with a hook-up?—J. Madonna, Kearny, N. J.

The diagrams show the equipment necessary to accomplish this. The two amplifiers that will be needed have not been shown, since they can be of any type. The transmitter will need a low-power amplifier of about 3 to 5 watts and this modulates the one-quarter watt neon lamp. Most radio receivers should have sufficient output to be used for this purpose. A reflector mounted back of the neon bulb and a double lens can be used to focus the light beam.

The receiver uses a photo-electric cell connected to a high-gain amplifier. If you can get hold of one of the old selenium cells, the amplifier will not have to be of the high gain type. Use a lens in front of the cell to focus the light rays on it.

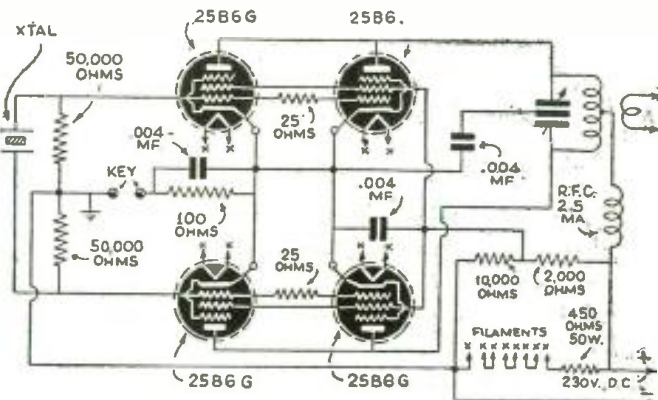


The diagrams above show simple transmitter and receiver hookups for the transmission of speech over a light beam. The Neon lamp will follow the rapid voice current fluctuations. (No. 1239.)

Self-Excited C.W. Transmitter

Please print diagram of a self-excited CW transmitter that could be operated from a 230 volt D.C. line.—L. Lawson, Louisville, Ky.

The use of the 25B6G tubes is ideal for your purpose. Four of them connected in push-pull parallel as an oscillator will deliver about 30 watts of R.F. Having 25 volt filaments, they can all be connected in series with a 450 ohm, 50 watt resistor across the line. Use a split stator tuning condenser having 140 mmf. per section. Standard coils can be used.



Hookup for a self-excited CW transmitter for operation on a 230 volt D.C. line. (No. 1240.)

160 Meter Phone

Will you please furnish me with a diagram of the simplest 160 meter phone transmitter that will pass F.C.C. requirements.

The diagram contains full information on a "rig" successfully used by W8NCM. The Pierce crystal oscillator requires no tuned circuits. The use of a mica blocking condenser removes the customary plate voltage from the crystal. The amplifier plate circuit

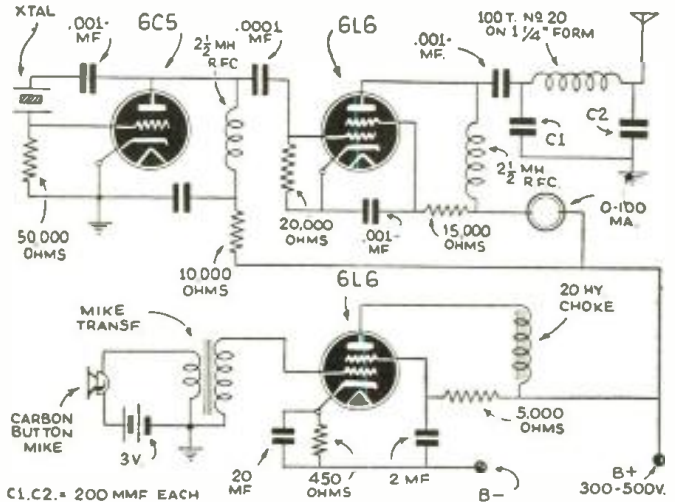


Diagram for 160 meter phone transmitter used successfully by W8NCM. The Pierce crystal oscillator is used. (No. 1241.)

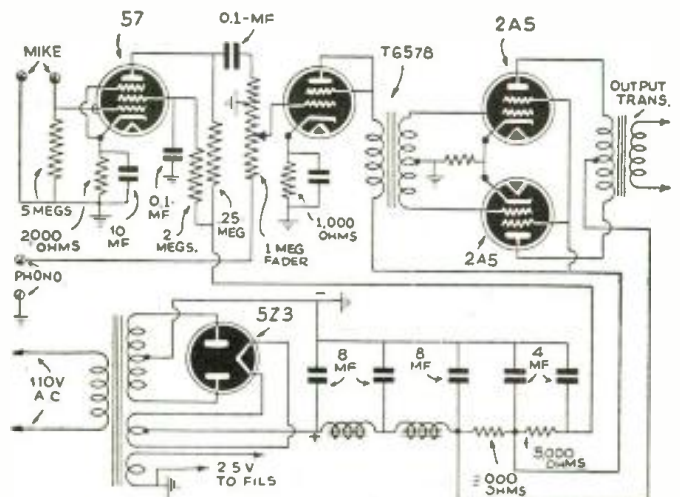
is also untuned and requires no neutralization. The antenna tuning network will permit of operation on 160 and 80 meters. Almost any wire can be used for an antenna, but it is best to have it somewhere near a half wavelength long. Condenser C-1 is for a plate current dip, while C-2 will determine the plate current at the dip caused by C-1. The transmitter should be operated straight through—that is, the "final" on the crystal frequency. The 6L6 modulator furnishes more than enough audio power.

This transmitter can be used on CW by disconnecting the plate voltage to the modulator and keying in 6L6 amplifier cathode.

20-Watt Amplifier

Will you please print me a diagram of a fifteen- or twenty-watt amplifier for a dynamic mike and phono pick-up, resistor-coupled, using a 2A5 driving two 2A5 tubes in the "final" to a dynamic speaker? The power supply here is 110 volts, 60 cycles A.C.

Here is the diagram you request.



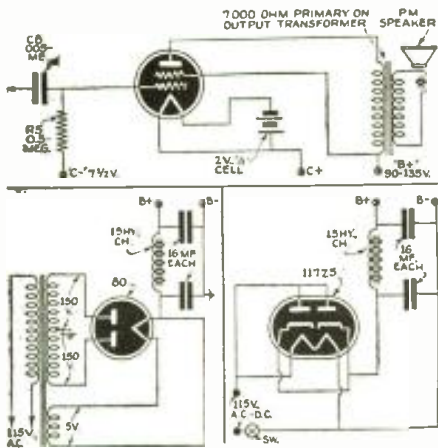
Circuit for 20-watt audio amplifier; it may be used in connection with a microphone or with phonograph pickup as the diagram shows. A well-filtered power-supply is included and it operates from 110 volt, 60 cycle A.C. circuit. (No. 1242.)

Queries to be answered by mail (not on this page) should be accompanied by fee of 25c (stamps, coin or money order). Where schematic diagram is necessary, our fee is 50c up to 5 tubes; for 5 to 8 tubes fee is 75c; over 8 tubes, fee is \$1.00. No picture diagrams can be supplied.

Radio Piano

? I would like to construct a radio piano (refer to your Feb. 1938 issue). First—is the total tonal range restricted to 16 notes? Or can this be extended to include sufficient keys to cover all or a goodly portion of the range covered by a mechanical piano? Would you advise using a 3-1 transformer between the 1A6 driver and 33 power tube? Is it necessary to use a "C" battery with the 33 tube in the circuit? If so, where should it be connected? Could a power-pack be used in connection with this circuit, instead of "B" batteries?

A. With reference to your questions on the electronic piano described in the February, 1938, issue, the principal point to understand is that the two tubes used ("30" and "1A6") comprise two R.F. oscillators, whose frequencies are close together, so that their difference frequency comprises an audio (audible) frequency note. The range of the instrument is therefore unlimited and as many keys as desired can



be used with the notes running to as high a frequency as needed. However, only one note at a time can be played—if two keys are struck at the same time, a single note, lower in frequency than either of the two, will result. Regular commercial electronic pianos contain separate oscillators for each note, and if you wish to be able to sound two notes at a time, it will be necessary to use duplicate oscillators similar to the one shown in the article and all fed into the amplifier. An audio transformer is unnecessary to couple the oscillator to the "33" power tube. Merely connect the grid of the tube, the terminal marked "to G of 33" on the diagram in the February issue.

A power-pack could be used with this equipment, and one is shown in the diagram. Incidentally, the small tuning condensers used for the individual notes can be 30 mmf. mica trimmers.

Code Practice

? I was interested in the method shown in the Kinks section of the June issue on using the constant signal from WWT for code practice. I placed a key in series with the headset of my receiver, but the signals are unsteady.—H. Newton, Brooklyn, N. Y.

A. This system of securing a signal for code practice is suitable only when the signal does not fade. However, WWT can be heard in most locations with a very good signal, although there may be certain hours of some days when the signal fades.

Lowest Priced Publications for Experimenters

10 FOR 50c

Here is a large number of radio, short-wave, and mechanical "how-to-make-it" designs. Each is a special publication originated by masters in their respective fields. For the low price of 50 CENTS, you buy TEN complete pamphlets with photographic reproductions, complete mechanical layout, and full description to make it possible for anyone to build the project in question.

PLEASE ORDER EACH PROJECT BY ITS PUBLICATION NUMBER, and use the special coupon below. We accept money orders, cash, checks or new U. S. stamps. (No foreign stamps.) If you send cash or stamps, register your letter. Money refunded if you are not satisfied. ANY TWENTY-FOUR PUBLICATIONS FOR ONE DOLLAR.

SHORT-WAVE RECEIVER PUBLICATIONS

- HOW TO MAKE THE "OSCILLODYNE" 1 TUBE WONDER SET..... No. 101
- HOW TO MAKE THE "19" TWINPLEX (ONE TUBE PERFORMS AS TWO) RECEIVER..... No. 102
- HOW TO MAKE THE WIZARD I-TUBE 50-WATT TRANSMITTER..... No. 103
- HOW TO MAKE THE IMPROVED 3-TUBE DOERLE SET FOR BATTERY OPERATION..... No. 104
- HOW TO MAKE THE "GO-GET-EM 2" RECEIVER FOR THE BEGINNER..... No. 105
- HOW TO MAKE THE 1-TUBE ALL-ELECTRIC OSCILLODYNE..... No. 106
- HOW TO MAKE THE 2 TO 5 METER TWO-TUBE LOUDSPEAKER SET..... No. 107
- HOW TO MAKE THE 3-TUBE BATTERY SHORT-WAVE RECEIVER..... No. 108
- THE BRIEF CASE SHORT-WAVE RECEIVER AND HOW TO BUILD IT..... No. 109
- HOW TO BUILD THE "POCKET" SHORT-WAVE RECEIVER..... No. 110
- HOW TO BUILD THE "CIGAR-BOX" I-TUBE "CATCH ALL" RECEIVER..... No. 111
- HOW TO BUILD THE "DUAL-WAVE" SHORT-WAVE BATTERY RECEIVER..... No. 112
- HOW TO BUILD THE 1-TUBE "53" TWINPLEX RECEIVER..... No. 113
- HOW TO BUILD THE PORTABLE MINIDYNE SHORT-WAVE BATTERY SET..... No. 114
- HOW TO BUILD THE HAM-BAND "PEE-VEE" 2-TUBE..... No. 115
- HOW TO BUILD THE DUO-AMPLIDYNE..... No. 116
- HOW TO BUILD THE "MONO-COIL 2"..... No. 117

RADIO BROADCAST RECEIVER AND SPECIAL RADIO PUBLICATIONS

- HOW TO MAKE THE A.C.-D.C. "CASH BOX" RECEIVER. No. 118
- HOW TO MAKE BEGINNER'S 2-TUBE ALL-WAVE SET..... No. 119
- HOW TO BUILD THE "RADIO-LAMP" 4-TUBE TABLE RECEIVER..... No. 120
- HOW TO BUILD A SUPER-SENSITIVE ALL-WAVE CRYSTAL SET..... No. 121
- HOW TO BUILD THE 2-TUBE "PENTODE PORTABLE" BROADCAST SET..... No. 122
- HOW TO BUILD THE RADIO "TREASURE" FINDER..... No. 123
- HOW TO BUILD THE GERNSBACK ONE-TUBE PENTODE LOUDSPEAKER SET..... No. 124
- HOW TO BUILD THE WORLD'S SMALLEST ONE TUBE BATTERY RADIO..... No. 125
- HOW TO BUILD A 6-TUBE BATTERY ALL-WAVE "FARM PORTABLE" SET..... No. 126
- HOW TO MAKE AN A.C.-D.C. ONE-TUBE "DEAF AID"..... No. 127
- HOW TO BUILD A PIANOTRON..... No. 128
- HOW TO BUILD THE ONE-DOLLAR RADIO..... No. 129
- HOW TO MAKE A VARIABLE-TONE CODE PRACTICE SET..... No. 130

MECHANICAL PROJECTS PUBLICATIONS

- HOW TO MAKE A SOUTH SEA OUTRIGGER CANOE..... No. 131
- HOW TO BUILD A PEE-WEE AUTOMOBILE..... No. 132
- HOW TO BUILD A DUAL-CONTROL GLIDER..... No. 133
- HOW TO BUILD A HOUSEBOAT ON PONTOONS..... No. 134
- HOW TO MAKE A BAND SAW FROM OLD AUTO PARTS..... No. 135
- HOW TO BUILD A REAL LATHE FOR \$5.00..... No. 136
- HOW TO BUILD A SAIL CATBOAT..... No. 137
- HOW TO BUILD A SIMPLE PORTABLE REFRIGERATOR..... No. 138
- HOW TO BUILD A XYLOPHONE..... No. 139
- HOW TO BUILD THE ROWMOBILE..... No. 140
- HOW TO BUILD LARGE TESLA AND OUDIN COILS GIVING 18 INCH SPARKS..... No. 141
- HOW TO MAKE AN ARC WELDER..... No. 142
- HOW TO USE AN A.C. ARC WELDER..... No. 143
- HOW TO MAKE YOUR OWN MICROSCOPE..... No. 144
- HOW TO MAKE A WILBURST ELECTROSTATIC MACHINE..... No. 145
- HOW TO MAKE A POWER DRILL PRESS FROM SCRAP PARTS..... No. 146
- HOW TO BUILD A GOOD LATHE FOR \$1.00..... No. 147
- HOW TO MAKE AND EXPERIMENT WITH AN ELECTROPHOROUS..... No. 148
- HOW TO MAKE AN ELECTRIC ARC WELDER FROM AN AUTOMOBILE GENERATOR..... No. 149

RADIO PUBLICATIONS • 20 Vesey Street • New York, N.Y.

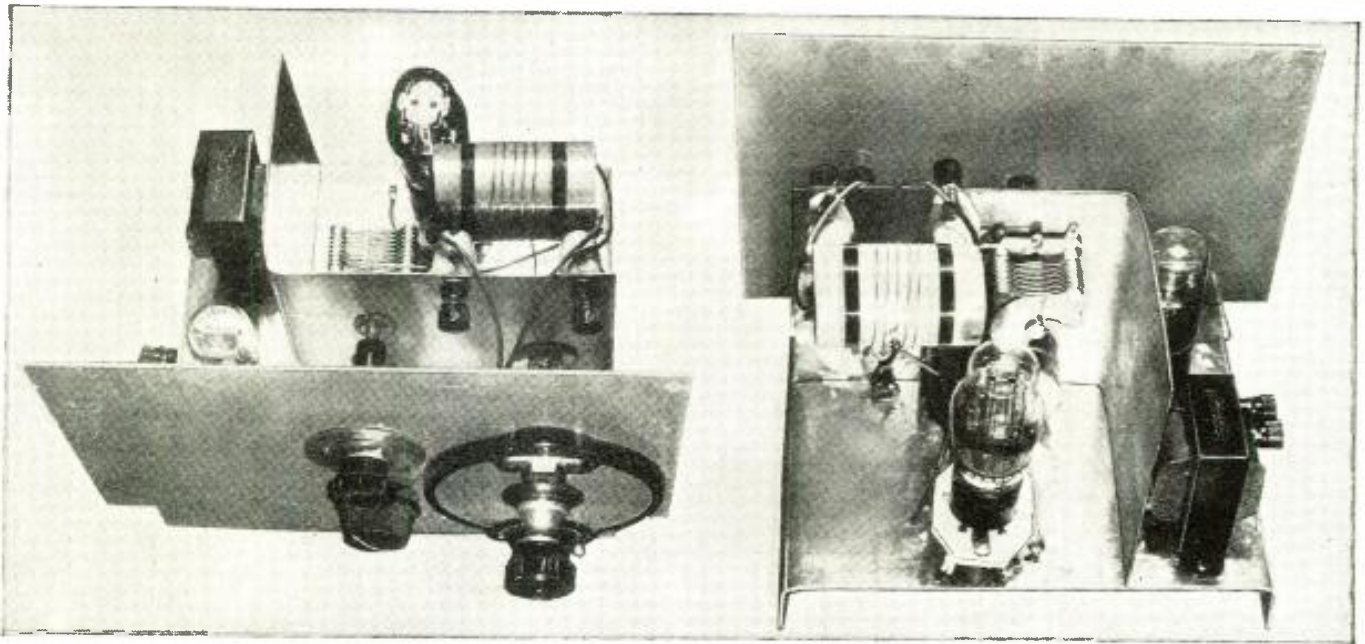
RADIO PUBLICATIONS, 20 Vesey Street, New York, N.Y. R&T-1240

I enclose \$..... for the publications listed by number, at right, at the rate of 50c FOR ANY TEN PUBLICATIONS. NO ORDER FOR LESS THAN 50c ACCEPTED. \$1.00 for 24 publications. These publications are to be sent to me postpaid. I have placed a circle around each number which I want.	101	102	103	104	105	106
Name	107	108	109	110	111	112
Address	113	114	115	116	117	118
City	119	120	121	122	123	124
State	125	126	127	128	129	130
	131	132	133	134	135	136
	137	138	139	140	141	142
	143	144	145	146	147	148
						149

WILL BUY FOR CASH
OLD POSTAGE STAMPS AND COMPLETE COLLECTIONS
 Thousands of dollars lying idle in old Postage stamps and collections. Dig yours out and sell at today's top prices. Especially interested in old United States stamps (used or unused) and later issues up to 1930. Write for references, or send stamps for prompt appraisal and offer.
HARRY P. BRIDGE
 1324 Walnut St. Philadelphia, Pa.

NEW! NO TUBES BATTERIES RADIO!
DURABLE PLASTIC CABINETS
 DUAL BANDS—MAGICTENNA—MICRODIAL. Fits your pocket or purse—Wt. 6 ozs. Small as extra retic package. Receives standard & some short wave. PATENTED POWER RECTIFIER. No tubes, batteries. Hi-ratio easy tuning slide "MICRODIAL" OF ILL. SAYS: "MIDGET RADIO WORKS FINE"
ONE YEAR GUARANTEE!
 Sent complete ready to listen with instructions & tiny phone for use in homes, offices, hotels, in bed, etc. **SIMPLE TO OPERATE—NO ELECTRICITY NEEDED!**
SEND NO MONEY! Pay postman only \$2.99 plus postage charges on arrival or send \$2.99 (check, M.O., Cash) and yours will be sent postpaid. A MOST UNUSUAL VALUE! **ORDER NOW! FREE! PLUG IN "MAGICTENNA" —ELIMINATES OUTSIDE WIRES!**
 MIDGET RADIO CO., Dept. RT-12, Kearney, Nebr.

A Christmas Present that will be appreciated by EVERYONE!
PHOTO SPOTLIGHT
 Large 10 1/2" lamp, complete with Westinghouse 140 candle-power frosted bulb and cord, ready to plug into your A.C. or D.C. 110 volt house socket. (Wt. packed 6 lbs.) **\$2.50**
FLOOD LAMP
 Same as described above, fitted with No. 1 G.E. Photoflood bulb, ready to plug in..... **\$2.25**
 If either lamp is desired in black crackle finish, **85c** add
 U. S. Engineer's Tripod, with bronze fittings, 42" high (not adjustable), (Weight packed 6 lbs.) **\$1.65**
 U. S. Gov't. adjustable tripod, extends to 6' 5 1/2" high, 1 lb. s. **\$3.00**
 F.O.B., N. Y.
GOLD SHIELD PRODUCTS
 350 Greenwich St., Dept. RT-1240 New York City



Front and rear views of the "push-pull" regenerative receiver.

A 2-Tube

Push-Pull Regenerative

Robert Bayne

Receiver

● THIS set was designed primarily for the beginner and incorporates simplicity with extreme selectivity. During the period in which it was tested it received not only a host of American stations but many European stations as well. Some of the European stations were worked using a loud speaker, which furnished comfortable room volume.

The detector circuit is somewhat unusual as it uses a center-tapped tuning coil with outer ends connected to the grids of a dual type '19 tube. Two tickler coils are placed each side of the grid coil so as to provide regeneration. Two variable resistors of 50,000 ohms resistance each are connected across the tickler coils to control regeneration. For ease of operation these are ganged to a single shaft.

The audio amplifier is of standard design, employing impedance coupling from the detector to the grid of the 1C5-G output tube. Sufficient volume is obtained with this arrangement to operate a speaker on signals of strong or moderate strength. Weaker signals may be heard quite easily on ear-phones.

In constructing the receiver it will be necessary to shield the detector from the audio tube and the coupling choke. Otherwise feed-back may result between the two stages, due to the strong regenerative action present in the detector. Extension shafts are used for all controls to eliminate hand-capacity effects. Small condensers and resistors are mounted underneath the chassis.

The author states—"This set has shown remarkable ability to receive foreign stations and receives many of them on a loudspeaker! Since it employs only two tubes, I believe this rather remarkable and trust it will be of interest to your readers."

Naturally all leads should be as *short* as possible for best results. This is especially true of the plate leads and the wiring connecting the variable condensers across the tuning inductance.

The coils used in this receiver are home-made and were wound on a bakelite tube two and one-half inches long, by one and one-half inches in diameter. Plug-in coils were not used on my receiver, but may be easily contrived in the following manner.

On each coil mount a row of nine small sized banana plugs, which are connected respectively to the leads from the tickler coils, the grid winding, the center tap, and the antenna coil. On the shield panel directly above the vernier tuning condenser, mount a strip of bakelite containing a corresponding row of jacks connected into the proper parts of the detector circuit. Thus the receiver may be made to cover a wide band of frequencies.

Coil Data

All coils wound on bakelite forms, one and five-eighths inches in diameter.

All grid windings are spaced to occupy length of one inch.

The grid windings are wound with No. 20 tinned copper hook-up wire.

The tickler coils are wound with No. 26 enameled magnet wire.

10 to 20 meter coil

Grid coil—6 turns

Tickler coil—11 turns

20 to 40 meter coil

Grid coil—8 turns

Tickler coil—14 turns

40 to 80 meter coil

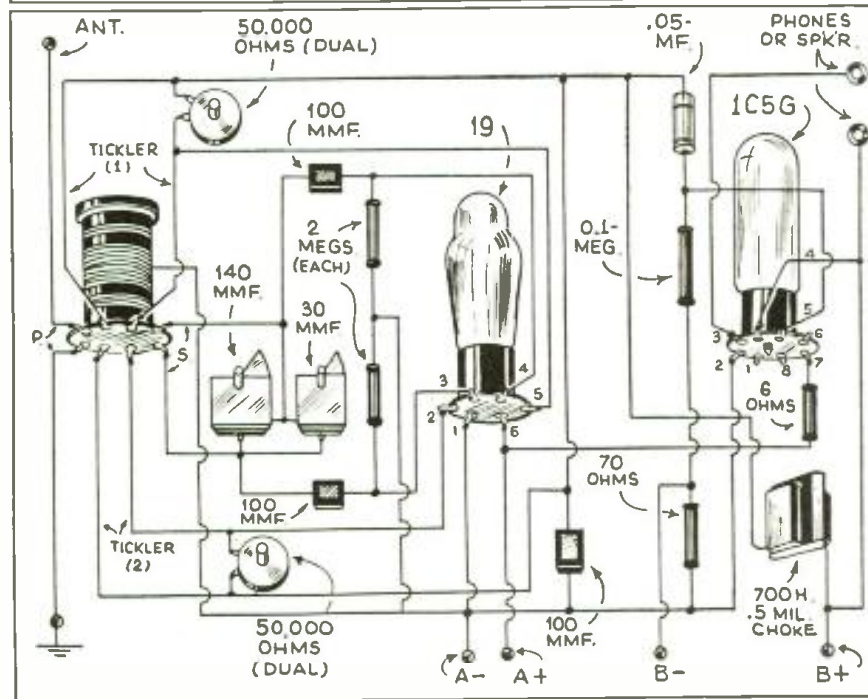
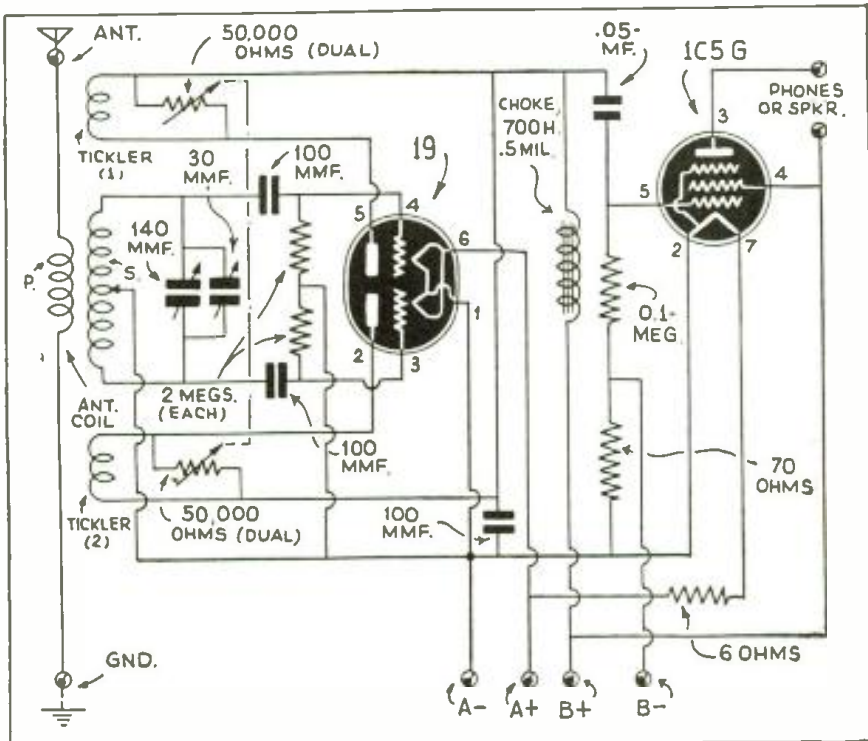
Grid coil—18 turns

Tickler coil—16 turns

After the coils are wound they should be coated with coil dope to preserve their electrical characteristics. All grid coils are center-tapped.

Parts List

One variable condenser .00014 mf.
 One variable condenser .00015 mf.
 Three fixed condensers .0001 mf.
 One fixed condenser .05 mf.
 One variable resistor (dual) 50,000 ohms
 Two resistors 2 meg. each
 One resistor 100,000 ohms
 One resistor 70 ohms
 One resistor 6 ohms
 One 700 henry plate coupling choke
 One six-prong tube socket for above panel mounting
 One octal tube socket
 One type '19 tube and one type 1C5-G tube
 Two eight by ten aluminum panels
 Hook-up wire, binding posts, etc.
 One foot of bakelite tubing one and five-eighths inches in diameter
 Coils of No. 20 wire and No. 26 magnet wire



It's a cinch to build this fine 2-tube receiver by following the simple schematic and picture diagrams presented herewith.

ANSWERS FOR THE PUZZLE DIAGRAM APPEARING ON PAGE 496

1. In the first tube, a 12SA7, the signal is fed to the suppressor grid instead of the control grid; also the control grid is grounded, which is wrong.
2. The 12SK7 I.F. tube signal is fed to the suppressor grid instead of the control grid; the control grid is grounded, which is also wrong.
3. The connections to the rectifier tube are reversed.
4. The grid of the 12SQ7 should go to B- instead of B+.
5. All the tube filaments should be connected in series; the series-parallel connection on two of the tube filaments is wrong in this case.
6. The plate of the 12SK7 goes to B- instead of B+.
7. The grid connections to the 35L6 tube are reversed.
8. The lower end of the grid coil of the 12SK7 I.F. tube should go to the AVC lead and not to B-.

Astonish YOUR FRIENDS!

Pass 500,000 Vts. Thru the Body! Light Lamps, etc.

NEW! 5-ft. Spark Oudin Coil, Condenser & 4 k.w., 40 k.v. Transf. data. net 75c

DATAPRINTS

Drawings & Construction Data Show You How

- 20c Each in Order for 10 TESLA-UDIN HI-FREQ. COILS**
(Data and Drawings only; no parts included)
- 36" Sp'k Tesla-Oudin Coil.....40c (1 K.W. Exc. Trf. Data, included FREE!)
 - 8" Sp'k Tesla-Oudin Coil.....40c (1/2 K.W. Exc. Trf. Data included FREE!)
 - 3" Sp'k Oudin; 110 Vt. "Kick Coil" type.....40c
 - 3" Sp'k Tesla Works on Ford Sp'k Coil.....40c
 - 3" Sp'k Violetta HI-Freq. Coil.....40c
- FREE with order for \$1.00 or more—'20 Tricks with Hi-Freq. Coils' (40c separate)

TELEGRAPHONE—Records on Steel Wire 40c
20 ELECTRIC PARTY AND LODGE TRICKS!
Loads of Fun!
How to Do 'em!40c
New Electric Ore & Pipe Locator40c

Solenoid & Magnet Data—Get Our List!
20 Telephone Hook-ups—Build Your Own . . 40c
RADIO CONTROL FOR MODEL BOATS, PLANES
Data 40c
Photophone; Data 40c

S-W DIATHERMY
(Artificial Fever)
Dataprint giving Constructional data for Small, Medium and Large size APP. (All 8).....40c

"Mind Reading" Radio Act40c

LOOK at these DATAPRINTS ! !
40c Each. See Special Prices below

- 20 A.C. Problems and their Solutions.
- 1/2 Motor Transm. & Rec. Water Superhet.
- 5 Motor Superhet.
- 100 Mechanical Movements.
- 20 Motor Hook-ups.
- Electric "Inductor" Organ
- 20 Simple Bell Circuits.

Special Prices: 4 prints \$1.00; 10 for \$2.00; 40c each, single orders. Get New List 100A

The DATAPRINT Co.
Lock Box 322A RAMSEY, N. J.

RADIO AND ELECTRONIC DICTIONARY Containing 3,800 Definitions



THIS RADIO AND ELECTRONIC DICTIONARY, written by Harold P. Manly, explains the meaning of 3,800 words used in radio, electronics and other closely allied fields. It includes new terms used in radio transmission, such as pictures, television, public address, aviation radio, navigation and industrial control, photo-electricity, photocell application, telephotography, etc. This dictionary permits learning every new expression whether you hear it or read it. Alphabetically arranged for quick reference. 550 illustrations augment definitions in the text.

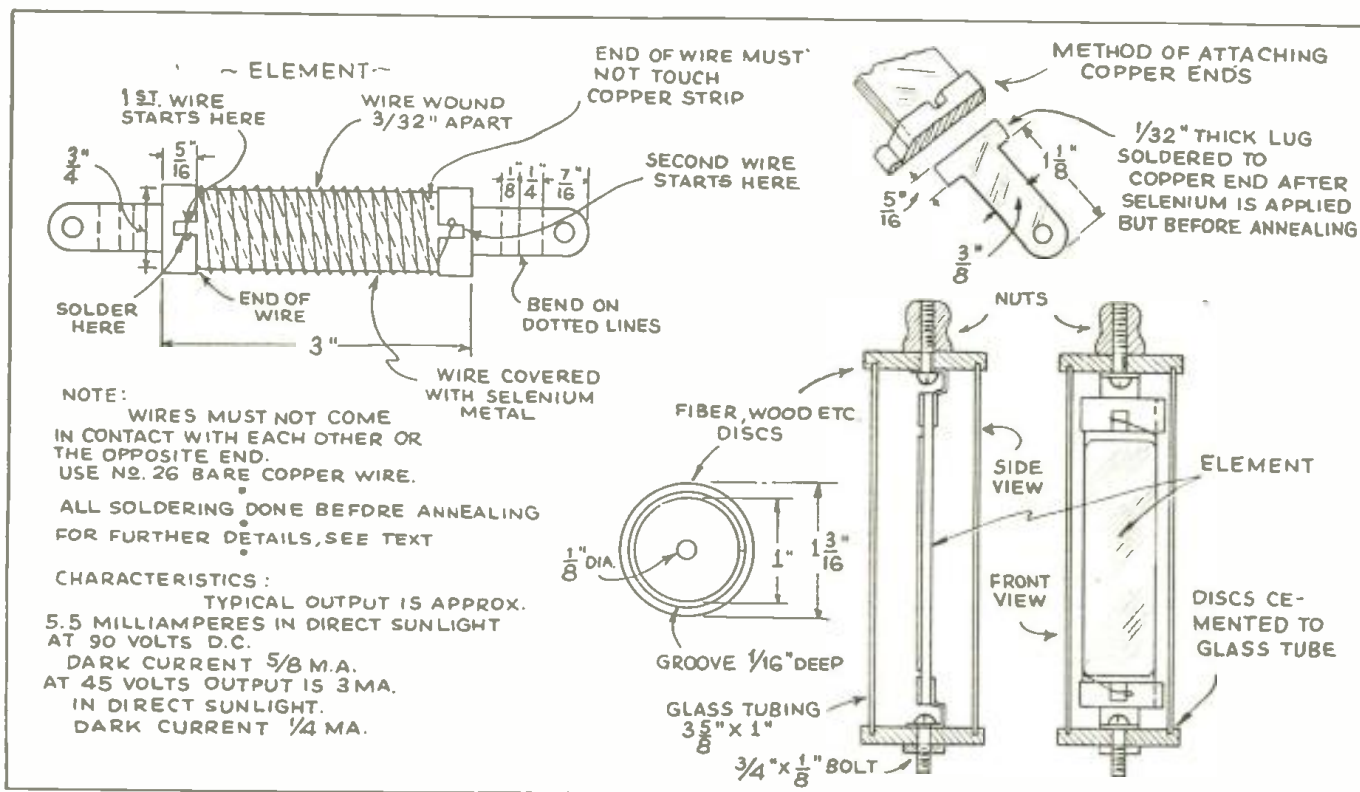
The book is recommended for students, instructors, engineers, service men, experimenters, salesmen and everyone in any way associated with radio. **ONLY THE RADIO AND ELECTRONIC DICTIONARY is new, authentic and printed in a single volume of 300 pages, size 6 x 9 inches. The book weighs two pounds, and bound in durable cloth. SHIPPED ANYWHERE \$2.50 IN U. S. A. POSTPAID Price**

Mail remittance by check or money order to
RADIO PUBLICATIONS
20 VESEY STREET. NEW YORK, N. Y.

How to Make Your Own

Martin D. Koehler

Photo-Electric Cell (Selenium Type)*



The drawing herewith shows how to construct a selenium-type photo-electric cell. When light falls on the cell its electrical resistance is lowered, permitting more current to flow and thus operate a sensitive relay or other device.

● THE Photo-Electric Cell is a very important tool of science today. In general there are three types of cells:

1. The Emissive Cell, which consists of two electrodes, one of which is sensitive to light, enclosed in a glass tube, either evacuated or containing a minute quantity of an inert gas. When light strikes the sensitive electrode electrons are freed in proportion to the intensity of the light. These electrons are drawn, by a positive potential, to the other electrode, thus producing a small current.

2. The Photo-Voltaic Cell is of the self-generating type.

3. The Photo-Conductive Cell is a device in which the resistance of a material is lowered when illuminated. There are many materials that show this effect, Rocksalt, Molybdenite, Lead halides, Selenium, etc., Selenium being the most active and most generally used in this type of cell. It is the conductive cell that we are concerned with here.

Construction Detail: First cut a piece of window glass, 3 in. long by 3/4 in. wide, this is to act as the base for the electrodes. Next cut 2 strips of copper sheet (about 1/100 in. thick, or less) 5/16 in. wide and 2 1/2 in. long. These are fastened to the ends of the glass plates (see print) by folding the strips over the end of the plates and rolling and squeezing the two ends together with a pair of long nosed pliers. Now take a sharp razor blade and make

two cuts about 1/8 in. apart in the copper and bend up the piece between the cuts. This piece acts as a hold and connection for the electrode wire. Do this on both ends of the plate (see print). Next comes one of the most important operations, forming the electrodes. Take a length of No. 26 copper magnet wire (bare) and form a small hook on one end. This is hooked on the projecting piece of copper on one of the plate ends. Now wind the wire on the glass between the two copper ends, leaving a space 3/16 in. between windings. When the wire is wound to approx. 1 1/2 in. from the opposite end, clip off the remaining wire and hook the end on the edge of the glass plate. Do not allow this end to touch the opposite copper strip. This is most important. Now repeat the same procedure, starting with the other copper strip, and wind the second wire between the windings of the first wire. At no point must the wires touch each other or the opposite copper ends. You now have a gridwork of two separate wires which act as the electrodes of the cell.

The next step is to apply the light-sensitive material, which is selenium. This metal comes in either stick or powder form. In this case, the powder must be used. Place 1/2 or 1/4 oz. of this powder in an old pepper shaker. Now spread the powder very uniformly over the grid wires. Put on enough to cover the wires well. It is best to leave the small space between the wire ends and copper ends open. Do not put on too much

or the sensitivity will be decreased. Place the cell on a copper or other metal plate and heat in a gas flame (kitchen range will do) till the powder melts. Now take a stiff piece of paper or light cardboard 3/4 in. by 4 in. and spread the molten selenium evenly over the wires. **Don't inhale the fumes!**

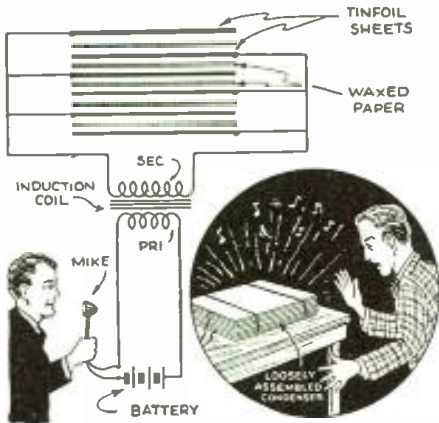
After the selenium is smoothly spread, remove plate and allow to cool (in cold air if possible). If any holes appear in the selenium, add a little more powder and remelt.

Annealing: This is the most important step of all. After the cell has cooled off, place in oven and anneal it for 4 hours at a temperature between 183 and 187 degrees CENTIGRADE. This is very important so employ an accurate thermometer and check the reading occasionally. (Do not allow oven door to remain open too long.) You may have to experiment some with the annealing time and temperature as selenium from different sources differs in its characteristics. The time and temperature is usually about the same as specified here. After it has annealed for the required time, remove the cell from the oven and allow to cool. When it is sufficiently cool, apply two coats of lacquer. This is to prevent excessive moisture and oxygen from harming the cell, which is very important. Use only a lacquer which has a high Dielectric Constant (insulating qualities). The lacquer used to coat radio-frequency coils is ideal and can be obtained from almost any radio supply house.

*Copyright 1940 by the author.

TALKING CONDENSERS!
Cover Feature

● THE secret of the *talking condenser* lies in the fact that the alternate sheets of tin-foil and wax paper used in making up the condenser are not tightly clamped, but are held loosely with a couple of rubber bands or even allowed to lie in a loose pile. The condenser itself may be made up of 12 to 15 sheets of waxed paper, measuring about 5" by 7" and between every 2 sheets of paper, tin-foil or other thin metal leaves measuring 1/2" smaller all around than the paper are interspersed. Every other tin-foil leaf is connected to a common terminal as the diagram shows. The induction coil used

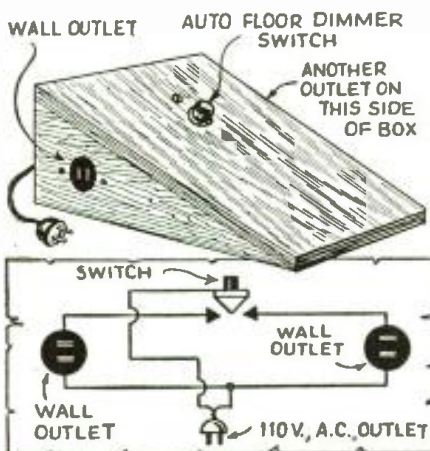


to excite the condenser may be a telephone type coil, an old shocking coil or a small spark coil; even an ignition coil may be used in a pinch. An ordinary microphone is connected in series with a battery of a few dry cells and the primary winding of the induction coil. The condenser really forms an electrostatic loud-speaker, and as the fluctuating electric charges caused by speaking into the microphone reach the condenser leaves, they vibrate in unison with the voice.

2-Way Foot Switch

● THE foot switch described here is easy to make, has a variety of uses, and gives good service for years. I use it for printing, enlarging, and when I paint on canvas from colored transparencies.

The whole thing is wired in a box with a slanting top. A hole is cut on the top for the switch and one on either side for the outlets. The plug is fastened to one end of the cord and the other end goes into the box.—Zoltan T. Bogar.



SUPER BARGAINS

Practically all of the attractive items listed here are brand new, others are reconditioned like new; but ALL are in PERFECT WORKING ORDER. In many cases, the parts alone total more than the price we are asking. 100% satisfaction guaranteed or your money refunded. ORDER FROM THIS PAGE. Use the convenient coupon below. Include sufficient extra remittance for parcel post charges, else order shipped express, collect. Any excess will be refunded. C.O.D. shipments require 20% deposit. If full remittance accompanies order, deduct 2% discount. Send money order, certified check, new U. S. stamps. No C.O.D. to foreign countries.

ORDER TODAY LIMITED QUANTITIES PROMPT SHIPMENTS ASSURED

2-SPEED PHONOGRAPH TURNTABLE



Adapts any phonograph for both 33-1/3 and 78 R.P.M. This ingenious device, by simply replacing your present turntable, automatically modernizes your machine to play 33-1/3 R.P.M. high-fidelity transcription records as well as the standard 78 R.P.M. records. Quickly installed by anyone. Complete instructions furnished. Felt-covered turntable measures 12" in diameter and fits all standard phonographs. Packed in original box. Shp. Wt. 3 lbs.
ITEM NO. 89
YOUR PRICE \$95

PATENT RADIOFORMER KIT
NOISE-FREE ANTENNA TRANSFORMER

Now you can have an expensive noise-free antenna system for a song. Kit consists of two matched R.F. transformers; one which is attached to the antenna and the other to the input of the receiver to enjoy noise-free radio reception. Only additional requirement is a shielded lead-in wire. Installation simple as ABC. Anyone can do it. For use with broadcast receivers only. Both transformers thoroughly shielded in aluminum cans. Weather resistant; can't corrode or rust. Complete instructions included. Packed in original box. Shp. Wt. 1 1/2 lbs.
ITEM NO. 92
YOUR PRICE \$95



New Catalog

JUST OUT

A POSTAL CARD BRINGS IT TO YOU
SEND FOR IT TODAY

G.E. INDUCTION DISC MOTOR FOR RECORDING PLAYBACK AND DISPLAY PURPOSES



Substantially constructed by General Electric, this ball-bearing motor is a high-quality phonograph unit. Its power and smooth-running make excellent home recording work. Its speed, governor-controlled, is variable both below and above 78 r.p.m. For 110 volts, 60 cycles. A.C. Solid less turntable and shaft. 7 1/2" diameter x 5 1/2" high. Shp. Wt. 14 lbs. Packed in Original Box
ITEM NO. 81
YOUR PRICE \$3.95

SUPER SPECIAL
3 1/2 R.P.M. SYNCHRONOUS MOTOR

There are 101 uses for a synchronous motor making only 3 1/2 revolutions per minute. Ideal for crowd-catching store-window displays, agitating film-developing tanks, as an electric winch on model motor boats, as derrick motor in erector sets, etc. Built-in high-ratio step-down gears provide amazing amount of power. Made by Haydon Mfg. Co. of Waterbury, 2" in diameter x 2 1/2" x 1" thick overall. Shp. Wt. 2 lbs.
ITEM NO. 76
YOUR PRICE \$1.95



MECHANICAL FLASHLIGHT

This battery-less flashlight generates its own power merely by pressing handle. Gives strong light whenever needed. Costs nothing to maintain. Amazing new miniature dynamo operates flashlight. Pocket size. 4 3/4" x 2" x 1". Shp. Wt. 2 lbs.
ITEM NO. 88
YOUR PRICE \$1.70



AMAZING BLACK LIGHT!



Powerful 30n-Watt Ultra-Violet Bulb
The best and most practical source of ultra-violet light for general experimental and entertainment use. Makes all fluorescent substances brilliantly luminescent. No transformers of any kind needed. Fits any standard lamp socket. Made with special filter glass permitting only ultra-violet rays to come through. Brings out beautiful opalescent hues in various types of materials. Novel for amateur parties, plays, etc., to obtain unique lighting effects. Bulb only. Size of bulb.
Shp. Wt. 1 lb.
ITEM NO. 87
YOUR PRICE \$2.00

ULTRA MAGNET

LIFTS MORE THAN 20 TIMES ITS OWN WEIGHT

LITTLE GIANT MAGNET. Lifts 5 lbs. easily. Weighs 4 oz. Made of ALNICO new high-magnetic steel. Complete with keeper. World's most powerful magnet ever made. The experimenter and hobbyist will find hundreds of excellent uses for this high quality permanent magnet. Measures 1 1/2" x 1 1/2". Shp. Wt. 3/4 lbs.
ITEM NO. 86
YOUR PRICE \$1.00



AUTO-RADIO REMOTE CONTROL

Designed for Ford cars, this fine remote control head may be adapted for use with most auto-radio receivers and in other type cars. Control furnished complete with two flexible cables (one for tuning and one for volume) and built-in pilot light. Flexible cables each 20 inches long. Tuning ratio is approximately 7:1 to 1. The on-off switch is built directly into the remote control. Over-all dimensions 3 1/2 inches wide, 3 3/4 inches high. Complete with matched knobs. Packed in original box. Shp. Wt. 4 lbs.
ITEM NO. 93
YOUR PRICE \$1.95



NEW ELECTRIC MOTOR-SAW

Now you can have all the fun of fine, fast jigsaw work without any of its difficulty. Simply steer the lightning-fast blade and see it seemingly melt its magic way through wood, plastics and building board. 7200 STROKES per MINUTE! Average cutting speed 1 foot per minute through 3/4" medium hard wood. Works 3 times faster than any free-hand saw. Operates on 60-60 cycle 110 v. Alternating Current. Screw adjusts blade stroke from 1/4" to 5/16". Off-On Switch built in handle. Complete with 6 ft. power cord and 2 saw blades.
ITEM NO. 97
YOUR PRICE \$4.85



KELLOGG LOUD-SPEAKER UNIT

This speaker unit sold originally for \$3.50, for use with speaker horns, it is an excellent unit and may still be used for the same purpose. Magnetic type, uses a powerful double-pole magnet. Volume is controlled by adjusting knob on back of metal case. Remarkably clear in tone. Excellent as an extra "personal" speaker. Easily attached to any radio. Can also be used as a sensitive high-impedance microphone. Gives excellent quality for speech. Cap is made of thick bakelite provided with threaded throat. Packed in original box. Shp. Wt. 2 lbs.
ITEM NO. 95
YOUR PRICE \$7.75



HUDSON SPECIALTIES CO., 40 West Broadway, N. Y. C.

IT'S EASY TO ORDER—CLIP COUPON—MAIL NOW ORDER FROM THIS PAGE.

HUDSON SPECIALTIES CO., 40 West Broadway, Dept. RT-1240, New York, N. Y.
I have circled below the numbers of the items I'm ordering. My full remittance of \$..... (include shipping charges) is enclosed.
OR my deposit of \$..... is enclosed (20% required), ship order C.O.D. for balance. No C.O.D. order for less than \$2.00. (New U. S. stamps, check or money order accepted.)
(Circle Item No. wanted: 76, 81, 86, 87, 88, 89, 92, 93, 95, 97)

Name Address
City State

Send remittance by check, stamps or money order; register letter if you send cash or stamps.

Digest of Recent Radio Patents

Get ONE or ALL of these books **FREE!**

THE publishers of RADIO & TELEVISION give you the opportunity to add three outstanding books to your technical radio library. They make the offer even more attractive by giving these books to you absolutely FREE. A subscription to RADIO & TELEVISION for seven months at the cost of One Dollar gives you a choice of either of the three books shown in this advertisement. For Two Dollars you receive RADIO & TELEVISION for fourteen months and you receive any two books absolutely FREE. To get all three books FREE, enter your subscription for twenty-one months for only Three Dollars.

ANOTHER SAVING FOR YOU—THE PUBLISHERS PAY POSTAGE ON THE BOOK OR BOOKS YOU CHOOSE.

All of the books contain numerous photographic illustrations and diagrams and have stiff, flexible covers.

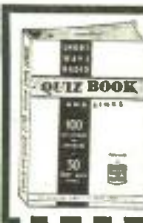


ABC OF TELEVISION

Contains latest material on Television developments. It covers theory of scanning; simple television receiver, how the eye sees; the photo-electric cell; neon lamps; need for broad channel width in transmission of high-fidelity television signals; cathode ray tube and television receivers; Farnsworth system of television transmission, and other important features.

SHORT WAVE GUIDE

Covers hundreds of short-wave questions and answers; illustrates popular short-wave kinks; gives explicit instructions for building simple short-wave receivers; instruction on the best type of antenna installation; diagram and construction details for building transmitters.



S. W. RADIO QUIZ BOOK

This book covers questions and answers on transmitters, short-wave receivers, ultra short-wave receivers, practical kinks, wrinkles, and coil winding data; novel hook-ups for experimenters; how to "hook-up" converters, noise silencers, power supplies, modulators, beat oscillators, antennas, pre-selectors and 3-tube receivers.

RADIO AND TELEVISION, 20 Vesey Street, New York, N. Y. R&T-12-10

Gentlemen: Enclosed you will find my remittance of \$..... for which enter my subscription to RADIO AND TELEVISION as checked below; also send me, postpaid, the book or books which I have marked below.

- ABC OF TELEVISION
- S. W. RADIO QUIZ BOOK AND KINKS
- SHORT WAVE GUIDE
- 7 months—\$1.00—choice of any one of three (3) books. (Canadian and foreign—\$1.30)
- 14 months—\$2.00—choice of any two (2) of the three (3) books. (Canadian and foreign—\$2.60)
- 21 months—\$3.00—all three books. (Canadian and foreign—\$3.90)

If you are a subscriber now, we will extend Your Present subscription.

- New subscriber
- Old subscriber

Name

Address

City

State

Send your remittances by check or money order. If you send cash or unused U.S. postage stamps, please be sure to register your letter for your own protection.

See our new offer of FREE PARTS with your subscription on Page 511.

Inventions Wanted

Patented or Unpatented

We have been successfully selling inventions, Patented and unpatented, since 1924. Write us, if you have a practical, useful idea for sale.

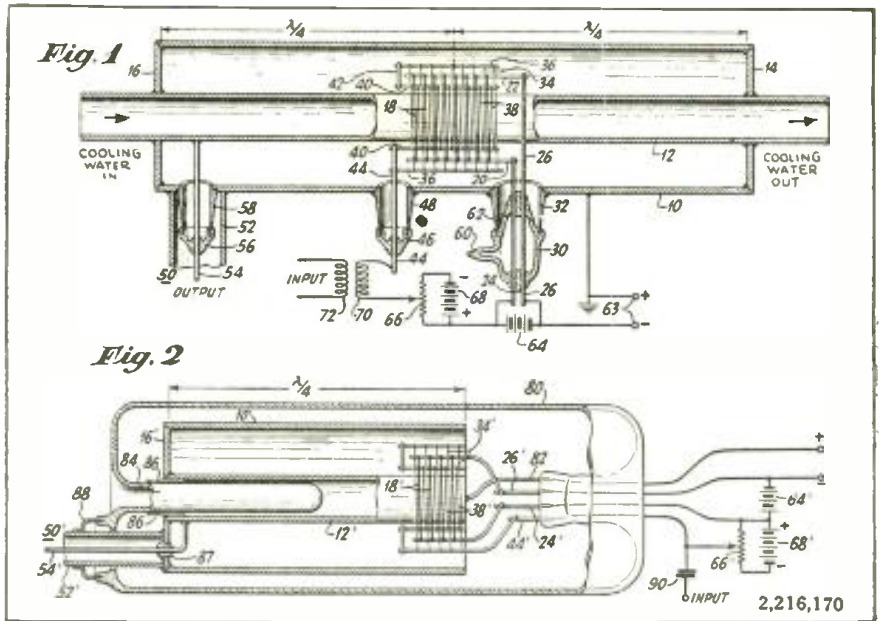
CHARTERED INSTITUTE of AMERICAN INVENTORS

Dept. 109 Barrister Building, Washington, D.C.

ULTRA-HIGH FREQUENCY OSCILLATOR

● THIS patent, No. 2,216,170, was recently issued to Roscoe H. George, and relates particularly to oscillators for developing ultra-high frequency currents. One of the objects of this invention is to provide an oscillator which will be stable in operation and which will also supply a fixed fundamental frequency as determined by the physical dimensions of the oscillator alone. A marked advantage of the present invention lies in the provision of means whereby the oscillator may be cooled through the cir-

culatation of a cooling medium such as water. Where necessary the cooling medium may be readily applied both to the exterior and interior of the oscillator tube proper. The cooling water may be passed through the central tube, as shown in Fig. 1. The two metal tubes and the end members are hermetically sealed and thus provide an evacuated chamber between the tubes, in which the filament, grid and other tube members are mounted. Many other items of interest are included in the patent.

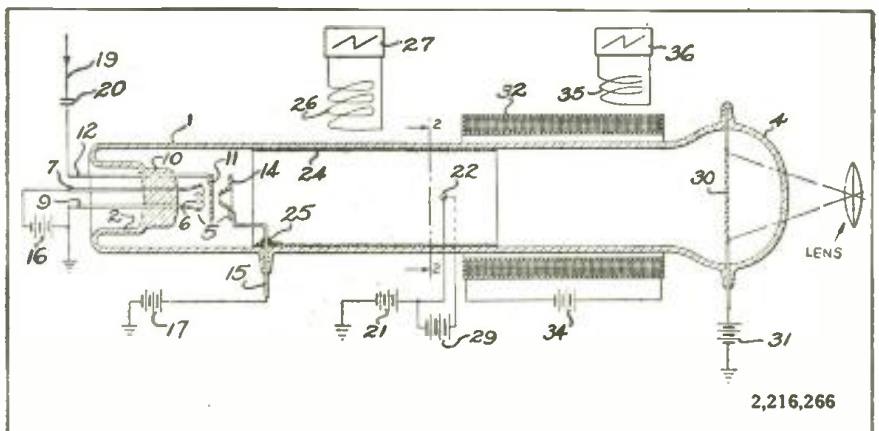


2-STAGE OSCILLOGRAPH

(Front Cover Feature)

● THIS patent, No. 2,216,266, recently issued to Philo T. Farnsworth, covers means of developing an amplified cathode-ray beam within the oscillograph tube; also to provide a method of increasing the beam power; further to yield a more brilliant visual image from a primary beam, etc. Still another object is to provide an oscillograph wherein an electron beam is utilized to produce an incandescent line image. A long evacuated tube terminates at one end by a re-entrant stem and at the

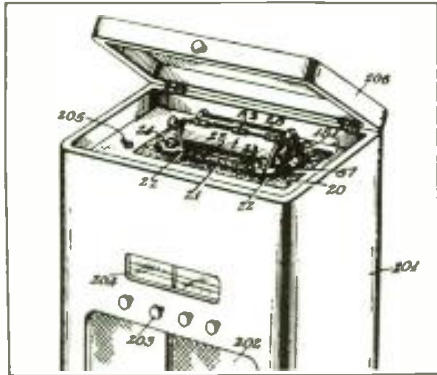
opposite end by an enlarged rounded head. The electron gun directs a signal modulated beam of electrons along the axis of the tube, the electrons being accelerated by a positive potential produced by a D.C. source connected to an intermediate electron-emitting electrode. The impact of the electron beam upon electrode 22 heats it to a degree of incandescence, varying along its length in accord with the variable light intensity of the picture element in corresponding position.



FACSIMILE PATENT

• THE U. S. patent office recently issued to W. G. H. Finch, of Finch Telecommunications, four more patents on his facsimile system.

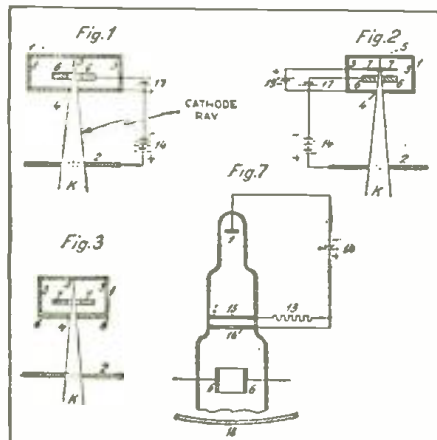
Two of these patents, Numbers 2,212,971 and 2,212,968, cover additional frequencies on his important and well-known automatic



synchronization system. The third patent, No. 2,212,970 covers a multi-stylus or triple pen recorder, while the remaining patent, No. 2,212,969, covers Mr. Finch's system of limiting the surges and recording signal level, thus insuring uniform high-fidelity facsimile reproductions on dry electro-sensitive facsimile paper, such as used with all Finch facsimile recorders.

COLD CATHODE TUBE

• THIS interesting patent was issued to Walter Rogowski and bears the No. 2,210,127. One of the objects of this patent is to provide means for varying the intensity of the electronic ray in a tube having a cold cathode, without altering the shape of the spot. One method of carrying out the invention consists in making the cathode hollow, so as to form a Faraday cage, and to dispose control electrodes in this cage, which are of a symmetrical rotation type. These electrodes must have sufficiently large openings for the ions or the electrons to pass through. (See Figs. 1-3.) In Fig. 1, K denotes the cathode ray; two continuous voltage sources are designated at 14 and 17; this arrangement may constitute a cold cathode ray oscillograph. A control electrode is indicated at 6, and either electrostatic or magnetic control fields may be used. Low voltages may be employed to effect control of the cathode ray in this system.



RADIO & TELEVISION OFFERS YOU 6 COPIES R & T FOR 50c

For a limited time only, and as long as they last, we will send you six back numbers of RADIO & TELEVISION assorted, your choice, for 50 cents.

The usual price for six copies would be \$1.50, and most publishers charge a higher price for back numbers over one year old.

We can supply only the following back numbers: April, Sept., 1931; July, 1932; Jan., 1933; June, Aug., Sept., 1934; May, Aug., Oct., Dec., 1935; 1936—all issues except Apr.; 1937—all issues except Feb.; 1938—all issues except Nov.; 1939—all issues; 1940—all issues to date.

If you do not specify copies, we will send assorted numbers to fill your order. Note, we cannot exchange the copies for ones that have been sent to you.

Every copy of RADIO & TELEVISION contains information which you should have. Here is a chance to get those copies.

As only a small supply of back numbers on

hand, this offer will be withdrawn as soon as they have been sold.

We accept U. S. stamps, U. S. coin, or money order. Rush your order today.

RADIO & TELEVISION 12-40
20 Vesey Street, New York, N. Y.

Gentlemen: I enclose herewith 50c (Foreign: Add 25c for postage), for which you are to send me six back numbers of RADIO & TELEVISION as follows:

Name

Address

City State

PATENTS—TRADE MARKS

Booklet concerning Inventions & Patents Form "Evidence of Conception" with instructions for use and "Schedule of Government and Attorneys Fees"—Free
LANCASTER, ALLWINE & ROMMEL
Registered Patent Attorneys.
436 Bowen Bldg. Washington, D. C.

RADIO AIRCRAFT DETECTOR

• A RADIO system for detecting the presence of aircraft comprising a reproducer apparatus of the television type, adapted to produce a television "scan" or "raster" in any manner well known to the television art. Also means of supplying the apparatus with periodic signals, to enable it to produce the said "raster"; a very short wave radio transmitter; means for modulating the waves transmitted from said transmitter, with a series of periodic signals occurring at a frequency correlated with the scanning line frequency in the "raster"; and finally—a plurality of very short wave radio receivers distributed over the area in which detection is to be effected. A transmission line system connects these receivers with the point where the television reproducer apparatus is located. With no airplane present to reflect the short waves, a vertical black line will appear on the screen of the C-R tube. If a plane appears and causes the wave to be reflected, the line on the raster will change in appearance, as explained in the patent. (No. 2,207,267)

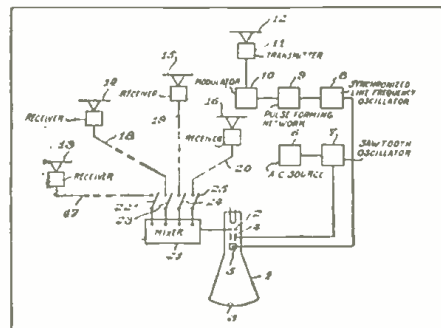
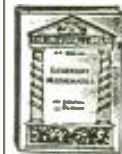


Diagram above shows arrangement of radio aircraft detector. At left—cold cathode tube.



ELEMENTARY MATHEMATICS

• EASY — SIMPLIFIED — PRACTICAL •

HERE is a book for the business man, the technician and craftsman explaining and answering every operation and meaning with interpreting illustrations and examples. It is the key to a simple understanding of many perplexing problems in daily life. In clear, positive and definite language, the author popularizes and clarifies every subject and helps the reader to overcome any apparent difficulty in the study of mathematics. A real home study-course in mathematics for the student or the man who wants to achieve proficiency or desires to brush-up on his knowledge. Entire Chapter on Special Mathematics for the Radio Technician

CONTENTS OF BOOK

CHAPTER I. Arithmetic—Addition—Subtraction—Multiplication—Division.

CHAPTER II. Factoring and Cancellation—Fractions—Decimals—Percentage—Ratio—and Proportion.

CHAPTER III. The Metric System.

CHAPTER IV. How to Measure Surfaces and Capacity (Geometry).

CHAPTER V. Powers and Involutions—Roots and Evolutions.

CHAPTER VI. Mathematics for the Manual and Technical Craftsman—Thermometer Conversions—Graphs or Curve Plotting—Logarithms—Use of the Slide Rule.

CHAPTER VII. Special Mathematics for the Radio Technician.

CHAPTER VIII. Commercial Calculations—Interest—Discount—Short Cut Arithmetic.

CHAPTER IX. Weights and Measures—Useful Tables.

ONLY 50c POSTPAID

"Elementary Mathematics" can be carried readily in your pocket. Send Stamps, Cash or Money Order.

TECHNIFAX

1917 S. State St. RT-1240 Chicago, Ill.

SEE THE FIRST ISSUE OF FLIGHT THE PICTORIAL FLYING REVIEW

Brings you news from the entire world of all important phases of aviation and aeronautics in a non-technical, yet educational manner. Keeps you abreast of all the major developments as fast as they develop anywhere.

Attractive three-color cover, numerous illustrations.

15c a copy

Subscription price \$1.50 a year, Canada and foreign \$2.00.

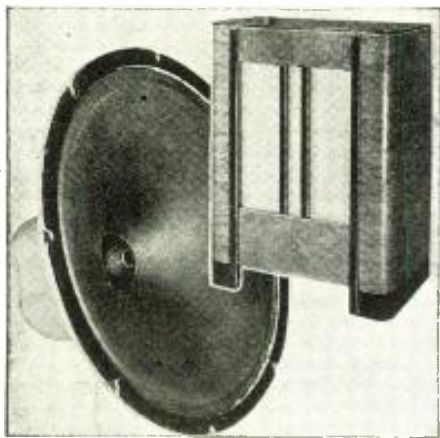
FLIGHT MAGAZINE
20-T Vesey St., New York, N. Y.

New Type Speaker Available Separately

• A NEW 15¼-inch High Fidelity loudspeaker mechanism, available either separately or with wall housing or console cabinet, has been announced by the Commercial Sound Division of the RCA Manufacturing Company. It is designed for use wherever tops in tone quality and fidelity are required, such as in music rooms, audition studios, school auditoriums, dance halls, night clubs, etc.

Also announced was a new type of baffle designed for mounting four 7-inch "accordion edge" High Fidelity RCA loudspeakers in both the new cabinets.

The 15¼-inch permanent magnet loudspeaker handles 15 watts of power, excellent for reproducing phonograph recordings or other sound under conditions of high noise level. The voice coil (impedance 8 ohms) is completely dust proof. It is designated as model MI-6237.



The console designed for the new mechanism is a walnut cabinet unit built to give correct acoustic response. An acoustic phase inverter circuit is built into the cabinet, to extend low frequency response. Model MI-6222; the cabinet stands 32" high, 24" wide and 14" deep.

The wall housing for the new speaker is of heavy veneer, finished in amber grey or, for installations where it is desirable to paint it to match its surroundings, in a neutral color. It measures 28" high, 19" wide and 13" deep, and is designed to give proper acoustic response. It is designated as Model MI-6223.

The new baffle (MI-6224) is cut to mount four RCA 7-inch "accordion edge" loudspeakers (MI-6234) in either the console cabinet or the wall housing mentioned above. Four matching transformers are supplied with and mounted on the baffle.

New FM-AM Radio Receiver

• A NEWLY-ENGINEERED radio receiver which will make available programs broadcast by frequency modulation as well as standard American broadcasts and domestic and foreign short-wave transmission, has been announced by the General Electric radio and television department. The new receiver, designated model JFM-165, is the first combination model to be built by them since the recent formal allocation of commercial frequency-modulation transmission channels by the Federal Communications Commission.

One of the most interesting features of the new receiver to those who have been enjoying the limited FM programs of the past year are the triple beamscopes (built-in antennas). Each antenna has been designed for a special purpose, and in the majority of cases the need for an outside antenna or ground connection has been eliminated. The standard broadcast beamscope is designed for the reception of programs on the standard broadcast band. The new short-wave beamscope, added to



several models in the 1940 line, makes possible the reception of foreign and domestic short-wave programs with a much higher degree of sensitivity than was formerly experienced except by means of a special outside antenna. The "FM" beamscope is a built-in dipole antenna, which eliminates in most circumstances the more complex outside dipole which has been standard for most FM receivers during the past year. In certain areas, and depending to some extent upon the power of the FM station being picked up by the listener, it will still be necessary to rely on an outside antenna of this type. With the growing popularity of frequency modulation because of its static-free characteristics and high-fidelity transmission, it is probable that transmitters of relatively higher power will be placed in service, thus easing the antenna requirements of the set owner.

Actually two receivers in one, the new AM-FM set has two super-powered chassis. The AM system has a rated power consumption of approximately 80 watts, and the FM one of approximately 145 watts. Operating cost of the former is about 1/3 cents an hour, that of the latter about 2/3 cents an hour at national average KWH rates. Each chassis has its own full complement of tubes. There are 12 tuning keys provided in all, on two tuning panels.

The FM, television audio, or phonograph key, on the front panel, automatically permits the listener to enjoy FM reception, television sound broadcasts when used in conjunction with a television picture receiver, or a wired type of record player.

The receiver stands 39½ inches high, 31½ inches wide, and 15 inches deep.

New All-Purpose Controls Simplify Replacements

• THE new Type D All-Purpose Volume Controls recently announced by the International Resistance Company pave the way for important savings in time and effort on the part of servicemen. Not only may these controls be used universally to replace either midget-size or larger, old-style units, but they are easy to install, thanks to the convenience of the new Tap-in Shafts. Moreover, a small stock of the most popular numbers will equip the serviceman for by far the greater percentage of all control replacements. For instance, 18 controls together with 6 switches and 5 special, extra Tap-in Shafts handle from 60% to 75% of all control replacements as shown by actual records.

4 New RCA Tubes

• RCA recently introduced four new tubes—three new transmitting tubes and a receiving tube, as follows:

RCA-833-A—R.F. Power Amplifier, Modulator
RCA-1627—R.F. Power Amplifier, Modulator
RCA-8003—Oscillator, Power Amplifier, Modulator

RCA-12A6—Beam Power Amplifier

The 833-A is a transmitting triode similar to RCA-833, but it has an improved construction and can be operated at higher output with forced-air cooling. The 833-A has a maximum plate dissipation rating of 450 watts (ICAS). It can be operated in class C telegraph service with a maximum input of 2000 watts (ICAS) at frequencies as high as 20 megacycles. The 833-A is directly interchangeable with the type 833 in circuits designed for the latter.

The 1627 is a transmitting triode the same as RCA-810, except that it is designed with a filament rated at 5 volts, 9 amperes. Other data are the same as for RCA-810.

The 8003 is a transmitting triode having a maximum plate dissipation of 100 watts. In self-rectifying oscillator circuits such as those used in therapeutic applications, two 8003's are capable of delivering a useful power output (at 75% circuit efficiency) of 375 watts. The 8003 is rated for operation at frequencies as high as 30 megacycles but it may be used with reduced plate voltage and input at higher frequencies up to 50 megacycles.

The 12A6 is a beam power amplifier of the metal type with a 12.6-volt, 0.15-ampere heater for use in A.C./D.C. receivers. With 250 volts on plate

Jr. Type Marine Radiophone

• TO more precisely meet the communications requirements of small boats, and of larger boats with moderate off-shore cruising range, Hallcrafters announce the Model HT-11 compact marine radiophone, which combines modest initial cost, with the lowest ship's battery drain consistent with reasonable working range.

The HT-11 includes a transmitter and receiver, all housed in one sturdy, corrosion-proofed metal cabinet only 14½" x 8¾" x 9¼". The standard power supply is a separate unit connected to the other by cable. This power supply operates from either 6-volt or 12-volt battery sources, or a special 110-volt, 60-cycle supply is available which may be driven from a 110-volt a.c. source or from a 32-volt or 110-volt d.c. converter.

The transmitter section provides 12 watts into the antenna and a choice of three gang-switched and crystal-controlled operating frequencies. These three channels are adjusted and pre-tuned during installation and thereafter need no further attention.



The receiver covers the "broadcast" and "marine" radiophone bands and consists of a 6SK7 r.f. stage, 6K8 mixer, 6SK7 i.f. amplifier, 6SQ7 detector-a.v.c.-audio, 6K6G output stage and two 6X5G rectifiers. The output is heard through a built-in speaker for "stand-by" service, or through the handset during actual communication. The handset is equipped with a push-button "send-receive" switch for instantaneous changeover during communication.

New Constant-Pressure Contact Band for Adjustable Resistors

• AN entirely new type of band for adjustable tubular power resistors developed by International Resistance Company eliminates annoying problems frequently met with in using units of this type.



The design and construction of the new adjustable band are such as to assure positive pressure at all times, without danger of wire breakage or damage without oxidation or corrosion at point of contact. The band cannot be adjusted too tightly and is designed and tempered for temperatures above those met in resistor operation.

The band is of cold-rolled steel, heavily cadmium plated. Contact is made through an opening in the band by a corrosion-proof silver button spot-welded to a stainless steel spring spot-welded to the outer surface of the band. Thus, no matter how much the band itself is tightened, the pressure of the button on the windings remains safe, constant and positive. No matter how often the band may be readjusted for tapping off different resistance values, there is no danger of damaging the resistance windings.

and screen, the 12A6 can handle a power output of 2.5 watts with 10% distortion.

8003 Oscillator, Power Amplifier, Modulator

RCA-8003 is a transmitting triode suitable for use as a power amplifier, modulator, and oscillator. In class C telegraph service, it has a typical power output of 250 watts. In self-rectifying oscillator circuits such as those used in therapeutic applications, two 8003's are capable of delivering a useful power output (at 75% circuit efficiency) of 375 watts. The 8003 is rated for operation at frequencies as high as 30 megacycles but it may be used with reduced plate voltage and input at higher frequencies up to 50 megacycles.

The 8003 has a construction which provides high insulation resistance between its electrodes. This

feature enable the tube to withstand high peak voltages.

Characteristics and Ratings

Filament Voltage (A.C. or D.C.)	10.0 Volts
Filament Current	3.25 Amperes
Amplification Factor	12
Direct Inter-electrode Capacitances:	
Grid-Plate	11.7 uuf
Grid-Filament	5.8 uuf
Plate-Filament	3.4 uuf
Bulb	T-20
Cap	Medium Metal
Base	Jumbo 4-Large Pin

Maximum CCS Ratings with Typical Operating Conditions

As R.F. Power Amplifier—Class B Telephony
Carrier conditions per tube for use with a max. modulation factor of 1.0

D.C. Plate Voltage	1350 max. Volts
D.C. Plate Current	150 max. Ma.
Plate Input	150 max. Watts
Plate Dissipation	100 max. Watts
Typical Operation:	
D.C. Plate Voltage	1350 Volts
D.C. Grid Voltage	-110 Volts
Peak R.F. Grid Voltage	135 Volts
D.C. Plate Current	110 Ma.
D.C. Grid Current (Approx.)	1.5 Ma.
Driving Power (Approx.)**	8 Watts
Power Output (Approx.)	50 Watts

As Plate-Modulated R.F. Power Amplifier—
Class C Telephony
Carrier conditions per tube for use with a max. modulation factor of 1.0

D.C. Plate Voltage	1100 max. Volts
D.C. Grid Voltage	-400 max. Volts
D.C. Plate Current	200 max. Ma.
D.C. Grid Current	50 max. Ma.
Plate Input	220 max. Watts
Plate Dissipation	67 max. Watts
Typical Operation:	
D.C. Plate Voltage	1100 Volts
D.C. Grid Voltage	-260 Volts
From a grid resistor of	6500 Ohms
Peak R.F. Grid Voltage	430 Volts
D.C. Plate Current	200 Ma.
D.C. Grid Current (Approx.)**	40 Ma.
Driving Power (Approx.)**	15 Watts
Power Output (Approx.)	167 Watts

As R.F. Power Amplifier and Oscillator—
Class C Telegraphy
Key-down conditions per tube without modulation

D.C. Plate Voltage	1350 max. Volts
D.C. Grid Voltage	-400 max. Volts
D.C. Plate Current	250 max. Ma.
D.C. Grid Current	50 max. Ma.
Plate Input	330 max. Watts
Plate Dissipation	100 max. Watts
Typical Operation:	
D.C. Plate Voltage	1350 Volts
D.C. Grid Voltage	-180 Volts
From a fixed supply of	5000 Ohms
From a grid resistor of	630 Ohms
Peak R.F. Grid Voltage	350 Volts
D.C. Plate Current	245 Ma.
D.C. Grid Current (Approx.)**	35 Ma.
Driving Power (Approx.)**	11 Watts
Power Output (Approx.)	250 Watts

As Self-Rectifying Oscillator

A.C. Plate Voltage (RMS)	1500 max. Volts
D.C. Grid Voltage	-400 max. Volts
Peak R.F. Grid Voltage	550 max. Volts
D.C. Plate Current	200 max. Ma.
D.C. Grid Current	40 max. Ma.
Plate Input	330 max. Watts
Plate Dissipation	100 max. Watts
Typical Operation in push-pull circuit at 25 Mc.:	
Unless otherwise specified, values are for 2 tubes	
A.C. Plate Voltage (RMS)	1500 Volts
Grid Resistor	5000 Ohms
D.C. Plate Current	400 Ma.
D.C. Grid Current (Approx.)	40 Ma.
Power Output (Approx.)	500 Watts
Circuit Power Output (75% circuit efficiency)	375 Watts

*Averaged over any audio-frequency cycle of sine-wave form.
 **Grid voltages are given with respect to the mid-point of filament operated on A.C. If D.C. is used, each stated value of grid voltage should be decreased by one-half the filament voltage and the circuit returns made to the negative end of the filament.
 *At crest of audio-frequency cycle with modulation factor of 1.0.
 **Subject to wide variations depending on the impedance of the load circuit. High-impedance load circuits require more grid current and driving power to obtain the desired output. Low-impedance circuits need less grid current and driving power, but plate-circuit efficiency is sacrificed. The driving stage should have a tank circuit of good regulation and should be capable of delivering considerably more than the required driving power.
 **Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

10 BEST RADIO BOOKS 10¢ ea.

RADIO FANS EVERYWHERE—these fine ten cent text books give you an excellent foundation for the study of RADIO. They are clearly written, profusely illustrated and contain over 15,000 words in each book. You'll be

amazed at the wealth of information contained in these handy books. Excellent for reference—ideal for every technical library. YOUR MONEY BACK if you are not satisfied. PROMPT SHIPMENTS



No. 1
HOW TO BUILD FOUR DOERLE SHORT WAVE SETS
 Thousands of radio fans have built the famous DOERLE Short Wave Radio Receivers. So insistent has been the demand for these receivers, as well as construction details, that this book has been specially published. Contains EVERYTHING that has ever been printed on these famous receivers.

No. 2
HOW TO MAKE THE MOST POPULAR ALL-WAVE 1- and 2-TUBE RECEIVERS
 This book contains a number of excellent sets, some of which have appeared in past issues of RADIO-CRAFT. These sets have been carefully engineered. They are not experiments. Not only are these sets described in this book, but it contains all of the illustrations, hookups, etc.



No. 3
ALTERNATING CURRENT FOR BEGINNERS
 This book gives the beginner a foothold in electricity and Radio. Electric circuits are explained. Ohm's Law, one of the fundamental laws of radio, is explained; the generation of alternating current; sine waves; the units—volts, amperes, and watts are explained. Condensers, transformers, A.C. instruments, inductors and Generators.

No. 4
ALL ABOUT AERIALS
 This book explains the theory underlying the various types of aerials; the inverted "L", the Doublet, the Doublet Doublet, etc. It explains noise-free reception, how low-impedance transmission lines work; why transposed lead-ins are used. It gives in detail the construction of aerials suitable for long-wave broadcast receivers, for short-wave receivers and for all-wave receivers.



No. 5
BEGINNERS' RADIO DICTIONARY
 Are you puzzled by radio language? Can you define Frequency? Kilocycle? Tetrode? Screen grid? Baffle? Anode? Triode? Pole? Ionization? Joule's Law? Harmonic? Gravity Coil? If you cannot define these very common radio words and dozens of other, more technical, terms used in all radio magazines and instruction books, you need this book in your library.

No. 6
HOW TO HAVE FUN WITH RADIO
 Stunts for parties, practical jokes, scientific experiments and other amusements which can be done with your radio set are explained in this fascinating volume. It tells how to make a newspaper talk—how to produce silent music for dances—how to make a visible music—how to make a "silent radio" unit usable by the deafened—how to make toys which dance to radio music, etc., etc.



No. 7
HOW TO READ RADIO DIAGRAMS
 All of the symbols commonly used in radio diagrams are presented in this book, together with pictures of the apparatus they represent and explanations giving an easy method to memorize them. This book by Robert Eichberg, the well-known radio writer and member of the editorial staff of RADIO-CRAFT Magazine, also contains two dozen picture-wiring diagrams of simple radio sets that you can build.

No. 8
RADIO FOR BEGINNERS
 Hugo Gernsback, the internationally famous radio pioneer, author and editor, whose famous magazines, RADIO AND TELEVISION and RADIO-CRAFT are read by millions, scores another triumph with this new book. Any beginner who reads it will get thorough ground work in radio theory, clearly explained in simple language, and through the use of many illustrations. Analogies are used to make the mysteries of radio clear.



No. 9
SIMPLE ELECTRICAL EXPERIMENTS
 Over 100 interesting and practical electrical experiments are described in this book, covering every branch of electricity—many simple experiments which may be carried out with simple apparatus, most of which can be found about the home.

No. 10
TELEVISION
 Every one is asking the question: How does television work? This book explains all of the different systems of television from the simplest to the most complex. It describes in A-B-C style just how the image is scanned, how the scene is picked up by the television camera and broadcast to your home, etc. Various types of television systems are described.



BOOKS ARE ALL UNIFORM

Every book in the GERNSBACK EDUCATIONAL LIBRARY has 32 pages—with illustrations varying from 30 to 66 in number. Each title volume contains over 15,000 words. Positively radio's greatest book buys! If you do not think these books worth the price asked, return them in 24 hours and your money will be instantly refunded.

RADIO PUBLICATIONS • 20 VESEY STREET • NEW YORK, N. Y.

RADIO PUBLICATIONS, Dept. RT-12-40
 20 VESEY STREET, NEW YORK, N. Y.
 Gentlemen: Please send immediately, POSTPAID, the book numbers circled below, I am enclosing cents—each book being 10c.

1	2	3	4	5	6	7	8	9	10
								NEW	NEW

Send FREE listing of 48 new 10c publications.

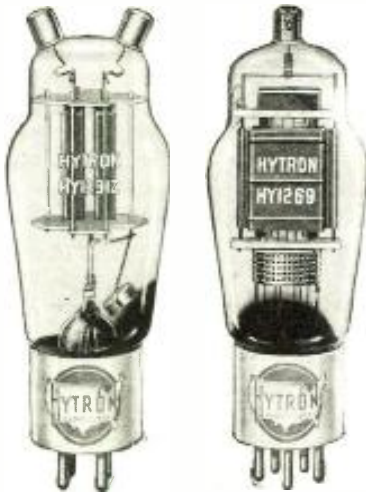
Name Address

City State

Remit by check or money order—register letter if you send cash or unused U. S. postage stamps.

MAIL COUPON TODAY!

Two New Tubes



● THESE 12 volt series tubes have been designed for mobile type operations and aircraft and marine services. They incorporate the same outstanding features which have made the Hytron HY69 and HY31Z's popular.

The HY1269 will deliver up to 50 watts RF output, while the HY1231Z will deliver up to 51 watts undistorted power output. Both of these tubes have instant-heating type filaments, which eliminate power drain during "stand-by."

Type HY1231Z

General Characteristics

Filament voltage (A.C. or D.C.) 11.4 to 13.2 volts
 Filament current 1.25 amperes
 Mutual conductance (per section) 1800 umhos
 Average amplification factor 45
 Bulb ST16
 Maximum overall length 5 3/4 inches
 Maximum seated height 5 1/16 inches
 Maximum diameter 2 1/16 inches
 Net weight 2 1/2 ounces
 Plate leads metal top caps
 Base 4-pin ceramic

Inter-Electrode Capacitances (per section)

Grid to plate 5.0 mmf.
 Grid to filament 5.0 mmf.
 Plate to filament 1.9 mmf.

Class B Modulator, R.F. Amplifier, Oscillator, Frequency Multiplier

The Hytron HY1231Z is a twin triode transmitting tube of the high- μ type for use as a zero-bias Class "B" modulator, radio-frequency amplifier, oscillator, and audio-frequency amplifier. The HY1231Z has an instant heating thoriated-tungsten filament and has been designed spe-

cifically for mobile operation as a companion tube and modulator for the HY1269.

Maximum CCS Ratings and Typical Operating Conditions

Class "B" Audio Amplifier-Modulator (Values for one section)
 D.C. plate voltage 500 max. volts
 Maximum signal D.C. plate current* 75 max. ma.
 Maximum signal plate input* 37.5 max. watts
 D.C. grid current 15 max. ma.
 Plate dissipation* 15 max. watts

Typical Continuous-Service Operation for Both Sections

D.C. plate voltage	300	400	400	500	volts
D.C. grid voltage	0	0	0	0	volts
Peak AF grid to grid voltage	104	140	98	131	volts
Zero sig. D.C. plate current	20	25	25	36	ma.
Max. sig. D.C. plate current	100	130	100	150	ma.
Max. sig. grid current	20	28	16	30	ma.
Load resistance per tube	1250	1250	1750	1750	ohms
Plate to plate effective load	5000	5000	7000	7000	ohms
Max. sig. grid driving power	1.4	2.0	1.2	1.8	watts
Max. sig. power output	18	40	24	51	watts

* Averaged over any audio-frequency of sine-wave form.
 # Continuous service.

Typical Operation for Two Tubes Class AB₂

Plate Voltage	500	400	600	600	volts
Screen Voltage	250	250	300	300	volts
DC grid Voltage	-25	-25	-25	-35	volts
Peak AF grid to grid voltage	106	145	120	145	volts
Zero signal DC plate current	60	60	65	65	ma.
Max. signal DC plate current	150	170	200	200	ma.
Max. signal DC screen current	23	14	23	18	ma.
Max. signal DC grid current	4.0	5.0	5.0	5.0	ma.
Load resistance per tube	1000	1000	1250	1250	ohms
Effective plate to plate load	4000	4000	5000	5000	ohms
Max. sig. driving power*	0.25	0.4	0.3	0.4	watts
Max. signal power output**	30	40	65	78	watts

Type HY1269

R.F. Amplifier, Oscillator, Class AB₂ Audio Amplifier Frequency Doubler

Hytron HY1269 is a filament-type transmitting tube of Beam-Tetrode design incorporating efficient inter-electrode shielding and high insulation factor. The HY1269 affords extremely high power sensitivity as an audio-amplifier and very high plate efficiency as an R.F. oscillator, amplifier or frequency doubler. Surprisingly high output is obtainable from a single HY1269 as a crystal oscillator due to the high amplification factor and the small transfer of energy from plate to grid. Because of its well suited characteristics, the HY1269 operates as a Class "C" doubler at high efficiency with relatively high power output. The internal structure of the HY1269 permits operation at maximum ratings at frequencies up to 60 megacycles. The maximum plate dissipation of the HY1269 is 40 watts.

The instant heating filament (thoriated tungsten) has been designed so that the tube filament may be controlled by the same switch or relay as the plate-supply motor generator, thereby eliminating the need for burning the filament during standby, consequently reducing battery drain. The usual push-to-talk circuit applying plate voltage during transmission should be employed.

When the HY1269 is used with an instant-

operating plate power supply the application of the plate potential must lag the application of the filament power by approximately 1 second.

General Characteristics

Filament Voltage (A.C. or D.C.) 11.4 to 13.2 volts
 Filament Current 1.25 amp.
 Mutual Conductance 3000 umhos
 Average Amp. Factor 140
 Bulb ST16
 Max. Overall Length 5 3/4"
 Max. Diameter 2 1/16"
 Net Weight 2 1/2 oz.
 Cap small metal
 Base Med. 5-pin ceramic

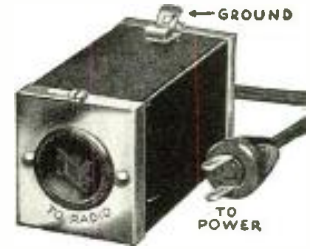
Maximum Ratings and Typical Operating Conditions

As push-pull amplifier—Class AB₂ (fixed bias)
 D.C. Plate Voltage 600 max. volts
 D.C. Screen Voltage (Grid #2) 300 max. volts
 Max. Signal D.C. Plate Current* 120 max. ma.
 Max. Signal Plate Input* 72 max. watts
 Max. Signal D.C. Screen Current 15 max. ma.
 Screen Input* 5.0 max. watts
 Plate Dissipation* 40 max. watts

New Line Filter

● HERE is a new Line Filter, which is claimed to eliminate all line noises. It may be used to prevent crackling and sizzling in your radio set, caused by household appliances, motors and high-frequency disturbance pickup from power lines. It requires no adjustment or attention.

The device combines both inductive and capacitive filtering, with duo-lateral wound choke and impregnated paper dielectric condensers. Comes complete in chromium and black KemArt metal case, with approved rubber cord and unbreakable plug. Made by the J. W. Miller Co.



Line Filter

New Radio Catalogs

Radio Dictionary

● A VALUABLE dictionary of radio terms, edited by L. O. Gorder, Professor of Radio Engineering at Chicago Technical College, has been issued by the Allied Radio Corp. of Chicago. The subjects are arranged in alphabetical order and wherever necessary suitable illustrations of the apparatus described are included. A valuable chart for the student shows all of the radio symbols used in wiring diagrams. This 36 page dictionary, measuring 6x9 inches, printed on good quality paper with stiff paper covers, will be found very useful.

New Allied Catalog

● THE 1941 catalog of the Allied Radio Corp. of Chicago contains 208 pages and has a very beautiful cover in colors, showing Elmer Davis reading the day's news in the CBS studio. Every imaginable type of radio set as well as parts of all kinds for service men, are elaborately illustrated and described. A new line of miniature radio receivers is included, with two new miniature portable sets of the personal type, resembling a camera in style. Ham apparatus including all the standard receivers, antennas, etc., are listed and illustrated, as well as public address amplifiers and allied equipment of every size—from a few watts up to 75 watts. Servicemen's test equipment is illustrated and described in elaborate profusion; a great assortment of tubes are likewise included. A number of new "portables," including three-way types, are listed and shown; also console-type receivers with provision for making your own records.

Stromberg-Carlson F-M Booklet

● A VERY interesting booklet describing the features of frequency modulation broadcasting has been brought out by the Stromberg-Carlson Co. and the various features of their line of F-M receivers are illustrated and described therein. The special features of their labyrinth and carpinchoe speakers are illustrated and described.

"Sun" Sound Systems

● A NEW 1941 catalog has just been brought out by the Sun Radio Co., of New York City, illustrating and describing their new line of Public Address systems. All sizes of amplifiers and speakers are described and illustrated, from those giving 6 watts—all the way up to elaborate 50-watt systems, intended for school and stadium requirements. An interesting assortment of pickups and loudspeakers as well as phono motors are described and illustrated.

Birnbach Radio Co. Catalog

● THE Birnbach Co. have recently issued their new catalog No. 41 on radio wires and cables, hardware, antennas, and ceramics. This catalog will appeal to every radio set-builder, Ham, and service man. A very complete line of radio wire, cables and hardware is illustrated and described, including doublet antennas for television and frequency-modulation reception. A couple of valuable graphs are given, from which the lengths of the elements of ultra-high frequency antennas may

be deduced, without any tedious mathematical calculations. Every imaginable type of radio knob, plug, jack and test cord is shown in the new catalog, plus all types of insulating tubing, wire and cable.

The Daven Company

● THIS elaborate catalog describes every imaginable type of variable resistor, attenuator, and measuring device for use in commercial or advanced amateur radio stations. A valuable chart and table is included, showing the different types of attenuators. A graphic curve is given for each type of variable resistance network illustrated, so that the designer can tell just which type of attenuator to select. Among the other pieces of apparatus covered in this catalog are—fixed attenuators, decade resistor units, output meters, volume level indicators, decade voltage divider, logarithmic resistors, transmission measuring set, and program line equalizers.

Allen B. Du Mont Laboratories

● A BEAUTIFUL new catalog containing 68 pages illustrates the complete line of Du Mont cathode-ray instruments, including oscillographs of all types and television image tubes. Other apparatus illustrated and described are synchronizing-signal generators, television cameras, television signal generators, variable frequency stimulator, electronic switch, cathode-ray modulator monitor, etc. An interesting table on all sizes of cathode-ray tubes from 3-inch up to 20-inch diameter is included, giving the anode voltage, etc.

New Radio Apparatus

New "Pack" Catalog

● PACK catalog No. 109-C is now offered by the Standard Transformer Corporation, Chicago, in addition to their Service Guide, Hammanual and Complete Catalog. This valuable book contains information on many stock packs manufactured by Stancor. A wide assortment of filtered and non-filtered "packs" are shown, together with technical data and operating graphs on each.

In this catalog will be found "packs" for use in portable battery radios, to convert them for use on 115 volt A.C., 115 volt D.C. and 6 volt D.C. There are model railway packs, units designed to operate pin games, packs for auto radio demonstration work, time clocks, etc. Other packs to be used in electro-plating, to operate telephones, for the operation of solenoids, etc. In fact, many uses will be suggested by the wealth of information contained in the book itself.

New R.C.P. Catalog

● RADIO City Products Co., Inc. announce a Supplementary Catalog (No. 123) covering a number of new pieces of test equipment which have been added to their line for the 1940-41 season, since the issuance of their Master Catalog. Included in these new items are several Tube-Testers, all featuring the new "Rolindex" tube chart; Multi-meters featuring high-speed testing; general test units; combination Tube and Set testers, etc.

Copies are obtainable without charge by addressing the manufacturer, or from the Service Dept., RADIO & TELEVISION, 20 Vesey St., New York, N. Y.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933.

OF RADIO & TELEVISION, published monthly at Springfield, Mass., for October 1, 1940.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared H. Gernsback, who, having been duly sworn according to law, deposes and says that he is the editor of Radio & Television, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912 and as amended by the Act of March 3, 1933, embodied in 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, Popular Book Corp., 20 Vesey St., New York, N. Y.; Editor, H. Gernsback, 20 Vesey St., New York, N. Y.; Managing Editor, H. Winfield Secor, 20 Vesey St., New York, N. Y.; Business Managers, none.

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.) Popular Book Corp., 20 Vesey St., New York, N. Y.; D. Gernsback, 20 Vesey St., New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent 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 shown above is: (This information is required from daily publications only.)

H. GERNSBACK, Publisher.

Sworn to and subscribed before me this 2nd day of Oct., 1940.

MAURICE COYNE, Notary Public.

Notary Public, N. Y. Co. No. 104
(My commission expires March 30, 1942.)

COMMERCIAL NOTICES 10¢ A WORD

Under this heading only advertisements of a commercial nature are accepted. Remittance of 10c per word should accompany all orders. Copy should reach us not later than the 10th of the month for the second following month's issue.

CODE MACHINES

AYERS ALL ELECTRIC CODE Practice Machines. Low monthly rental, 50,000 words practice tapes. World's Champion code machine designed by T. R. McElroy, World Champion telegrapher. Write N. C. Ayers, 711 Boylston St., Boston, Mass. Dept. C.

DIATHERMY MACHINES

DIATHERMY, SHORT-WAVE Therapy, and ultra short-wave therapy machines custom-built by radio engineer at considerable saving over commercial machines; 6 meters, 16 meters or any other frequency specified can be furnished. Machines substantially built with high patient safety factor. 250-300 watts output. Neat professional appearance. Automatic safety time switches. All necessary pads and electrodes. For sale only to physicians, hospitals, and sanatoriums. Prices from

\$195.00 to \$300.00. Not for sale to the general public. Write for further information giving your own specifications and requirements. Allan Stuart, P.O. Box 58, Teaneck, N. J.

INSTRUCTION

\$15.00 STEAM ENGINEERING Course—6 vols. \$4.50; Radio and Electrical text-book bargains—get list. Life of Napoleon, 3 de luxe volumes \$3.00. \$10.00; New Cyclopaedia of Science, 1300 pp. \$1.50; Hopkins' "Experimental Science," 2 vols. \$3.50. Harry Ackerson, Box 322, Ramsey, N. J.

MOTORS

RECONDITIONED MOTORS, 1/50 HP. AC-DC. Nickel \$1.50; 1/30 HP. Black \$2.50. Fully guaranteed. F.O.B. New York. Wonderful value limited quantity. Act promptly! Gold Shield Products, Dept. 124, 350 Greenwich St., New York City.

PATENT ATTORNEYS

INVENTORS — PROTECT YOUR rights before disclosing your invention to anyone. Form "Evidence of Conception"; "Schedule of Government and Attorneys' Fees" and instructions sent free. Lancaster, Allwine & Rommel, 436 Bowen Building, Washington, D. C.

PHOTOGRAPHIC

FILMS VAPORATED FREE. FINE Grain with Kodak prints 5 or 8 exposures developed, rolled double size up to and including 116-35c. 35 M.M. developed, each good frame enlarged to 3 x 4—\$1.00. 35 M.M. reloads with Eastman film 3 for \$1.00. Box 1109, Hollywood, Calif.

TELEVISION

TELEVISION TUBES, DISKS, MOTORS. Arthur Pohl, 2304 Scouten, Detroit, Mich.

FOR SALE (NOT COMMERCIAL) 3¢ A WORD

Under this heading we accept advertisements only when goods are offered for sale without profit. Remittance of 3c per word should accompany all orders. Copy should reach us not later than the 10th of the month for the second following month's issue.

RECONDITIONED GUARANTEED

communications receivers cheap. Free trial. Terms. Hallcrafters, Nationals, Hammarlunds. RMEs, RCAs, Howards, and all other makes and models at lowest prices. Write for free list. W9ARA, Butler, Missouri.

HAVE SUPREME SIGNAL GENERATOR and Frequency Modulator 582A, three months old, cost \$66.95, sell for \$35.00 cash. A. Fama, Plaquemine, La.

AUDIO OSCILLATOR — \$2.00. SWLCO, 16 Sanker Street, Medford, Mass.

DON'T BUY A RECEIVER UNTIL you get my free list of reconditioned, guaranteed Receivers! Practically all models at money saving prices. Trade-ins. Time Payments. Send for list. W2AVA, 12 West Broadway, New York.

BARTER AND EXCHANGE — 1¢ A WORD

NO ADVERTISEMENT TO EXCEED 35 WORDS, INCLUDING NAME AND ADDRESS

Space in this department is intended solely for the benefit of our readers, who wish to BUY or EXCHANGE anything in the Radio, Television and Photographic fields for Radio, Photographic and other merchandise; therefore we charge only 1c a word. Each word in a name and address is counted. Remittances should accompany orders.

Only one advertisement can be accepted from any reader in any one issue.

Copy should reach us not later than the 10th of the month for the second following month's issue.

We cannot accept responsibility for any statements made by the readers. All dealings MUST be above board. Remember you are using the U. S. mail in all these transactions and therefore you are bound by the U. S. Postal Laws. Describe anything you offer accurately and without exaggeration. Treat your fellow men the way you wish to be treated. We welcome suggestions that will help to make this department interesting and helpful to our readers.

WILL EXCHANGE NEW RADIO receiving and transmitting parts, tubes, receivers, Rider's Manuals, etc., for old U. S. stamps. Major Fred Luther Kline, Kent, Ohio.

HAVE RADIO PARTS, V-O-M, POWER pack, speaker; list on request—trade or Royce Saxton, RI, Pontiac, Ill.

WANTED: R.C.A. 106 XTAL Receiver or equal, parts list for your reply. Schoonover, Oakland, N. J.

METERS, ANALYZERS, CHECKERS, receivers, tubes, adapters, parts, magazines, manuals, tools, trombone, etc. for what have you? Roby, 6303 Kenwood, Chicago.

HAVE AC AND DC METERS, ANALYZERS, tubes, checkers, rectifiers, pickups, buzzers, Xtal, parts, receivers, telephones, magazines, books, manuals, trombone, rifles, fence charger, micrometers, tools, etc. — for what? Roe, 6144 South Park, Chicago.

SWAP—AUTO RADIO, SPEAKERS, B Eliminator, Trickle chargers, key, I-Mil and ¼ W. Neoms, Radio parts, Electric Shaver, Violet Ray Oscillator, Vacuum Motors. Want: Mike, pickup, service manuals, testing equipment, or what have you. Charles H. Wallace, 532 Foster Rd., Princess Bay, Staten Is., New York.

SWAP UNITED STATES, BRITISH Colonial stamps for radio equipment. J. Weiss, 547 E. 105 St., Cleveland, Ohio.

HAVE SUPREME 592 MULTIMETER, cost \$44.00, six months old. Will trade for portable recorder or what have you. A. Fama, Plaquemine, La.

WANTED—NATIONAL 3580 "B," carbideium crystal and loose coupler. Behringer, Oakland, N. J.

HAVE AUTO RADIO, CAMERAS, projector, enlarger, mikas, pickups, books, records, player, many others. Want photo books, films. Swap lists. M. Epstein, 2953 Ruckle, Indianapolis, Ind.

HAVE SMALL KELSEY PRINTING press and type. Arkus candid camera. Electric vibrating machine. Warner Electroplating outfit. One Minute post-card camera, 1 ½ gross bottles of "Footprint." Stamping machines. In exchange for — S. Hartman, 728 E. 9th St., N. Y. City.

SWL EXCHANGE

This department is for the benefit of all short wave listeners who wish to exchange SWL cards. Remittance of 1c a word for each word in the name and address should accompany order.

UNITED STATES
PAUL ANKERMAN, 404 Lima Street, Wapakoneta, Ohio
O. HARNESON, 6332 Metropolitan O. Station, Los Angeles
R. BOULLE, W9BEH, 159 Orchard St., City Island, New York
JOE & AL KAISER, 318 West Market St., Mahanoy City, Penna.
MERT MEADE, W9KXL, 819 Wyandotte, Kansas City, Mo.
GEO. M. RUDENHIMER, W9K3, Box 162, Exello, Ohio
LEE ROY TALLANT, R.F.D. No. 3, Lincoln Highway, Irwin, Penna.
GEORGE TURKEY, 1020 Fourth St., S.W., Massillon, Ohio

TRADE: WRITE FOR MY LIST of transmitting, receiving parts, meters, tubes, modulation transformers, battery portable, magazines and other equipment, new and used, collected during my ten years in amateur radio. Must dispose. W9BON, 3940 Grenshaw, Chicago, Ill.

R.C.A. MODEL 155 COMMUNICATIONS Receiver in perfect electrical and mechanical condition. What have you to offer in trade? Marvin Shellhauser, Tamata, Pa.

WILL EXCHANGE KODAK AUTO-focus enlarger, anastigmat F-6.3 lens, built in red filter, calibrated focal range. Will take negatives up to 4 ½ x 6. 15 x possible. Want fast camera. W. Miller, M. U.S.C.G., Ellis Is., New York, N. Y.

TRADE—BEST OFFER ACCEPTED. Complete 120 watt tube transmitter, new and guaranteed. Will trade for HQ 120 or N.C. 100A or similar receiver. Also new Stancor 1-10 all coils and slugs and mikas. Write for details. E. Wooster, Freshurk, Ohio.

WILL TRADE SIX NEW 32x6 truck tires for factory built communications receiver or transmitter. Must be modern equipment. O. Link, High Bridge, Wisconsin.

TRADE: 33,000 COMMON U. S. AND foreign stamps in good condition, for H. G. Cist's Space Explorer, Model 7-B, factory built model wanted. Robert J. Kolb, 5139 Enright Ave., St. Louis, Mo.

BOOK REVIEW

(Continued from page 465)

RADIO OPERATORS' LICENSE GUIDE by Wayne Miller; 155 pages, stiff cloth covers, illustrated, published by Wayne Miller, Chicago, Illinois.

This extremely important and timely radio guide contains over 1250 answers to radio questions which are likely to be asked in operators' license examinations. The book is right up-to-date and contains diagrams where necessary, together with short concise answers to the general type of questions encountered by those applying for radio operators' license, following those given in the new Federal Communications Commission study guide. The author is a radio communications engineer of many years' experience and the answers given to the

various questions have been very carefully prepared, so that they may be clearly understood by the student. The value of such a book will be at once realized by every radio student who has attempted to find answers to many problems by reference to half a dozen or more text-books. Here one does not have to read his head off and try to digest several chapters on theory, before he can formulate an answer to a fairly simple question. Besides the many circuits illustrated and described, other vital radio subjects covered in concise "question and answer" form are: Basic Radio Laws, Radio Theory and Practice, Radiotelephony—both elementary and advanced, Radio Telegraphy, F.C.C. Rules and Regulations governing radio operators, Abbreviations used by operators, etc.

FREE CATALOGS and INFORMATION

By carefully reading the advertising columns, you will find many offers to furnish literature containing valuable technical information that will help you in your work. Use this list freely.

Firm	Business	Offer	No.	Cost	Adr. Page
ABC Radio Laboratories	Set Mfr.	Information		Free	477
Acme S. W. Radio Co.	Kit Mfr.	Circular		Free	477
Allied Engineering Institute	Kit Mfr.	Circulars		Free	469
Allied Radio Corp.	Mail Order	1941 Fall Radio Catalog		Free	463
		New Radio Dictionary		10c	
American Radio Institute	Radio School	Booklet		Free	477
Arrow Radio, Inc.	Mail Order	Information		Free	497
Audel, Theo., & Co.	Book Publisher	Information		Free	491
Ayers, Automatic Code Machines	Code Machines	Information		Free	491
Bliley Electric Co.	Parts Mfr.	Circular	D-2	Free	474
		Engineering Bulletin	E-6	10c	
		Bulletin	E-7	Free	
		Circular	A-7	Free	
		Information		Free	499
Bridge, Harry P.	Stamps	Information		Free	484
Browning Laboratories	Kit & Parts Mfr.	Information		Free	471
Bud Radio, Inc.	Parts Mfr.	Catalog		Free	471
Burstein-Applebee Co.	Mail Order	1941 Catalog	57	Free	479
Candler System Co.	Code Course	Book of Facts		Free	474
Cannon, C. F., Co.	Parts Mfr.	Folder	T-18	Free	475
Chartered Institute of American Inventors	Inventors' Organization	Booklet		Free	504
Cowell, R.A.	Publisher's Rep.	Information		Free	479
Crowell, Thomas Y., Co.	Book Publisher	Information		Free	475
Dodge's Institute	Radio School	Catalog		Free	491
Eagle Radio Co.	Kit Mfr.	Information		Free	486
Goldentone Radio Co.	Set Mfr.	1941 Bargain Catalog		Free	493
Gold Shield Products	Mail Order	Catalog		Free	491,493 496,499
		Literature		Free	B. C.
Hallicrafters, Inc.	Set Mfr.	Catalog		Free	485
Hammarlund Mfg. Co.	Set & Parts Mfr.	Information—List		Free	477
Harrison Radio Co.	Mail Order	Information		Free	475
Harvey Radio Company	Mail Order	Information	120	Free	474
Henry Radio Shop	Mail Order	Information		Free	484
Hickok Elec. Instrument Co.	Test Instruments	Catalog		Free	484
Howard Radio Co.	Set Mfr.	Information		Free	451
Hytronic Laboratories	Tube Mfr.	Information		Free	463
Instructograph Company	Code Machine	Information		Free	483
Jensen Radio Mfg. Co.	Parts Mfr.	Information	82	Free	467
Lafayette Radio Corp.	Mail Order	196-Page Catalog	83	Free	465
		Gift Catalog		Free	
Lancaster, Allwine & Rommel	Patent Attorneys	Booklet		Free	505
Mass. Radio School	Radio School	60-Page Catalog		Free	491
Midget Radio Co.	Set Mfr.	Information		Free	499
Midwest Radio Corp.	Set Mfr.	Catalog		Free	493
Millen, J., Mfg. Co., Inc.	Parts Mfr.	Catalog		Free	486
Miller, J. W., Co.	Kit & Parts Mfr.	Information		Free	471
National Company, Inc.	Set & Parts Mfr.	Folder		Free	I.F.C.
National Radio Institute	Radio School	64-Page Book		Free	449
National Schools	Radio School	Catalog		Free	491
Nelson Co.	Used Courses	72-Page Catalog		Free	488
Radio Corp. of America	Radio & Television	Literature		Free	459
Radiocrafters	Parts Mfr.	Information		Free	486
Radio & Technical Publ. Co.	Radio Textbooks	Circulars on each book		Free	488
RCA Institutes, Inc.	Radio School	Catalog		Free	491
RCA Manufacturing Co., Inc.	Set & Parts Mfr.	Folder		Free	I.B.C.
Remington Rand	Typewriter Mfr.	Catalog		Free	495
Sprayberry Acad. of Radio	Radio School	52-Page Book		Free	491
Sun Radio Co.	Mail Order	Information		Free	483
Supreme Publications	Publishers	Information		Free	479, 497
Teleplex Co.	Code Machines	Booklet	S-12	Free	477
Triplett Electrical Inst. Co.	Parts Mfr.	Catalog		Free	483
Vibroplex Co.	Code Machine	Illus. Catalog		Free	475

What Do YOU Think?

ANENT THOSE QSL CARDS!

Editor,

For the past two years I have had a SWL listening post. In this column I have read the arguments which have arisen over QSL cards. You SWL's can send in the call letters of all amateurs you have sent reports to that were correct, and who have not returned the r QSL card. If you're a ham you can send in your call letters, explaining you do not send out QSL cards. Send the call letters to me and when I get enough calls, I will send out a *black list* to the persons sending in letters. If you want a black list and haven't any letters, send in a self-addressed stamped envelope or post-card. You can also send me your QSL card and I'll QSL 100%.

BOB MILLER,
9215 Birwood,
Detroit, Michigan.

England Hails Us

Editor,

I am unfortunately unable to renew my subscription to your very splendid magazine. This is of course a greater loss to me than it is to you for I found your magazine very helpful indeed. As a matter of fact I have constructed quite a few short wave receivers from circuits printed in "R.&T." I have been a regular reader for the past four years, although I have been on your mailing list only for the last two years. I suppose that I shall have to revert to getting my "R.&T." from my American Newsagency.

73 and long life to the best Radio magazine on the market.

Yours faithfully,
LESLIE G. DOOLCHIE,
23, Wormholt Road,
London, W. 12,
England.

"Full of Information"

Editor,

I am a regular reader of your wonderful magazine RADIO & TELEVISION, and it is full of information for radio men. Anything that I can do to help "R.&T." I feel as though I should do, for it helps everyone interested in radio from beginning to end. So please keep up the fine work in television, and 73 to R.&T.

RICHARD DICKERSON,
R. 3, Laurel, Dela.

Prefers "All-Radio" Mag.

Editor,

During the past three years that I have been reading RADIO & TELEVISION, I have never written you condemning or praising your magazine.

RADIO & TELEVISION has always been a "F.B." Ham publication. I have derived a great deal of technical information from your departments and articles. Thanks to you I am soon to take the test for my amateur license.

LIAM O'KEEFE,
103 West 74th St.,
New York City.

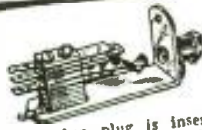
(Continued on page 512)

FREE TO YOU!


RADIO PARTS AND ACCESSORIES

HERE is some real BIG NEWS for you! Through a fortunate arrangement which we have been able to make, we can now offer you FREE premiums of such extraordinary value that they overshadow anything we have ever offered in the past with subscriptions to RADIO & TELEVISION Magazine.


NEVER BEFORE, in the 11 years' history of the magazine, have we offered such worthwhile premiums. All of these radio parts and accessories can be used to good advantage by the "ham" or constructor in his daily experiments.




TELEPHONE JACK
Substantial long frame phone jack. 2-circuit filament control type. opens 2 circuits, closes 2. Can be used for a variety of control purposes in radio and telephone work. 2 1/2" long, 1" high. Ship. weight 4 oz.
Premium No. 1 (3 Pts.) Val. 35c.



PUNCHED CHASSIS
Heavy plated steel chassis with holes punched for 11 tubes, power transformer, speaker plug and tuning dial. Great for large experimental sets, transmitters, etc. Reinforced construction. 13"x7 1/2"x2 1/2". Ship weight 3 lbs.
Premium No. 2 (5 Pts.) Val. 25c.

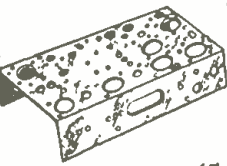


TWO GANG POTENTIOMETER
Well-made Yaxley 2-gang wire wound potentiometer. 2 units are insulated from each other. One is 5000, the other is 1000, used as dual action volume control (antenna and bias in broadcast receiver). Also useful in experimental circuits. Ship. weight 1 lb.
Premium No. 3 (5 Pts.) Val. 25c.




ALLOY CHASSIS
Medium weight alloy metal chassis punched for power transformer and 8 tubes as well as numerous mounting holes. Easily drilled metal. Open ends. Well made weight 2 lbs.
Premium No. 4 (5 Pts.) Val. 25c.

These parts are given to you IN ADDITION to the cut-rate subscription prices we list below:
7 mos. for \$1 (saving you 75c over the single-copy price)
16 mos. for \$2 (saving you \$2 over the single-copy price)
24 mos. for \$3 (saving you \$3 over the single-copy price)



7 TUBE CHASSIS
Alloy metal chassis punched for 7 tubes, condensers, etc. Ideal for building small sets or simple apparatus. Metal is easy to drill. Size 10 1/4"x5 3/4"x2". Ship. wgt. 2 lbs.
Premium No. 5 (5 Pts.) Val. 25c.



CONNECTING CABLE & TERMINAL
Unusually well made. Philco 8 foot, 5 wire cable with spade terminals at one end and block terminal with 8 positions at other end. Wires color coded. Well insulated. May be used for remote control or battery connections, etc. Terminal block 3"x3"x3/4". Ship. weight 1 lb.
Premium No. 6 (6 Pts.) Val. 35c.

And, of course, the longer your subscription runs, the more merchandise you obtain FREE. As we expect a tremendous response to this offer, we would suggest that you send your remittance without delay, as our supply of parts is limited and we won't be able to duplicate this offer again.



LOUDSPEAKER UNIT
Kellogg magnetic loudspeaker unit for use with horn speaker. Has adjustable diaphragm. May be used as pillow speaker or attached to acoustic phonograph. Also useful as sensitive microphone for voice reproduction. Threaded (7/8" diam.) throat. Size 2 1/2" diam., 1 1/2" deep. Ship. wgt., 2 lbs.
Premium No. 7 (10 Pts.) Val. 75c.

A SHORT while ago we were informed that one of the largest surplus houses in the East was ready to sacrifice a huge quantity of radio parts and accessories which cost the original manufacturers thousands of dollars. We entered into an agreement with this house whereby we suggested to them to allow us to offer these parts to our readers in connection with subscription offers. The surplus house enthusiastically endorsed our plan. We—the publishers—pay the surplus house cash for each of these parts, and you—the reaper of this fortunate arrangement—will get these valuable radio parts and accessories ABSOLUTELY FREE. This is positively the first time that we have been enabled to make such an unprecedented offer which in many ways sounds too good to be true. Nevertheless, we vouch for it in every way and we know you will not be disappointed. This special arrangement enables us to offer you this valuable merchandise FREE with your subscription to RADIO & TELEVISION magazine, at a price which is already a tremendous saving over the newsstand cost. This is how the plan works:— Next to the premium number of each item, we show its point value.

- For each 7 months' subscription (\$1.00) you receive 15 points' worth of merchandise free.
- For each 16 months' subscription (\$2.00) you receive 30 points' worth of merchandise free.
- For each 24 months' subscription (\$3.00) you receive 45 points' worth of merchandise free.

For instance, if you send us a seven months' subscription at \$1.00, you are entitled to 15 points' worth of free merchandise. You may order one No. 4 (5 points) and one No. 7 (10 points). Or if you wish, one each of numbers 2, 3 and 4 (each 5 points), or any other combination which totals 15 points. Similarly, if you send us a 16 months' subscription (\$2.00) you may order any combination of merchandise which totals 30 points. On a 24 months' subscription (\$3.00), any combination totalling 45 points. Due to the high cost of the merchandise, we cannot ship the articles

prepaid, therefore we show the weight of each piece, packed. If you wish your free parts sent by parcel post, please add to your remittance a sufficient amount to cover postage. Or, if you would rather have us send the parcel express charges collect, we will be glad to do so. Please remember that we do not sell these articles. You cannot buy them from us at any price. In order to make sure that you receive your parts promptly, ORDER TODAY. Fill out the coupon, clip and mail to us together with the proper remittance.

ALL RADIO PARTS ARE NEW AND UNUSED
Many are in their Original Packing

IMPORTANT TO PRESENT SUBSCRIBERS

If you are already a subscriber or have recently subscribed to the magazine, this offer still holds good for you, too. We merely will lengthen your subscription for either 7 months, 16 months or 24 months, as the case may be. There is a place on the coupon which provides for this.

RADIO & TELEVISION, 20 Vesey Street, New York, N. Y. RT-1240

Please enter my subscription to RADIO & TELEVISION for

7 months—\$1.00. Plus 15 points' worth of FREE radio parts.

16 months—\$2.00. Plus 30 points' worth of FREE radio parts.

24 months—\$3.00. Plus 45 points' worth of FREE radio parts.

I enclose my remittance for \$..... which includes parcel post charges on the FREE parts I am ordering.

Please send the merchandise to me express charges collect.

I am a subscriber now. Lengthen my subscription for months:
I am circling the numbers of the parts I wish to have you send me Free.

Nos. 1 2 3 4 5 6 7

Name Address

City State

(Send remittance in form of check or money order. If you send cash or unused U. S. postage stamps, be sure to register your letter.)

DON'T MISS THIS OPPORTUNITY! WE ASSURE YOU THAT YOU WON'T BE DISAPPOINTED. ORDER TODAY! SIMPLY FILL OUT THE COUPON. PROMPT SHIPMENT ASSURED!

RADIO & TELEVISION
20 VESEY STREET
NEW YORK, N. Y.

GEOPHYSICAL PROSPECTING OUTFITS



BLUE PRINTS and INSTRUCTIONS

For Building the Following Treasure Finders and Prospecting Outfits

- Folder No. 1. The "Radioflector Pilot"—consists of a 2-tube transmitter and 3-tube receiver. Principle: radiated Wave from transmitter loop is reflected back to receiver loop. Emits visual and aural signals. Tubes used: two 1A5G—two 1N5G—one 1H5G.
- Folder No. 2. The "Harmonic Frequency Locator"—Transmitter radiates low frequency wave to receiver, tuned to one of Harmonics of transmitter. Using regenerative circuit. Emits aural signals. Tubes used: one 1G6G—one 1N5G.
- Folder No. 3. The "Beat-Note Indicator"—Two oscillators so adjusted as to produce beat-note. Emits visual and aural signals. Tubes used: Three type '30.
- Folder No. 4. The "Radio-Balance Surveyor"—a modulated transmitter and very sensitive loop receiver. Principle: Balanced loop. Emits visual and aural signals. By triangulation depth of objects in ground can be established. Tubes used: Seven type '30.
- Folder No. 5. The "Variable Inductance Monitor"—a single tube oscillator generating fixed modulated signals and receiver employing two stages R.F. amplification. Works on the inductance principle. Emits aural signals. Tubes used: six type '30.
- Folder No. 6. The "Hughes Inductance-Balance Explorer"—a single tube Hartley oscillator transmitter and sensitive 3-tube receiver. Principle: Wheatstone bridge. Emits aural signals. Tubes used: two type '30—one type '32—one type '33.
- Folder No. 7. The "Radiodyne Prospector"—a completely shielded instrument. Principle: Balanced loop. Transmitter, receiver and batteries enclosed in steel box. Very large field of radiation and depth of penetration. Emits aural signals. Tubes used: two 1N5G—one 1G4G—one 1H5G—one 1Q5—one 1G4.

With any one of the modern geophysical methods described in the Blue-Print Patterns, Radio outfits and instruments can be constructed to locate metal and ore deposits (prospecting); finding lost or buried treasures; metal war relics; sea and land mines and "duds"; mineral deposits; subterranean water veins; oil deposits (under certain circumstances); buried gas and water pipes; tools or other metallic objects sunken in water, etc., etc.

Each set of blueprints and instructions enclosed in heavy envelope (9 1/2" x 12 1/2"). Blueprints 22" x 34"; eight-page illustrated 8 1/2" x 11" fold. **50¢** or of instructions and construction data. Add 5¢ for postage

The complete set of seven folders..... **\$3.00**
Shipping weight 2 lbs. (add 25¢ for shipping anywhere in U.S.A.)

TECHNIFAX

RT-1240
1917 S. STATE ST. CHICAGO, ILL.

TECHNIFAX 1917 So. State, Chicago, Ill.

Enclosed herewith \$..... for which mail to address below:

Treasure Finder No. 1, 2, 3, 4, 5, 6, 7.
Complete set of seven folders.

NAME

ADDRESS

CITY STATE

RT-1240

A "CLEARING HOUSE" FOR SWL's

Editor,

For the past eight years I have been an enthusiastic reader of R. & T. I have built several sets from your diagram and they work astoundingly well. I have veris from the 48 states, most of the U. S. possessions and 87 countries!

In the July issue of "R. & T." one of your readers stated that what is needed to settle the SWL's QSL problem is a "clearing house," which will inform them which radio broadcasting, amateur radio stations, as well as SWL's will not veri. I believe it to be the most sensible idea given yet.

Several of my friends, most of them SWL's, and myself, have formed a small organization for the benefit of all SWL's all over the world. The name of this organization is the "International Radio Listeners' Guild." At present the organization has the support of 43 members. We have elected only a president, who is none other than yours truly. I would like to have everyone join this organization, because the more members we have the greater will be the amount of privileges granted to us. Everyone wishing to enroll may do so by sending 10 cents in coin to me. This is a non-profit organization, the 10 cents is to cover the cost of printing and mailing of membership cards. When applying for enrollment be sure to give full name and address, and most important of all, the international prefix. On the card will appear the name and address of the "Guild," the member's international prefix, name and address.

The organization operates in the following manner: Every member must QSL 100% to his best ability, and members knowing of a SWL, ham or short wave broadcasting station who will not verify will send in the station's call letters (and address if possible) to the organization's headquarters. Then every month we mail out to every member a list of stations and SWL's who will not mail out veris.

I hope that through the cooperation of your fine magazine we can publish a monthly list of all SWL's, hams and short wave broadcasting stations who will not answer. I believe that this way we can clear up this whole situation.

My shack has four panel racks. At the bottom of the first two, I have two 15" P.M. speakers. Above the first I have a Hammarlund Super-Pro; above this an antenna coupling unit. Above the second an RME 70, above this the DB20 and the antenna coupling unit. The third rack contains the Hallicrafters Marine, a home-made 2 1/2 and 5 meter super, and above it another antenna coupling unit. The third rack houses a 1 kw. rig on 6 bands, which will be ready to go on the air as soon as I receive my ticket. As for the antenna, I have 2 horizontally polarized barrage broadside antennas, one a 3-section, the other a 4-section. With these two antennas and the aid of a very complicated antenna coupling unit, I manage to get very good reception and very little outside interference. Anybody is welcome to the diagram of either the antennas or coupling unit or both. Just drop me a line.

THEODORE ZAMMIT,
122-53 Nellie Street,
Jamaica, L. I.

Index to Advertisers

A	
ABC Radio Laboratories.....	477
Acme S. W. Radio Co.....	477
Allied Engineering Institute.....	469
Allied Radio Corporation.....	463
American Radio Institute.....	477
Arrow Radio, Inc.....	497
Audel, Theo., & Co.....	491
Ayers Automatic Code Machines.....	491
B	
Barter & Exchange Ads.....	509
Bliley Electric Co.....	474
Bridge, Harry P.....	499
Browning Laboratories, Inc.....	484
Bud Radio, Inc.....	471
Burstein-Applebee Co.....	479
C	
Candler System Co.....	474
Cannon, C. F., Co.....	475
Chartered Institute of American Inventors.....	504
Commercial Notices.....	509
Cowell, R. A.....	479
Crowell, Thomas Y., Company.....	475
D	
Dataprint Company.....	493, 501
Dodge's Institute.....	491
E	
Eagle Radio Co.....	486
F	
Flight Magazines.....	505
For Sale Ads.....	509
G	
Goldentone Radio Co.....	493
Gold Shield Products.....	491, 493, 496, 499
H	
Hallcrafters, Inc.....	Back Cover
Hammarlund Manufacturing Co., Inc.....	485
Harrison Radio Co.....	477
Harvey Radio Company.....	475
Henry Radio Shop.....	474
Hickok Electrical Instrument Co.....	484
Howard Radio Co.....	451
Hudson Specialties Company.....	503
Hystonic Laboratories.....	463
I	
Instructograph Company.....	483
J	
Jensen Radio Mfg. Co.....	467
L	
Lafayette Radio Corp.....	465
Lancaster, Allwine & Rommel.....	505
M	
Mass. Radio School.....	491
Midwest Radio Co.....	499
Midwest Radio Corporation.....	493
Millen, James, Mfg. Co., Inc.....	486
Miller, J. W., Co.....	471
N	
National Company, Inc.....	Inside Front Cover
National Plans Institute.....	488
National Radio Institute.....	449
National Schools.....	491
Nelson Co.....	488
R	
Radio Amateur Course.....	493
Radio & Technical Publ. Co.....	488
Radio Corporation of America.....	459
Radiocrafters.....	486
Radio Publications.....	479, 499, 501, 507
Radio-Television Reference Annual.....	452
RCA Institutes, Inc.....	491
RCA Manufacturing Co., Inc.....	Inside Back Cover
Remington-Rand, Inc.....	495
S	
Sprayberry Academy of Radio.....	491
Sun Radio Co.....	483
Supreme Publications.....	479, 497
T	
Technifax.....	505, 512
Teleplex Co.....	477
Triplett Electrical Instrument Co.....	483
V	
Vibroplex Co., Inc.....	475

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

A New Thrill in Radio Reception



AR-77

COMMUNICATIONS AND ALL-PURPOSE
RECEIVER WITH MI-8314 EXTENDED-
RANGE, HIGH-FIDELITY LOUDSPEAKER

- ☆ Unmatched Stability
- ☆ Highest Signal-to-Noise Ratio
- ☆ Finer, Noise-Free Reception
- ☆ Higher Fidelity Reproduction
- ☆ Foreign Reception at its Best

Here is a receiver that looks different and *is* different — just the thing for the short wave listener, amateur or radio fan who wants a radio capable of bringing in those hard-to-get signals or giving superlative short wave or broadcast reception. It is the finest, most sensitive and most stable receiver of its type RCA has ever made — bar none!

The band-spread dial of the AR-77 makes the tuning of foreign stations remarkably easy. Once you've tuned a broadcast it "stays put." "Drift" is reduced to a minimum. As for noise, the manually-operated Noise Limiter of the AR-77 is a feature that has brought high praise from all sides. In actual test, peak noise voltages hundreds of times higher than the signal have been pulled down to signal level, so that the signal could be clearly heard and understood.

Frequency coverage is from 540 to 31,000 KC in six ranges, with

calibrated band-spread for the 10, 20, 40 and 80 meter bands.

As illustrated here, the AR-77 is shown with the RCA MI-8314 Extended Range Loudspeaker. The unusually wide frequency range, the tremendous power handling capabilities and outstanding performance of this Loudspeaker combine with the AR-77 to produce reception that is amazing for clarity and faithfulness to the original broadcast.

Hear this remarkable outfit perform at your nearest RCA Amateur Equipment Distributor's store. You be the judge! Descriptive folder free.

AR-77 Receiver, \$139.50 net, f.o.b. factory. 8" Speaker in matched cabinet (not shown above) \$8.00 net, extra.

AR-77 Receiver and MI-8314 Extended Range Loudspeaker \$159.50 net, f.o.b. factory.

Read these Comments from Radio Men Who Know



● Reliable reception under all conditions is a "must" for operators of the well-known Amateur stations. What these prominent operators say of the AR-77 tells its own story of outstanding dependability.

"It beats receivers costing twice as much!" says Thomas A. Consalvi (above), owner of world-famous W3EOZ at Bryn Mawr, Pa. "In many features, the AR-77 is superior to any other I ever tried at any price. In every way, it matches the performance of my old receiver costing more than twice as much."

● "The AR-77 is even finer than your announcement led me to expect," states Dr. Burton T. Simpson,



W8CPC of Buffalo, an old-time amateur and still one of the best known voices on the air. "The Noise Limiter is particularly valuable because of its manual adjustment which can easily be regulated to meet local conditions in separating signal from noise. I am more than pleased with the outfit and believe it is the last word in receivers."



for Performance Plus

RCA MANUFACTURING COMPANY, INC., Amateur Division, CAMDEN, N. J. • A Service of the Radio Corporation of America





a new hallicrafters
 WITH 1941 IMPROVED FEATURES
The SKYRIDER MARINE
 (MODEL S-22R)

THIS communications model is truly an all purpose receiver: Covers Weather and Time Signals (NAA). Beacons and Aircraft Weather. Commercial wave lengths—Ship-to-Shore, Ship-to-Ship, (calling and working on the same band.) The Broadcast band. The Amateur Bands (160 to 20 meters inclusive.) Police. High Frequency Ship-to-Shore, Aircraft, Press and Government channels. Plus the International Short Wave channels. 4 Bands. Frequency range from 16.5 to 2730 meters

IMPROVED FEATURES—Two stages of IF—Greater sensitivity and selectivity. Permeability tuned IF transformers assure permanency of tuning.

Specially treated variable mica condensers will maintain adjustment under all atmospheric changes.

Directly calibrated main tuning dial. Permeability-tuned beat oscillator with control to change BFO setting.

All steel parts and chassis heavily copper plated and nickled.

(18 mc. to 110 kc.). 110 volt AC/DC operation.

Easy logging is provided by mechanical bandspread with separate dial. The directly calibrated main tuning dial eliminates the use of confusing charts and tables. The improved image rejection at the higher frequencies is achieved through the use of a 1600 kc. IF amplifier. Tuning permanency is assured through permeability tuned IF transformers. The 1941 Skyrider Marine (Model S-22R) will give the maximum in utility and dependability.

Highly efficient mechanical bandspread with separate dial provides easy logging.

Frequency range 16.5 to 2730 meters (18 mc. to 110 kc.). Band 1—110-410 kc. . . . Band 2—400-1500 kc. . . . Band 3—1.7-5.9 mc. . . . Band 4—5.3-18 mc. 8 Tubes. cabinet dimensions 18½" x 9½" x 8½".

The Skyrider Marine (Model S-22R) complete with tubes and speaker, \$64.50 net.

the hallicrafters inc.
 CHICAGO, U. S. A.

USED BY 33 GOVERNMENTS • SOLD IN 89 COUNTRIES