RADIO'S *Complete* MAGAZINE

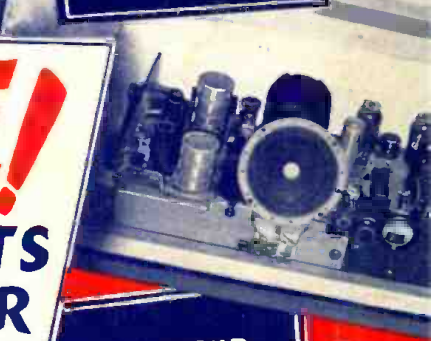
RADIO & TELEVISION

TELEVISION NEWS Department

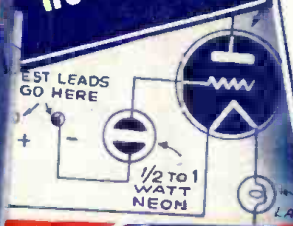
RADIO BEGINNER Department

MARCH OF RADIO Department

RADIO CONSTRUCTION Depart

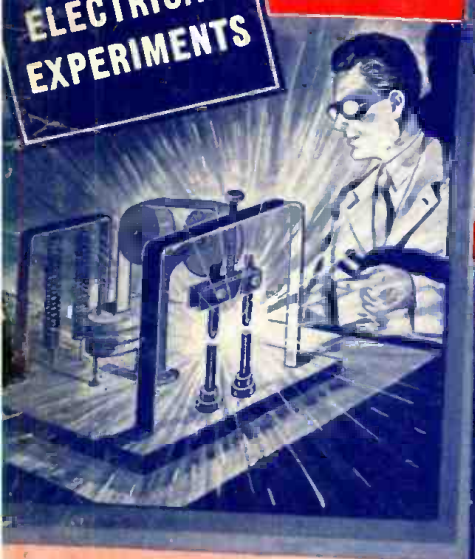


RADIO HOOK-UPS Departm



FREE!
RADIO SETS FOR YOUR LETTERS !
See Page 133

ELECTRICAL EXPERIMENTS Department



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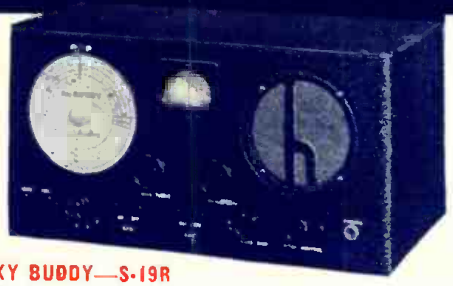
HUGO GERNSBACK
EDITOR

AMATEUR & EXPERIMENTAL RADIO JULY

CONSTRUCTIVE RADIO ARTICLES 1941

The RADIO SHACK takes you on a World Tour with hallicrafters



SKY BUDDY—S-19R

The unusual design of this receiver gives you unusual performance at the lowest possible cost. Coverage from 44 mc. to 545 kc.: four bands: electrical bandspread: provisions for battery operation. Cash Price **$29.50**

down payment $4.43—six monthly payments of $4.43

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Probably the greatest receiver value that exists. Nine tubes: four bands: frequency 545 kc. to 43.5 mc.: preselection: crystal filter: provisions for battery operation. Cash Price **$69.50**

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Nine tubes: 545 kc. to 44 mc.: electrical band spread: noise limiter. Cash price **$49.50**

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This latest model Super Sky Rider sets a new standard for communication receiver performance.

Two stages of preselection: 15 tubes: 550 kc. to 43 mc.: adjustable noise limiter: six-stage selectivity: crystal calibrated band spread: drift compensation. Cash price **$159.50**

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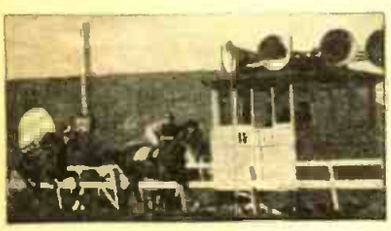
He has directed the training of more men for the Radio Industry than anyone else.

Broadcasting Stations employ operators, installation, maintenance men and Radio Technicians in other capacities and pay well.

Set Servicing pays many Radio Technicians $30, $40, $50 a week, others hold their regular jobs and make $5 to $10 extra a week in spare time.



Loudspeaker System building, installing, servicing and operating is another growing field for well trained Radio Technicians.

Get my sample lesson Free. Examine it, read it—see how clear it is, how easy to understand. Find out how I train you at home in spare time to be a Radio Technician. Do it now. Mail the coupon.

Jobs Like These Go to Men Who Know Radio

Radio Broadcasting stations employ Radio Technicians as operators, maintenance men and pay well for trained men. 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 of opportunities for which N. R. I. gives the required knowledge of Radio. And my Course includes Television, which promises to open good jobs soon.

Why Many Radio Technicians Make $30, $40, $50 a Week

Radio is already one of the country's large industries even though it is still young and growing. The arrival of Television, the use of Radio principles in industry, are but a few of many recent Radio developments. More than 28,000,000 homes have one or more Radios. There are more Radios than telephones. Every year millions of Radios go out of date and are replaced. Millions more need new tubes, repairs, etc. Over 5,000,000 auto Radios are in use and thousands more are being sold every day. In every branch, Radio offers opportunities for which I give you the required knowledge of Radio at home in your spare time. Yes, the few hundred $30, $40, $50 a week jobs of 20 years ago have grown to thousands.

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—start showing you how to do actual 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. My Course includes Television, too.

DRAFT REGISTRANTS, ATTENTION!
Hundreds of men who know Radio when they enter military service are going to win specialist ratings in the Army, Navy and Marine Corps. These ratings pay up to 6 times a private's or seaman's base pay, in addition to carrying extra rank and prestige! If you ARE NOT called, you are getting into Radio when the Government is pouring millions into the Radio industry to buy Defense equipment, on top of boom civilian Radio business. Whether you enlist or wait for conscription—IT'S SMART TO LEARN RADIO—NOW!

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.

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J. E. SMITH, President
Dept. 1GB3
National Radio Institute
Washington, D. C.

I Trained These Men

Chief Operator Broadcasting Station
Before I completed all the lessons, I obtained my Radio Broadcast Operator's license and immediately joined Station WMPC where I am now Chief Operator. HOLLIS F. HAYES, 327 Madison St., Lapeer, Mich.

$10 to $20 a Week in Spare Time
I repaired some Radio sets when I was on my tenth lesson. I really don't see how you can give so much for such a small amount of money. I made $600 in a year and a half, and I have made an average of $10 to $20 a week—just spare time. JOHN JERRY, 1529 Arapahoe St., Rm. 17 Denver, Colorado.

Had Own Business 6 Months After Enrolling
I went into business for myself 6 months after enrolling. In my Radio repair shop I do about $300.00 worth of business a month. I can't tell you how valuable your Course has been to me. A. J. BATEN, Box 1168, Gladewater, Texas.

SAMPLE LESSON FREE

I want to prove our Course gives practical, money-making information; that it is easy to understand—what you need to master Radio. My Sample Lesson text, "Radio Receiver Troubles—Their Cause and Remedy," covers a long list of Radio receiver troubles in A.C., D.C., battery, universal, auto, T.R.F., superheterodyne, all-wave, and other types of sets. And a cross reference system gives you the probable cause and a quick way to locate and remedy these set troubles. A special section is devoted to receiver check-up, alignment, balancing, neutralizing, testing.

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J. E. SMITH, President, Dept. 1GB3
National Radio Institute, Washington, D. C.

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RADIO & TELEVISION

The Popular Radio Magazine

July — 1941
Vol. XII No. 3

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

In August Issue

600 Watt Transmitter—Larry LeKashman, W2IOP

End-Fed Zepp for Receiving—R. H. Newkirk, W9BRD

3-Way Code Practice Set—L. B. Robbins

Trees as "Antenna Masts"

Your "First" Short-Wave Set—Wm. J. Vette

A 3" x 4" Image Televisor YOU Can Build!—Ricardo Muniz, E.E., and S. Morton Decker

Ultra-High-Frequency "Pocket Receiver"—1 to 5 Meters—George Baptiste

In This Issue

GENERAL FEATURES

RADIO CONSTRUCTION

AMATEUR RADIO

NEW FEATURES

TELEVISION NEWS

MISCELLANEOUS

Cover Composition by Hugo Gernsback and Charles Pearsall

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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; EMIL 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.

What Do YOU Think?

HE INDEXES CIRCUITS

Editor,

To avoid the fuss and bother of having to look through untold copies of RADIO & TELEVISION to find a particular idea or circuit, which had appeared in an earlier copy, I have, for some time used the following idea.

I have taken all diagrams that are or might be of interest to me, and pasted them in an indexed loose-leaf note-book, carefully adding notes beneath each, relative to construction, operation and general understanding of the various subjects. The smaller diagrams may, of course, be copied, so that the larger ones, which may appear on the opposite page, will remain intact. Paste only the top edge of each clipping and you will find your paper does not curl or wrinkle from paste.

H. YOUNG,
1444 Walnut St.,
Victoria, B. C.

SCHEMATIC VERSUS PICTURE DIAGRAMS

Editor,

Maybe there are just a few of us in existence; the kind of fellows who are not altogether new, new beginners, and who are also not old-timers in the art of piecing together a receiver or a transmitter or a P.A. system from what we have in the "spare parts drawer." Partly due to our scarcity, and mostly due to the fact that we don't even have a "spare parts drawer," we don't have much of a voice in this amateur game, which often weeds out the fellow who has only one Sunday suit. I'm speaking of those of us who have hungrily devoured the "book-larnin'" we could find access to, but haven't had a chance to tinker much.

We like to converse with the boys in the know, and we turn out an intelligible conversation ourselves, as the talk turns to swinging chokes, pentagrid converters, and back to parasitics, but when one of our better-to-do-brothers under the skin pulls a gadget from his pocket, and grins like a child with a new toy, we don't even know what it is, till he tells us it's merely a new kind of vernier. What are we to do about it, fellows? Well, this idea may irk the boys who like their circuits meaty, but we think that these photographic (picture) diagrams really serve to augment the schematic diagrams to a point where we can at least visualize what we are going to put into our theoretical circuit, which is the only kind we build. Naturally, we wouldn't be in favor of using only photographic diagrams, but this method of showing both the schematic and picture diagrams of circuits such as the one for the fourteen-tube Communications receiver in the February issue of "our mag" seems to be what we need. How about more photographics?

EUGENE E. HADDAN,
614 S. Morgan St.,
Brazil, Indiana.

LEARNING CODE

Editor,

After reading Bob Forman's letter about the "Code Bugaboo" it seems that the time and effort required to learn the Code scares away some prospective Hams.

Perhaps when they read of what the Hams and prospective Hams are doing in this country, it may encourage them and show them that it is not as difficult as it seems. After this war is over the number of Hams in Canada will show a great increase over former figures. Now this is not a blind prophecy; as an instructor in a wireless school, I am speaking from my own experience. This war with its mechanized armies, modern air and sea fleets, has shown the general public the value of the radio amateur. Many of the old timers of the Ham game are on active service; others are acting as instructors.

The younger group of young men, those ranging in age from 16 to 20, seeing what their fathers and big brothers are doing, have also become interested in the radio game, and are learning about radio and the code. Some study at home, others go to night classes at technical schools and telegraphy schools.

To speak of a group that I know, they started out at first by building a receiver from "junk parts" and at first were interested only in picking up phone stations. The farther away the station, the more they liked it. I dropped in one night and explained to them that they were missing half the fun. I tuned on their set and picked up a code station sending press and copied some of the news. After that I was besieged with requests for a copy of the code. I also gave them the circuit of an oscillator and a few days later showed them how to send code correctly.

I drop around to see how they are doing on the average of once a week; now I don't have to worry about their code. They are getting full use out of their receiver, copying anything up to 15 w.p.m. and a couple of the boys taking 20 w.p.m.

All these boys needed was a little help and encouragement. If any of you Hams know of a group of youngsters interested in radio, lend them a helping hand; they won't take too much of your time. My little group picked up the code in four months, and by the time they are on the air, after the war is over, they will be showing up some of the "old timers."

JOHN RYAN,
1757 Centre Street,
Point St., Charles,
Montreal, P. Q., Canada.

WANTS TO SWAP "HOME RECORDINGS"

Editor,

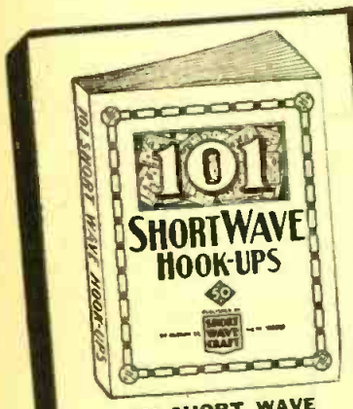
I wonder if any of your readers would be interested in swapping home recordings with me? I'll answer "by record" all messages thus received. How about it, SWL's?

R. L. HALKS,
303 Joplin Street.
Joplin, Missouri.

(Continued on page 189)

These Are the 6 Best Selling Short Wave Books . . . SEE THEM AT YOUR DEALER!

YOU buy parts, tubes, kits, accessories from your local radio dealer—that's what countless thousands of short-wave fans do. 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.



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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.

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HOW TO BUILD AND OPERATE SHORT WAVE RECEIVERS

Including
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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.

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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.

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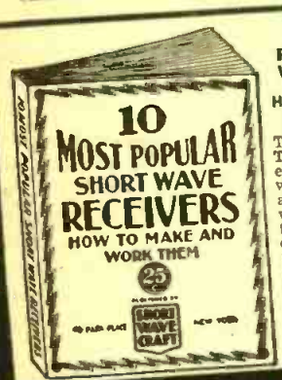

TEN MOST POPULAR SHORT WAVE RECEIVERS

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
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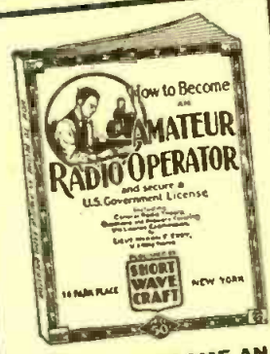

HOW TO BECOME AN AMATEUR RADIO OPERATOR

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.

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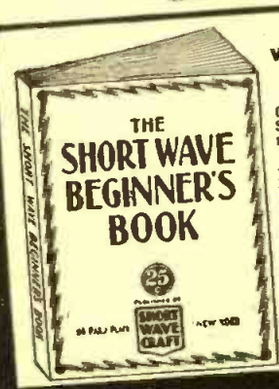

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United Radio Co., Newark
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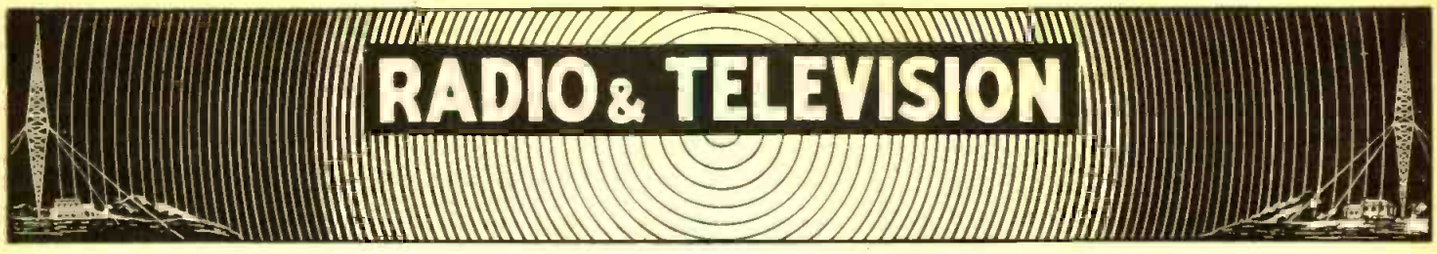


Readers' Editorials

Radio Education by Mail

● *"HOW I wish I could afford a good education in radio."* *Doubtless, this thought has often occupied the minds of many of our young men.*

Here is a solution to that problem. There are, at this time, quite a number of schools in this country that offer a course in radio theory and practice by correspondence, to young men who cannot afford to attend a school. I studied by this method, and the best evidence I have of its ability to train one thoroughly, is my First Class Radio Telephone Operator's License, which I received after one trip to the examining office. Most of these schools have a plan of payment for their course of training which can be very easily managed. The proper procedure for choosing a course of study would be to communicate with several of the schools, then compare the merits and outstanding advantages of each school with those of the others.

This Month's Prize Winner

After investigating the schools thoroughly, choose the plan which you think best suits you.

Now, a word about the training itself. You must realize that it is somewhat more difficult to learn radio theory and practice without the aid of an instructor, but fellows, I tell you it can be done by proper study and perseverance. *Just keep in mind the ultimate goal, and I am sure you can come through as many others have done. Remember, too, that our rapidly increasing armies and defense operations are increasing their demands for trained radio engineers. So fellows, let's dig in and get that training to enable us to receive the reward.*

ELDRED WINN,
Box 231,
Spray, N. C.

SHORT WAVE LISTENERS' DUTY

● NOW, in time of National Emergency, it is the duty of every true American to do his or her utmost to cooperate with the Government officials.

Norway, Belgium, France and the others fell because of the "Fifth Columnists." Their favorite means of communication was by *Radio*. Here in America, there are many spies; and it is here that the *Shortwave Listeners* can help to defeat the purposes of these agents.

The majority of Shortwave Listeners are equipped with good antenna systems, and with powerful, modern receivers. Every city or town has many Listeners who devote their spare time to shortwave listening. If these Listeners kept a lookout for subversive activities on these wave-bands, and immediately notified the police authorities or the district office of the F.C.C. of any suspicious communications, the usefulness of Radio contacts would be greatly diminished.

In this way, the *Shortwave Listener* would not only be helping to maintain safety and Democracy, but also to insure the lives and happiness of our loved ones.

J. S. SHINO,
686 Powell Street,
Vancouver, B. C.

WHAT AMATEURS CAN DO

● THE value of the radio amateur in time of emergencies such as floods has already been proven. Yet I believe that there is another important role in which the amateur should indulge more deeply, that is radio experimentation. It is true that nearly all amateurs experiment, but as there is a great deal yet to be discovered, the amateur should make better use of his knowledge to learn more about radio.

This experimentation is not limited to the amateur alone. There is another fellow who should be concerned—that fellow who gets up in the early morning, turns on his home-made set and strains his ears for hours hoping he can catch the call letters and location of that faint music he is receiving, in other words, the *shortwave listener*, the *future Ham*. He also has a chance to discover and invent. His field may include low power receiving, new uses for radio tubes and especially observations of reception conditions at different times of the year and during magnetic storms.

The amateur can try different transmitting tube hookups, explore the ultra-short waves, run a series of tests with other amateurs and discover the truth about how and why the radio waves travel.

Another important thing to be experimented with is the all important antenna. Beam antennas are now in use but no doubt they can be greatly improved. As radio plays a very vital part in war, beam antennas designed to prevent signals from reaching the enemy would be of the utmost value. All this would help our country, which we love. So fellow Hams and shortwave listeners, let's experiment.

BERNARD R. HAMILTON,
Ulysses, Pa.

PATROL THOSE SW BANDS!

● NOW, indeed, is the time for all good men to come to the aid of their party. Political differences should be forgotten for the moment, and everyone should do his utmost, whether he be a licensed radio amateur or just a shortwave listener.

The shortwave listener can play an important role in the national defense program. The licensed amateur listens on his respective band, but the shortwave listener covers *all* bands and at all hours of the day and night.

With many nations banished from the air because of war conditions, it is evident that subversive activity on the air lanes will flourish more now than in the past. The shortwave listener can be of great assistance to the United States government by reporting any such evidence (however insignificant it may seem) immediately to the proper authorities.

Let us devote as much time as possible to "patrolling" the shortwave bands for this cause. We will not only be helping our government, but will also be ridding the ether waves of bad odors and we shall make shortwave radio a better thing to listen to.

WARREN H. STARK,
2117 North 62nd Street,
Wauwatosa, Wisconsin.

(Continued on page 192)

Prize Award

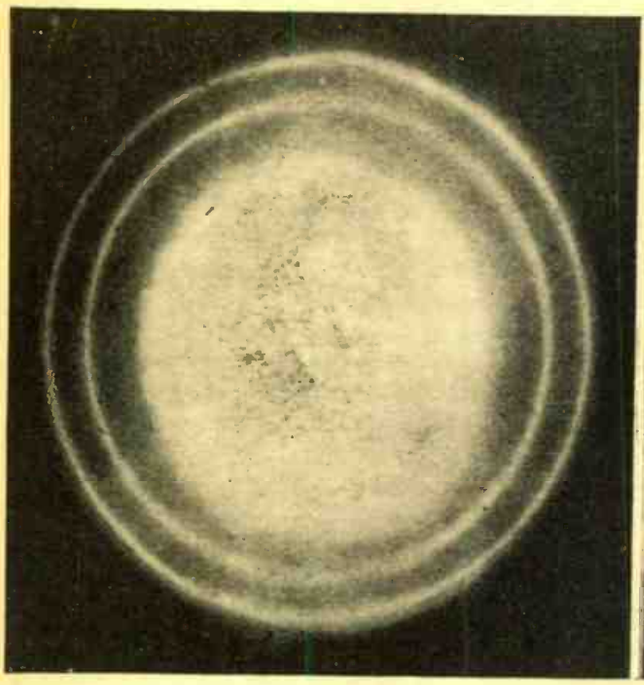
ZENITH MODEL 6G601M

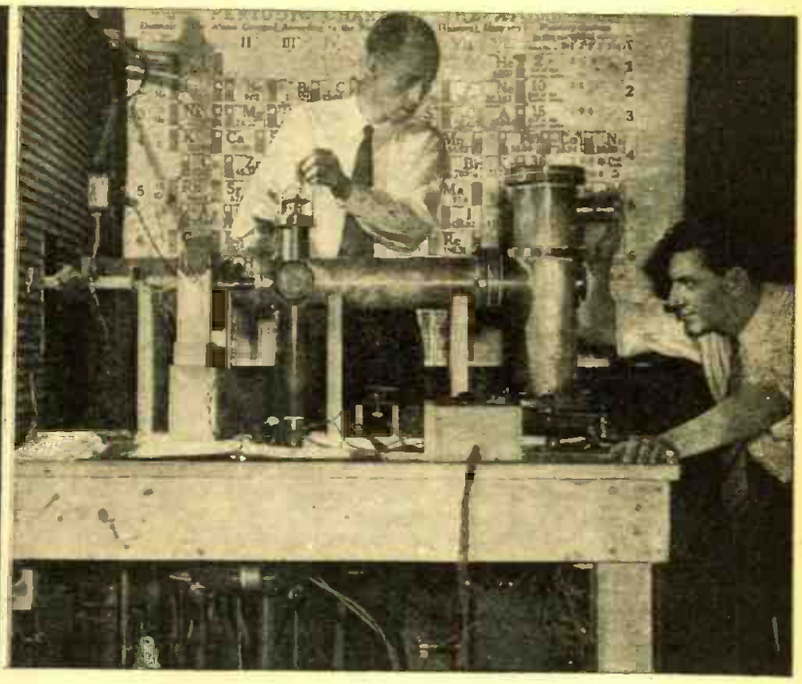
Value $29.95

Awarded to Eldred Winn for his Guest Editorial All others receive a year's subscription.

Electron Microscope Used to Study Films for Grain

Amateur photographers—and professionals—are bothered with "grain" in negatives when pictures are enlarged many times their original size. In order to study the silver "grains," Dr. C. E. K. Mees, Vice-President in Charge of Research and Development, has used an *electron microscope* to photograph these silver grains which are so small that their structure cannot be seen with even the strongest ordinary microscope. Previously believed to have a coke-like structure, the silver was found to develop in the form of filaments, the thickness of which depends upon the developer. Photographed with ten times the magnification ordinarily used in optical microscopes, grains were seen to resemble masses of seaweed rather than coke. The electron microscope illustrated herewith, with which the photos were taken, was patterned after one designed by Professor E. F. Burton of the University of Toronto; the photos were taken in the Kodak Research Labs by C. E. Hall.





Break-Up of Broadcasting? Some Radio Men See It in F.C.C. Move

The new network regulations by the Federal Communications Commission on May 3rd passed by a vote of 5 to 2 have aroused much controversy among broadcasting stations. The ruling would make it more difficult for large chains, dominated by a single group, to be organized and maintained. According to the F.C.C. and Mutual Broadcasting System, this is highly desirable, from the viewpoint that it would afford greater freedom to independent stations. However, the two major networks, CBS and NBC, do not see it in the same light. Mr. William Paley, President of the Columbia Broadcasting System, views this not as a move to free radio, but a way of getting government control of this means of communication.

In a statement entitled "First Paralyzing Blow at Freedom of the Air in the United States—New Regulations by Federal Communications Commission Sound Innocent—Actually They Would Destroy Existing Broadcasting Structure—Public Asked to Believe Commission Is Promoting What It Is Actually Destroying."

Mr. Paley says, in part:

"While crediting the Commission with cleverness in cloaking the inevitable results of its proposed action in language designed to make the public believe it is promoting what it is actually destroying, I feel it to be a public duty as head of one of the major networks to warn that if the Commission succeeds in the venture it now launches networks will become mere catch-as-catch-can, fly-by-night sellers of programs. Permanence and stability will have departed from the industry and incentive to public service will have been removed from the broadcasting the American people know and like. Worst of all, the first paralyzing blow will have been struck at freedom of the air, because a Commission which can exercise such drastic powers without even going to the Congress for authority will have reduced the networks and stations of America to impotent vassals, able to survive only so long as they please the regulatory authority.

"Ramming what the Commission calls a 'Magna Carta' down the throats of the affiliates of the major networks is really taking away from them that freedom of independent lawful action without which radio itself cannot remain free. This is true even though there may be opportunistic elements in the industry who will see in a sudden upset of the whole broadcasting structure a chance to gain temporary commercial advantage.

"The fact that the Commission has proposed to go so far, and that it openly threatens government ownership or common carrier regulation if it is thwarted in its purpose, is evidence enough that the American people should be alarmed and on the alert.

"If these are strong words, they are measured ones. Competition in broadcasting exists now; its principal limitation is imposed by the physical limitation upon existing facilities. To make a fetish of competition to the extent the Commission proposes, makes as much sense to me as if one were to argue that freedom of the press cannot exist unless one national magazine is allowed to sell advertising in the columns of another.

"This argument is absurd. If the one making it were to add that his real purpose was to strengthen and improve the national magazines as a whole, his sincerity would come into question.

"The Commission in its report and proposed actions persistently ignores the evidence. It disregards the remarkable progress of radio, the absence of substantial complaint and insists upon considering the whole question of monopoly without giving the slightest weight to the fact that the networks and the stations of America are publicly committed to a policy of freedom and fairness of the air, devoid of any editorial bias whatsoever.

"I do not believe that either the President or the Congress will countenance what the Commission seeks to do."

Querying a number of listeners, your *March of Radio* Editor finds about 80% favoring Mr. Paley's stand. The minority believes that greater enterprise will result from the Commission ruling, but the majority feels that it will be impossible for costly, elaborate programs to be presented if the break-up of the networks is carried to a logical conclusion. This majority also believes that the incentive toward organizing will be greatly decreased as the possibilities of building a permanent broadcast structure are diminished. As one of them pointed out, "No Gestapo makes the stations sign with a network, does it?"

"Heil Hitler" Radio Station Seized; Run by "Smart" Student

Search by the National Defense Operations Section of the Federal Communications Commission for unauthorized radio transmission which trespassed on Government frequencies and purported to be in the service of "foreign agents" recently culminated in the arrest at Peoria, Illinois, of Charles W. Johnson, who identified himself as a senior student in electrical engineering at a certain mid-western institute. Johnson's home revealed illegal equipment, which was seized by a United States marshal, and Johnson was charged with violating Sections 301 and 318 of the Communications Act.

The monitoring stations in the Commission's national defense operations were originally enlisted to trace signals from an unlicensed radio station, the operator of which called himself "Fritz," and who frequently concluded his transmissions with "Heil, Hitler." No identifying call letters were used.

Listening-in procedure revealed this operator to have more than average knowledge of certain codes and ciphers. In fact, he claimed on the air to be a cryptographer for a signal unit in a German army of occupation. His general procedure was to broadcast that he was a "foreign agent" and to attempt to engage in communications between United States Government stations. In so doing, he declared that he was relaying information from foreign agents. On one occasion he implied that Government channels would be "jammed" by high-powered radio stations being constructed for that purpose. At another time he sent out a message in cipher which, when decoded, proved to be in German and related to certain foreign troop movements. In his transmissions "Fritz" made an effort to obtain military information.

The following excerpts are typical of "Fritz's" communications:

"Staff plans are now coming in, but they are very detailed and long. Too much trouble to re-encipher again.

"Tell your cryptographer that this is a columnar position (Fritz proceeded to transmit the cipher message).

"I am a cryptographer. You must give me some information in exchange for this stuff. Give me the location of (gave several U. S. Government station calls).

"This station is now in hands of enemy. Your insolence will not be tolerated by German troops. This station now in control of German Signal Corps.

"Name here is Hans VonKeitel. Heil Hitler.

"I want your codes and ciphers. Give them to me or else we will jam this net with big rig.

"You will be in concentration camp. I am a cryptographer for this signal unit in the German Army of Occupation.

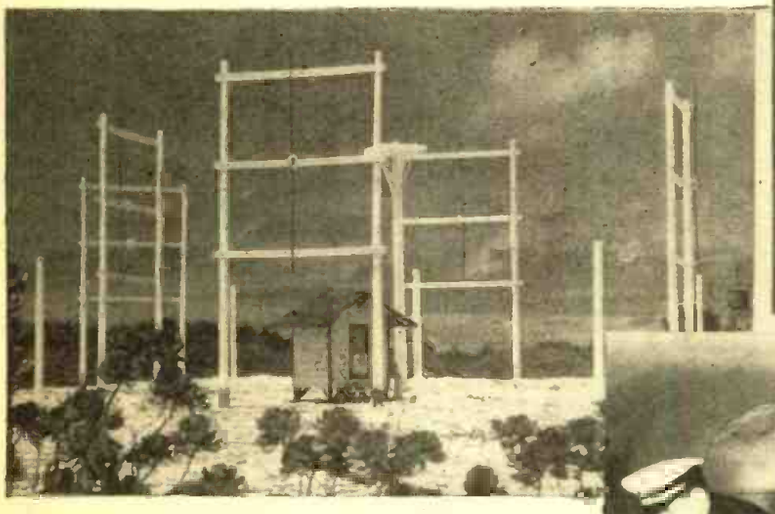
"I am on the *Admiral Scheer* and never dock. (When asked where he was located, 'Fritz' said, 'Off coast of Madagascar.')"

When the signals were first intercepted, there was no indication of where "Fritz" was located. The task of hunting down his station involved the use of highly specialized equipment recently perfected for the Commission's national defense field forces. The transmitter was finally traced to Johnson's residence on North Sheridan Road in Peoria. When the officers entered, Johnson tried to destroy his equipment but was prevented.

Air Traffic Directed by Midway Island Beam

● THE pictures on this page give a comprehensive idea of how American planes are enabled to fly between the United States and the Orient. The illustration below reveals the antenna system of Pan-America Airways' radio shack on Midway Island, far out in the Pacific Ocean. This is used principally to relay weather reports to the giant clipper ships as they wing their way above the sea. You will note particularly the sturdy frames which are used to support the short wave vertical radiators. This insures good transmissions for the planes even when strong winds are blowing across the island.

The lower right-hand picture shows the flight deck aboard a B-314 type clipper. The pilot and the co-pilot are visible in the extreme background, the navigator at the left, and the radio operators at the right. At the right rear is the radio officer, upon whose skill depends, in a large measure, the success of the flight.



A close-up of this officer and his controls is seen in the upper right-hand photograph, where he is found taking a radio bearing with the directional loop antenna.—*Photos Pan-American Airways System.*

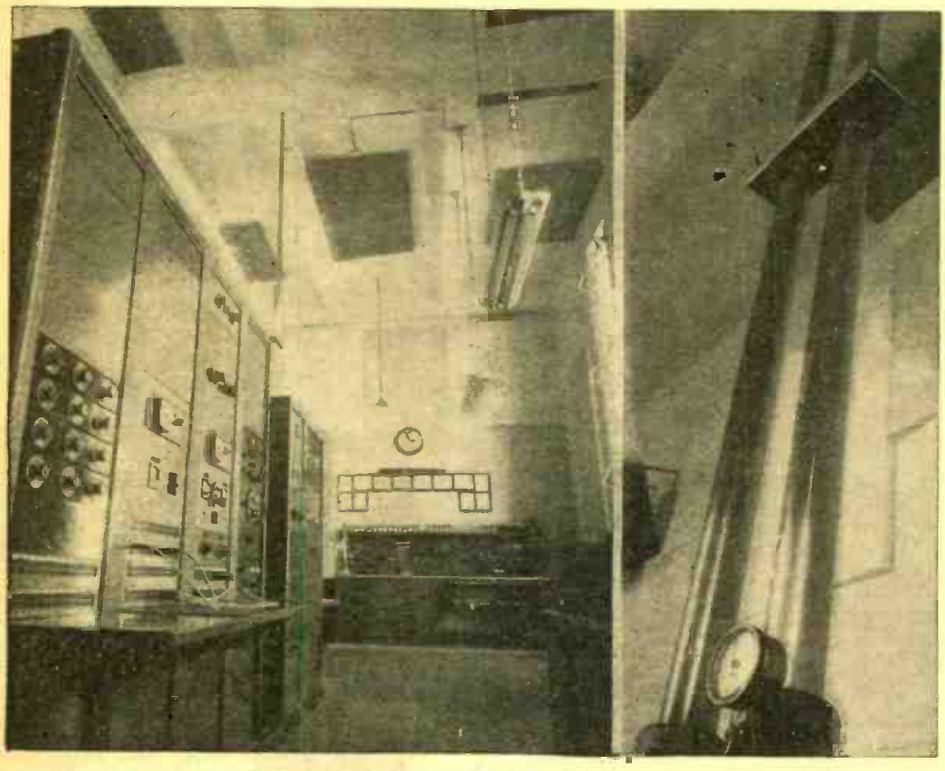
Photo above shows special radio beam antenna and shack on Mid-Way Island—part of the elaborate radio beam checking system by means of which the famous clipper planes flying across the Pacific are guided night and day.

Photos at right—radio officer aboard clipper plane, taking a radio direction bearing; lower view—the radio operating room aboard clipper, which is located just behind the pilot's compartment.

INSIDE AN "FM" STATION—WOR'S W71NY

The two pictures reproduced herewith are a general view of W71NY, the station operated by WOR, and the coaxial transmission line employed there. Looking at the general view first, you will see the speech equipment in the two panels at the left, and in the third panel the volume-limiting apparatus which increases the station's effective range through suppressing peak signals, with a corresponding rise in the average output. At the extreme right of the rack layout is a view of the main transmitter unit. The workbench is seen at the rear.

Coming from the main unit you will notice the coaxial transmission line which connects with the antenna. A close-up of this line is seen in the other illustration. The meter at the base of the line indicates pressure of nitrogen gas used within the line to keep out all moisture. At the left is a shorter length of coaxial tubing used as a shunt to suppress the second harmonic. —*Photos courtesy Westinghouse.*



G-E FREEZES RADIO MODELS

Beginning immediately, the extensive resources of the General Electric Company normally concerned with the research and development of radio and television receivers and electronic tubes, will be devoted in a large measure to vital defense production of an electronic nature for which a sudden need has arisen, Charles E. Wilson, president of the company, has announced. The corporation's offer, made voluntarily to Secretary of the Navy Frank Knox, and to Admirals Stark and Bowen, has been accepted as an example of industry's whole-hearted cooperation with the defense program.

The plan involves the transfer of development and research personnel and facilities from work on commercial equipment to the new electronic apparatus so urgently needed by the government in all branches of the armed services. From the government standpoint, it will mean an immediate and considerable acceleration in production of certain radio and electronic devices for which there is a vital and urgent need.

This company is particularly qualified to undertake this vital defense job, Mr. Wilson said, since for many years it has devoted a large part of its extensive research and development facilities to the electronic art. At Schenectady and Bridgeport the G-E radio and television department has what is probably the largest radio and electronic engineering, research and development laboratories in the world, specializing not only in radio and television receivers, transmitters, and tubes, but in all types of electronic energy-transmitting and control equipment.

The action of the company will not affect the commercial radio receiver models for 1941-42, which are now designed and already in production, but it will undoubtedly mean standardization on fewer models and a minimum of changes for the duration of the defense period. To compensate for this temporary sacrifice on the part of the company there will undoubtedly be, after the emergency, rich rewards for seller and consumer alike, in the form of scientific achievements to advance radio and television, and as evidence the rapid development of radio itself as a direct result of the last war was pointed out.

NEWS TO SPAIN AND PORTUGAL

Starting Monday, April 28, the International Division of the National Broadcasting Company has been beaming a fifteen minute period of unbiased news to Spain and Portugal seven days a week. The broadcasts are in Spanish and Portuguese, by International Division news announcers.

These news casts are beamed out over NBC's International shortwave transmitter WNBI, operating with 50,000 watts, on 11.890 mc. or 25.23 meters.

Oopgemaak!

The fan-mail of a *short-wave* radio station, as typified by WGEO, General Electric station in Schenectady, is full of oddities, both inside the envelopes and out—frequently funny, sometimes impressive, often rather sad.

Oopgemaak may look like a word out of "Jabberwocky" or like something the drunk said when he tripped over the rug. But to the natives of the U. S. A. (no, not the United States this time, but the Union of South Africa) it's a perfectly good word meaning "opened," or, more literally, "open-made." As such, "open-made" appears on the censor's reseal of every letter that comes to WGEO from, or via, the Union of South Africa.

Oopgemaak is only one of the strange censorial seals on letters from belligerent nations. The censor in British Guiana, to mention another instance, not only explains that he has opened your letter, but is careful to point out that he has also resealed it.

Another interesting envelope oddity, appearing on letters recently received by WGEO, is the sticker currently in use in Rhodesia. Decorated in its upper left-hand corner by the red-white-and-blue flag of this tiny segment of the British Empire, the sticker reads, "We realize in Rhodesia the safe arrival of this letter is due to the *British Navy.*" Impressive proof that the struggle of the British Navy has the support of the most far-flung dominions.

Addresses, too, frequently present rather interesting facets. Just suppose, for example, that you were a United States Post Office, and you got a letter addressed to WGEO, Connecticut, New York, U.S.A. Foreign listeners tuning in the G-E stations for the first time sometimes understand Schenectady as Connecticut, a name with which they have previously been more familiar, and it is on envelopes from these first-time listeners that such addresses sometimes occur. Thanks to the efficiency of the U. S. P. O., one of these double-talk envelopes recently did finally reach WGEO, but it probably isn't necessary to explain that by that time just about the only readable words thereon were in the stamp of the post-office of origin—"GROW MORE FOOD; DIG FOR VICTORY"—in letters a quarter of an inch high.

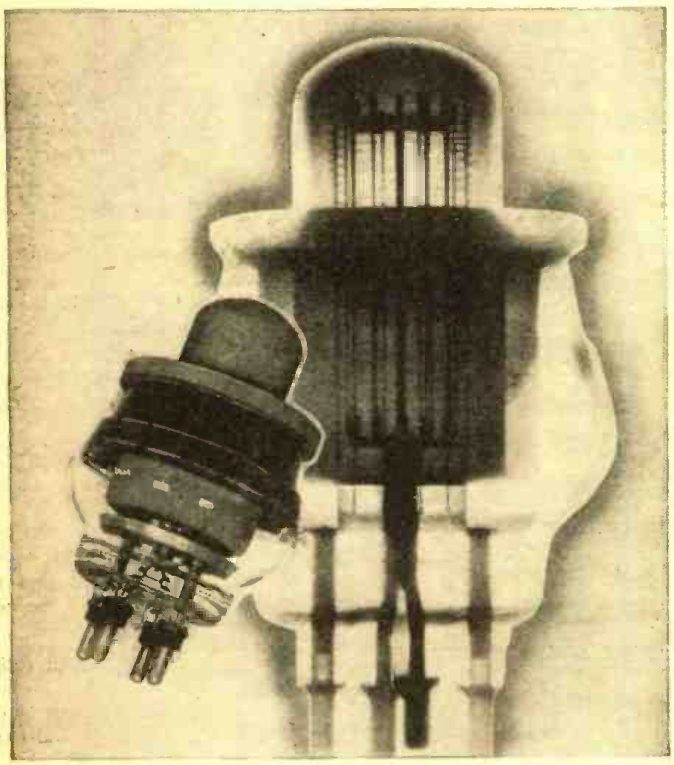
From Mexico comes one of many friendly letters, dated "3th april of 1941," reading, "I see yours calling Leters in the 'Readers Digest Selecciones' and I wish so much to know the time when you transmiting in Spanish, because The Nort American Programs in Espanish like me very much," and signed, "haspere yous letters, I am your good Mexican Friend." WGEO hasn't yet figured out whether that "haspere" means "hoping for" or whether it's just that outrage of the English language, "as per," but the station's good Mexican Friend got a nice letter back anyway.

"Our bunch of girls—the Girls of the Hot Corner" in a Latin American country advise WGEO that they hear every night that *"fenomenal"* orchestra which is simply "chuchin" and has "that certain latin rhythm, oh! that drums!" This is nice to know.

X-RAY VIEW OF TRANSMITTING TUBE

The pictures herewith illustrate the largest transmitting tube which General Electric turns out for high frequency (FM and television) service. It is a type GL880, a three-electrode power tube designed to work as R.F. amplifier, oscillator, or Class B modulator.

The large picture shows an X-ray view, revealing the filament and spiral grid inside the copper anode, which is water-cooled and capable of dissipating up to 20 kw. The design of the terminal mount connections and the folded plate minimizes lead inductance and suits the tube to H.F. applications. The tube is about seven inches in diameter and a foot long. A pair of them will give a 50 kw. plate modulated carrier at 25 mc.



The original type GL880 three-electrode power tube is pictured at the left and, behind it, its X-ray photograph, which reveals its internal construction.

LAUGHS FROM THE F.C.C. MAILBAG

With every month that goes by our heart bleeds more and more copiously for the poor F.C.C. Here are some of the reasons for this acute sympathy:

One Californian writes the F.C.C. and complains that only one radio commentator says "unquote" when he finishes a quotation. This Native Son finds this bewildering as he does not know when other newscasters who merely say "quote" at the beginning are finished quoting. He wants an order passed making it mandatory that all quotations end with "unquote."

Then there is a chap in New Hampshire who wants advertising eliminated from news casts, an Illinois fan who wants all advertising banned on Sundays, a Texas man who would like to have news rebroadcast from Berlin banned and a Los Angelino who kicks against the London rebroadcasts; both of the latter claim that such material is nothing but propaganda. Again the F.C.C. repeats that it has no power of censorship and suggests that the stations carrying the material be contacted directly.

Another Californian fears that certain radio programs make children rebel against parental supervision and a Jerseyite concurs. For the F.C.C.'s reply, see the paragraph above.

When a Washington woman complained that stations interfered with each other, the F.C.C. suggested that she either needed a wave-trap or a new set, because stations, since their recent re-allocation, are spaced far enough apart in the band so that they do not overlap on modern efficient equipment.

A Wisconsin sheriff wants to know whether a private garage has the right to listen in on police calls so that it can chase out the repair car in a hurry when there is a wreck or an accident. Yep, there's a law against it!

Because it functions largely as a licensing authority, the Commission cannot entertain an Idaho suggestion that radio sponsors who offer prizes be heavily taxed, or grant the appeal of a Texan organizing "prayer bands" that national networks broadcast his program, or meet a Pennsylvania listener's urge that important national programs be presented over the facilities of a single major network.

ANTENNAS ENGROSS HAMS

A *large* part of the Ham chatter these days is concerned with the erection of simple but effective antennas. Due to the fact that a national emergency has been proclaimed, the amateurs are eager to have their equipment in the best possible condition, so that they will be ready to aid in communications should developments so demand. Many have expressed their desire to serve their country.

ELECTRONIC VACUUM CAMERA

An *electronic* vacuum camera that photographs the crystalline structure of substances millionths of an inch thick has been built by Dr. Ralph P. Johnson of the G.E. Research Laboratory, for use in studying deposits on the surfaces of metals, such as tarnish, polish, lubricants such as grease and oil and the first stages of corrosion. It supplements X-ray apparatus that permits study of the interior of substances of greater thicknesses.

The camera proper (shown here operated by Dr. Johnson), consists of a brass tube about 3½ feet long, and a focusing magnet. A 40,000-volt electronic beam enters one end of the tube, is focused by means of the magnet upon the material suspended in the middle of the tube, diffracts, and produces a picture upon a lantern slide at the other end of the tube. The tube is evacuated to permit free passage of the electronic beam without collision with gas molecules. The material to be photographed is suspended in such a way that it can be raised or lowered or tilted at any angle to the beam.

The electronic beam is reflected by or transmitted through the material and a diffraction pattern or picture of the structure

is produced upon the lantern slide. The spacing and intensity of the circles or spots of the pattern enable the physicist to determine the crystalline structure.

Layers of atoms in table salt, for example, are spaced only one one-hundred millionth of an inch apart, yet an electronic picture of this spacing would show a circle one inch in diameter.

ANTI-STATIC AERIALS FOR USW RECEIVERS

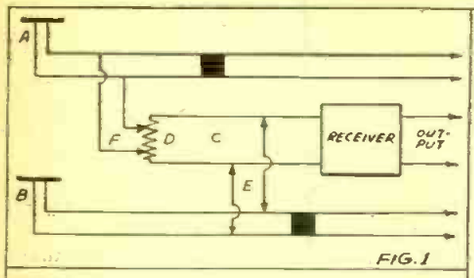


FIG. 1

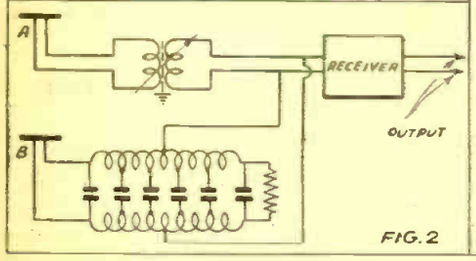


FIG. 2

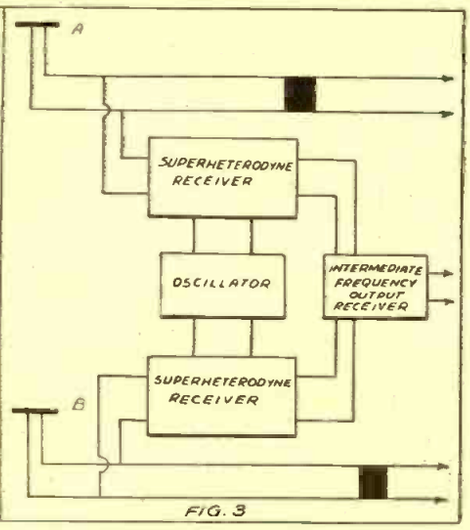


FIG. 3

● RECEIVING antenna for ultra short wave use which shall be comparatively free from the effects of man-made static are discussed in *Electronics and Television & Short Wave World* (London). In Fig. 1 an upper aerial A and lower aerial B are each connected to a transmission line, linked by movable contacts over a third line C, which is connected to a receiver. The value of resistor D is not given. Noise cancellation is achieved by varying the positions of the movable links E; to achieve phase cancellation, the intensities of the two noise voltages are balanced by sliding the contacts F along the resistance D. A more convenient method is shown in Fig. 2, in which the feeder from the upper aerial is transformer-coupled to the receiver line-up, while phase adjustment is provided by the sliding contacts along the artificial line connected to the lower aerial, terminated in a resistance. When the correct adjustments are made in either of the antenna systems shown, the desired signal is received at high strength because of the wide difference of signal intensity in the upper and lower aerials, although the noise is balanced out. Fig. 3 shows a different application of the same principle, but in this case two superhets are employed in cooperation with a common R.F. oscillator to produce an intermediate frequency output.

VARIABLE SPEED FOR SYNCHRONOUS MOTOR

● VARIABLE speed is obtained from a synchronous motor by means of a cone drive which is described in *Electronics and Television & Short-Wave World* of Britain. This apparatus is used to afford different speeds necessary for best reproduction of records and it can readily be adapted to operate at the proper speed for both 33 and 78 rpm recordings; without the use of gears and ball races.

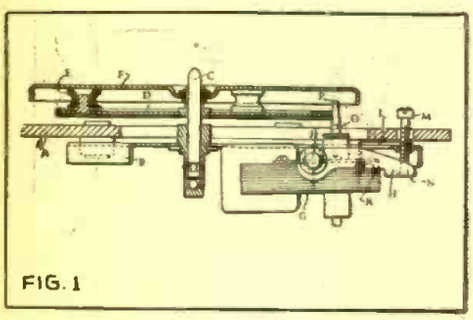


FIG. 1

The motor is coupled to the turntable unit through a friction drive which can be adjusted by turning a screw to vary continuously the velocity ratio, so that accurate setting of the speed can readily be accomplished. The drive comprises a friction wheel and a cone which are relatively displaceable to vary the point at which the

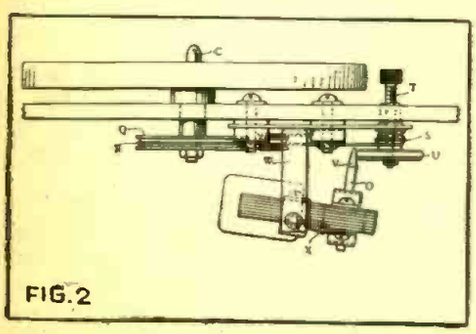


FIG. 2

surface of the cone engages the friction wheel and thus vary the velocity ratio.

A friction disc secured to the turntable spindle and provided with a rubber rim may constitute the driven member of the train, or the turntable itself may be provided with a rubber drive rim. The end of the motor shaft can be made conical and arranged to bear against the driven member and velocity can be varied by adjusting the height of the motor.

An arrangement of this kind is shown in Fig. 1. In this A is the motor board which supports a frame B that carries the turntable spindle C and the driven friction disc D The disc D is rubber faced and is coupled to the turntable.

The motor G is pivotally mounted on a pair of oppositely disposed pins J, and is arranged so that its center of gravity lies to the left of the pins J.

The weight of the motor tends to rotate it anti-clockwise, and a vertical screw M acts as a buffer and prevents rotation. The screw M is adjustable to vary the angular position of the cradle.

The rotor shaft O of the motor is provided with a conical tip P which bears against the rim of the driven friction disc under the action of gravity and constitutes the driving member.

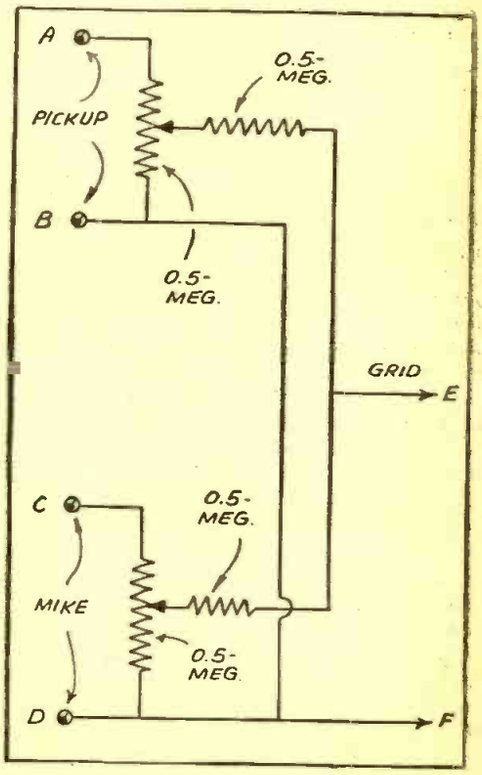
To adjust the speed of the turntable it is only necessary to adjust the screw M.

An alternative arrangement is shown in section in Fig. 2. In this case the turntable spindle C is coupled by pulley Q and belt R to a second pulley S rotatably mounted on an extension of the speed regulating screw T. The pulley S is secured to a friction wheel U and the conical tip V of the motor shaft drives the wheel U. The motor is pivotally mounted on a fixed bracket W and is biased in a clockwise direction by the spring X so that the end V of the shaft and the friction wheel U are maintained in engagement.

In this case the speed of the turntable can be varied by adjustment of the screw T to raise or lower the wheel U relative to the driving shaft. A useful idea for those who build their own.

SIMPLE MIXER STAGE

● AN extremely simple mixer, using but few parts, is described in *Popular Radio* of Denmark. As the diagram shows, this consists of no more than four resistors, each of which has a value of .5 megohm; two of the resistors are of the potentiometer type. The other two, which are fixed resistors, are connected in series with the potentiometer arms and the grid of the amplifier as the diagram shows. The mixer may be used with the outputs of two crystal pickups, two crystal microphones, one microphone and one pickup, etc. It permits



Danish idea in simple mixer circuits—a smooth working idea.

the full volume of either to be used alone or in conjunction with the other, or permits any degree of mixing which may be desirable.

ADDING PHONES TO YOUR SET

● WHAT with so many Hams sitting up half the night to contact DX and so many SWL's remaining sleepless to hear the Hams, the use of headphones will save much annoyance to the people who live in the same house as such night owls. Not only this, but the listener will derive benefit in that signals inaudible on the loudspeaker can be clearly heard on a pair of sensitive phones, says a writer in *Electronics and Television & Shortwave World*, London. All that is needed to make the improvement in the set is one phone jack, one phone plug, one pair of phones, a soldering iron and a little care.

The average communication receiver (he continues) is terminated with a pentode power tube which may have negative feedback. It is not desirable to disconnect the loudspeaker from the secondary of the output transformer as the pentode would produce very high transient voltages across the primary winding, with resultant damage. The best way of silencing the loudspeaker is to short circuit the grid input load of the pentode, preferably by means of a jack, so that when the headphone plug is inserted the output tube is automatically static. Fig. 1 shows one circuit arrangement which will meet these requirements.

It will be seen that when the 'phone plug is not inserted in the jack, the grid circuit is completed through the springy center contact making connection with the frame. When the 'phone plug is inserted, it becomes virtually the plate load of the next to last stage, the grid resistance is short circuited and the grid of the output stage grounded. This circuit necessitates the use of high-resistance headphones and the 4,000-ohm type should be employed.

The 'phones are at ground potential so that no danger from shock can occur as is the case when they constitute part of the plate circuit.

If it is felt that the additional amplification of the output stage is desirable, the alternative scheme shown in Fig. 2 can be used. In this diagram the 'phones, which are against of the high-resistance type, are fed through a 2 mf. condenser capable of withstanding the anode voltage plus the peak signal voltage—usually a 400-volt working type will be adequate. By means of the jack contacts, the loudspeaker connections are open-circuited when the phones become the load impedance of the pentode.

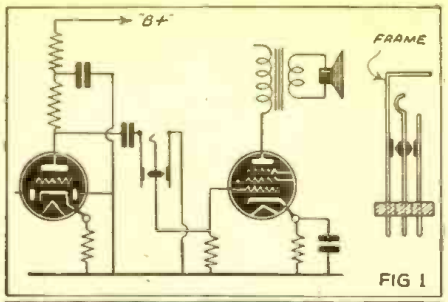


FIG 1

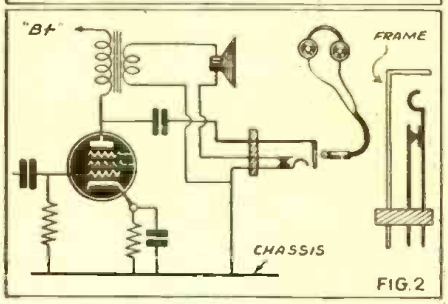


FIG. 2

How to connect headphones.

Alterations to the wiring are quite simple. If low-resistance headphones are used, a suitable matching transformer is necessary; in the case of the first circuit a reflected load of 50,000 ohms is desirable and in the second case one of 8,000 ohms. The transformer ratio is readily calculated from the formula.

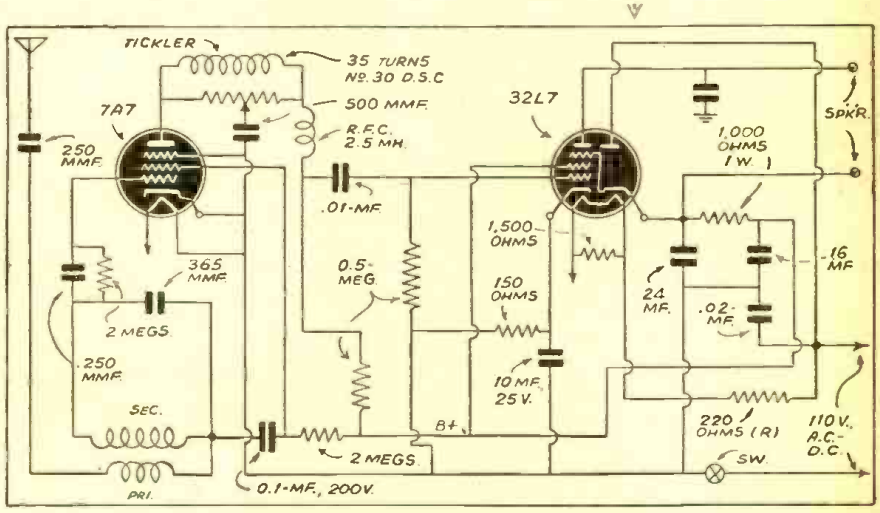
$$\sqrt{\frac{\text{tube load}}{\text{'phones impedance.}}}$$

BOMBS & BROADCASTS

● MOST amazing phenomenon to American SWL's is the way European shortwave broadcasting stations continue their schedules despite enemy bombs. Five minutes after listening to a local news commentator's report that London or Berlin is undergoing a heavy air raid, the SWL tunes to Europe and hears the calm voice of the announcer in London, or the menacing tones of the Nazi propagandist. One secret of how this is done is—*recordings!* A keen ear can often catch the needle noise of a transcription.

ULTRA COMPACT TWO-TUBE RECEIVER

● A TWO-TUBE receiver built on a chassis only 2⅝ x 5⅜ x 1¼ inches high and employing a panel three inches high, is described in *Radio Revista* of the Argentine. The receiver as seen is of the regenerative type using a variable resistance to control feed-back. This is a 25,000 ohm potentiometer and the switch is incorporated in it. The antenna coil is of a standard midget type and the tickler coil is wound on a cardboard form one inch in diameter. The set is designed to operate from either A.C. or D.C. As it is intended for 220 volts, additional resistance or a stepdown transformer will be necessary when used on the standard 110 volt line. It is suggested that a three-inch permanent magnet speaker be used. When complete the receiver weighs only about 2½ pounds, midget parts being used throughout. It may be put in a small wooden carrying case provided with handle.



Can YOU Answer These Radio Questions?

1. For what purpose is an electron microscope useful in studying films? *(See page 134)*
2. In what manner were the large television images recently demonstrated by RCA thrown on the screen? *(See page 140)*
3. How can two different programs be faded in or out on an audio amplifier? *(See page 144)*
4. How can a phono pick-up be wired into the receiving circuit of a 7-tube T.R.F. job? *(See page 150)*
5. What is the advantage of a variable antenna coupler? *(See page 152)*
6. What is an easy way to bend sheet metal when making a cabinet? *(See page 154)*
7. What is a simple and efficient way to connect the voice amplifier to a small emergency transmitter? *(See page 156)*
8. If you had a quantity of odd receiving parts, how would you connect them together to make a serviceable phone transmitter and receiver? *(See page 160)*
9. How would you construct a simple "signal tracer" from ordinary radio parts? *(See page 168)*
10. If you were asked to build a one-tube receiver to operate from any lamp socket, what tube would you select for the purpose? *(See page 172)*
11. How would you use a Neon tube to build a simple condenser tester? *(See page 174)*
12. What is one of the simplest and effective methods of marking circuit wires? *(See page 179)*
13. What value of ballast resistance should be used with a "twin" series arc lamp on 110 volts D.C.? *(See page 180)*

BIG IMAGE TELEVISION DEMONSTRATED

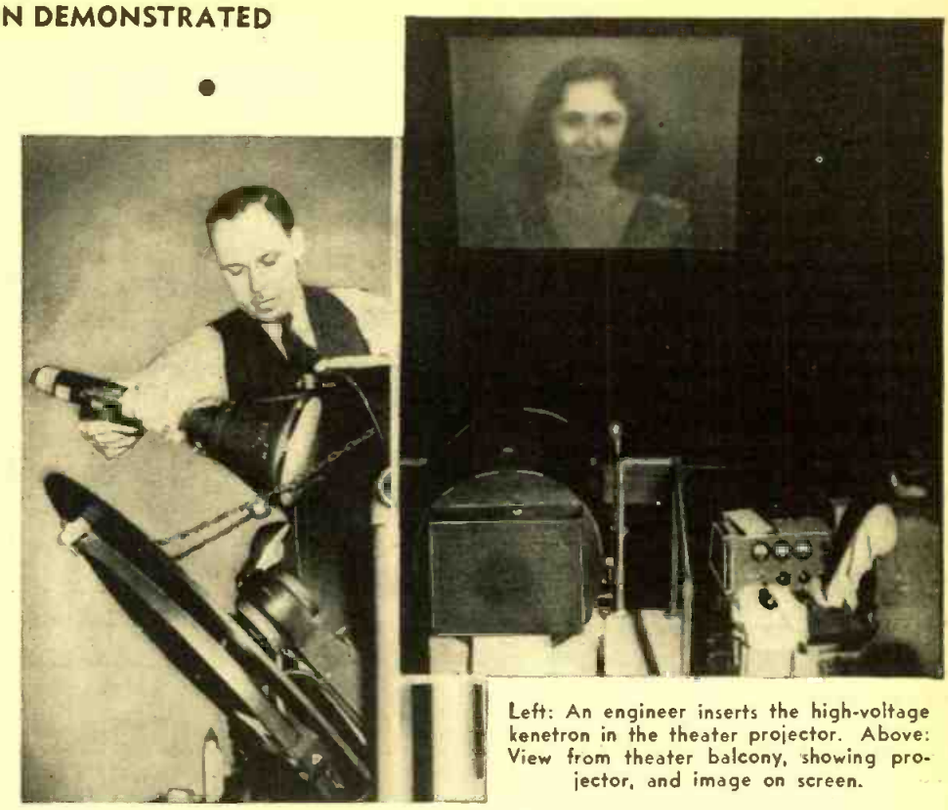
Twelve hundred representatives of movie, sports, radio and newspaper elite recently saw the first public showing of RCA large-screen theatre television at the New Yorker Theatre in New York City.

Featured on this program, was the Ken Overlin-Billy Soose middleweight championship tussle televised from Madison Square Garden. Close-ups of the fight action projected on a 15 by 20 foot screen afforded the audience a better-than-ringside view of the battle.

First, the fight was "shot" at the Garden by a *mobile* Television unit. Television cameras caught the light impulses and parabolic (long-range) microphones caught the sound. Together these light and sound impulses were conveyed by telephone wire to NBC in Radio City. From there they were relayed to the theatre over a balanced telephone wire. At the theatre the signals were "un-mixed," the light impulses directed to the projector and the sound impulses to loudspeakers by means of two control consoles in the balcony.

The sound system consisted of 16 loudspeakers set up in different positions throughout the auditorium. The research staff devised the arrangement of the speakers so that the man at the control console can give direction to the sound. For instance, if the operator saw from the screen that the sound was coming from the right, he would bring the loudspeakers on the right into play, to give an illusion of three-dimension sound.

The projector, which looks like a steel drum, is located at the balcony edge. It is 34 inches in diameter and 34 inches long. Inside it is the kinescope, a big television tube built to handle 60,000 to 70,000 volts which are supplied by a high voltage transformer that stands near the projector. At the back of the barrel-shaped projector is a concave mirror 30 inches across. This reflector takes the televised images as they materialize on the face of the tube and casts them through a rectifying and magnifying lens to the screen, 60 feet away. When they reach the screen, the images are 15 by 20 feet.

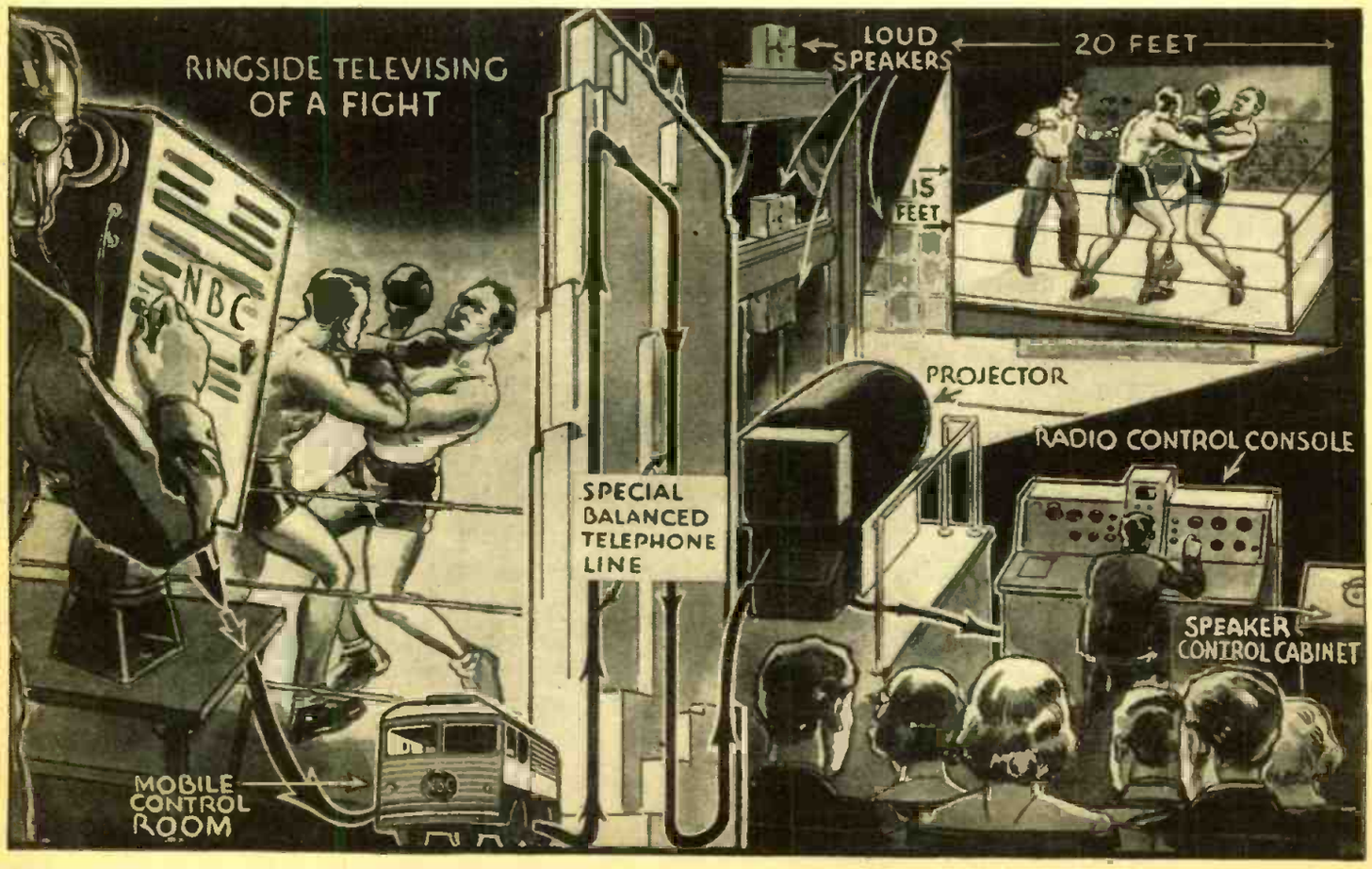


Left: An engineer inserts the high-voltage kenetron in the theater projector. Above: View from theater balcony, showing projector, and image on screen.

Close-ups of the Overlin-Soose fight, made possible by telephoto lenses of the latest television cameras, afforded the audience in the New Yorker a better view of the battle than many Garden spectators had.

The telephone wire from the Garden to Radio City and the telephone wire from there to the theatre is a miniature of the television networks, which RCA engineers predict will some day make theatre television available all over the United States.

(Continued on next page)



TELEVISION SITUATION STILL CHAOTIC

Although the F.C.C. finally gave a tentative okay for television commercialization, the industry is still much upset. Inquiries at CBS, NBC, Philco and other interested organizations reveal that the blow originally struck still has the industry reeling. In the first place, according to some station officials, the report issued by the F.C.C. leaves much to individual interpretation. In the second place, the manufacturers state that their attention has been turned to defense work and that plans for producing television receivers in quantity have not yet been formulated.

Because of this—and because of the comparatively few receivers already distributed—the broadcasters are dubious as to how much sponsorship can actually be attained. Stations which have been carrying three to six hours per week look at the 15 hour minimum, which the new regulations specify, with some dismay; they fear that sponsorship will not be sufficient to carry the financial burden, at least at the start, and that they will be compelled by the regulations to keep alive public interest in television, so that other companies who follow may profit. The consensus of opinion so far as the broadcasters is concerned is. "If we have to put on 15 hours a week in order to hold our license, I suppose we will have to do it, but if they will permit us to continue experimenting with shorter time, this would be preferable at present."

The manufacturers seem to feel, "If there is a big demand for television receivers and if we can free enough of our facilities from defense radio production, we will go ahead, but we would feel safer if the F.C.C. had not stipulated that new standards might be specified after another six months' experimental period. If drastic changes are made, this may call for elaborate and costly servicing on our part to prevent the public from suffering a loss through the obsolescence of receiving equipment."

BIG IMAGE TELEVISION

(Continued from preceding page)

The television first-nighters saw also a news broadcast and interviews by Lowell Thomas; a "Parker Family" playlet with Leon Janney; and a newsreel transmitted from NBC's television studios in Radio City.

Another part of the program originating in the studios was a round-table discussion on the possibilities of theatre television. Participating were John F. Casey, trustee of T.P.U. No. 1; T. F. Joyce, vice-president of RCA Manufacturing Co.; Col. John Kilpatrick, president of Madison Square Garden Corp.; Frank Leahy, director of athletics, Notre Dame University; Bill Klem, head umpire, National Baseball League; Gene Sarazen, Lakeview Country Club golf pro; and W. G. Van Schmus, managing director of Radio City Music Hall. The consensus was that television will revolutionize theatre entertainment.

Finale of the preview was the national anthem sung by Lucy Monroe, famed "Star Spangled Banner Girl."

The complete television show reached the theatre from Radio City via a balanced telephone wire, a special wire for carrying television signals. The fight signals were relayed from Radio City after having been sent by telephone wire from the Garden.

The circuit formed by the telephone wire from the Garden to Radio City and the telephone wire to the theatre comprised on small scale the basic television network which RCA engineers predict will some day bring televised events to every neighborhood movie.

Other theatres in the metropolitan area could have been plugged in on the show by telephone wire if facilities were available. A special television cable already installed between New York and Philadelphia would have made the program available to southern New Jersey and eastern Pennsylvania movie houses, had facilities been installed for the purpose.

Cost of equipping a theatre for television, it is estimated, would be between $25,000 and $30,000 under prevailing conditions. Later, increased demand and mass production would probably pare the cost.

DU MONT TELEVISION STATION ALMOST READY

With most of its equipment already installed and tested, the Du Mont television station W2XWV perched 650 feet above the sidewalks of New York, is rapidly mobilizing its technical and program facilities for anticipated commercialized television.

This station, whose lofty antenna high above the 42-story skyscraper commands a rare sweep of the entire metropolitan area, is equipped with a 4000-watt peak rating video transmitter, and a 1000-watt audio (2000-watt F.M.) transmitter for complete *sight-and-sound* broadcasting. The new antenna is supported on a retractable pole atop the steel tower; the pole can be lowered by winch to a platform for changes, adjustments or inspections. Thus the engineers can try various kinds of aerials until the best reception is attained throughout the metropolitan area.

The studio facilities cover both direct and film pickup, not overlooking remote pickup as well. Direct pickup equipment will take care of close-ups and small studio groups, and is believed ample for present program technique and available material. Incidentally, engineers have just installed a 960-watt fluorescent lighting system (illustrated herewith), comprising 24 fluorescent tubes, whereby performers are no longer subject to intense glare and uncomfortable heat. The general fluorescent lighting, closely approximating diffused daylight is reinforced by baby spots for modelling and dramatizing when required.

A fireproof room with several projectors will provide *film* pickup programs. Both 35 mm. and 16 mm. will be used, for the greatest variety of film subjects. The pictures are projected through loopholes in the fireproof wall, on to the image-dissecting tube of the television pickup equipment. This equipment is mounted on wheels riding on rails parallel to the fireproof wall, in order that the pickup can be brought in line with any projector. Thus the pickup covers the battery of projectors, and picks up one projector while another is being threaded or prepared for the continuation of the program. The program director of Station W2XWV, Will Baltin, has spent months rounding up film subjects, assuring the television audience of fine entertainment.

Another feature of this station is the relay receiver room, where signals from the remote pickup truck are intercepted, monitored and turned over to the main transmitter. The station will have its remote pickup transmitter, W10XKT, on a truck for use in the metropolitan area. It is the present opinion that much of the direct pickup program will be handled by remote pickup.

The highest grade electrical transcription equipment is being installed, to provide fine incidental music for programs otherwise silent. In the case of film pickups, sound tracks will be used when available and satisfactory.

With the early delivery and installation of two more units, the transmitting facilities will be completed, and Station W2XWV will be ready for its debut.

Fluorescent lighting in use at Dumont Television Studio.

CBS Getting Ready for Video

(As there has been much publicity regarding color television, the editors of "R. & T." asked the CBS Television Division several questions regarding plans for the development of this new art. Together with their answers, these are given below.)

Q. Will color television images be broadcast on part of the programs at least, by CBS after July 1st?

A. We don't know, because we are not certain that color will qualify under the FCC ruling. However, we intend to continue experimental work in color, for we feel that color may be a critical factor in hastening public acceptance of television.

Q. What proportion of *live* talent and *film* programs will be used?

A. This depends to a large extent on the availability of high quality film suitable for television.

Q. What are the present tentative plans for television network?

A. Television networks will be realities when communications companies build them. The sooner the better, say we.

Q. Will any other CBS television stations open in the larger cities shortly? (These stations to operate independently and not on a network, at least for the present.)

A. At present we have construction permits in Los Angeles and Chicago. Negotiations for equipment are under way.

Q. Do your engineers favor *coaxial lines* or ultra short wave *relay* stations to link television broadcast stations in the various cities?

A. Our engineers naturally favor the system that does the better job. I don't believe that either system has yet proved its superiority over the other.

Q. What is the power in kilowatts of the CBS television station in New York City; also its height and radius of service in miles.

A. We have not yet determined the power of the N.Y.C. television station, W2XAB, because rebuilding the transmitter has not yet been completed. Radius of service is the New York area.

Q. What is the frequency of the image and voice channels of the CBS New York television station?

A. Picture carrier—61.25 megacycles; sound carrier—65.75 megacycles. Sixty fields or thirty complete pictures per second. Ordinary alternate-line interlacing.

Q. Will the large CBS television studio in the Grand Central Terminal Building on 42nd Street be ready for use by July 1st when commercial television programs are scheduled to start?

A. Yes.

Q. What type of television studio lighting do CBS engineers now favor?

A. We favor the family of *cool* lights. Naturally, the basic light is fluorescent, which CBS engineers adapted specially for television.

Q. Do your television program directors contemplate using a special "scenic effects" studio in which miniature ships, houses, etc., are used for reproducing scenes of *news* events, etc.?

A. There has been no decision made yet on the question of "miniature" props.

DON LEE TELEVISION EXPANDS PLANS

Front Cover Feature

Plans are now being formulated under the direction of Lewis Allen Weiss, vice-president and general manager of the Don Lee Broadcasting System, parent company of the Don Lee Television System, to

Thomas S. Lee, West Coast Radio Wizard

effectuate the availability of this newest advertising medium for commercial sponsorship.

So exciting is this big news of commercial television that many persons already have overlooked the stipulation that *Frequency Modulation* must be a part of the transmission technique. Mr. Lee has again used his vision in this matter by having ordered some time ago a high-power FM transmitter.

But as an auxiliary service some of the regular KHJ and Mutual Don Lee programs will be simultaneously broadcast through the new FM unit. This will be accomplished by installation of a new special FM telephone line from KHJ at 5515 Melrose Avenue to the FM base on Mount Lee, thereupon the sound waves being broadcast from the new antenna.

The call letters will be K45LA.

Atop a 230 foot steel tower will be erected a six-bay turnstile antenna 70 additional feet in height, bringing the total altitude of the antenna to 300 feet. Special flashers will be installed on top for aviation safety.

The larger unit will service 2,600,000 people within a 7,000 square mile area, or roughly the region extending from San Diego to Santa Barbara. A special feature of the transmitter will be a Frequency Control Circuit, to synchronize all signals.

Already there are several factory-made Frequency Modulation receivers on the market.

Federal Communications Commission, Washington, D. C.
TELEVISION BROADCAST STATIONS

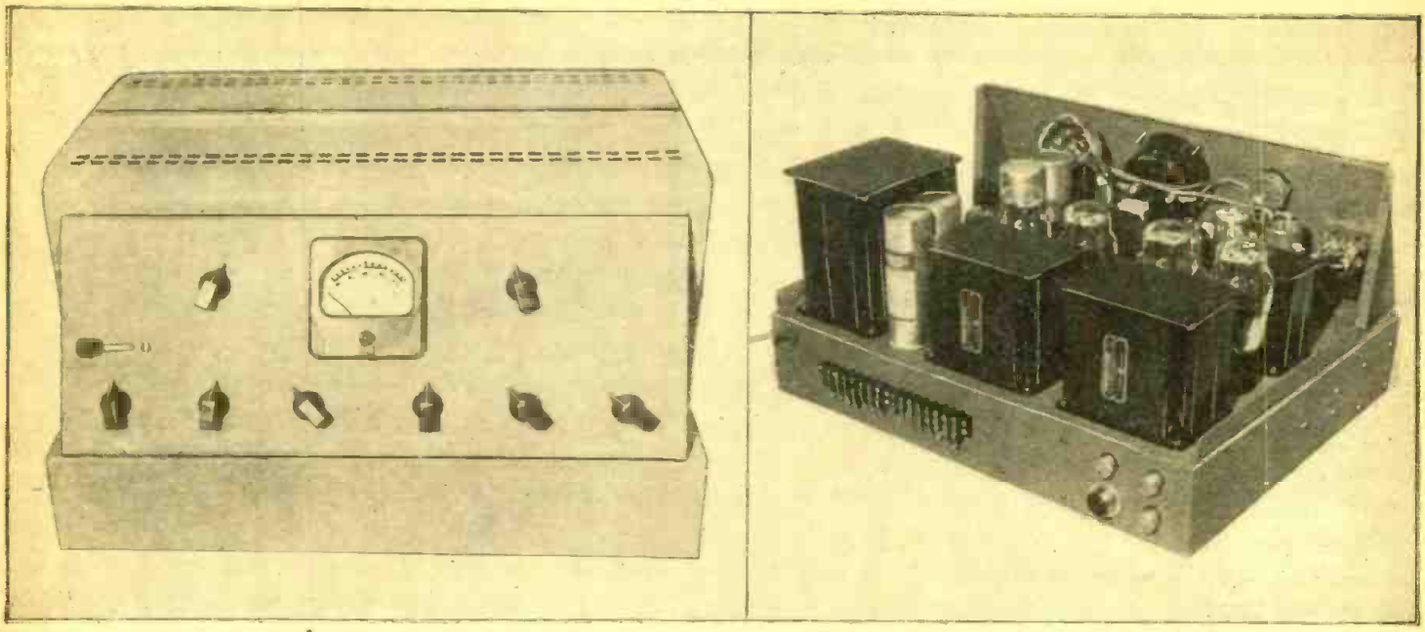
as of January 1, 1941

Licensee and Location	*Call Letters*	*Frequency (Kc.)*	*Power Visual*	*Power Aural*	*Emission*
Earle C. Anthony, Inc. Los Angeles, California	W6XEA	96,000-102,000 Channel 6	1 kw.	1 kw.	A3, A5 (C.P. only)
Balaban & Katz Corporation Chicago, Illinois	W9XBK	60,000-66,000 Channel 2	1 kw.	1 kw.	A3, A5 (C.P. only)
Balaban & Katz Corporation Portable-Mobile Area of Chicago, Illinois	W9XBT	204,000-216,000 Channels 11 & 12	250 w.		A5 (C.P. only)
Balaban & Katz Corporation Portable-Mobile Area of Chicago, Illinois	W9XBB	384,000-396,000	10 w.		A5 (C.P. only) (Tele. Relay with W9XBK)
Balaban & Katz Corporation Chicago, Illinois	W9XPR	384,000-396,000	10 w.		A5 (C.P. only)
Bamberger Broadcasting Service, Inc., New York, New York	W2XBB	96,000-102,000 Channel 6	1 kw.	1 kw.	A3, A5 (C.P. only)
Columbia Broadcasting System, Inc., New York, N. Y.	W2XAB	60,000-66,000 Channel 2	7½ kw.	7½ kw.	A3, A5
Columbia Broadcasting System, Inc., Los Angeles, California	W6XCB	162,000-168,000 Channel 8	1 kw.	1 kw.	A3, A5 (C.P. only)
Columbia Broadcasting System. Inc. Portable Area of New York, N. Y.	W2XCB	336,000-348,000	6.5 w.		A5 (C.P. only) (Tele. Relay with W2XAB)
Columbia Broadcasting System, Inc., Chicago, Illinois	W9XCB	78,000-84,000 Channel 4	1 kw.	1 kw.	A3, A5 (C.P. only)
The Crosley Corporation Cincinnati, Ohio	W8XCT	50,000-56,000 Channel 1	1 kw.	1 kw.	A3, A5 (C.P. only)
Allen B. DuMont Laboratories, Inc., Passaic, New Jersey	W2XVT	42,000-56,000 C.P. 78,000-84,000 Channel 4	50 w. 5 kw.	50 w. 5 kw.	A3, A5 Special
Allen B. Dumont Laboratories, Inc., New York, N. Y.	W2XWV	78,000-84,000 Channel 4	1 kw.	1 kw.	A3, A5 (C.P. only)
Allen B. DuMont Laboratories, Inc., Portable-Mobile Area of New York, N. Y.	W10XKT	258,000-270,000	50 w.		A5 (Tele. Relay with W2XVT)
Allen B. DuMont Laboratories, Inc., Washington, D. C.	W3XWT	50,000-56,000 Channel 1	1 kw.	1 kw.	A3, A5 (C.P. only)
Farnsworth Television & Radio Corporation, Fort Wayne, Indiana	W9XFT	66,000-72,000	1 kw.	1 kw.	A3, A5 (C.P. only)
General Electric Company New Scotland, New York	W2XB	60,000-86,000	10 kw.	3 kw.	A3, A5
General Electric Company, Schenectady, New York	W2XD	162,000-168,000	40 w.		A5

TELEVISION BROADCAST STATIONS

(Continued from opposite page)

Licensee and Location	Call Letters	Frequency (Kc.)	Power Visual	Power Aural	Emission
General Electric Company Schenectady, New York	W2XH	288,000-294,000 Channel 18	40 w.		A5
General Electric Company New Scotland, New York	W2XI	162,000-168,000 Channel 8	10 w.		A5 (Tele. relay with W2XB)
General Television Corporation, Boston, Massachusetts	W1XG	S.A. 50,000-56,000	500 w.		A5
Hughes Productions Div. of Hughes Tool Company, Los Angeles, California	W6XHH	60,000-66,000 Channel 2	10 kw.	10 kw.	A3, A5 (C.P. only)
Hughes Productions Div. of Hughes Tool Company, San Francisco, California	W6XHT	60,000-66,000 Channel 2	10 kw.	10 kw.	A3, A5 (C.P. only)
The Journal Company (The Milwaukee Journal) Milwaukee, Wisconsin	W9XMJ	66,000-72,000 Channel 3	1 kw.	1 kw.	A3, A5 (C.P. only)
The Journal Company (The Milwaukee Journal) Area of Milwaukee, Wisconsin	W9XCV	300,000-312,000	6.5 w.		A5 (C.P. only) (Tele. relay with W9XMJ)
Kansas State College of Agriculture & Applied Science, Manhattan, Kansas	W9XAK	50,000-56,000 Channel 1	100 w.	100 w.	A3, A5 (C.P. only)
Don Lee Broadcasting System Los Angeles, California	W6XAO	50,000-56,000 Channel 1	1 kw.	150 w.	A3, A5 (C.P. only)
Don Lee Broadcasting System San Francisco, California	W6XDL	50,000-56,000 Channel 1	1 kw.	1 kw.	A3, A5 (C.P. only)
Don Lee Broadcasting System Portable-Mobile—Area of Los Angeles, California	W6XDU	318,000-330,000	6.5 w.		A5 (Tele. relay with W6XAO)
LeRoy's Jewelers (a partner- ship consisting of B. B., F. P., & H. Shapiro, partners) Los Angeles, California	W6XLJ	230,000-236,000 Channel 10	1 kw.	1 kw.	A3, A5 (C.P. only)
The May Department Store Co. Los Angeles, California	W6XMC	210,000-216,000 Channel 12	1 kw.	1 kw.	A3, A5 (C.P. only)
Metropolitan Television, Inc. New York, New York	W2XMT	162,000-168,000 Channel 8	250 w.	250 w.	A3, A5 (C.P. only)
National Broadcasting Co., Inc., New York, N. Y.	W2XBS	50,000-56,000 Channel 1	12 kw.	15 kw.	A3, A5 S.A. Special
National Broadcasting Co., Inc., Portable (Camden, N. J., and New York, N. Y.)	W2XBT	162,000-168,000 Channel 8	400 w.	100 w.	A1, A2, A3, A5 (Tele. relay with W2XBS)
National Broadcasting Co., Inc., Portable-Mobile Area of New York	W2XBU	282,000-294,000 Channel 17, 18	15 w.		A5 (Tele. relay with W2XBS)
National Broadcasting Co., Inc., Washington, D. C.	W3XNB	60,000-66,000 Channel 2	1 kw.	1 kw.	A3, A5 (C.P. only)
National Broadcasting Co., Inc., Portable (Area of Camden, N. J., and New York, N. Y.)	W2XBT	162,000- 168,000	400 w.		A1, A2, & A5 (Used with W2XBS)
National Broadcasting Co., Inc., Philadelphia, Pennsylvania	W3XPP	102,000-108,000 Channel 7	1 kw.	1 kw.	A3, A5 (C.P. only)
Philco Radio & Television Corporation, Philadelphia, Pennsylvania	W3XE	66,000-72,000 Channel 3	10 kw.	10 kw.	A3, A5
Philco Radio & Television Corporation, Portable (Area of Philadelphia, Pennsylvania)	W3XP	230,000-242,000 C.P.	15 w. 125 w.		A5 (Tele. relay with W3XE)
Purdue University West Lafayette, Indiana	W9XG	66,000-72,000 Channel 3	750 w.	750 w.	A3, A5 (C.P. only)
RCA Manufacturing Co., Inc. Portable (Camden, New Jersey)	W3XAD	321,000-327,000	500 w.	500 w.	A3, A5
RCA Manufacturing Co., Inc. Camden, New Jersey	W3XEP	84,000-90,000 Channel 5	30 kw.	30 kw.	A3, A5
State University of Iowa Iowa City, Iowa	W9XUI	50,000-56,000 210,000-216,000 Channels 1, 12	100 w.		A5
Television Productions, Inc. Los Angeles, California	W6XYZ	78,000-84,000 Channel 4	1 kw.	1 kw.	A3, A5 (C.P. only)
Television Productions, Inc. (Area of Los Angeles, California) (Portable-Mobile)	W6XLA	230,000-242,000 Channels 13, 14	250 w.		A5 (C.P. only) (to be used with W6XYZ)
WCAU Broadcasting Company Philadelphia, Pennsylvania	W3XAU	84,000-90,000 Channel 5	1 kw.	1 kw.	A3, A5 & Special (C.P. only)
Zenith Radio Corporation Chicago, Illinois	W9XZV	50,000-56,000 Channel 1	1 kw.	1 kw.	A3, A5



1—A front view of the deluxe amplifier showing simple and neat appearance. 2—Rear view of amplifier, showing input and output connections.

HIGH FIDELITY AUDIO AMPLIFIERS

Part 2

Larry LeKashman, W2IOP

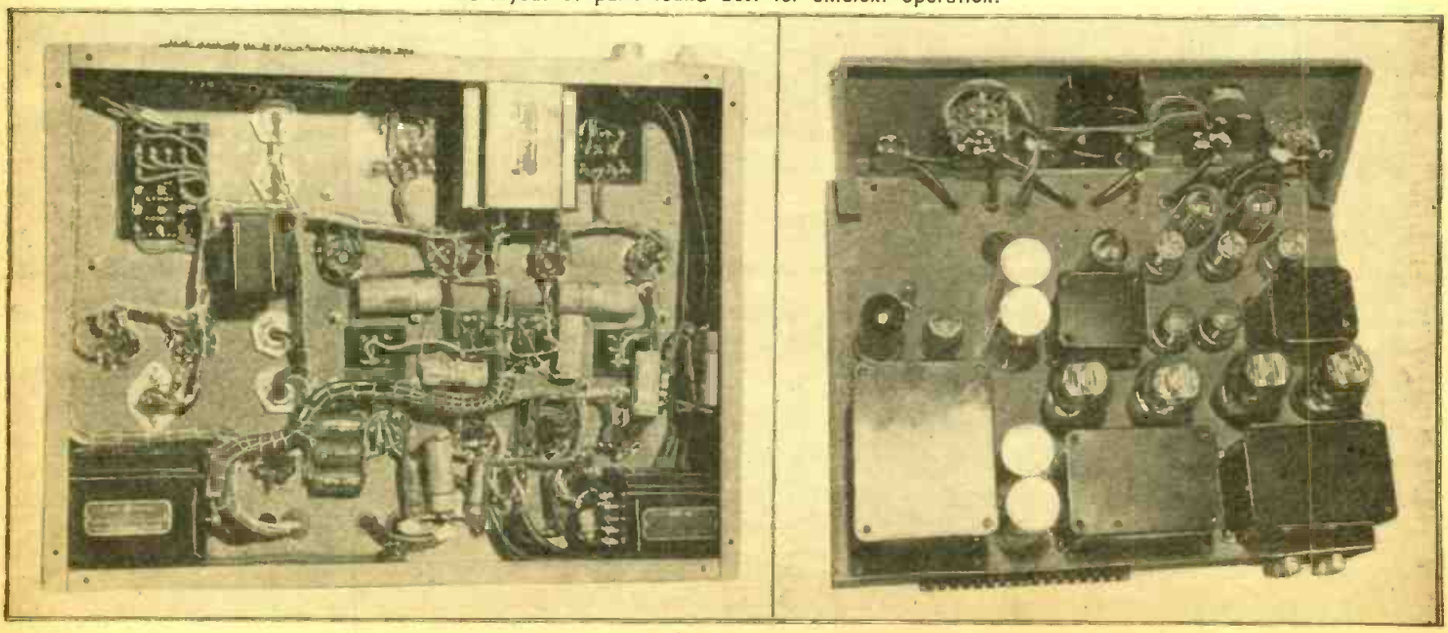
● THE semi-professional multi-purpose amplifier which was promised for last month is presented herewith. The extra month's grace was necessary to iron out a few bugs that arose in the original model. To justify any criticism of this amplifier because of its complex nature, it should be pointed out that it has not been designed for anyone but the experienced builder.

This unit may be used as a conventional audio amplifier, using either one or all of its three input circuits and two output circuits — singly or in any desired combination. High level electronic mixing is employed. Normal output from either channel is 15 watts; 30 watts is obtainable by paralleling outputs.

15 or 30 Watts

The unit may be used as a conventional audio amplifier, using either of its three input circuits or two output circuits together, singly, or in any desired combinations. Two high impedance inputs and one universal input make it possible to connect the amplifier to just about any type gear available. The mixing is *high-level electronic mixing*, that is—it is accomplished at high impedance, after the signal level has gone through one audio stage. The advantage of this method is that when the volume control is used at very high levels, there is less tendency for noise to develop. Normal output from either channel is 15 watts. They may be paralleled up to give an undistorted output of 30 watts. Since the

3—The bottom of the amplifier is neat, despite the complicated circuit and numerous parts. 4—The top of the amplifier shows to full advantage the layout of parts found best for efficient operation.



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three input circuits may be mixed, there is an unlimited number of effects possible.

Dual Channel

As a recording amplifier one channel may be used for monitoring and one for recording. This prevents disturbance of the reflected load to the output stage. Output taps are available on the back terminal strip from 4 ohms to 500 ohms. This immediately introduces the possibility of using the amplifier as a cathode modulator, or as a speech amplifier in a medium or high power *radio transmitter.*

The amplifier line-up consists of 14-tubes and 1 neon bulb, arranged as indicated in the block diagram (Fig. 3). For obvious reasons it is not practical to attempt to place tubes in any specific order, since they are all related to one another and in many cases in identical manner. Tubes used are 3 6SJ7; 3 6J7; 2 6C5; 4 6A5G; 1 6H6 and 1 5T4. The 6SJ7 and 6J7 have only 5 volts on the filament despite ratings of 6 volts. The reason for this action is reduction of hum and shot effect (hiss due to electrons breaking loose from the cathode) and the minimizing of thermal agitation. The 6C5's are used as voltage amplifiers before the final stage. The 4 6A5G's serve as the two separate output stages. The 6H6 is the rectifier for the bias supply, the two diodes being placed in parallel and the neon bulb serving as the regulator. The 5T4 is the rectifier for the entire amplifier.

Controls

To simplify to some degree construction of the amplifier a full description of the *controls* is in order. The accompanying diagram may be used as a reference chart (Fig. 2).

Control number one is the *range selector* for the volume indicator. This indicator is calibrated in decibels using 0 DB as 6 milliwatts. In order to increase the effective range of this scale an antennuator is inserted in series with the meter. Actually the meter is nothing more than a reference indicator, but as such is invaluable for audio work. After determining correct levels with the DB meter it may be continually referred to as a check for correct levels. Its most important use is in recording to prevent overcutting and undercutting, and in connection with this phase of the amplifier's operation is an absolute essential.

Use as Speech Amplifier

When the amplifier is used as a speech amplifier in a transmitter the DB meter is useful primarily to supplement the Class B plate meter, which is the normal modulation

Wiring diagram for the high-fidelity audio amplifier described by Mr. LeKashman. Elaborate controls provide great flexibility.

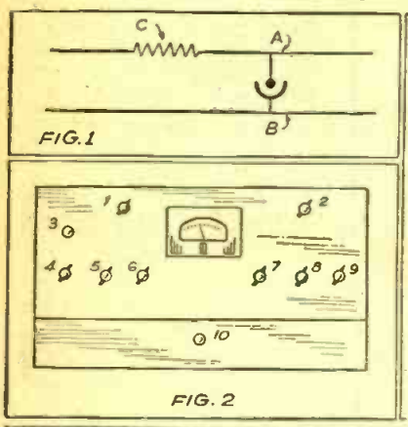


FIG. 1

FIG. 2

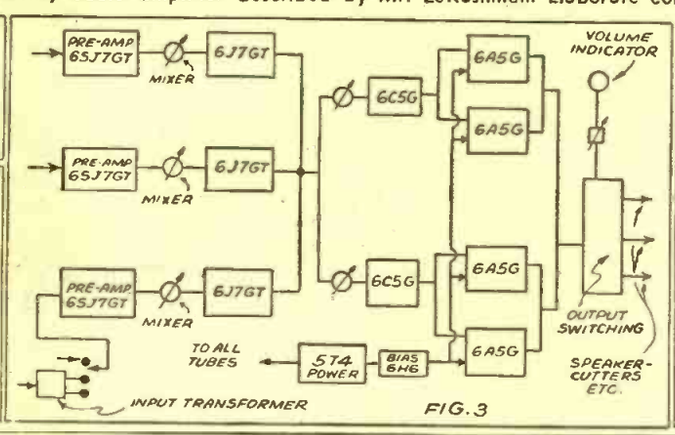


FIG. 3

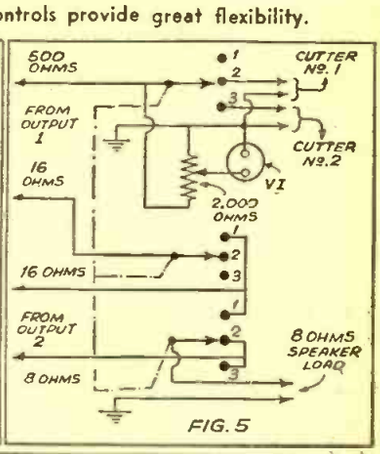
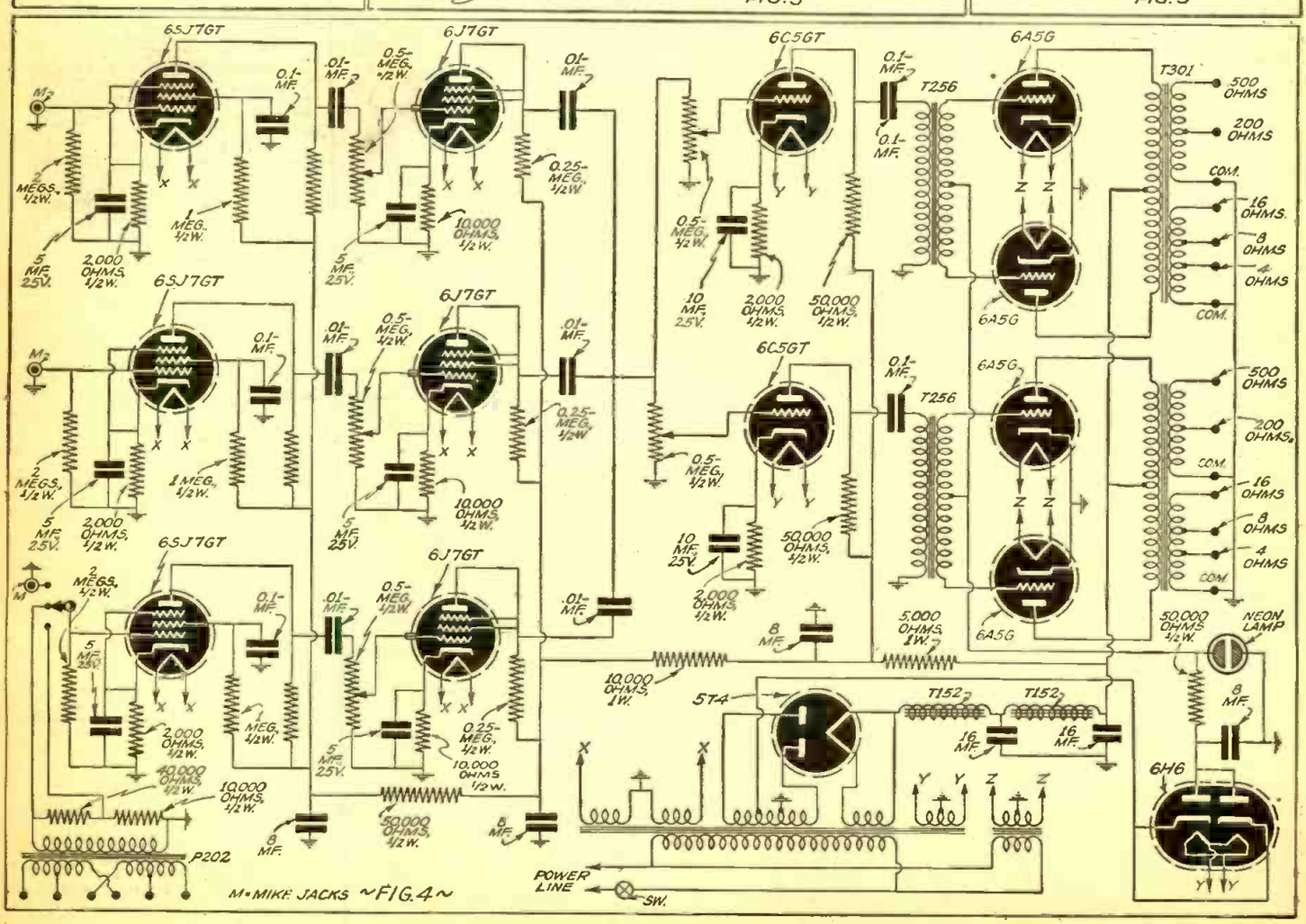


FIG. 5



indicator. The DB meter may be calibrated against the Class B plate milliammeter or better yet against an oscilloscope. This operation is quite simple. A calibration chart is drawn up showing at what point on the meter 100% modulation is shown on the scope. These percentages may be recorded from 0 to 100 in whatever steps the operator desires, although 0, 25, and 100 should be ample.

The DB meter will serve as an indicator of popular response at a party, or in amateur contests at various clubs, etc. It is often referred to as an *applause meter*, and while relatively unimportant the availability of the gadget should not be overlooked.

Output Switch

Control number two, as indicated on the diagram, is the *output switch*. In this particular case position number 1 connects the two output stages in parallel to give a maximum audio output of 30 watts into an 8 ohm load. Position number 2 switches a monitor speaker to channel number 2 and connects the recorder to output channel number 1. Position number 3 connects the monitor speaker to channel number 2, as in the case of position 2, but switches a second recorder, if used, to channel number 1. The purpose of this rather elaborate setup is to enable continuous recording with dual turntables. The builder may, of course, select any switch setup to suit his needs, providing the impedances are available on the transformer.

Control number 3 effects only input channel number 1. It was found desirable to obtain more flexibility in matching input impedances in at least one channel. Commercial microphones and some high quality pick-ups, as well as the output of some tuners are low impedance. Its first position connects the first grid to a chassis connector on the rear of the amplifier. Position number 2 connects the grid to the secondary winding of a quadruple hum shielded line to grid transformer. This position is used to match low impedance microphones to the amplifier, or as a matter of fact any low impedance. This is in direct contrast to the high impedance available when the switch is on the first position. Position number 3 connects this transformer to the grid of channel A through a fixed pad. In this position the channel may be used to amplify the output of a telephone line, high output-low impedance pick-up, or any other low impedance high-level source.

Volume Controls

Control number 4 is the volume control for input channel number 1. Control numbers 5 and 6 are volume controls for input channels 2 and 3 respectively. Control number 7 is for equalizing purposes, but since this is to be explained in a separate article, it will not be treated here. Controls number 8 and 9 are volume controls for output channels number 1 and 2. The toggle switch is A.C. on-off control.

Voltage Regulator: The neon bulb is used as a *voltage regulator* because of its ability to change its resistance, depending upon the voltage drop across it. The circuit is extremely simple as Fig. 1 illustrates. The theory behind is that the neon bulb draws an initial load. A higher voltage across A and B will cause the neon bulb to draw higher current, thus causing a greater drop between C and A. A lower voltage will increase the resistance and consequently cause a corresponding decrease in voltage drop across CA. Regulation is not perfect, but it is better than the regulation available when using a small tube like the 6H6, with a high resistance filter. At no time was regulation poor enough to require an elaborate voltage regulation system using VR regulators, or a heavy duty bias supply.

Condenser output is used for the rectifier circuit to obtain a voltage high enough to be usable as bias. No condenser is necessary at the output of the bias supply, because of the property of the neon bulb to oppose changes in voltage.

Needless to say a good common ground throughout the entire unit is essential. To obtain low grid-to-ground capacity, crystal microphone cable was used for all grid leads. In order to obtain a somewhat neater job of wiring spare prongs on tube sockets were used as mounting lugs.

One final caution must be observed, if the reader is to ever achieve any permanent success with this, or any other piece of radio equipment. Be careful of the high voltage! Despite the fact that the voltages used are not of transmitting magnitude, they are thoroughly capable of electrocution! There are countless cases on record where people have met destruction from less voltage than that generated by the high voltage supply used here. Exercise every precaution when working with VOLTAGE ON!

Parts List

PAR-METAL
1—F13170

I.R.C.
6—500,000 ohm audio taper controls 13-133
(For all other resistors refer directly to circuit diagram.)
1—WW—2000

KENYON (Transformers)
2—T256
2—T301
1—T215
2—T152
1—P202
(Telescopic shielded "humbucking" transformer-input)

NATIONAL UNION (Tubes)
4—6A5G
2—6C5GT
3—6J7GT
3—6SJ7GT
1—6H6
1—5T4

GENERAL ELECTRIC
1—CD 2005 resistorless, bayonet double-contact base neon

SIMPSON ELECTRIC CO.
Model 47 decibel meter, 5000 ohms, general purpose

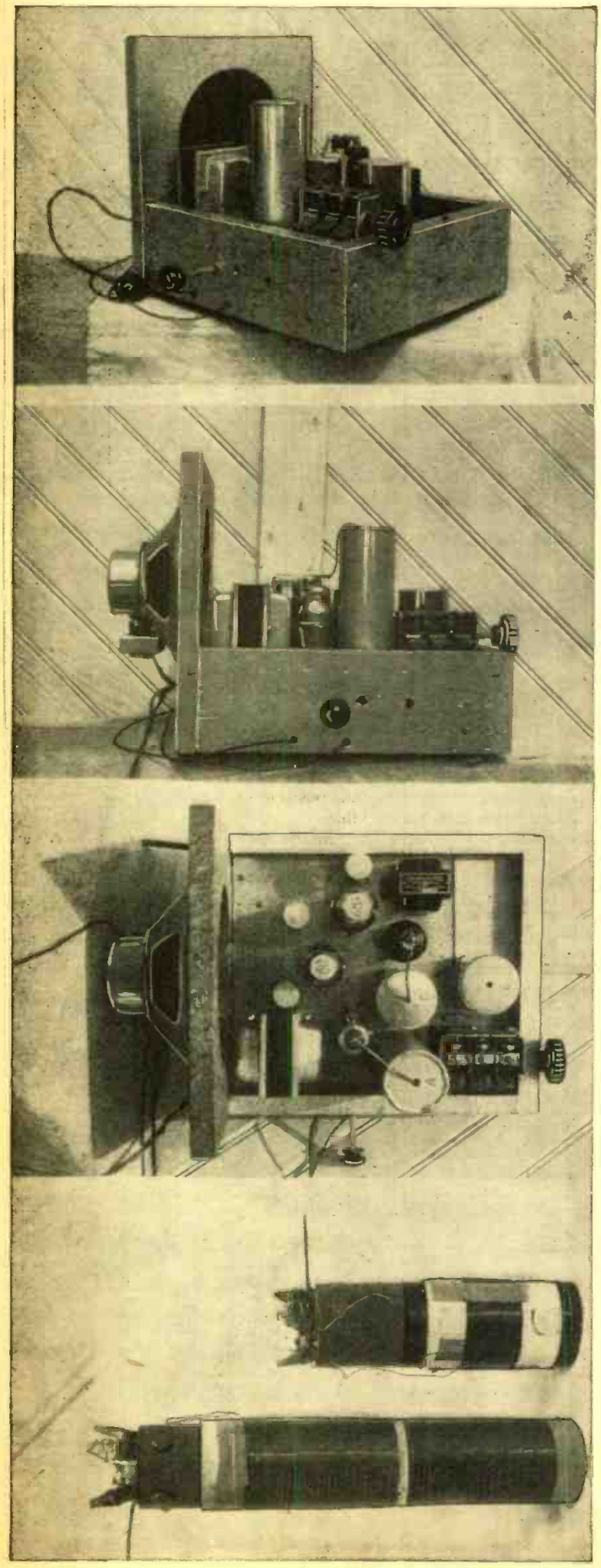
AMPHENOL
14—RS8 sockets
3—CLPC 1M
3—MC 1F
1—PC 3F
1—MC 3M

CORNELL-DUBILIER (Condensers)
2—EB 9160
2—EB 8800
(For all other condensers refer directly to circuit diagram.)

MISCELLANEOUS
1—MILLEN neon bulb socket
1—CENTRALAB 1454 switch
2—JONES terminal strips
1—SPST toggle
8—Bar knobs
4—STANCOR P3064
1—CENTRALAB 1406 switch

The SUPER T.R.F.-4

Ralph W. Martin



The group of photos at the left show various views of the "Super T.R.F." receiver, as successfully built by Mr. Martin.

Here is a mystery set — it works well says the author—it resembles a superhet, and what else it does is for our reoders to find out. The editors will be pleased to receive a brief explanation of the technical operation of this circuit. The best one received will be published.

● THE circuit of the super T.R.F. receiver here shown is substantially the same basic circuit that was shown in RADIO & TELEVISION for March, 1941, page 687, with the exception that the embryonic one-tuber has now been developed to four-tube circuit, which successfully operates an eight-inch loudspeaker. The "Super T.R.F.-4" gives excellent volume with high fidelity, and also good selectivity—due to the interaction of the band-pass tuner with the tuned oscillator circuit, comparable to that obtained by regular superhet circuits.

The author wishes to point out that the excellent performance obtained with this receiver circuit has been attained by the use of home-made tuning coils, and also with a 6J8 tube; no specially engineered parts or tubes have been employed to obtain the results described.

The experimenter will find this circuit very interesting and plenty of opportunities will suggest themselves for further investigation. The circuit is very simple and easy to construct, and in the writer's experience, it has thus far proved surprisingly stable. The final adjusting and aligning is as simple as ABC. The author has spent a lot of time with this circuit and developed it successfully through various forms using at first one tube, then two and three tubes, finally arriving at the four-tube development here shown and diagrammed. In the writer's opinion the excellent results obtained with this four-tube receiver-circuit makes this type of receiver of more than passing interest, and the idea involved shows virile signs of developing into a factor that may have some important bearing on receiver design in general.

The photo of the set here shown gives a good idea of the layout of the parts. This layout gives good results, but need not be strictly adhered to by the constructor, as other arrangements giving *short* leads should work equally well.

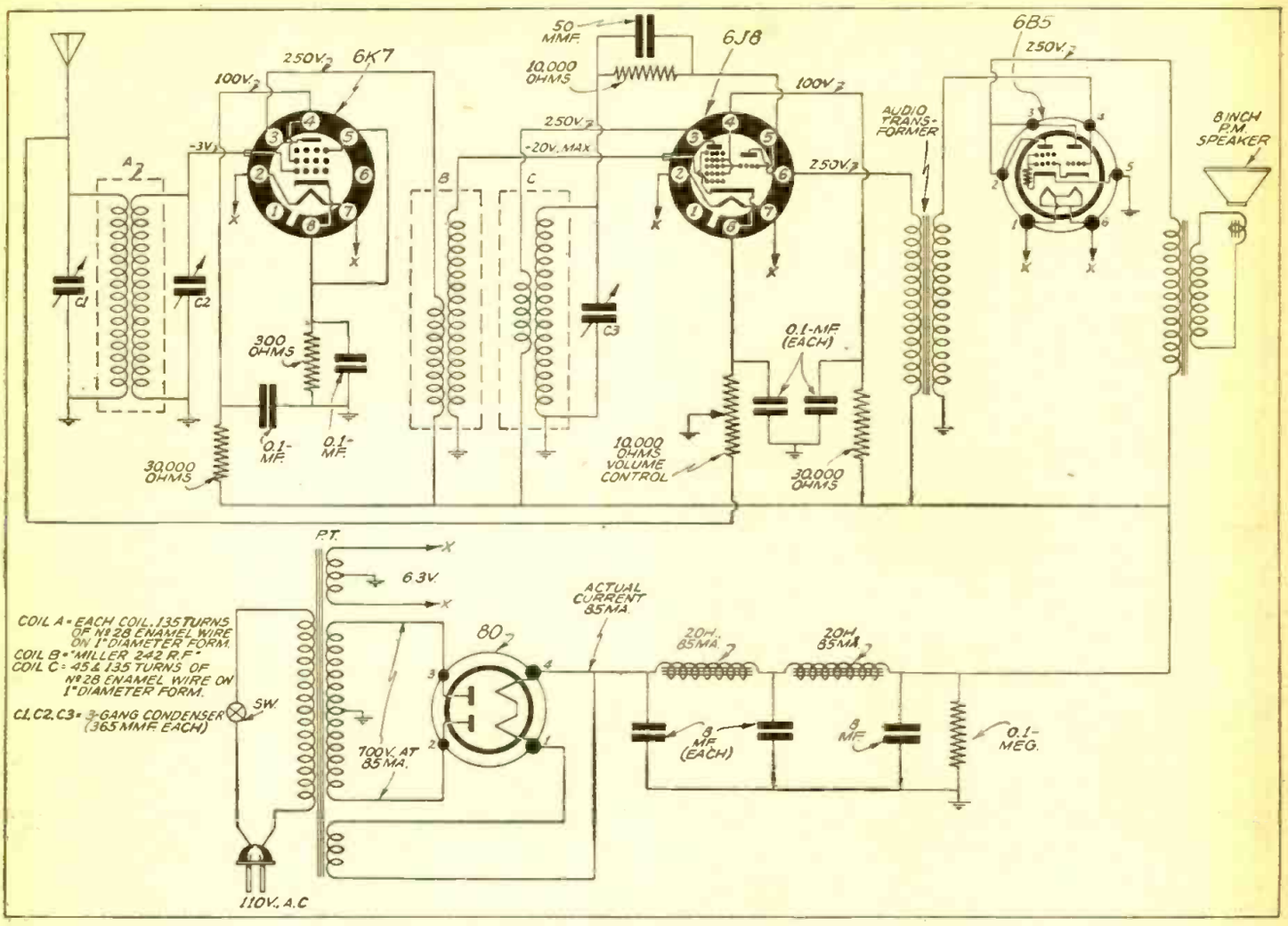
The three-gang tuning condenser is of the standard broadcast type, each section having a capacity of .000365 mf.

The two tuning coils used in the circuit are also shown by photo, and are further described as follows:

The coil forms are of fiber tubing, having an outside diameter of one inch. The three resonating coils each consist of 135 turns of perfectly spooled No. 28 enameled copper wire. The tickler coil of the oscillator, also No. 28, has $\frac{135}{3}$ or 45 turns. The direction of winding is the same as for any other R.F. coil, i.e., a right-hand helix. Each resonating coil occupies a length of about 1⅞ inches when wound on the form. The exact length of the tubular form for coil "A" is five inches; and for the oscillator coil "C" 2¾ inches is ample.

Coil "B," which is untuned, is a "Miller 242 R.F." It has a high impedance primary, which provides maximum amplification for the 6K7 tube.

Since coil "A" must have a loose coupling in order to prevent *double-spot tuning,* its coil form must be about twice the length of the oscillator coil form. In order to allow coupling adjustment, the primary is wound upon a thin paper sleeve made of several turns of good bond paper, firmly glued, so as to form a thin stiff cylinder. This cylinder should be made so that it will neatly



Circuit diagram of the Super T.R.F.-4—How does it work?

slide back and forth over the secondary coil.

The tickler of coil "C," on the other hand, must be *closely coupled*, so it is wound on a paper form directly over and in the center of the secondary.

The long form of coil "A" requires a special high shield can, which a farmer might mistake for a silo. This shield can be home-made by securing a piece of thin brass tubing and then soldering a head into the end. (See photo.) The writer used an arc-light torch for doing the soldering job, as a soldering iron will not furnish sufficient heat. (See RADIO & TELEVISION, Feb., 1941, page 588.)

The audio transformer coupling is a Thordarson, type 5736, or any other make that will match a 10,000 ohm plate. So far, a resistance coupling has not worked well at this position, although it may yet prove possible.

The final adjustment of the trimmer condensers is quite simple: No. 1 can be set most anywhere. No. 2 should be set at the point of loudest response, and finally, No. 3 also at the point of loudest response. The only instruments required are a screw-driver and the human ear . . . . not to mention extreme care and accuracy.

Valuable Articles for Reference

ARTICLES ON FREQUENCY MODULATION

In past Issues of this Magazine

A Frequency Modulation "Converter"—R. Muniz, E.E., and J. Haddad—June 1940.

Frequency Modulation—R. Muniz, E.E., and J. Haddad—July 1940.

Hints on Operating the "F.M." Receiver—R. Muniz, E.E., W. Oestreicher—Aug. 1940.

Principles of Frequency Modulation—R. Muniz, E.E.,—Aug. 1940.

Principles of Frequency Modulation—R. Muniz, E.E., Part 2—Sept. 1940.

Building the Browning "Frequency Modulation"—G. H. Browning—Oct. 1940.

Frequency Modulation "Tuner"—to Suit Your Pocketbook—Larry LeKashman and Anton Schmidt—Oct. 1940.

A Frequency Modulation Tuner—Herman Yellin—Dec. 1940.

A "Pull-Swing" Frequency Modulation System for the Amateur—R. Muniz, E.E., Donald and Warren Oestreicher—Feb. 1941. (Also March, April and May 1941.)

Principles of Frequency Modulation—F. L. Sprayberry—Feb. 1941.

An U.H.F. Receiver for FM and AM—S. Gordon Taylor—Feb. 1941.

F-M Receiver for the Home—L. M. Dezettel—March 1941.

Principles of Frequency Modulation—Part 2—F. L. Sprayberry—March 1941.

Principles of Frequency Modulation—Part 3—F. L. Sprayberry—April 1941.

TELEVISION ARTICLES IN PAST ISSUES OF RADIO & TELEVISION

New Portable Television Pickup — Sept. 1940.

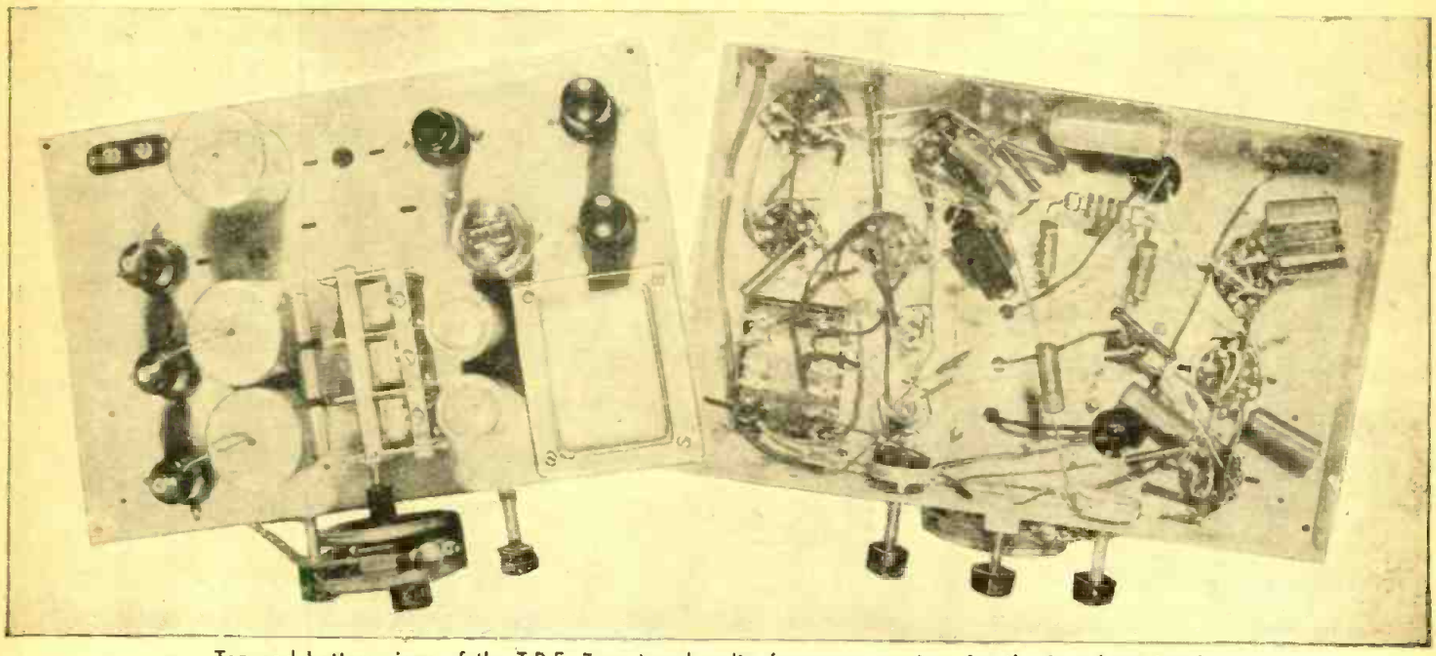
10 by 8 Inch Television Images—Television Club, Brooklyn Tech. High School—Oct. 1940.

Amateur Television Made Practical by New Image Pickup Tube—Aug. 1940.

A Semi-Portable Television Receiver—R. H. Horn—Jan. 1941.

Television Travels 190 Miles Over Wires—Mar. 1941.

Interference Phenomena in Television Reception—Thornton Chew—April 1941.



Top and bottom views of the T.R.F. 7—a tuned radio frequency receiver for the broadcast band.

7-Tube B. C. Receiver

This set has lots of Zip and Go. The average radio experimenter and set-builder will like this design very much, as it uses simple tuned radio frequency stages, with no I.F. transformers to align. Phono pick-up is provided and the set operates on 110 volts A.C. and drives a loudspeaker.

Stanley Weber

● THE radio receiver using tuned radio frequency stages is still preferred over the superheterodyne in some respects. Chief preference of the T.R.F. circuit is its simplicity of construction, inasmuch as no instruments are required to adjust it for operation and likewise it is free from image frequency and other faults so common to superheterodynes when improperly aligned.

Nearly all amateur operators at some time have desired an extra receiver for the shack that can be used for faithful reproduction of music. The majority of our commercial commuuications receivers use small built-in speakers, which serve quite well for speech but aren't very good for music. With this thought in mind, I constructed a receiver from parts usually found in the junk box or piled away on a shelf somewhere. This set really has a great amount of selectivity and sensitivity, topped off with excellent gain.

This set will appeal to the experimenter and set-builder also as a fine one for use in the home, placed either in a pretty cabinet for an extra portable set to carry from room to room. If the latter is the intention, the chassis can be made very compact and a small speaker may be used, as long as proper push-pull output transformer is provided.

A type 80 rectifier is employed, as the author feels that it is superior to corresponding metal tubes. All the remaining tubes are of all-metal type.

Two type 6K7's are used as R.F. amplifiers, followed by a 6J7 as power detector, which incidentally is operated with rather high screen voltage (100 volts) for greater gain at no appreciable sacrifice of reproduction quality. The detector is resistance-capacity coupled to a 6C5, which in turn drives a pair of 6F6's in push-pull. You will note that the 6F6's are used as triodes with screens tied to plates. In this case the stage is capable of 18 watts power output.

A front view of the T.R.F. 7 broadcast receiver with loudspeaker. It may be mounted in a suitable cabinet and the tone quality improved by a suitable baffle chamber.

Provisions are made for phonograph pick-ups or even for microphone input if you wish. A tiny switch for the purpose such as Cutler-Hammer #13044 is very convenient for switching from phonograph to radio.

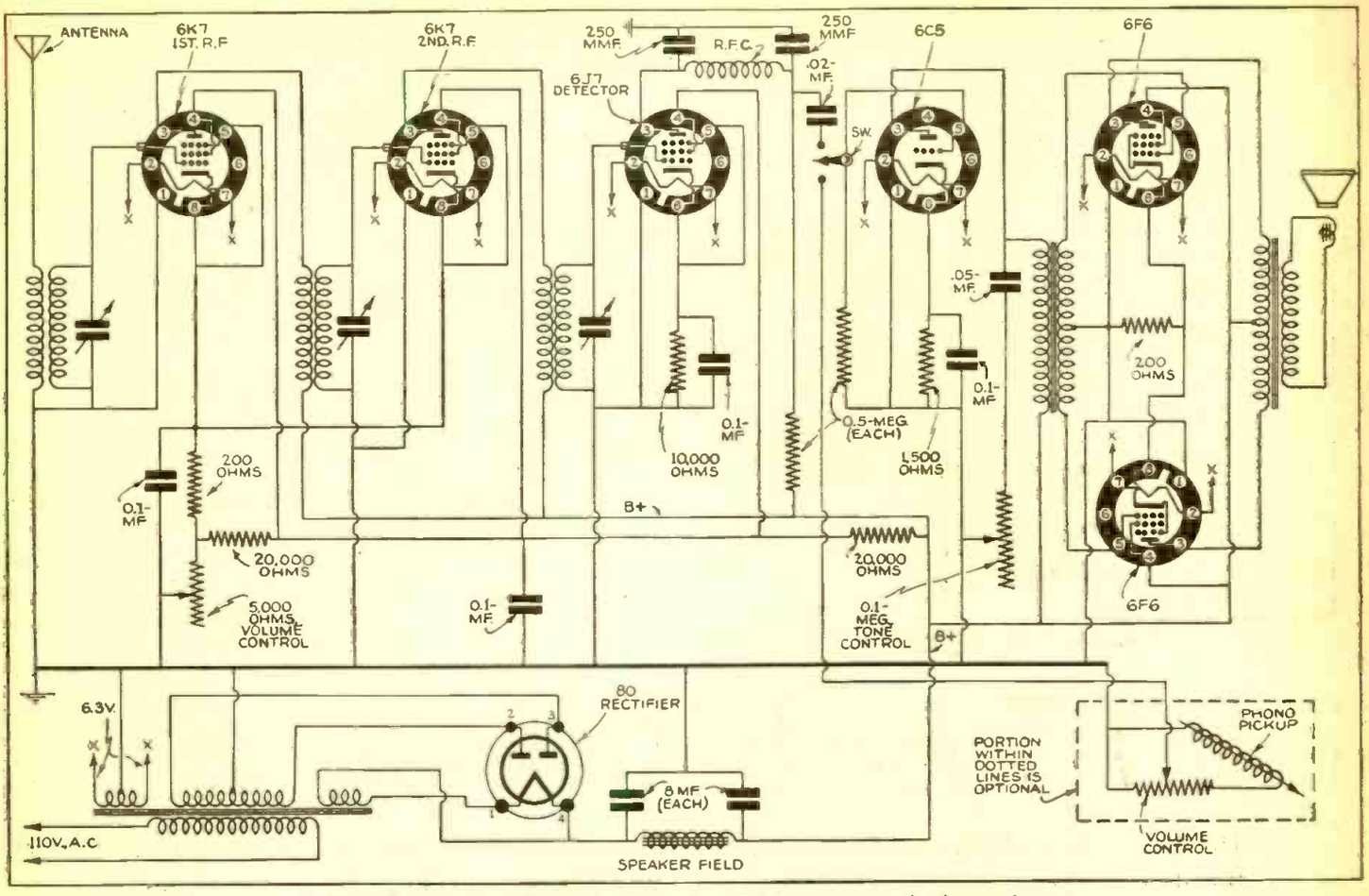
It is suggested that all leads be as *short* as possible, and neatly arranged; above all, keep grid circuit wires away from those of the plate circuits, as far as possible. Use shielded hook-up wire from R.F. transformer shield cans to grid caps on tubes. These precautions are recommended to eliminate feed-back with its resultant squeaks, whistles and erratic operation. There is no need to be afraid of this happening if reasonable care is used in the construction and planning.

A 4-prong wafer tube socket is placed in rear folded side of chassis, into which is plugged the dynamic speaker and assembly. The speaker field serves as filter choke and connections are made so that the two large speaker plug prongs are placed in this circuit, while the two small prongs are used for the audio output circuit. This of course is for identification purposes.

A phonograph input terminal strip is mounted somewhere on the same plane with the speaker socket, while a terminal strip for "antenna and ground" is placed at the left rear corner of the chassis, referring to top view.

When the set is completely wired, check it over completely before connecting to the 110 v.-A.C. line. This is always a good procedure to follow, regardless of how good you may be at set construction.

Connect to a good straight wire antenna (inverted L type) if distant stations are



Wiring diagram for building the T.R.F. 7—a T.R.F. receiver with plenty of pep!

expected. This antenna may be from forty to sixty feet in length and used in conjunction with a good ground. The original set works quite well however on only a few feet of wire and *no ground connection.*

Now we adjust the trimmers on the tuning condensers; start by tuning in a station near the center of the dial and adjust volume to a suitable level. With a bakelite or wooden screw-driver adjust detector trimmer for maximum speaker output as observed by ear. Next adjust the trimmer for the 2nd R.F. stage and finally the trimmer for 1st R.F. stage. Now recheck your adjustments. Next we tune in a station at the high frequency end of the band. We now make adjustment by bending slightly in or out, as need may be, the outer rotor plates and only the portion in mesh at that frequency. This is done at regular intervals from high frequency to low frequency end of dial. At each setting the segments are carefully bent for maximum output.

Parts List

MILLER
1—Antenna coil No. B5848
2—R.F. coils No. B5849
1—R.F. choke No. B5785

RAYTHEON (Tubes)
2—6K7's
1—6J7
1—6C5
1—80
2—6F6's

MEISSNER
Power transformer No. T70R78
Push-pull input transformer No. T33A91
Push-pull output transformer No. T13S44

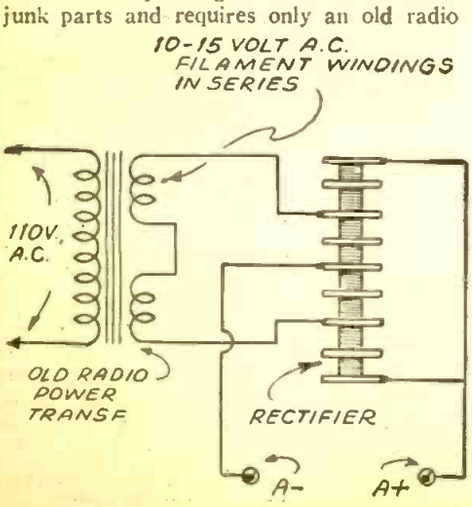
MALLORY
5—.1 mf. condensers, 400 volt
1—.05 mf. condenser, 400 volt
2—.00025 mf. condensers, 600 volt
1—.02 mf. condenser, 600 volt
2—8 mf. wet electrolytics. No. B13481

I.R.C. (Resistors)
Type 11-128 potentiometer for tone control (100,000 ohms)
Type 13-114 volume control (5000 ohms)
2—20,000 ohm BT-2 watt resistors
2—200 ohm resistors, BT-1 watt
1—1500 ohm resistor, BT-1 watt
1—10,000 ohm resistor, BT-1 watt
2—500,000 ohm resistors, BT-1 watt

MISCELLANEOUS
Metal chassis
Tube and transformer shields
Knobs
Tuning dial assembly
Grid caps
Terminal strips
8 wafer sockets
Speaker cord and plug

BATTERY CHARGER

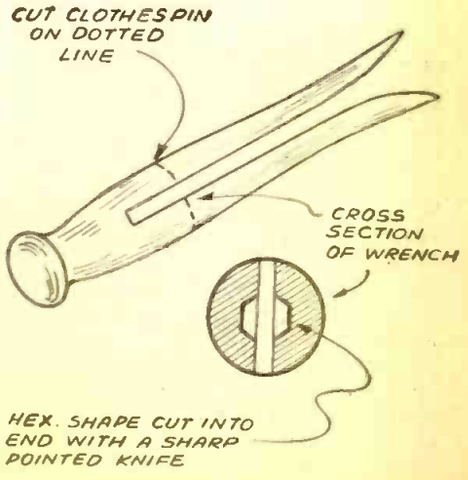
This battery charger can be made from junk parts and requires only an old radio power transformer and a dry disc rectifier of the Elkon type M-16. A little experimenting may be necessary to get the filament windings of the transformer connected in series so as to get the desired voltage. The output of this charger is from two to four amperes at six volts. For those having an old "A" battery eliminator of the dry rectifier type, they may have an efficient charger by removing all resistance, chokes, etc., and connecting the battery to the output.—*H. D. Malvin.*



SIMPLE HEX WRENCH

Not having an insulated hex wrench and having several trimmer condensers of that variety to use, I found that a clothespin would work okay. It was cut as indicated and a small amount of filing with a wood rasp, was all that was needed to make it fit through the hole in the chassis to the hex nut on the condenser.—*W. L. Doud.*

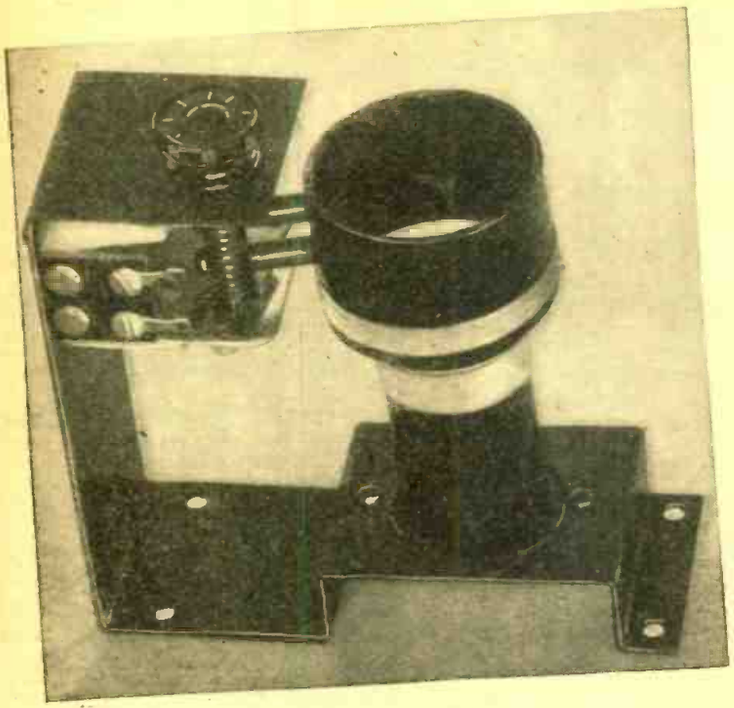
Any piece of hard wood will serve the same purpose if suitably slotted.



A Variable Antenna Coupler

A. Binneweg, Jr.

By using the device here described, the maximum performance may be realized from any receiver, whether large or small.



Appearance of the variable antenna coupler here described.

● IT is true that the aerial on a radio receiver for best all-around results is the most important consideration for receivers using low gain in the R.F. stages. Without a good antenna, no matter what condition the receiver is in, or how good the receiver is, results are not so satisfactory. An ordinary broadcast station receiver is always better on distance with a good aerial and this is particularly true when the waves to be received are short or ultra-short waves. When there are many powerful local stations, a short aerial has to be used, not for any other reason than that the selectivity, due to the powerful input, should be greater.

Regenerative Receivers

The simplest type of receiver for short waves is the regenerative receiver, a familiar type, and a type that is capable of tremendous amplification at proper operation, when properly adjusted and when properly supplied from a long antenna. The greatest volume possible from a single tube, and for best radiophone reception, will come from a single regenerative receiving set. Without regeneration such a tube would be dead, and no code stations could be heard.

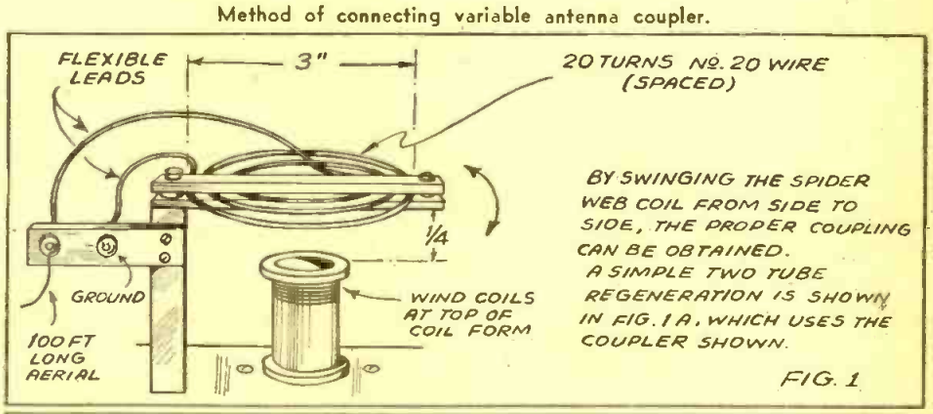
When a regenerative receiver plays directly from an aerial, the aerial should be high and long. This introduces difficulties at short waves because the coupling varies with frequency. At certain frequencies resonances frequently appear, and it is these that give rise to dead spots on the receiver's dials. If the stations are to be heard at any frequency within the range of the receiver it will be necessary to either use different antennas, change the natural period of the antenna or use variable coupling. The use of variable coupling to produce high gain at any frequencies within the range of the receiver, is the subject of this article. I personally believe that variable coupling is the only satisfactory solution for regenerative detectors working directly from the aerial and arranged to tune over a great range of wavelengths from say 200 meters down to about 5 meters.

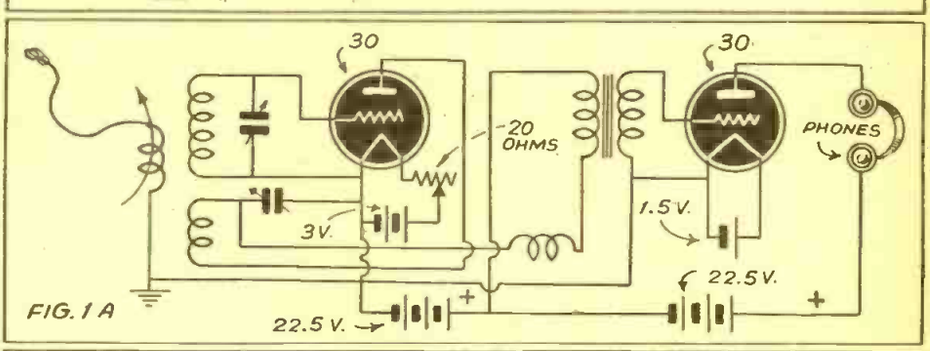
Variable Coupling

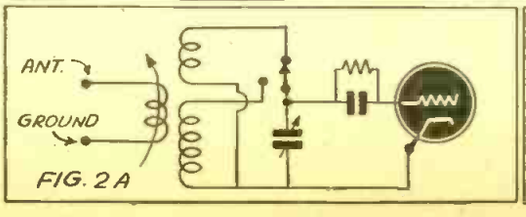
I have experimented with various kinds of antenna couplers and have found that they do have some great advantages. Some experimenters arrange a small coil in series with the aerial so to vary the coupling but this is not very convenient.

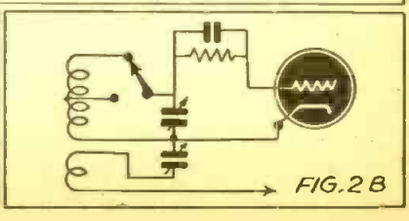
In Fig. 1 is shown a special spider web coil that can be turned from side to side to vary the coupling between it and the fixed or removable coil under it. It is also possible to arrange two coils near each other so that the aerial coupler can be turned from one to the other so to change wavelength; of course, the coils will have to be switched in some way so that the same detector can be used with the two different coils which have two different tuning ranges. Perhaps the set constructor will be content to use the two coils in his set and not bother with the use of so many. Any arrangement of coils can be used, but a very convenient arrangement is to have two plug-in coils next to each other so arranged that the antenna coupler can be changed from the one to the other. A switching arrangement is arranged so that the aerial coupler can be changed from the one inductance coil to the other. This is shown in Fig. 2A. The arrangement of Fig. 2B is probably better which uses only a

Method of connecting variable antenna coupler.









single coil with a tap on it. If two separate coils are used, separate tickler coils should preferably be employed which requires a separate switch just for the tickler coils alone.

Variable Coupling

I have designed a special spider-web arrangement of coils that is very effective. This is shown in Fig. 1.

The usual plug-in coils can be used, but it is best to have the coils quite close to the rotatable spider web so that the windings on the plug in form should be close to the top of the form.

For use in a higher grade of receiving set or for use in transmitting sets to adjust the coupling between stages, or between antenna and transmitter output, I have designed a very neat type of coupler shown in the picture herewith. It uses a variable condenser frame. The shaft of the variable condenser is drilled for a common size of machine screw, and the bakelite tubing is supported from two machine screws passing through the tubing. The frame can be formed of any heavy metal stock. The bakelite piece normally used for the stator of the variable condenser can be used to support the lugs which connect with the aerial and ground. To turn the coupler, a knob is provided on the shaft of the condenser. The ends of the winding on the bakelite tubing have flexible leads which extend to the lugs shown on the bakelite piece of the condenser.

Use of Coupler

The plug-in coil shown in the photo, fits down into an ordinary tube socket which is raised above the baseboard so that the socket terminals clear and so that the leads can be above the chassis on the baseboard. If the coupler is formed as a part of the set, it will be unnecessary to provide a raised portion for the socket. The socket can then be part of the chassis. It is to be noted that this coupler is especially designed for use with plug-in coils and since the coupler has fixed distance above the baseboard or chassis, that all the plug-in coil forms must be of the same height.

Wind all the coils on the same height forms and wind all the coils near the top of the coil forms. In the model used, the secondary coil was at the top of the form and the tickler coil was just underneath this; it worked very satisfactorily indeed.

It can be seen that, for best operation at any frequency, the coupler is turned to a definite relation with respect to the plug-in coil underneath and this position should be selected for each coil. To do this, it may be desirable to use a scale on the knob which turns the coupler.

If a dead spot appears on the tuning range of the set, turn the coupler away until the dead spot disappears.

Tuning

It is true that the adjustment of the coupler when operating in conjunction with the detector coil, does change the frequency slightly, but if a definite coupling value is selected, the dial settings will always be the same wavelength settings. Most experimenters don't care whether the dial settings change slightly or not, so long as better results are obtained. That is exactly what the purpose of these couplers is—to give the maximum of performance, and hence the lowest cost per tube for a given result, for a small receiving set. There are of course many applications where variable coupling can be used in transmitting sets, in measuring apparatus and in all kinds of receiving sets. For example, this coupler idea can be used in connection with an ordinary amplifying tube with the plate return passing through the movable part such that the regeneration in the stage can be adjusted to give a maximum of volume, especially useful at the very high frequencies. It is seen that these couplers have use in any type of receivers, whether the receiver is purchased ready made or is assembled from a kit or available parts.

Effect of Close Coupling

When a station is located, at the fixed value of coupling, keep increasing the coupling until the station is received at its loudest, no matter what form of receiver you are using the coupler in. You will notice that more feed-back will be necessary when a greater antenna coupling is used, but the station will come in a great deal louder when the coupling is increased.

It is believed that the use of adjustable coupling will greatly increase the results from your present small set, or from any small or even large set, for transmitting or for receiving, that you may construct. Above all, use a long aerial, 100 ft. or longer, high above the earth and for general use wind about twenty turns on the 2½ inches diameter bakelite tubing if you prefer this type of coupler.

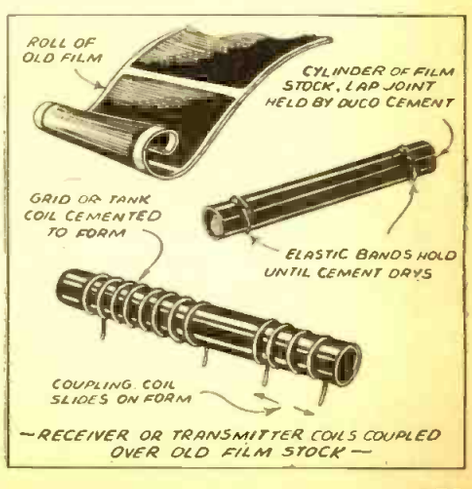
COIL FORM FROM FILM

● GET either an old roll film of large size or a large cut film. Exposed material is OK.

Cut out a piece the length you require. Then roll it over a round stick, lapping the joint and cementing with Duco cement.

Wind on one coil and hold the turns with a few drops of cement. Then wind the coupling coil slightly smaller so it will make a sliding fit when free. Push this over the form and there you are. The coupling coil can be slid back and forth until the proper amount of coupling is obtained and then cemented in position if desired.

Roll the stock so the emulsion is *inside*. —*L. B. Robbins.*



METAL CABINET Construction

John T. Frye, W9EGV

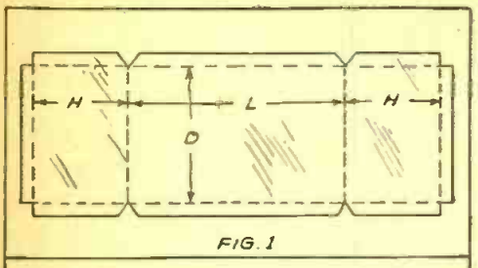


FIG. 1

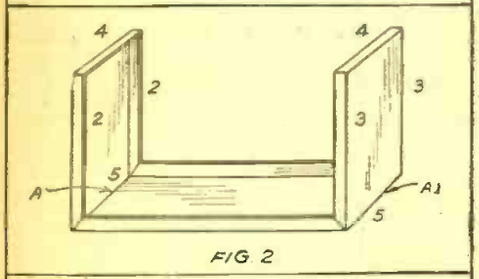


FIG. 2

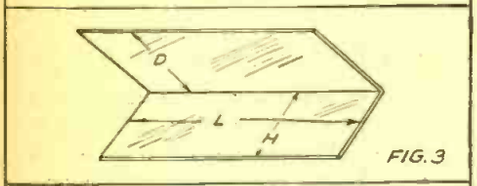


FIG. 3

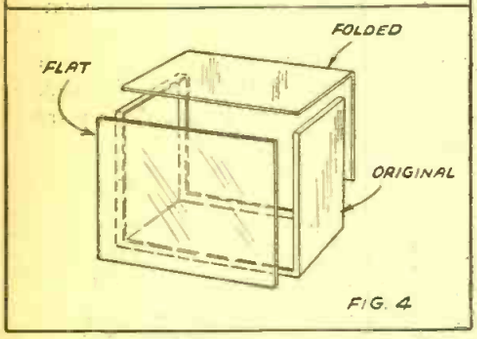


FIG. 4

Various stages in metal cabinet construction.

● THE type of cabinet construction described in this article can be built by most anyone. It describes a method of construction that enables the experimenter to construct easily and quickly, in his own shop and using simple tools, cabinets of any size and shape he may desire that will vie with manufactured products in appearance and excel them in convenience.

The tools needed are a vise, a pair of metal shears, a drill, and two bars of iron about a quarter of an inch thick and as long as the greatest dimension of the largest cabinet contemplated. Materials required are a stock of heavy sheet metal and a can of crackle-finish paint. The first can be obtained from any iron company. Its thickness will depend upon the size of the cabinet that is going to be constructed, the apparatus that is going to be mounted in this cabinet, and the facilities that are at hand for working it. If access is to be had to a power shear and folder, eighteen gauge or even heavier material may be used. Twenty gauge, though, will be found heavy enough for most cabinets, and it may be readily cut with a good pair of metal shears. The paint to use is called "Air Dry Shrivel" and is made by the Murphy Varnish Co.

With the materials at hand, you are ready to lay out your cabinet. The first thing is to determine upon the exact dimensions of the desired box; then draw a diagram upon a sheet of metal similar to Fig. 1, making dimension L equal the length, dimension D equal the depth, and dimension H equal the height of the finished cabinet. Notice that these dimensions do not include the width of the flanges. These flanges should be of generous size, varying from a quarter- to a half-inch in accordance with the size of the cabinet. For a given box, they should all be of equal width. The "V's" that are cut into these flanges should be made first. The angle formed by the legs of the "V" should be a 90-degree angle.

Next comes the *folding*. The first fold to be made is the narrow flange on the longest dimension. Place the sheet of metal in the vise so that just the flange is gripped between the two bars of iron held by the jaws of the vise. The top edges of both bars should be in the same plane and should lie against the metal exactly along the line where the bend is to be made. Take a flat piece of wood or metal and place it against the sheet with the bottom resting along the line of the contemplated bend. Exerting pressure evenly against this piece, force the sheet backward, taking care that the bottom of the piece of wood is kept against the line of bending so as to assure a sharp, right-angle bend. Such a bend will not be had if the bottom of the piece of wood is not kept flat against the sheet during the entire bending process.

The other flanges are bent in the same manner, those along the sides being bent first, and the ones on the ends of the piece being bent last. After the flanges are all bent, the two bends are made at points A and A^1 of Fig. 2. This same Fig. 2 shows the correct order in which to make all bends as well as the completed appearance of the piece.

Next comes the construction of what we shall term the "folded piece." It is made, as indicated by Fig. 3, by making a single right-angle bend in a sheet of the metal. Cutting the sheet of metal to exactly the right size and placing the bend in exactly the correct line is all that needs watching. If the original piece has been cut and bent exactly as planned, the dimensions of the folded piece will be the same "H," "L," and "D" dimensions used in laying out the original piece; however, it is a good idea to check the measurements of the first piece made before bending or even cutting the folded piece. The bend is made in exactly the same manner as the others were made.

The third and final piece is simply a flat plate cut from the metal of dimensions "L" by "H." Careful measurement and careful cutting are necessary if an exact fit is to be had.

Fig. 4 shows the method in which the flat piece and the folded piece are placed upon the original piece to form a complete steel cabinet. Leaving the original piece in the position shown in Fig. 2, the folded piece forms the top and back of the cabinet; the flat piece makes the front.

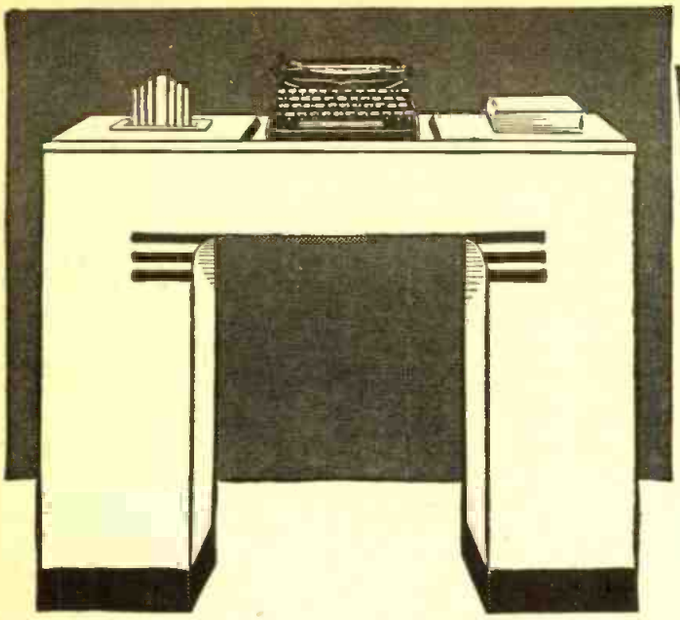
The method of fastening the pieces of metal together is dependent upon the tools available and the use to which the cabinet is to be put. If accessibility is not of primary importance, either the folded piece or the flat piece could be spot-welded to the original piece. The most simple and probably the best method, though, is to drill and tap holes in the flanges and use screws to fasten the flat and folded pieces to the original piece. Self-tapping screws may be used if desired. If, in spite of all careful measuring, some of the pieces do not fit just as snugly as desired, a little grinding on an emery-wheel will usually take care of matters.

When it comes to mounting parts, the versatility of this type of construction can be appreciated. Any side or either end can be used for the front of the cabinet. It may be placed in any position. Suppose the flat piece is used for the panel. Then, in one position, the removal of the folded piece exposes the top and back. Turned squarely over, the removal of this same piece gives access to the bottom and back. Parts may be mounted on the folded piece, with or without a sub-panel. In that case, the flat and original pieces together form a dust-cover. Still another method is to use the flat surface of the original piece for a panel, with a sub-panel built in. Then, the removal of the flat and folded pieces leaves top, back, and bottom exposed for inspection and service. In some cases, a deep narrow cabinet may be wanted. Use the end for a panel, and then the removal of the flat and folded pieces will lay bare three sides of the cabinet.

Remember, there is absolutely no restriction upon the dimensions of the cabinet to be constructed. Exactly the same procedure and method of laying out is used if the cabinet is to be 2" x 4" x 10" or if it is to be 10" x 20" x 12". You can build a cabinet to fit your apparatus instead of having to crowd your apparatus into a given space.

If the apparatus is mounted upon the flat piece together with a sub-panel, this is the only piece that will have to be replaced, if it is desired to build other apparatus into the same cabinet. The rest of the cabinet need not be discarded.

The final operation, of course, is the application of the crackle finish. Using "Air Dry Shrivel," this is no task at all. The finish is simply applied as is any other paint and allowed to dry. Instead of drying into a smooth, shiny finish, this paint shrivels as it dries and leaves a true crackle finish. Absolutely no baking is necessary. The only precautions necessary are to follow carefully the simple instructions furnished with the paint. It will feel dry to the touch within four or five hours, but it really should not be handled for twenty-four hours.



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12-WATT Emergency Xmitter

Roger C. Zaun, W9UVV*

This article describes the construction of a 12-watt amateur phone and CW (code) transmitter—a dandy job for the junior or advanced Ham. Ideal for portable or emergency service.

Photos at left show front and rear views of the 12-watt emergency transmitter.

AT this time, when preparedness and the radio amateur's part in the defense program are being so strongly stressed, a transmitter capable of portable and emergency operation is of paramount interest to all amateurs.

This transmitter is extremely universal in its application, as it can be powered from either a 110-120 volt 60 cycle line or from a 6 volt storage battery. While mainly designed for emergency service, this transmitter can be used as a stand-by transmitter around the shack, or for short-haul-cross-town-rag-chews, where power would just be wasted by turning on the big rig. Or, with an anxious eye to balmy days ahead, its small size and light weight make it the ideal vacation transmitter.

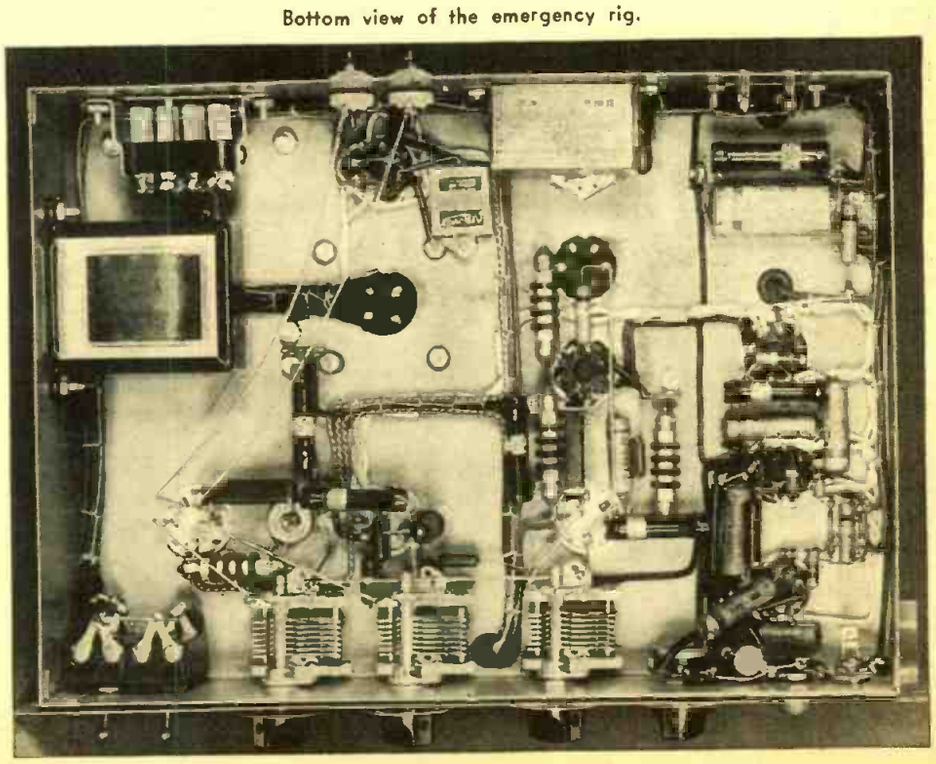
The crystal oscillator stage uses a 6V6-G in a regenerative circuit, which provides either fundamental or harmonic output, dependent upon the frequency to which the oscillator plate circuit is tuned. Capacity coupling is employed between the oscillator stage and the 807 grid circuit. The final stage is sufficiently shielded so that neutralization of the 807 is not required. The final tank circuit is of such a design as to permit matching to a wide variety of antennae. It will be noted that the tank circuits are shunt fed; this was mainly done so that the condensers could be grounded to the chassis, thus simplifying their mounting.

A milliammeter with switching arrangement is provided for reading either the oscillator or final amplifier plate current. The R-F. stages use manufactured coils, Bud type OEL.

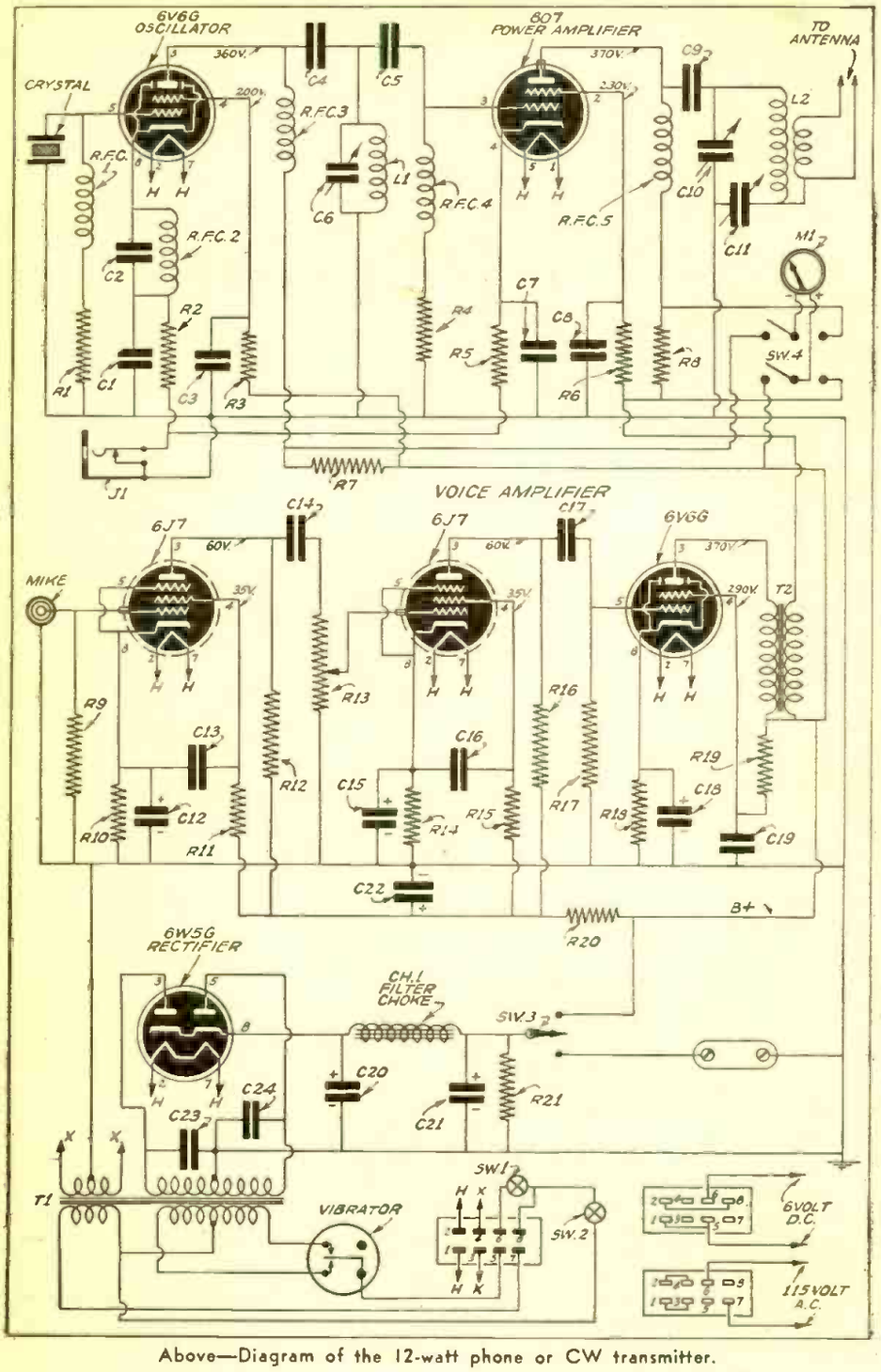
The modulator consists of a single 6V6-G in Class A1 operation. This is preceded by two 6J7 high gain pentode stages providing sufficient gain for crystal microphone operation. If the constructor prefers to use a carbon microphone, one 6J7 stage should be omitted. The power output of the modulator is sufficient for 100% modulation of the carrier with speech signal input.

The power supply uses a special vibrator transformer, permitting operation from either a 6 volt storage battery or a 110-120

Bottom view of the emergency rig.



*Engineering Department, Thordarson Electric Manufacturing Co.



Above—Diagram of the 12-watt phone or CW transmitter.

volt AC power source. Changeover from AC to DC operation is accomplished merely by insertion of the proper power plug.

In AC operation, filament voltage is obtained from a winding on the power transformer, while on DC operation, the filaments are paralleled directly across the 6 volt battery. An added feature of this transmitter is that it makes available a high voltage DC supply for operation of a portable receiver or other equipment. The switch, SW-3, located on the front panel removes the high voltage from the transmitter plate circuits and makes it available at the two lug terminal board on the rear of the chassis. Approximately 300 volts DC at 100 milliamperes is obtainable when either a DC or AC power source is used.

All of the component parts of R-F, audio and power supply sections are mounted on a single chassis measuring 10" x 14" x 3". The panel and cabinet supplied by Parmetal, give the transmitter a neat, compact and modern appearance. The layout of parts on the chassis is clearly shown in the accompanying photographs. All small parts, such as resistors, by-pass condensers and R-F chokes, are mounted underneath the chassis, supported by their own leads or with the aid of soldering lugs and resistor mounting strips. It is important that all R-F section ground connections be tied together with No. 14 solid bus wire, as the metal chassis should not be relied upon as a conductor at radio frequencies. It is desirable, also, to use No. 14 bus wire when connecting up the R-F tank circuits.

It will be noted that the vibrator is mounted on a small sub-chassis by means of rubber grommets. This was done to prevent the mechanical vibration of the vibra-

tor unit from jarring the tube elements—thus setting up microphonic noises. The leads to the primary winding of the vibrator transformer should be No. 10 stranded wire or larger to prevent excessive voltage drop, resulting from the relatively high direct current flowing in this circuit. Also, switches SW-1 and -2 should be of the heavy duty type, having contacts rated to handle the high current.

For proper operation of the transmitter, the following points should be observed:

First, depending upon the source of power available, the proper power plug should be inserted in the receptacle on the back of the chassis. This plug performs all the necessary circuit changeovers when going from AC to battery power source.

Operation of the transmitter may be obtained on any of the amateur bands from 160 to 10 meters. The oscillator stage may be worked straight through or doubling may be accomplished in the plate circuit. The 807 modulated stage operates equally well when doubling as when operating as a straight amplifier. Care should be taken not to over-excite the grid of the 807 pentode. Only a very small amount of power is necessary to drive this stage. Over-drive will result in excessive screen grid heating with a resulting reduction in power output. The amount of excitation can conveniently be controlled by detuning the oscillator tank condenser C-6.

While nominally rated at 12 watts input on phone operation, greater inputs may be used when working CW by simply removing the modulator and speech amplifier tubes, thus making more current available, allowing heavier loading on the 807 final stage.

Due to the unpredictable conditions under which the transmitter may be called on to operate, an output circuit was employed which would efficiently match, to the final stage, any antenna. This circuit will accommodate either an antenna fed by a low impedance line, any end fed, or single wire fed, antenna; or, in fact, any random length of wire which is available at the moment. The 807 tank circuit consists of two condensers C-10, C-11 and a coil L-2. When feeding a doublet antenna, C-11 is tuned to maximum capacity, in which position it is shorted out by means of a bend rotor plate. The tank circuit is then adjusted in the conventional manner, tuning for maximum plate current dip.

When using an antenna of the single wire feed variety, connect one end of it to the junction of C-11 and L-2. With this connection, the circuit elements C-10, C-11 and L-2 constitute a pi-network. The degree of final stage loading may be adjusted by tuning C-11. Loading is increased as the capacity of C-11 is decreased.

To turn on the transmitter in DC operation, first close SW-1 which causes the filaments to heat. Next, close SW-2 which controls the vibrator. A short time interval should elapse between the closing of SW-1 and SW-2 to allow the rectifier heater to come up to operating temperature. Otherwise, damage to the 6W5-G tube may result.

For AC operation, SW-1 should be closed permanently. Filament and plate voltages are then controlled by SW-2. SW-3 may be used as a stand-by switch, if desired.

Parts List for Emergency Transmitter

(Thordarson) Transformers and Chokes

1—T-1 T-14R40 power transformer
1—T-2 T-19M13 modulation transformer
1—CH-1 T-57C53 filter choke

TUBES

1—Type 6W5-G tube
2—Type 6V6-G tubes
2—Type 6J7 tubes
1—RCA type 807 tube or Hytron HY61/807

RESISTORS

1—R1, 20,000 ohm, 1 watt resistor
1—R2, 350 ohm, 10 watt resistor, Ohmite Brown Devil
1—R3, 15,000 ohm, 10 watt resistor, Ohmite Brown Devil
1—R4, 100,000 ohm. 1 watt resistor
1—R5, 300 ohm, 10 watt resistor, Ohmite Brown Devil
1—R6, 15,000 ohm, 10 watt resistor, Ohmite Brown Devil
1—R7, 50 ohm, 10 watt resistor, Ohmite Brown Devil
1—R8, 50 ohm, 10 watt resistor, Ohmite Brown Devil
1—R9, 5 megohm, ½ watt resistor
1—R10, 5000 ohms, 1 watt resistor
1—R11, 3 megohm, ½ watt resistor
1—R12, 500,000 ohm, ½ watt resistor
1—R13, 1 megohm volume control, Centralab N-104
1—R-14, 5000 ohm, 1 watt resistor
1—R15, 3 megohm, ½ watt resistor
1—R16, 500.000 ohm, ½ watt resistor
1—R17, 500,000 ohm, ½ watt resistor
1—R18, 300 ohm, 10 watt resistor, Ohmite Brown Devil
1—R19, 20,000 ohm, 1 watt resistor
1—R20, 20,000 ohm, 1 watt resistor
1—R21, 30.000 ohm, 20 watt resistor, Ohmite Brown Devil

CONDENSERS

1—C1, 0.01 mf. 400 volt condenser, C-D-DT-4S1
1—C2, 0.0001 mf. 500 volt mica condenser, C-D 5W-5T1
1—C3, 0.01 mf. 400 volt condenser, C-D DT-4S1
1—C4, 0.002 mf. 1000 volt mica condenser, C-D 4-6D2
1—C5. 0.0001 mf. 500 volt mica condenser, C-D 5W-5T1
1—C6. 100 mmf. variable condenser, HAMMARLUND Mc-100-M
1—C7, 0.002 mf. 500 volt mica condenser, C-D 1W-5D2
1—C8, 0.002 mf. 500 volt mica condenser, C-D 1W-5D2
1—C9, 0.002 mf. 1000 volt mica condenser, C-D 4-6D2
1—C10, 100 mf. variable condenser, HAMMARLUND MC-100-M
1—C11, 100 mf. variable condenser, HAMMARLUND MC-100-M
1—C12, 10 mf. 25 volt elect. condenser, C-D EDJ-2100
1—C13, 0.04 mf. 400 volt condenser, C-D DT-4S4
1—C14, 0.04 mf. 400 volt condenser, C-D DT-4S4
1—C15. 10 mf. 25 volt elect. condenser, C-D EDJ-2100
1—C16, 0.04 mf. 400 volt condenser, C-D DT-4S4
1—C17, 0.04 mf. 400 volt condenser, C-D DT-4S4
1—C18, 10 mf. 25 volt elect. condenser, C-D EDJ-2100
1—C19, 0.5 mf. 400 volt condenser, C-D DT-4P6
1—C20, 4 mfd. 600 volt condenser, AEROVOX GL-600
1—C21, 8-8 mf. 450 volt condenser, AEROVOX PBS
1—C22, 8-8 mf. 450 volt condenser, AEROVOX PBS
1—C23, 0.05 mf. 1600 volt condenser, AEROVOX No. 1130
1—C24, 0.05 mf. 1600 volt condenser, AEROVOX No. 1130

MISCELLANEOUS PARTS

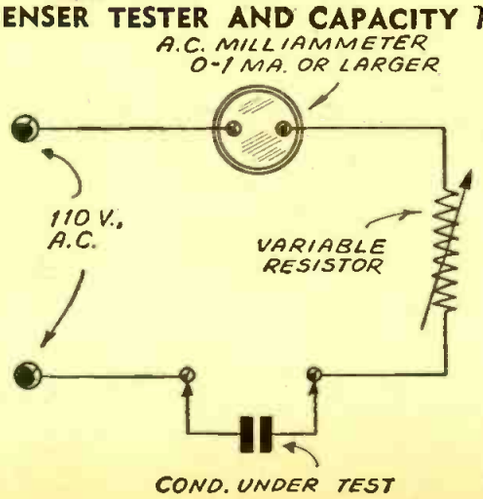
1—Chassis, 10" x 14" x 3"
1—Panel and cabinet, ParMetal No.
1—RFC-1 RF choke, MILLEN, No. 34101
1—RFC-2 RF choke, MILLEN, No. 34101
1—RFC-3 RF choke, MILLEN, No. 34101
1—RFC-4 RF choke, MILLEN, No. 34100, RFC-5 RF choke, MILLEN, No. 34101
1—SW-1 DPST switch, arrow H & H type HDT, nickel-plated
1—SW-2 DPST switch, nickel-plated, arrow H & H type HDT
1—SW-3 SPDT switch, nickel-plated, arrow H & H No. 20902
1—SW-4 DPDT switch, arrow H & H, nickel-plated
1—2-lug screw terminal board
1—J-1 phone jack, circuit closing, Yaxley B-233
3—Feed-through insulators, Johnson No. 55
1—Plug, H. B. Jones P-8-AB ¼"
2—Sockets, H. B. Jones S-8-GCT
1—Vibrator, Mallory 825
1—Mic plug, Amphenol PC-1M
1—Mic plug shield, Amphenol MC-1F
4—Knobs, MILLEN No. 10007
1—Name plate marked "A.F. GAIN," Bud N-1716
1—Name plate marked "CRYSTAL OSC. PLATE," Bud N-1173
2—Name plates marked "POWER AMP. PLATE," Bud N-1184
1—Name plate marked "SEND-RECEIVE," Bud N-1150
1—Name plate marked "PLATE VOLTS," Bud N-1168
1—Name plate marked "KEY," Bud N-1156
1—Name plate marked "PLATE CURRENT," Bud N-1721
1—0-100 MA D.C. meter, 2" square case, no illumination, Triplett No. 227-A
3—5-contact sockets, MILLEN No. 33005
5—Octal sockets, Amphenol S-8
1—4-contact socket, Amphenol S-4
1—5-contact socket, Amphenol S-5
1—Tube shield, HAMMARLUND type PTS
2—Metal tube grid caps
2—Metal tube grid shields
1—Grid grip, NATIONAL type 24
1—Set Bud R-F coils, end linked no tap, type OEL*

Plus miscellaneous nuts, bolts, soldering lugs, lockwashers, hookup wire, grommets and other hardware.

*Two coils required for operation on any one band.

CONDENSER TESTER AND CAPACITY METER

Here is a condenser tester and capacity meter which I constructed with a few parts at low cost and which works very well. As shown in the diagram, it consists of a small A.C. milliammeter and a variable resistor, also a source of current. These, with the condenser which is to be tested, are all connected in series and the meter measures the amount of current which apparently "flows through" the condenser. Since a large condenser passes a greater amount of current than a smaller one, the larger readings of capacity will be near the full scale end of the meter scale. The scale can be calibrated in mfs. by using some reliable make of condenser for calibration purposes, and then the meter can be used as a direct-reading capacity meter. The resistor is used to obtain a "zero-adjustment" on the meter. Since the circuit is essentially a series circuit, with the condenser test leads shorted a full scale reading should be obtained. An open condenser (shorted condenser) will give a full scale reading while a good condenser will give a reading proportionate to its capacity.



The diagram herewith shows how to connect up a few simple instruments in order to make a convenient and useful condenser tester and "capacity meter". The scale of the milliammeter can be calibrated to read directly in microfarads.

This meter cannot be used to test electrolytic condensers, since they are polarized, and cannot be connected into an alternating current circuit without ruining them.—*Louis Castelli.*

MEETING TWO REGULATIONS IN A DIFFERENT MANNER

(MODULATION AND POWER INPUT)

D. Reginald Tibbetts, W6ITH

● UNDER the new regulations, "An Amateur transmitter operating with a plate power input exceeding nine hundred watts shall provide means for accurately measuring the plate power input to the vacuum tubes, etc." This means a voltmeter either should or must be used to determine the product of current and voltage.

High range voltmeters are quite expensive. However this cost can be kept down by using a 0-1 milliammeter in series with resistors. Of course this being 1000 ohms per volt, 500,000 ohms should be used for each 500 volts wanted for full scale. It is desirable to use two watt carbon resistors in series. Although small current is being passed the oversize resistors minimize heating and consequent change in value. Also this keeps the voltage to 500 volts drop across each and no arcing will result.

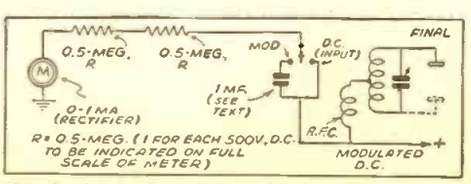
Now for the modulation indication. It is a known fact that the usual copper oxide rectifiers indicate the *average* value of alternating current voltage. In any transmitter, audio power equal to 50% of the D.C. power to the modulated stage will give 100% modulation. By simple calculation it can be shown that average sine wave alternating current voltage equal to 63.6% of the D.C. voltage also equals 100% modulation!

Thus if we connect our voltmeter on the final amplifier in the lead between the modulation transformer and the R.F. choke we read the D.C. value. By multiplying this by 0.636 we get the value of average audio voltage that will give 100%. We then connect a 1 mf. condenser in the lead between the final and the resistors. On modulation we can read directly the modulation voltage. For instance if we are using 1000 volts D.C. on the final, we should hit an average value, sine wave, of 636 volts for 100% modulation. The meter should read full scale for the D.C. value so that 100% modulation will hit a little less than two-thirds of full scale.

The nicest feature of this modulation indication is that, regardless of the power input, the modulation is accurately indicated. This is very fine for the amateur who has a series of beams that give different loading conditions to the final. It also prevents overmodulation in case some particular antenna does not take normal loading. The usual meter in an audio circuit will not divulge the actual modulation under different loading conditions.

When using voice modulation the 100% value should not be used. Many factors are responsible for this statement. The biggest factor is that the average amateur transmitter is not capable of taking 100% modulation without causing trouble. Power regulation, primary and modulation is not perfect and in most cases the peaks in voice jump when speaking. The meter may have some sluggishness in its action and not show the peaks as fast as they are reached when speaking. However, the average copper oxide rectifier 0-1 ma. meter has a nice action, rapid upswing and very little overthrow.

Thus two important regulations are met, voltage and modulation in one instrument in a circuit simple and fool-proof.

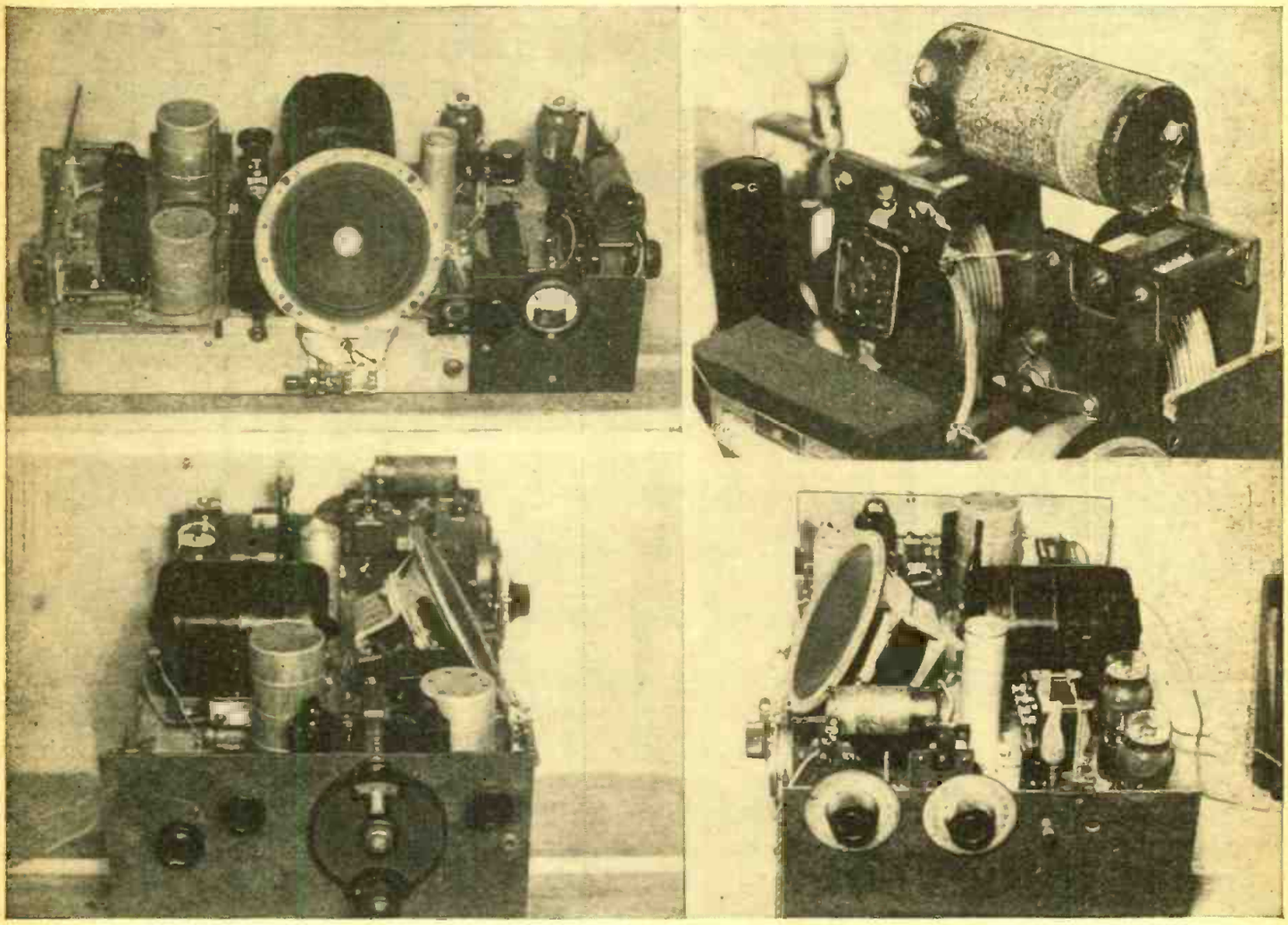


This simple circuit, together with an ordinary meter, will be found extremely useful by the amateur to check modulation and voltage.

Portable Phone Rig

L. B. Robbins, W1AFQ

This small portable phone "rig" combines a transmitter and receiver, made from odds and ends—mostly receiver parts. The author had very good results in actual tests "on the air" with this set, and covered over 35 miles in Red Cross tests, with 100% signal reports.



Various views of the portable phone transmitter and receiver, made mostly from odd parts found about the Ham shack.

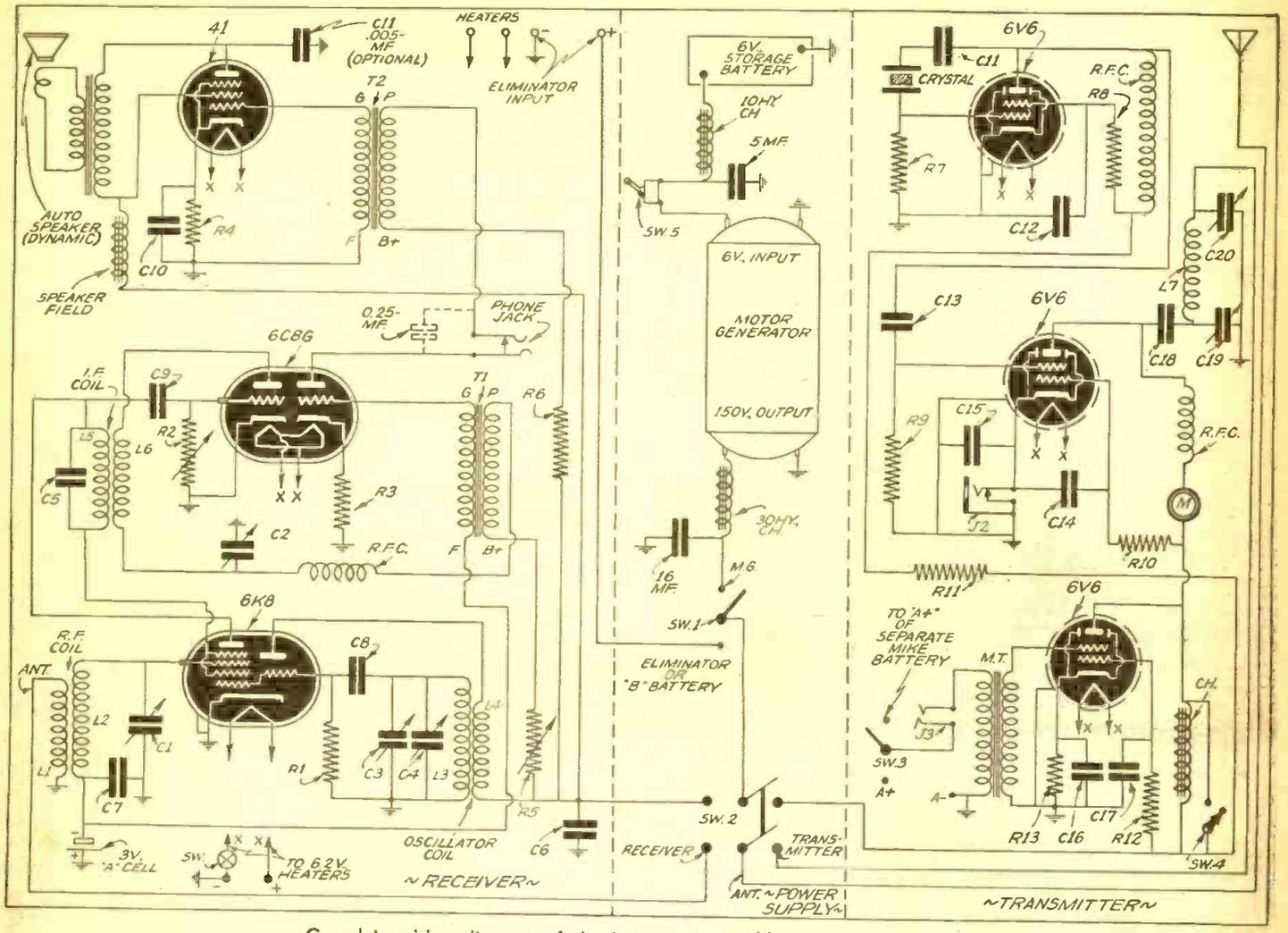
● NOWADAYS all amateur radio stations are asked to be equipped with *emergency* rigs to take care of transmissions during periods when power lines may be down and all other means of communication crippled, from whatever cause. With this in mind the writer worked out the problem in the manner shown in the pictures, diagrams and the following text. A single chassis measuring 20 x 12 supports every piece of equipment necessary to carrying on a QSO, except the antenna and mast. The transmitter input is but 2.5 watts yet 100% phone transmissions have been he'd over a distance of 35 miles air line at midday. The receiver is a semi-super-het type using three tubes which will operate a small auto type speaker. Switch-over from transmitter to receiver is instantaneous and all necessary power is that furnished by an ordinary 6 volt auto storage battery. Facilities are also included so the rig may be also operated from a power-pack or even dry "A" and "B" batteries. Altogether it is a real rig and is often used at other times than emergencies for *two-way* work. Ninety per cent of it was constructed from old receiver parts and ham "junk".

Chassis

Any discarded steel broadcast receiver chassis approaching the size mentioned may be used and can be adapted to this use, as no particular layout of parts are necessary. In this case however the transmitter is mounted at the right, the receiver at the left and the power plant and speaker in the center. The diagram shows this arrangement. Most of the wiring is underneath, but meter, switches, controls, etc., have been placed at convenient points. At each end was bolted a low panel of Masonite for dials, etc., also a short panel at the front of the transmitter for jacks, meters and modulation switch. Other accessories and equipment can be arranged by the builder to suit the type of chassis used in his case. Octal sockets replaced those not capable of use.

Transmitter

The transmitter consists of three tubes, all alike—6V6s—because of the low voltage required to swing them and their beam power charactistics. The first is crystal-controlled in a Pierce oscillator, which needs no tuning. This easily swings a second 6V6 in the final stage, and is fully modulated by a third 6V6 in the speech stage. The circuits are purely conventional and need but little explanation. No neutralization is necessary to the final. Jack 3 is for a single-button carbon mike, while a telegraph key



Complete wiring diagram of the low-power portable transmitter-receiver.

in Jack 2 provides for perfect CW operating. Switch 4 shunts out the modulation choke when operating CW. The final tank also acts as an antenna net-work so that tuning may be done to fully load any wire from 25 feet up to a half wave.

The photographs show something of the manner in which this circuit was assembled on this chassis. In the front is the tank coil mounted on top of the two tuning condensers—19 and 20, with dials on the end panel. Beside it is the modulation choke, with switch and meter in the front panel, as well as the *mike* and *key* jacks. Along the rear are the modulator and oscillator tubes with the crystal between. Mike transformer is midway between back and front and the final tube is near the end panel.

Receiver

In the receiver three tubes act as five to provide a semi-super-heterodyne type of circuit. The third tube is a straight second audio for operating a speaker. All are of the 6.2 heater type; first is a 6K8 RF-HF oscillator, while the second furnishes the detector and first audio. The third is a 41 or other type to furnish sufficient speaker "drive."

In the set-up the two tuning coils sit behind the end panel and the several variable condensers. Back of them are arranged the 6K8 and the 6C8G. The first audio transformer sits between the tubes and the third tube and its transformer are arranged nearer the chassis center and the speaker.

As this is fundamentally an "emergency rig," acting on low power, only three tuning coils will be needed to cover the 160 and 75 meter bands. Two at a time, as described, serve as RF and HF oscillator coils. Wind them according to the data given on old tube bases when possible. Only one longer form will be needed for the 160 meter RF coil.

The IF coil can be easily wound on a fiber form ¾ in. in diameter and about 3 in. long. The turns and details are all shown and should be carefully followed to bring the frequency in the neighborhood of 1600 kc. This is accomplished by fixed tuning with a high grade fixed mica condenser across the larger winding. R6 is an optional fixed resistance to lower the voltage to the plate of the second section of the 6C8G. This should be higher than the voltage to the detector section, which is reduced considerably by the variable 25,000 ohm variable resistor. A voltage of from 50 to 75 volts will give smooth detection, with the use also of a variable grid-leak. Full voltage is applied to the 6K8 and the 41. If "fringe howl" arises when using the phones, connect a ¼ mf. condenser across the phone jack.

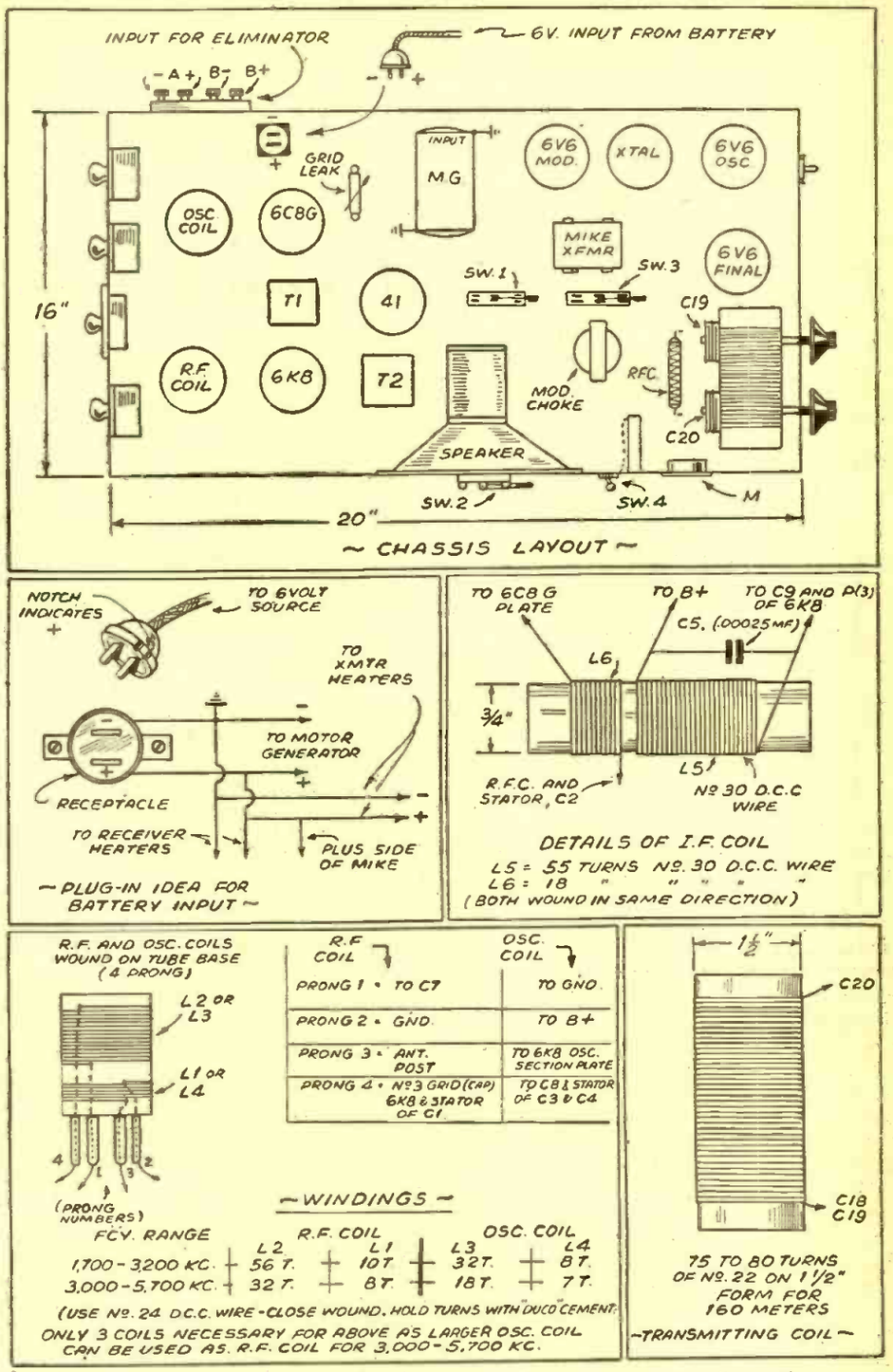
Two four prong sockets will suffice for the coils. With approximately 90 volts on the first audio, approximately 3 volts bias is needed on its grid and can be supplied by two cells of flashlight battery as shown. Jack 1 serves for headphone listening. Use fully 10 mf. of capacity to by-pass the second audio tube for best quality.

Power-Supply

The emergency power-supply in this rig consists of a 6 volt-150 volt motor-generator formerly used in an automobile power-supply. Anything similar will do nicely but this was used because it was on hand. It was mounted in the rear center, on rubber washers, and filtered. This consists of 16 mf. of electrolytic condenser across it, behind a 30 henry choke for the high power filter, and a 10 henry choke for the 6 volt input, followed by a 5 mf. low voltage condenser across the 6 volt input. No "hash" is evident in either the transmitter signal or the headphone or speaker reception. Other types of power-supply may call for different filtering and will have to be worked out by the builder. There is no reason why a vibra-pack or even 110 volts D.C. cannot be used as power. In the latter case where a 110 volt bank of batteries in a home lighting plant are used, no filtering at all will be necessary, provided the generator is not used at the time. The six-volt heaters can be lighted from three of the cells, tapped off. Binding posts will also be noticed for the use of other means of supply such as a small "B" eliminator, "B" batteries, etc. In fact the rig is fitted to take any kind of heater and plate supply available at the time. You *never* need he off the air for want of power—except a flat wallet.

Switching

Note the various switching arrangements. Switch 1 is a SPDT switch with the arm



Auxiliary diagrams showing plan of layout of "transmitter-receiver," together with coil winding data.

connected to top arm of SW 2—a DPDT affair. One side connects to the high power of motor-generator. The other side to "B" plus binding-post. Thus you can switch from generator to outside plate power.

In Switch 2 the other side of the arm connects to the antenna direct. The right side furnishes the transmitter with high power and antenna. Switching to the left throws antenna and power to the *receiver*.

Switch 3 is a SPDT which furnishes the mike with either the storage battery power used to energize the rig, or to a separate battery in case a B eliminator or other A.C. filament power is used. Switch 4 cuts out the modulation choke when using CW, as before mentioned. Heater switches are used to cut out lighting tubes to either transmitter or receiver, if one is desired to be used separately.

The storage battery or 6 volt D.C. supply to the heaters is plugged in to a common lighting receptacle at the left rear of the chassis. Mark one side of the receptacle and the plug to denote the *plus* side of the battery, so no mistake will be made. All 6 volt supplies spring from this receptacle terminals as noted in the detail sketch.

Antenna

This presents practically no problem at all. The combined final transmitter tank coil and antenna network will tune and fully load about anything at all. This circuit has loaded and worked stations many miles away, *simply using a wire strung across the room.* It has also been used with a *half-wave* antenna and was able to load it perfectly. So you see in an emergency practically any piece of wire or inde-

terminate length may be strung up and contact made. Naturally, the longer the wire, the better the chances are for working over considerable distance. Always use a *ground* wire, which becomes more necessary in receiving.

"Tuning Up"!

Putting the rig into operation is not difficult. Attach antenna and ground wires, plug in the storage battery and turn on the heaters. Plug in either mike or key and see that switch 4 is in right position. Then for transmitting throw switch 2 to right. Close switch 5 and, with switch 1 at MG position, tune up the transmitter. The crystal oscillator takes care of itself. Close C20 and then tune with C19 until the input in the meter appears about right. If too high reduce C20 until, operating both condensers, the input in the meter gives maximum output to the antenna which can be judged by touching it with a small neon bulb. If key is being used this will have to be closed to make these tests. With key out and mike in, just go ahead. A good mike will fully modulate and upward modulation will show by an upward swing of the meter. When the transmission is done simply throw switch 2 over to the left and power and antenna are then transferred to that side.

In making the *receiver* ready for operation—reduce the power input by fully closing R5. Put on headphones. Then, with filaments lighted, gradually turn on R5 until a hissing sound is heard in the phones. This hissing denotes oscillation and should be increased to a spilling point by adjusting C2 and variable leak. Then tune to signals with C3 and lastly adjust C4 for *band-spread* when the right spot in the band is found. R5 should then be adjusted for the maximum voltage input, so that no *squealing* can be heard in the phones. From 50 to 75 volts will be found about right. Remove the phones and the second audio is put into operation with full voltage on the third tube. Then readjust R5 if necessary to smooth out the signal.

Now you can see how easy it is to operate "break-in" with this outfit.—Switch 2 to right, *transmitting*—to the left, *receiving*. In any spot where a wire can be strung up for an antenna and to a spare storage battery (or even to the car battery, if the latter can be backed up to the transmitting point) and the input cable hooked on in some convenient manner. Even four dry cells, a Hot-Shot battery of 6 volts, can be used for quite a few hours' operation. Altogether, the drain from this particular motor-generator and heaters is not over 6 amperes.

Notes

In winding receiver coils, make all windings in the *same direction* and hold them with a light smear of Duco Cement. Winding ends of all coils go to the same prongs so they may be interchanged for use as RF or Oscillator coils.

R6 in receiver is to put a higher voltage on the first audio if desired, but is not necessary. Otherwise tap off that line from R5.

Other tubes can be used in the second stage other than the 41, so long as they operate on 6 volt heaters.

C1 should be set at a point for best antenna input when tuning receiver.

In winding the receiver IF coil, use the exact number of turns specified and cement them down to prevent any straying of this frequency. Use a *good* ruby mica condenser if possible.

Turns on the transmitter tank may have to be reduced so the condensers C19 and C20 will tune at about half way out. Otherwise take off or add plates to those condensers.

Higher power can, of course be used on the transmitter—in fact up to 300-350 volts with a proportionate increase in output. This is too much for the receiver under normal conditions and will have to be partly shunted out to ground until a workable voltage is obtained. Better use a low voltage supply as specified.

Make all connections rugged, well soldered and such a rig will withstand travel in a car for portable operation—with such restrictions of the FCC always in mind.

No one should hesitate in building this outfit because of cost. The one shown in the photographs cost less than $5.00 and that for the tubes, sockets and a few fixed condensers and the meter. Everything else came from old broadcast receivers or was made on the spot.

Parts List for Emergency Transmitter and Receiver Rig

Receiver

L1-2-3-4-5 and 6—See coil diagrams and data
C1-2 and 3—100 mmf. variable condensers
C4—15 mmf. variable condenser
C5—.00025 mf. mica condenser
C6—.01 mf. fixed condenser
C7—.005 mf. fixed condenser
C8-9—.0001 mf. fixed condensers
C10—10 mf. (low voltage)
R1—50,000 ohms ½ watt
R2—Variable grid-leak for detector 0-10 meg.
R3—200 ohms grid-leak
R4—400 ohms grid-leak
R5—25,000 ohms variable resistor
R6—750 ohms 1 watt (optional)
RFC—2.5 millihenry choke
T1-T2—2 3:1 audio transformers
J1—Closed-circuit jack for phones
Filament lighting switch
Small dynamic speaker

Transmitter & Power Supply

C11—.001 mf. fixed condenser
C12—.001 mf. fixed condenser
C13—.0001 mf. fixed condenser
C14—.001 mf. fixed condenser
C15—.001 mf. fixed condenser
C16—25 mf. 50 v. electrolytic
C17—2 mf. 300 v. electrolytic
C18—.001 mf. fixed condenser
C19-20—2 200 mmf. variable tuning condensers
R7—50,000 ohms ½ watt
R8—20,000 ohms ½ watt
R9—20,000 ohms ½ watt
R10—15,000 ohms 5 watts
R11—5000 ohms 5 watts
R12—5000 ohms 1 watt
R13—450 ohms ½ watt
L7—Final tank—see detail
RFC—2.5 millihenry choke (2)
CH1—20 henry modulation choke
MT—Single-button mike transformer
M—0-50 milliammeter
J2—Key jack (closed circuit)
J3—Open circuit mike jack
SW1—SPDT switch
SW2—DPDT switch
SW3—SPDT switch
SW4—SPST switch
Filament switch for heaters
Batteries—(Any well-known brand of "A" and "B" batteries, or other power-supply specified in the article.)

THE CONVERSION OF A 6-VOLT FARM SET

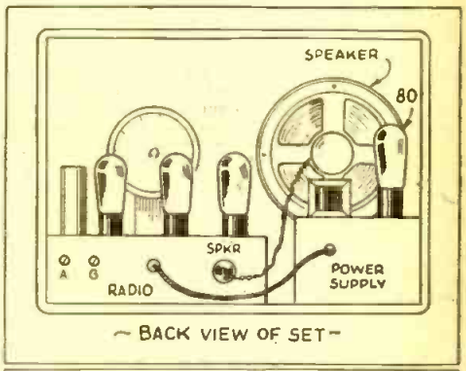
James L. Lanterman

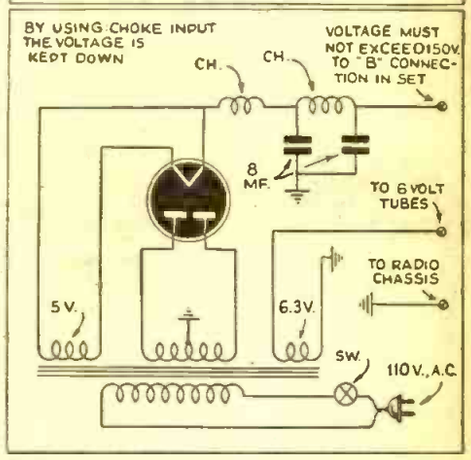
● DUE to the fact that rural electrification will do away with most 6 volt windcharger radios, there will be lots of good radios of this variety that will have to be traded or junked.

If they are equipped with the cheaper 2 volt tubes the radio probably wouldn't be worth converting. The type of set conversion I am speaking of is one equipped with the regular 6 volt .3 ampere tubes which are also used in the newer 110 volt A.C. radios.

The conversion of 6 volt to 110 volt A.C., of which I am going to describe was made on a 6 tube Motorola Model No. 56 T chassis No. B-5-2. Although I describe the conversion of this particular set, I have used the same principle on various other 6 volt radios.

The first and most important point is that this receiver originally operated with about 120 to 130 volts "B" supply. This being the case, the manufacturer built this receiver using 200 volt condensers, which worked OK with the low plate voltage. Now in making a power-supply care must be exercised in choosing the transformer in order to keep the high voltage down. The transformer I used delivered about 200





Picture above shows rear view of 6-volt set, fitted with 110 volt power-supply unit, together with a diagram of the power-supply.

volts when used with a condenser input circuit. By using a *choke* input circuit I was able to keep down the voltage to 140 volts, *with no trace of hum.* Of course the voltage might vary, somewhat, due to the condition of the rectifier tube and other circuit components.

Most battery radios have the P. M. dynamic type of speaker which makes the conversion easy.

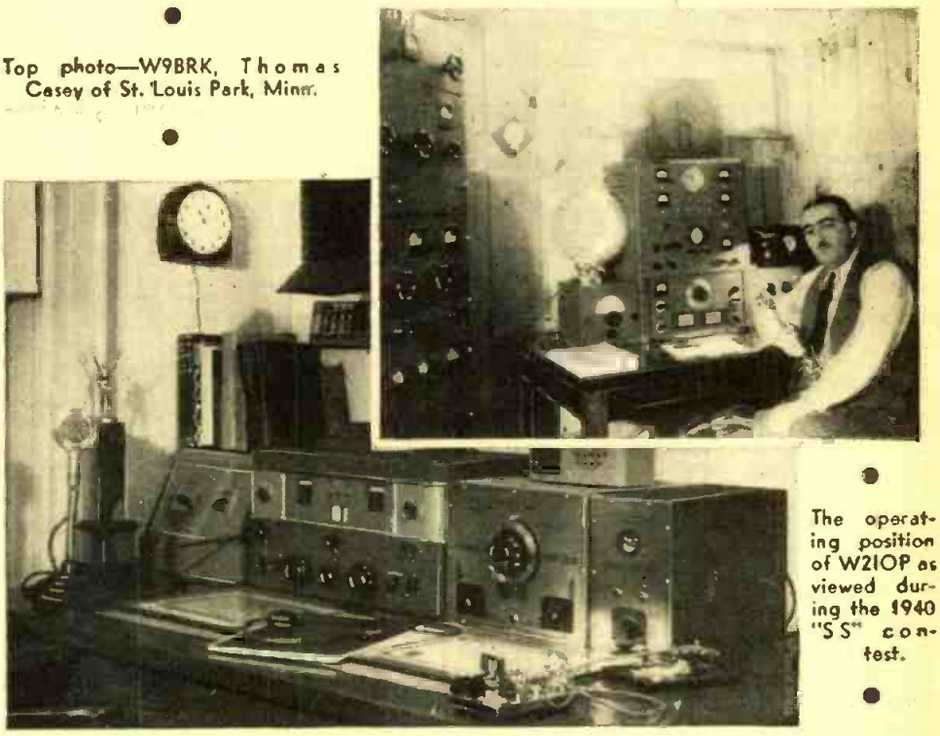
I used a type 80 tube but an 84 may be used. In hooking up the filament supply, one side of the 6 volt secondary must be grounded; as one side of the heater connection in the radio is grounded to the chassis. This also makes the B return. If the transformer used has a center-tapped 6 volt secondary *Do Not Use It.*

CAUTION: Be doubly sure that the high voltage does not exceed 150 volts, with the receiver in operation, because the radio was designed to operate efficiently at that voltage. The volume will remain approximately the same.

"CQ"

Larry LeKashman, W2IOP

Top photo—W9BRK, Thomas Casey of St. Louis Park, Minn.



The operating position of W2IOP as viewed during the 1940 "SS" contest.

● IN the springtime a young man's fancy turns to outdoor operation of amateur equipment—and of course other activities not necessarily associated with radio.

This rejuvenation of young blood always has a negative effect on columnists, that often results in a complete lack of material. For once we do not care particularly, since it permits us space to discuss an interesting question brought up by W2AOE regarding the licensing of amateur radio operators. Mr. Griffin has pointed out, and logically enough, that in gaining knowledge the usual method is to start with the simple forms and develop them over a period of time to a high state of perfection. In school almost every subject is a perfect analogy. One starts with simple arithmetic and only after an average period of 12 years arrives at Differential Calculus. An infinite number of cases may well serve as illustrations. Surely there can be no sense in learning to read with books like Homer's Iliad and then returning to readers dealing with Reynard the Fox.

Obtaining an amateur radio license is the exception to the irrefutable facts given, probably because it has been chosen as the exception to prove the rule!

In amateur radio the beginner must start with a comprehensive knowledge of radio theory, practice, and code. Obviously the majority of this information cannot be obtained by actual practice, since such is prohibited by law. On the other hand necessity to secure this information to obtain an amateur license results in the applicant acquiring it in an unsatisfactory manner. The ARRL best seller on license Questions and Answers is proof that thousands use the "memory lane" for other things than pleasant recollections. This method of obtaining a license is means to an end, but defeats the very purpose of the examination!

The professional radio man who makes light of the technical requirements must not lose sight of the fact that the majority of all amateurs are not drawn from technical fields. "Doctor, lawyer, Indian chief," was coined to describe the amateur fraternity. We must assume that at the time of their initiation into amateur radio they know nothing about the field of radio. What is the solution to this problem?

Mr. Griffin's suggestion, and fully concurred in by other prominent amateur authorities, is simple and straightforward. Have amateur license requirements completely re-written. Make it possible for anyone expressing an interest in radio to obtain a beginner's permit licensing ultra high frequency operation. The sole requisite should be nothing more than citizenship and the ability to read and write English. Code work could be made compulsory until the applicant can copy, say 7 words per minute. He should then be permitted to divide his time evenly, or in any ratio he desires, provided that no further privileges be granted until his code speed reaches 13 words per minute and he can pass a practical test on radio theory and laws, as well as practice. There could be several grades of examinations which would ultimately lead to the present Class A type.

Visualize the results! Hundreds of thousands of trained amateurs who really know their stuff! The amateurs who can't make the grade will never be able to clutter up the ham frequencies, and those that do will all have a firm background. The critics that feel we haven't enough frequencies must face the argument that this tremendous number of operators will present a

powerful argument for more amateur frequencies. Furthermore, by the limitations placed on the beginners we can fully occupy, 5, 10, and the low end of 20 (meters) which heretofore have been slighted in no small way.

That's a thought worth thinking about and your comments on the idea will be appreciated. *So far we have not heard a sound argument against the plan.* While it is no reflection on the ARRL, we think it might be an excellent plan for them to fully investigate. As the organization that represents the majority of hams in the United States it is their solemn duty to further amateur interests. This looks like the opportunity of a lifetime. An intriguing hobby such as *amateur radio* should rank with stamp collecting and photography. This license change would popularize ham radio to such an extent that we too, as stamp collectors have done in the past for example, could demand special acts from the legislature. More frequencies, better trained men to serve the country, thousands more friends, a bigger and better hobby—that is the picture as I see it!

We have been taken to task by the well known phone man W6ITH for some slurs, although unintentional, on the phone branch of our hobby. We want to take this opportunity to go on the record as absolutely non-partisan in any phone-CW controversy that may arise. As a matter of fact, as we told W6ITH, CQ will not recognize anything such as a separate division in amateur radio itself. Every amateur should know the code, so that in the event of any emergency (and we do not mean *war* in particular) he could perform—using this medium of expression. However it is up to the individual operator to choose his own type of emission and no intelligent, liberal person should question this right.

We have also had several comments on the 40 meter phone situation. Mr. Tibbetts has admitted that Latin American phones bother 40, bnt has philosophically pointed out that CW bothers them too. Of course there is a reason for their use of the 7 MC. band. The higher frequencies are not suitable because of long skip, the lower frequencies are useless because of QRN. The solution to this might be opening a part of 40 to W phones, with a nominal power limit to prevent jamming of our lower power *foreign* neighbors. This plan would never succeed, however, if the DX stations took to the CW band as they have on 20—purely as self-defense against QRM. More frequencies, because of more amateurs, might be the best solution!

Again W9BRD's letter came in-between columns. A few items though: W9VES is changing QTH quite a bit. 9KIO, MFY, and MCM joined the AARS. 9ELC has dropped his traffic activity temporarily while he drives a tractor. 6ROZ schedules K6THG and W3GKO, consequently pushes plenty of traffic. 7HFZ operates from Jigger Ranch near Melville, Montana . . . . he nses a gas generator and has lots of room for antennas. With the price some of us pay for the old kilowatts, we'd be better off making our own. 1JZB is back in new Connecticut QTH plugging for FTS. Al, K6NJZ, who ops at K6TSF, was on his way back to get a W6 call, when his boat was cancelled. K4KD and K4HEB are father and son, FB ops and 100% QSL. 5IGO made the BPL. 9MFY has trouble getting his VFO-ECO working right. BCL trouble gripes 9MCM. G5FA has been training radio operators in the R.A.F. cadet corps.

We have been trying to fix up a schedule with a neighbor of ours now signing KA3RA. Edward Weiss is using a 6L6, 10 watts on 20 and 40. The antenna is an end-fed Zepp, receiver a Hammarlund Comet-pro. So far the best DX has been the 5th district. If you work him QSL to KA3RA, Tenth Signal Service Company, Camp John Hay, Baguio, P. I.

Want a QSL from KB6RWZ? John is now in Washington and may be reached by writing John Roop, Room 1631, Navy Department, Washington, D. C. W2MET is on 75 phone with his new 600 watt transmitter. W2MVJ and W2MUO are busy snagging K4's for their WPR certificates. W2KDC burned out a 250TH, but hastily got his hands on a 150 to keep the power up. W2JNO and W2LFL, brothers, are both now serving in the Navy. W2MYK is still on duty at the Brooklyn Navy Yard. W2FLL has moved to a new QTH.

The Grand National SWL Club with the International DXers Alliance and the International Round Table will hold an outstanding DX Club convention in the beautiful Hotel Netherland Plaza in Cincinnati, Ohio, on August 15th, 16th, and 17th. Among the long list of program items offered for members and visitors are several DX broadcasts; stage show; television demonstrations; prominent speakers; prizes; even a trip to Cincinnati's "Coney Island" by boat. For further information write The Grand National SWL Club, P. O. Box 141, Station V, Cincinnati, Ohio.

W2JGH is now serving with the R.A.F. in England. GM6ZP, now serving as a civilian instructor of radio tells of one VE who sat perplexed for two days of discussions on British valves until it dawned on him they meant tubes. G8RY still found enough time to take an XYL in spite of his active duty with the army. VU2AN at Jubbulpore, India, reports another amateur there, the first in three years, G4CN.

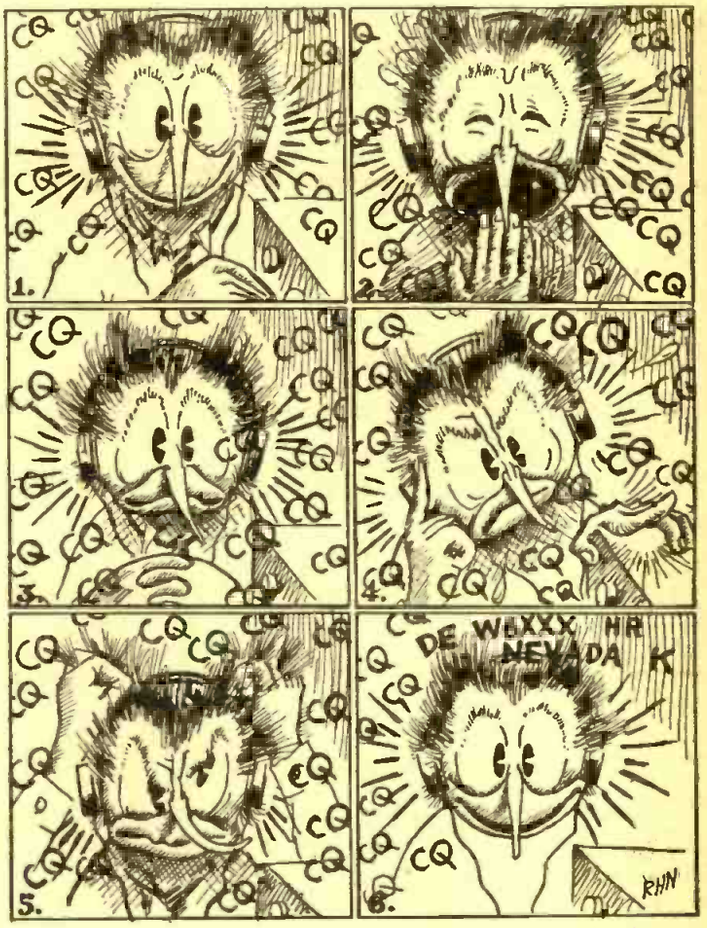
An additional list of amateurs active *overseas* includes: G3LX, G3MF, G4HD, G4CG, G3RN, GW3JI, G5IV, G6IX, G5MY, G6VG, G8RW, ZD2G, G3GU. and G3LB.

Silent keys for this month is fortunately considerably shorter than the previous one we carried. It is with sincere regret we announce the deaths of G8QF and G6QZ.

Running through the British *T & R Bulletin* we came across numerous lists of W calls being recorded overseas. Of interest in particular is a note from ZD2H, Kano, Northern Nigeria, who reports LU9VA. K5AY, and K6QNX on 7 mc. and during December W1, 2, 3, 4, 8. and 9 on 80. W1AW was the best signal with W4BPD a good second. Many phones were heard with W3EWW and W3FQP among the best. The American habit of signing rapidly was a handicap in definitely identifying many signals. G8QR mentions a recent phone QSO between K4EZI and a YL operator in New Mexico and wonders what they would have said had they been able to see the group of boys dressed only in

R.A.F. underwear, sitting up in bed and listening to them.

W5GBS, 5GKB, 6AII, 6DAE, 6FYR, 6GM, 6RJH, 6SIF, 6TBK, 7FTO, 9ALF, 8CBJ, 9EEU, and 9HBE were all reported on 10 meters. Dozens of W's are heard on 40-U2NE, YS2LR, F3ZA, EA4BA, and several other DX calls from days of old are also listed as active. Address all "Ham" notes to the author in care of this magazine.



A Radio cartoon — Drawn by W9BRD.

Army Radio "Hams" Work All Summer

● BECAUSE of the possible imminence of a national emergency and the hundreds of thousands of men in the training camps for whom they transmit messages free of charge, the 2,400 "Hams" of the *Army Amateur Radio System* will stay by their instruments this summer for the first time in fifteen years, instead of recessing their activities until September, says a recent dispatch to *The New York Times*.

Members of the Army Amateur Radio System have a regularly scheduled "drill night" every week and usually participate in drill at least one other night. The Signal Corps' program for the amateurs is designed to develop traffic handling ability and operating speed and to instruct them in army procedure. About 12 per cent of the active amateurs are enrolled at present and more are wanted.

On the night of June 2 the air crackled with far-flung messages as the members of the A. A. R. S. engaged in a contest to determine who could make the most contacts with other operators affiliated with the Army. They competed not only as individuals but collectively by corps areas. Points were given for each contact with another A. A. R. S. station, for transmission of local data to station contacted and for reception of location data.

Regular drill night for A. A. R. S. members is Monday. It consists of receipt of information or instructions from the Message Center of the War Department in Washington, administrative messages, a drill in Army signals and procedure and the transmission of personal messages.

Don't forget, "Hams," to register for the Army and Navy net!

IN JULY, 1941, RADIO-CRAFT

Review—Radio Parts National Trade Show

The How and Why of Frequency Modulation—Part I

24 Recent Radio Tubes

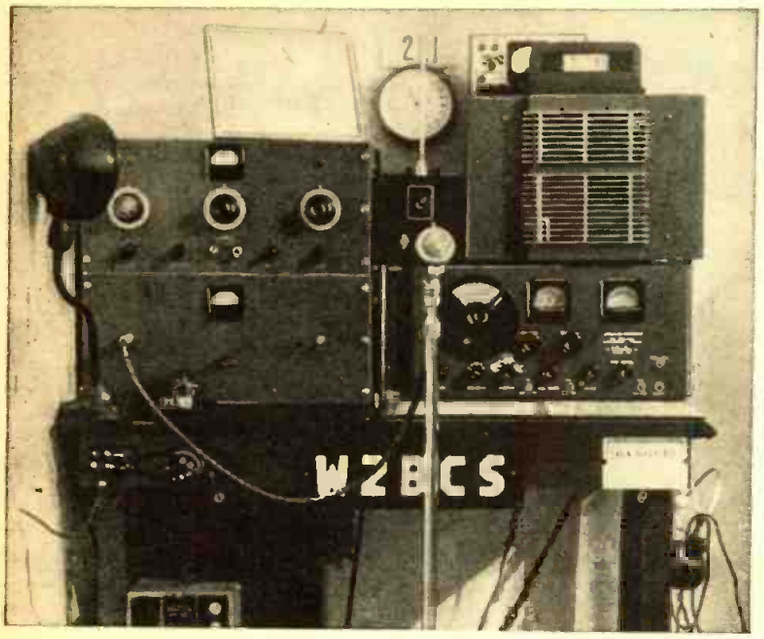
Rejuvenating Dry-Batteries

Modern Miniature Portables

Eliminating Ignition Interference in Car-Radio Installations

Dynamic Testing With Your Signal Generator

Latest Developments in 1941 Auto-Radio Circuits



Amateur's radio station W2BCS operated by Norman S. Bernat, Brooklyn, N. Y. Receiver used is a Hallicrafter Model SX24.

"Honor" Plaque Awarded

To N. S. Bernat, W2BCS

For Best HAM Station Photo

● THE transmitter is a revamped Temco, using a 6L6G xtal oscillator, an 807 buffer doubler, a T40 in the final, running at 100 watts on phone and 65 watts on C.W. The speech amplifier is a 6J7, resistance-coupled to a 6C8G phase inverter, resistance-coupled to a pair of 6L6's in push-pull, running Class AB. The microphone is a Turner 22X. At present the rig is on 10 meter phone and 20 meter C.W. The antennas are half-wave vertical for 10 and half-wave flat-top for 20. DX is on WAC, WAS on 20 C.W. The receiver is a Hallicrafter SX24. Phones are Trimm featherweights. Have been an active Ham since 1927.—*Norman S. Bernat, W2BCS, 21 St. Paul's Court, Brooklyn, N. Y.*

●

Here is the new "Award of Honor" Plaque which measures 5" x 7" 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.

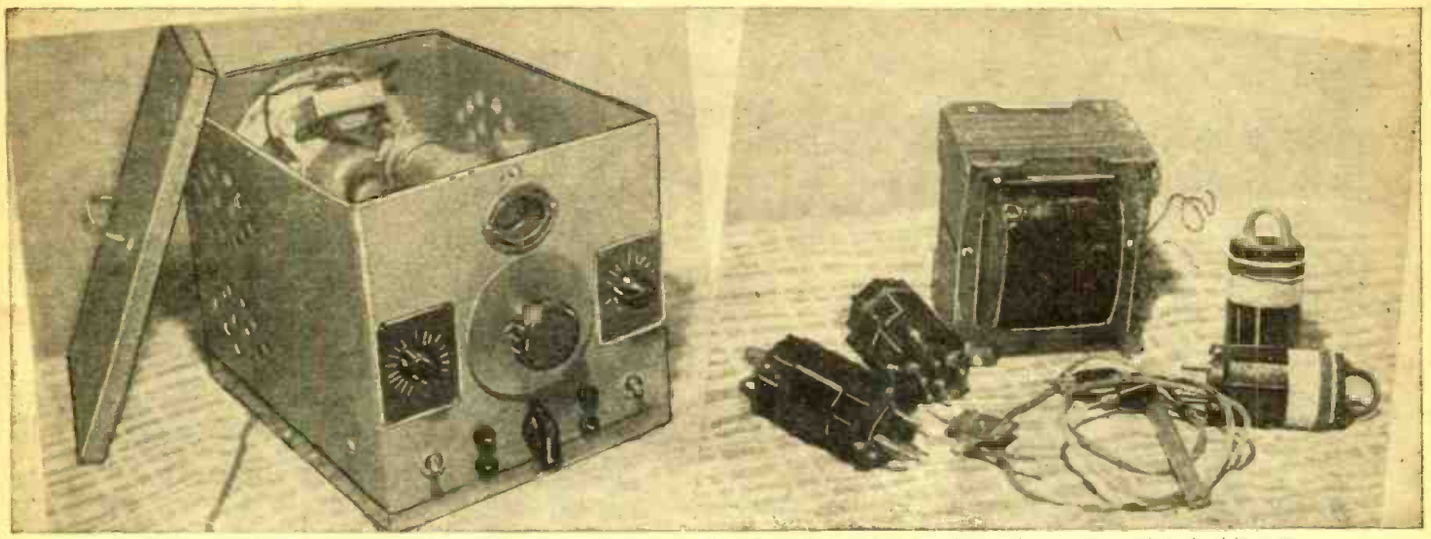


Photo at left shows general view of the "signal-tracer," while the photo at right shows the parts used in building it.

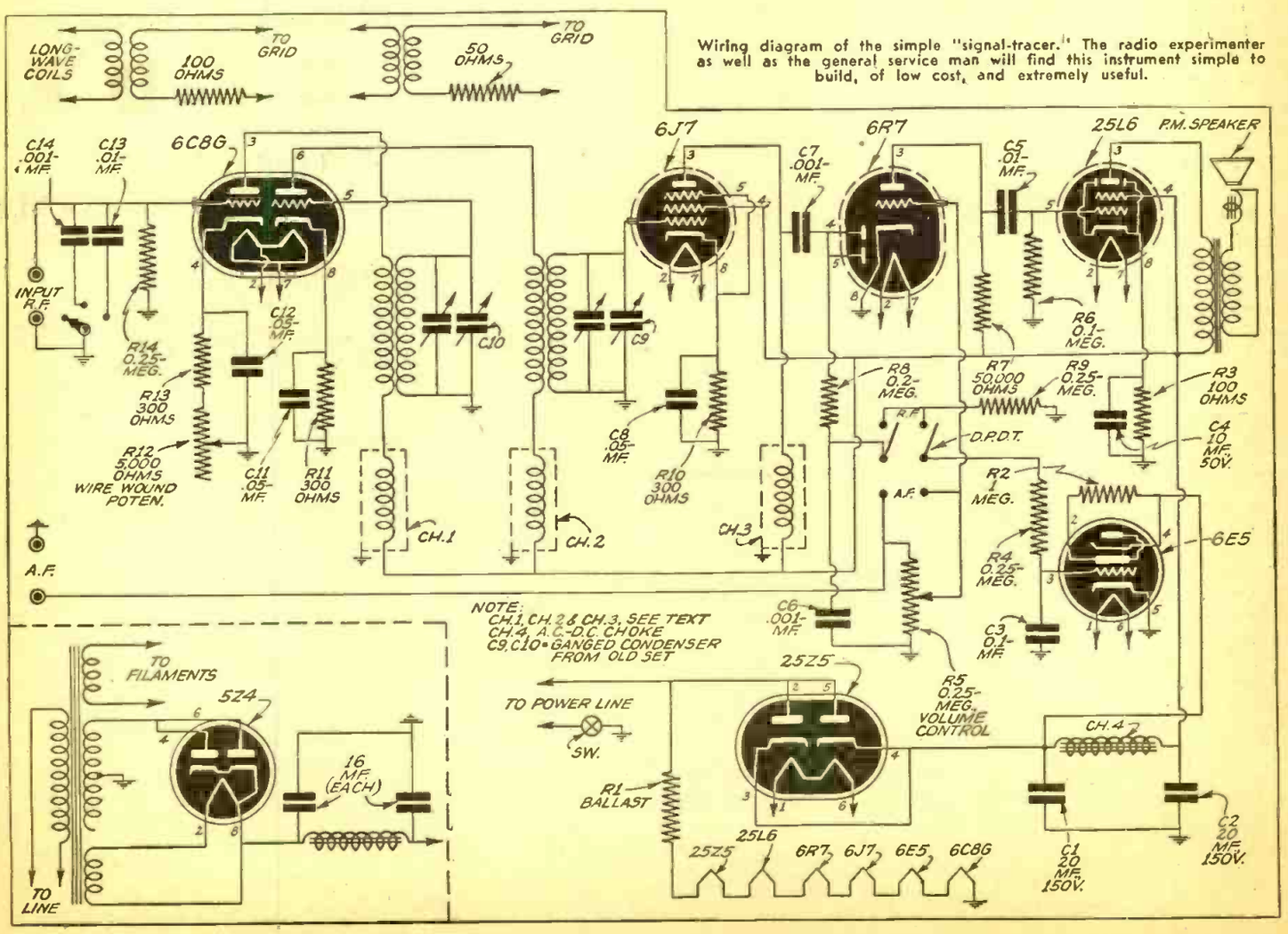
Simple "Signal - Tracer"

Homer C. Buck

● THE photographs are those of a simple *signal-tracer* and accessories constructed almost entirely of odd parts. In the construction at various times, the writer was almost compelled to purchase special items. By changing the circuits to match the "odd parts" box, we got away with almost everything but the cost of a couple of tubes, a PM speaker and a spool of No. 18 copper wire.

The wire went into the isolation transformer secondary. As the core was from an old auto radio battery eliminator, it was not necessary to wind a primary. There are approximately 313 turns of No. 19 wire on the primary and 344 turns of No. 18 wire on the secondary, the additional turns on the secondary being necessary for losses. The total weight is 7½ lbs., and it will carry 100 watts at 96% efficiency.

As this "tracer" is an A.C.-D.C. unit, an isolation transformer is almost a necessity, unless one is to use a blocking condenser in the ground lead when testing. If pre-



Wiring diagram of the simple "signal-tracer." The radio experimenter as well as the general service man will find this instrument simple to build, of low cost, and extremely useful.

cautions aren't taken the signal-tracer and the receiver under test may be grounded on opposite sides of the line, and "fire-works" and blown fuses will result. As it is, it is necessary to always *ground* the tracer to the receiver under test, to form a proper path for the signal and to prevent hum.

Referring to the schematic diagram, the chokes are from burnt out auto-radio vibrators and are fully shielded by being enclosed in I.F. transformer cars. By using these chokes instead of resistors, a higher plate potential can be applied to the tubes. Note that the 6E5 derives its potential direct from the cathodes of the 25Z5 for this purpose. This results in a brighter glow on the target. The condensers in the filter must be 20 x 20 mf. or better.

The 6C8G is a dual triode and was used because of the space saved. The 6R7 was used instead of a 6Q7 because a 6R7 will take more signal voltage from the A.F. gain control without blocking. Plug-in coils were used to save expense and make winding and matching easy. As to the number of turns, the writer wound on as many even turns as possible on two coil forms, 1½" in dia. and plugged them in. With the aid of an oscillator their tuning range was determined. Less turns were wound on the second pair to increase the range.

The coils used by the writer tune from 330 kc. to 730 kc. and 630 kc. to 1530 kc. It was found unnecessary to wind coils to tune below 330 kc. as the harmonic principle can be used on this low range. Approximately the same signal voltage used to close the eye on the second harmonic of 175 kc. (350 kc.) will close the eye at 525 kc. It will be noted on the schematic that "losser" resistors had to be installed in the long-wave coils to decrease the sensitivity.

The pick-up *prod* is interesting, in that it consists of a test lead prod and a meter tip-jack. The original prod-tip was removed, the hole enlarged and a meter tip-jack screwed in. A condenser or resistor can then be inserted by the pig-tail for pick-up. This makes the pick-up load a matter of choice, in addition to the switch and the .01 mf. and .001 mf. condensers in the tracer input. The writer uses a variable air-trimmer with pins soldered to the plates. This is pictured with the transformers and pick-up prod.

A good way to check on the type or size of condenser to use in the *prod* is to tune the tracer, using a short antenna, to a *broadcast* station. Then touch the pick-up prod (with the condenser inserted) to the grid-cap of the input, or R.F. tube of a good receiver and tune the receiver to close the eye on the tracer. If the condenser used in the prod is small enough, it will be noted on the receiver dial. If the condenser is too large, the setting of the dial pointer on the receiver will be too high for the station tuned in. This means the condenser used is in shunt or parallel with the receiver's tuned circuit. If the condenser is light enough or small enough not to off-set the receiver's tuned circuit, and still pick up enough signal to close the eye on the tracer, little or no trouble will be experienced in picking off signals from tubes in receivers in operation. If the signal in the receiver under test is rather weak, a larger condenser can be installed in the tip and the signal taken from the plates.

The R.F.-A.F. switch means that an R.F. signal can be applied to the R.F. input and be amplified at any setting of the switch. Only the A.F. gain control will have to be adjusted in conjunction with the R.F. gain control when the switch is on A.F. to listen to the R.F. signal. An A.F. signal applied to the A.F. input is unaffected by any setting of the R.F. gain control. On the other hand, when the unit is on R.F. the A.F. control will have no effect on the R.F. This is in reference to the operation of the 6E5, of course.

The audio amplifier of any radio set can be connected to the A.F. jacks and the unit used as an R.F. tuner. By turning the R.F.-A.F. switch on and off, or from one to the other, a comparison check can be made, using the tracer as the standard. Carbon mikes can be checked by hooking them to a transceiver transformer, in series with a battery, and inserting the secondary into the A.F. jacks. By using a cable, one-way communication can be had from one part of the shop to another.

If the reader desires to build this unit, the writer would like to mention that this is not an engineered job, in the true sense of the word, but the values of the components used have made this tracer a honey, and has saved many hours of work. Further, the reason why this unit was made A.C.-D.C. was because the writer had the parts. If it is desired to make the outfit strictly A.C., it is suggested that the reader use a Stancor power transformer, number P6011, or a 6-volt job that will deliver 70 mils, (300 or 350 volts—preferably 300) from center-tap. Hook it up as shown in the diagram, using a 5Z4, two 16 mf. 450 V. electrolytics in the filter section, and R3 changed to 160 ohms. The 25L6 can be exchanged for a 6L6, no changes in the wiring being necessary. The writer always uses Stancor universal out-put transformers for convenience. Do not connect a capacitor from one side of the A.C. line to ground. This will leave the input "free."

COAST STATION HAS NEW BEACON

Installation of an aeronautical hazard beacon of 4,840,000 candlepower and designated as a "true light" was completed atop the Don Lee television station W6XAO in Hollywood recently, it was announced by the Civil Aeronautics Administration.

The giant light is described as type D-1-a, according to Inspector H. T. Bean. Made of cast aluminum, the beacon revolves at six revolutions per minute and has a range of about twenty miles. Its altitude is 1,738 feet. It is the first and most powerful of its kind in Southern California. A special transformer built for it steps the power from 115 down to 30 volts, concentrating the filament of the lamp and giving it greater intensity, according to Thomas S. Lee, owner of the television station, who installed the light for the service of airmen at his own expense.

The installation is one of the most outstanding landmarks in the Hollywood Hills and provides an outstanding hazard marking on the high terrain, affording a greater degree of safety for the flying public.

Thoughts on Portable-Mobile Reception

S. Gordon Taylor

With the simple provisions described here, a portable receiver can be installed in the car or boat in a few seconds—and as quickly dismounted.

The mounting accessories consist of two self-threading hooks turned into the dash, and a metal strip bolted to the engine bulkhead. A stud or projecting bolt-head at the bottom edge of the receiver locks into the keyhole-shaped hole on the foot of this strip. Screw-eyes in the front-top of the receiver slip into the dash hooks. The "S" hooks provide an extension to clear the handle atop the receiver.

● NUMEROUS hams will turn to portable-mobile operation this summer to fill the void left by the banning of foreign DX contacts. For these and for SWL's as well a thought or two on mounting the receiver in the car and on the receiver itself will not be amiss.

There are few who find it practical to install short-wave receiving equipment permanently in the car. More often a receiver suitable for this application doubles at home as a spare unit, or perhaps is used in the boat as well. The result is that, when used in the car, the receiver is usually placed precariously on a seat, employed with more or less haywire antenna lead-in arrangements, etc.

The accompanying illustrations suggest a stunt which has distinctly practical aspects for both car and boat mounting. Developed by Hallicrafters for use with the S-29 portable communications model illustrated, it is equally well adapted for use with any other equipment. The receiver is suspended just below the dash where it is convenient to operate from the driver's seat yet is reasonably well out of the way. Entirely secure, it can nevertheless be removed or slung into position at will and in a matter of seconds.

As shown in one of the illustrations, the permanent mounting accessories consist of a pair of screwhooks screwed into the under edge of the dash and a metal strip bolted to the engine bulkhead. (The "S" hooks in this particular installation provide an extension necessary to enable the handle on top of the receiver to clear the under side of the glove compartment.) The second illustration shows the receiver in use.

The steel strap has a right angle bend at its lower end to provide a mounting foot. In this is a keyhole-shaped cutout into which a stud on the bottom of the receiver slips and locks by sliding it forward into the slot. This stud may be a bolt with locknuts to space its head slightly away from the receiver bottom. The strap is attached to the bulkhead by bolts near its upper end. This permits the lower portion to flex forward to accommodate the depth (from front to back) of the receiver.

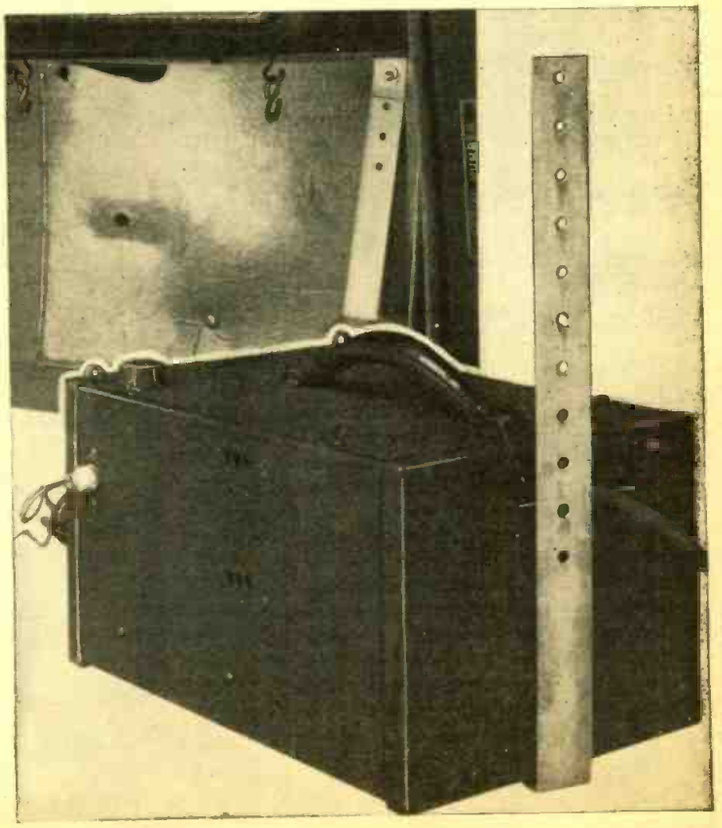
Screweyes threaded into the top of the receiver cabinet engage the screwhooks on the dash. To mount the receiver, once these accessories have been installed in the car, it is only necessary to slip the rear stud into the keyway in the strap, hook the screweyes into the screwhooks and the job is done.

The type of antenna to be employed is, of course, a matter of personal choice but in any case convenience suggests that its lead-in terminate in a plug, with a corresponding socket mounted in the receiver cabinet. In the installation illustrated the shielded lead may be seen plugged into the near side of the receiver. The antenna in this case is a 6-foot telescoping rod mounted on the cowl.

The matter of a receiver for portable mobile use is usually somewhat of a problem. Many of the present-day communications receivers also have provision for operation from a car battery, with a socket into which is inserted a plug with the battery and a vibrator supply driven by this same battery connected to it. Owners of such receivers have the answer to the problem, of course.

With other receivers which do not have this provision it is possible to employ a standard 6-volt D.C./115-volt A.C. vibrator type converter which provides the necessary 115-volt A.C. supply for the receiver. But due thought must be given to battery drain when using this latter equipment, inasmuch as such units have rated efficiency of only about 80% to 85%. Thus a receiver with rated power consumption of 100 watts may actually pull 125 watts from the battery. If the battery will take this the fuses may not.

For all 'round portable and portable-mobile operation, a receiver built especially



The S-29, showing screw-eyes and mounting strip. This strip is permanently installed on the engine bulkhead. This receiver suggests two other convenient features for portables — the compartment at the rear to accommodate the line cord when operating from self-contained batteries, and the "plug-in" antenna arrangement.

for the job will likely prove most satisfactory. This may be a commercial type such as the S-29 already mentioned, or of the home-built variety. If of the commercial type one which is capable of operating from both the light lines or its own self-contained batteries will be found to have distinct advantages, because such a receiver can be used anywhere at any time without dependence either on line supply or a storage battery. Yet when used in the home "shack" battery economy is obtained by operating from the light line.

It goes without saying that for mobile operation a good automatic *noise limiter* is practically imperative. R.F. amplification is likewise important, to help compensate for the subnormal pick-up usually encountered in any type of car antenna system.

For 2½- and 5-meter operation a simple, *good* super-regenerative receiver is entirely practical. While receivers of this type lack selectivity, they are by the same token less critical to tune and less likely to be jarred out of tune by car vibration. Their hiss level is high but their ignition pick-up is relatively negligible and for this latter reason their *effective* sensitivity (when the car engine is running) is likely to equal that of a superhet.

Poorly designed super-regens are capable of radiating "hash" over an area of several miles. But this is purely a matter of design and the receiver that radiates badly is invariably a poor performer so far as sensitivity, selectivity and "rush" are concerned. On the other hand, a well designed receiver of this type will cause little radiation interference. This was demonstrated some time ago when tests made of two such receivers showed their radiation negligible at 100 yards and completely inaudible at 200 yards.

Superhet converters working into the car's broadcast receiver offer another solution of the problem—but one which *for ultra-high frequency work* usually proves better in theory than in practice. Microphonics, the effect of car vibration on the oscillator stability, ignition noise and difficulty in tuning and making the tuning stay put, all constitute drawbacks of such an arrangement at the very high frequencies.

The foregoing discussion is not intended to throw cold water on the hams' aspirations in the direction of portable mobile operation. Actually there is no branch of ham activity that is likely to provide more real fun. But one who contemplates going in for this pastime should realize that there are obstacles to be encountered. Among hams the tendency is too often to concentrate all attention on the mobile transmitter and resort to makeshift so far as the receiver is concerned. But the old story—"what you can't hear, you can't work" is nowhere more true than here. So if you are going into the game, build or buy a receiver worthy of the game—and preferably make it one that can be used as a "spare" in the shack when not engaged in mobile service.

MORE about TELEVISION in the Next Issue!

The one-tube 110 volt A.C. or D.C. receiver is here shown in operation in the photo at left. Just the set for summer vacationists.

How to Build

The "CAMP-anion" 1-Tube Receiver

By H. G. Cisin, M. E.

The editors have received many requests for a "one-tube" receiver which could be packed along with ties and shirts in a small suit-case, for week-end or other vacations—a set that can be plugged into any convenient 110 volt lamp socket. Mr. Cisin tells how.

● DURING the past few years, compact "Personal" receivers have enjoyed an ever-increasing popularity. Many different types have been exploited by radio manufacturers. Some are designed for battery operation only, while others are made for interchangeable socket and battery power. All these new sets, however, feature loudspeaker operation.

In many cases, a loudspeaker is neither desirable nor practical. The truly "personal" receiver should be heard only by its owner. This is particularly necessary in barracks, training camps, hospital wards, etc.

Strangely enough, no commercial or factory-built personal sets are as yet available for earphone use. The "CAMP-anion" is offered to meet this particular need. It is compact, light and self-contained. It operates equally well in barracks supplied with alternating current, or on shipboard—where the lighting system happens to be supplied with direct current. Instead of using a plurality of delicate miniature tubes, as in the case of other *Personal* sets, it employs a single sturdy "GT" type tube, which takes up little room but which is really able to withstand plenty of hard travel.

One Tube Serves Two Purposes

The "CAMP-anion" utilizes the twin purpose 117L7GT tube which contains an efficient rectifier and a beam power pentode within the same glass envelope. As the designation "117" indicates, this tube may be connected directly to a 117 volt (110-120 volt) lighting circuit, without recourse to ballast tubes, heater line cords, etc. As a result, the circuit is simplified to the utmost and there is less likelihood of trouble developing during usage.

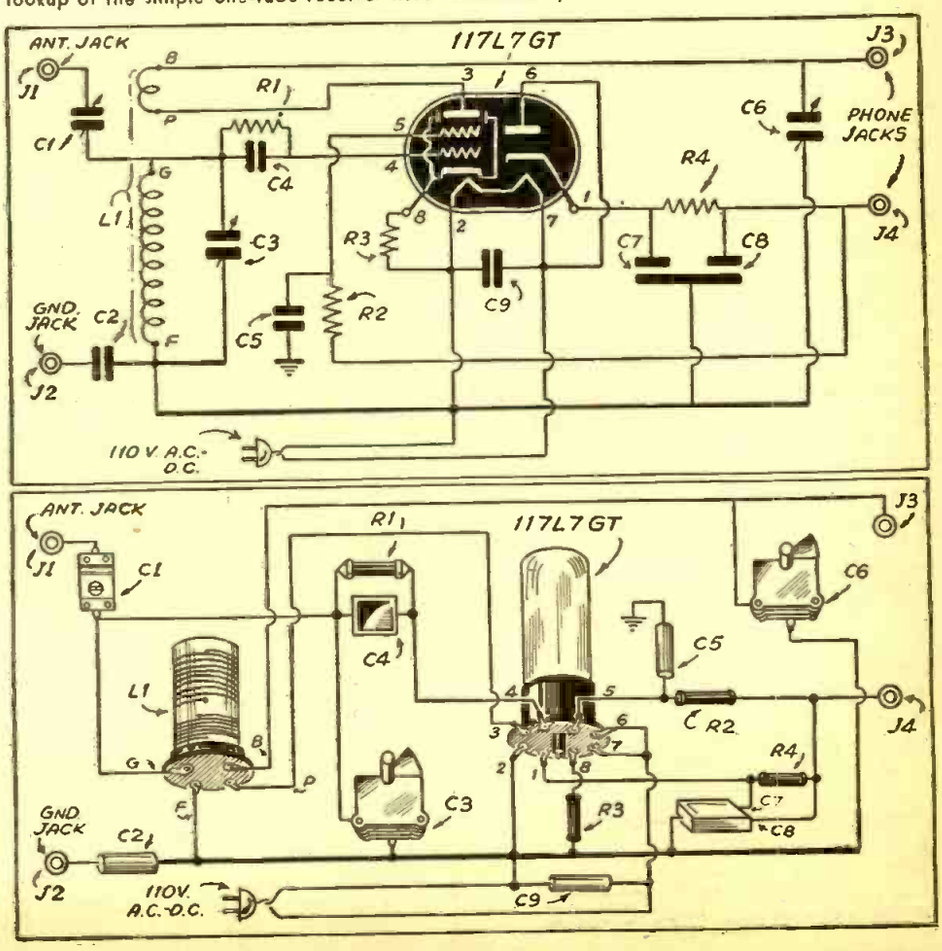
For easy analysis, the circuit may be considered as being divided into its two essential portions. The first is the section devoted to signal pickup and demodulation or detection. The second, to be described later, is the rectifier section which supplies the proper type of voltage and current to the plate and screen grid of the pentode section of the tube.

Regeneration is used to solve the problem of adequate sensitivity despite weak signals. The pentode portion of the 117L7GT tube is used as a regenerative detector. Part of the energy developed in the plate circuit is fed back inductively by means of a tickler winding, into the input or grid circuit. As a result, very weak signals are built up or strengthened, thus getting the necessary increased R.F. strength otherwise obtainable only by means of several additional stages of amplification and involving additional tubes.

How Sensitivity Is Improved

Another way in which maximum sensitivity is developed is through the use of the grid-leak and condenser method of detection, rather than other methods such as

Hookup of the simple one-tube receiver here described by Mr. Cisin. Can be built by anyone.



diode or grid bias detection ordinarily used in factory-built sets. As a matter of fact, the grid-leak and condenser method of detection gives best results on weak signals. No negative D.C. bias is applied to the grid and therefore on the positive half cycles of the R.F. signal, current flows from grid to cathode. Hence the grid and cathode perform the function of a diode detector, the grid-leak serving as a diode load resistor and the grid condenser as the R.F. by-pass. The voltage across this condenser thus reproduces the audio frequency modulation and since it is between the grid and the cathode, it is amplified in the plate circuit. In this way, the output voltage is made to reproduce, in greatly enhanced form, the original audio signal. In general, a high resistance grid-leak, on the order of one to three megs., has been found to increase selectivity and sensitivity. A compromise is desirable, however in order to improve the A.F. response and stability, which call for lower values of grid-leak resistance. For reception on the *broadcast* band, the use of a 2 meg. grid-leak is generally considered standard, while for short-wave reception, a 1 meg. leak is often recommended.

The fact that the grid-leak and condenser method of detection draws current from the input circuit is its chief disadvantage, since this has a tendency to reduce selectivity. This is offset however, through the use of regeneration, which when handled properly, may be made to sharpen the tuning (and also through the inclusion of an antenna trimmer condenser, C1), which prevents station overlapping, even in localities where congestion of broadcasting stations is extreme. The antenna trimmer is a low capacity screw adjustment variable condenser, in series with the antenna and the grid circuit of the tube. In a sense, it tunes the antenna in much the same way as though the antenna were shortened or lengthened to make it respond to desired frequencies.

Broadcast Band Covered

The "CAMP-anion" is designed to cover the *broadcast* band. Of course it is possible to change the design so that this set will tune in the higher frequencies. This may be done, either by reducing the number of turns of the tuned winding "G-F" or by using a tuning condenser with fewer plates (lower maximum capacity). In this receiver, tuning is accomplished by means of a Hammarlund 140 mmf. *Micro* condenser. This is a high quality air dielectric condenser, with isolantite base and cadmium plated soldered brass rotors and stators, used to insure rigidity, stability and lowest losses. Where space is at a premium, especially for "Personal" receivers, the "Micro" condenser is essential. A second "Micro" condenser, C6, is used as a regeneration control. Since there is a gradual variation of capacity between 6.7 mmf. and 140 mmf., the regeneration control is smooth and easily handled.

As regards the coil, L1, this consists of the tuned section "G-F" and the tickler winding "P-B". If this coil is to be wound by the constructor with only the facilities ordinarily found in the home workshop, it would be better not to attempt the ultra-compact lattice wound coil, but instead to wind a regular 200 to 550 meter broadcast coil on a 1½" diameter form, using 126 turns of No. 28 enamelled wire for the tuned (grid) winding and 28 turns of No. 34 enamelled wire for the tickler, with ¼" between the grid winding and the tickler.

Ground Connection Optional

The above very nearly completes the analysis of the first portion of the circuit. It will be noted that antenna and ground pinjacks are provided. In most cases, a short length of wire plugged into the antenna jack J1 will provide more than sufficient pickup for all local *broadcast* stations. In some localities, however, improved results may be obtained by lengthening the antenna wire or by connecting a second wire between a radiator or water pipe and the ground jack J2. This jack is isolated from the line by means of condenser C2, thus preventing the possibility of short-circuiting the line and blowing out of a fuse. It is important in this connection not to use the chassis or panel as a common negative return. In other words, all returns should be *wired in* and kept well *insulated* from the metal panel. Otherwise, a ground wire which happened to touch the panel, while being plugged into J2, might blow a fuse.

The second portion of the circuit uses the triode section of the 117L7GT tube to rectify the raw A.C. coming from the supply line. Before being supplied to the plate and screen grid of the pentode, the rectified current is smoothed out by a filter consisting of resistor R4 and electrolytic condensers C7 and C8. The condenser C9 directly across the line input serves the purpose of preventing tunable (60 cycle) hum.

As shown in the illustration, the entire receiver is housed in a compact little case, which measures only 3⅝" by 6¾" x 2¼" high. The complete outfit, ready to plug in and use, weighs about 18 ounces. An aluminum panel is employed, measuring 3¼" x 6¼" x 1/16". The front of the panel may be black crackle finished, using Egyptian lacquer. This adds to the attractiveness of the set.

Complete Parts List

HAMMARLUND (Condensers)
1—Antenna trimmer, 3 to 30 mmf., type "MEX" (C1)
2—140 mmf. MICRO variable condensers, type HF-140 (C3, C6)

AEROVOX (Condensers)
3—.1 mf., 200 volt tubular cardboard condensers, type 284 (C2, C5, C9)
1—.00025 mf. mica condenser, type 1467 (C4)
1—8 mf., 200 volt dry electrolytic condenser, type PRS-150 (C7)
1—40 mf., 200 volt dry electrolytic condenser, type PRS-150 (C8)

I.R.C. (Resistors)
1—2 meg. 1/3 watt Fixed Carbon resistor (R1)
1—1 meg. 1/3 watt Fixed Carbon resistor (R2)
1—10,000 ohm, ½ watt Fixed Carbon resistor (R4)
1—150 ohm, 1/3 watt Fixed Carbon resistor (R3)

NATIONAL UNION RADIO CORP. (Tube)
117L7GT

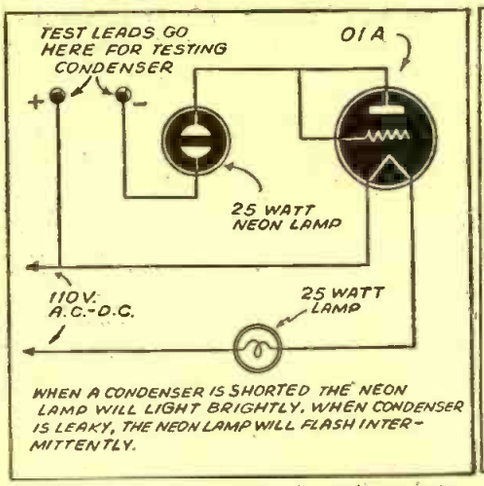
MISCELLANEOUS
4—Pin jacks (J1, J2, J3, J4)
1—Line cord and plug
1—Roll hook-up wire
2—Knobs
1—Dial
1—Aluminum panel
2—Right angle brackets
1—Octal socket
Hardware
1—Wood cabinet
1—Special broadcast coil (see article)
1—Pair earphones

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.

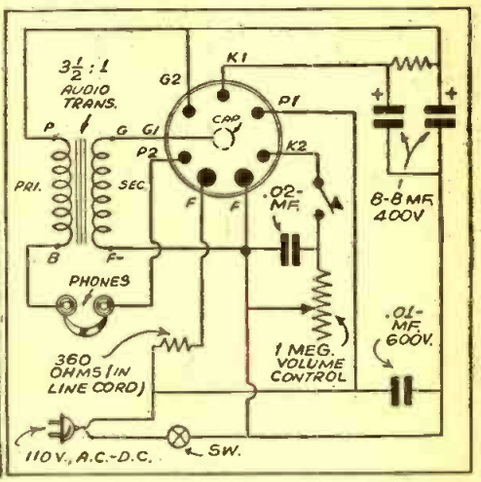
All diagrams and descriptions accepted and published will be awarded a year's subscription. Diagrams may be for receivers, adapters, amplifiers, etc. Send them to Hook-Up Editor, RADIO & TELEVISION, 20 Vesey Street, New York City.

CONDENSER TESTER



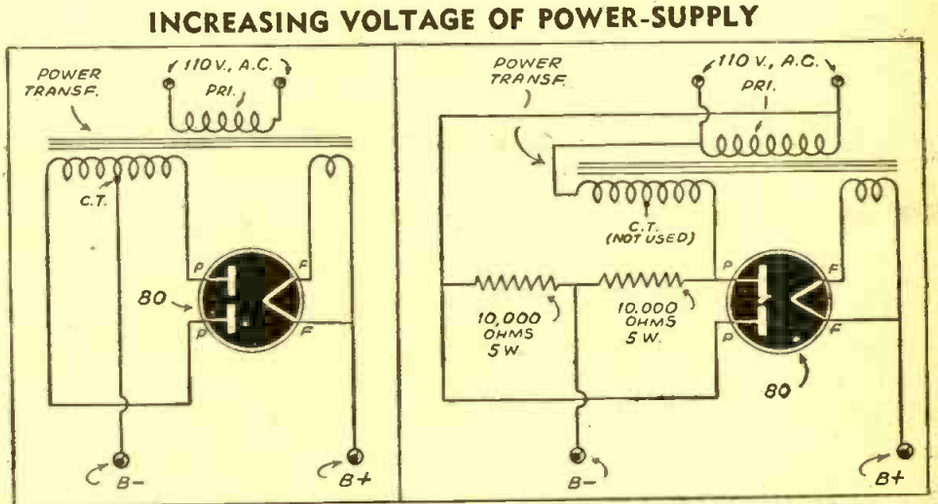
The diagram above shows a simple condenser tester contributed by Leon A. Wortman, W2LJU. This device will quickly indicate defective condensers. Be sure to observe polarity on electrolytic condensers.

CODE PRACTICE OSCILLATOR



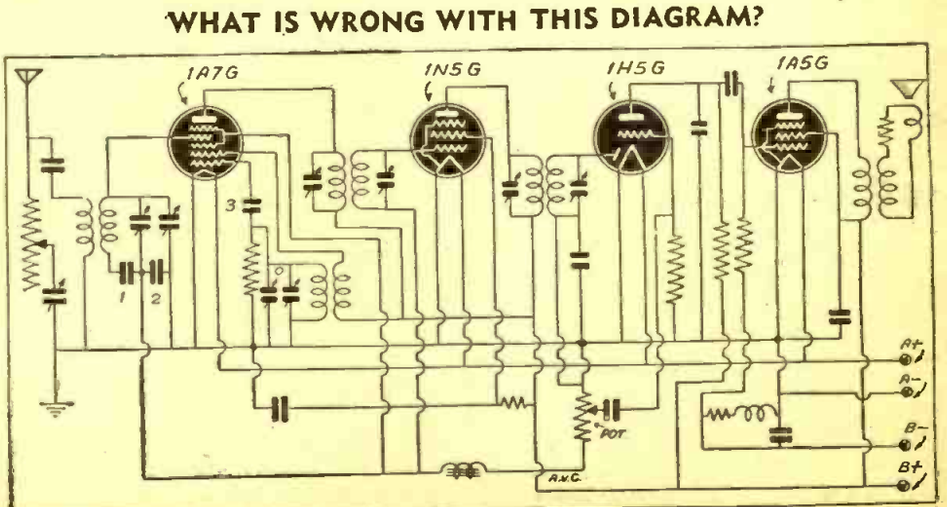
Gene Clardy sends this diagram for a simple code oscillator, made of odd parts found about the shack. The volume control serves to vary the tone. A 12A7 was used by the author.

INCREASING VOLTAGE OF POWER-SUPPLY



Edgar Boles contributes the above circuit for increasing the voltage of a power-supply; standard circuit at left and revised circuit at right. Transformer primary is connected as auto-transformer, making the voltages additive. Use condenser in series with "receiving set" ground.

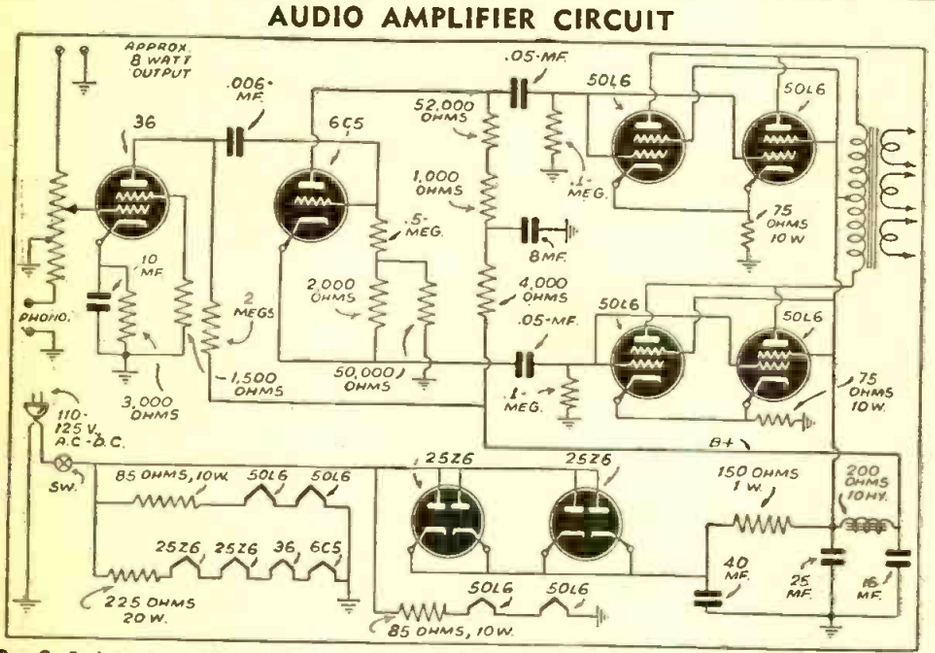
WHAT IS WRONG WITH THIS DIAGRAM?



Study this diagram at least three minutes before turning to the answer on page 189.

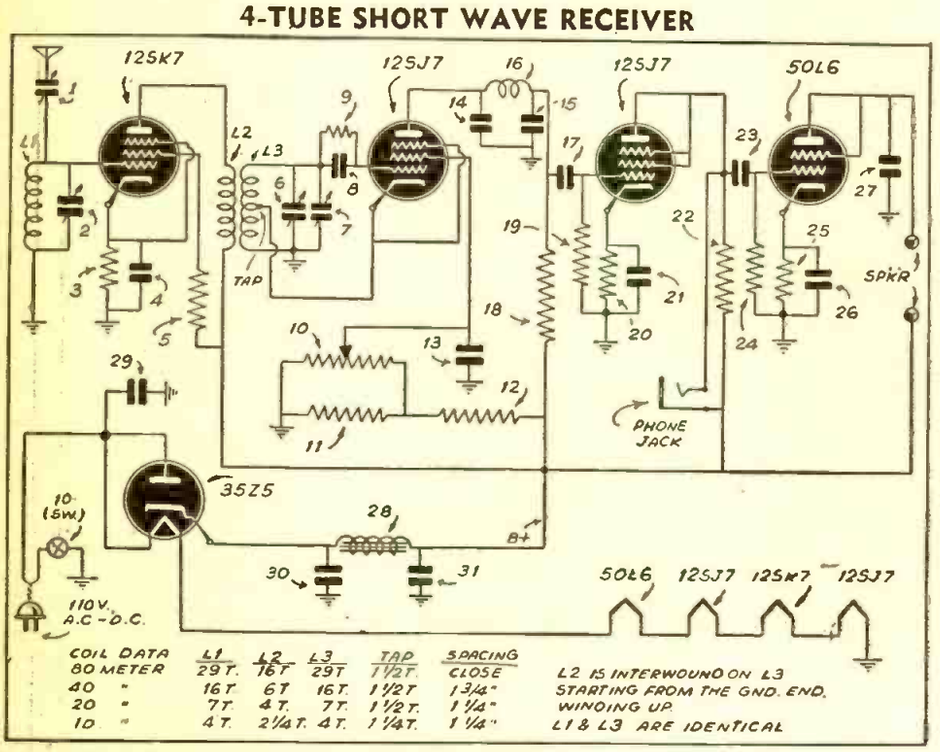
to the Radio Experimenter

AUDIO AMPLIFIER CIRCUIT



Rex C. Dudoward provides this interesting circuit of an audio amplifier, using four 50L6 tubes in the output stage. He suggests that the 36 tube be changed to a 6J7 or 6SF5. The output transformer should have a 3,000 ohm primary center tap, capable of passing 100 ma. All resistors are one-half watt unless marked otherwise.

4-TUBE SHORT WAVE RECEIVER



COIL DATA	L1	L2	L3	TAP	SPACING	
80 METER	29 T.	16 T	29 T	11/2 T	CLOSE	L2 IS INTERWOUND ON L3
40 "	16 T	6 T	16 T.	1 1/2 T	1 3/4"	STARTING FROM THE GND. END.
20 "	7 T.	4 T.	7 T.	1 1/2 T.	1 1/4"	WINDING UP
10 "	4 T.	2 1/4 T.	4 T.	1 1/4 T.	1 1/4"	L1 & L3 ARE IDENTICAL

HAMMARLUND (Condensers)
1—3 to 35 mmf. trimmer
2—6 100 mmf. midget variable condenser

SOLAR (Condensers)
4—13 .1 mf. 600 v. tubular condenser
27—.006 mf. paper tubular condenser
29—.05 mf. 600 v. paper tubular condenser
17—23 .01 mf. 200 v. paper tubular condenser
14—15 .0001 mf. mica condensers

BUD
7—15 mmf. midget variable condenser, 8 5-prong forms 1¼"

NATIONAL CO.
16—2.5 mh. R.F. choke, R100

SPRAGUE
21—26 5 mf. 25 v. electrolytic condenser

THORDARSON
28—A.C.-D.C. filter choke—10 hy. 55 ma. 350 ohms, T14C64

WIRT (Resistors)
3—400 ohms, 1 watt resistor
5—100,000 ohms, ½ watt resistor
9—2 megohm ½ watt resistor
11—12 4,000 ohms ½ watt resistor
18—250,000 ohms ½ watt resistor
19—750,000 ohms ½ watt resistor
20—600 ohms 1 watt resistor
22—500,000 ohms ½ watt resistor
24—1,000,000 ohms ½ watt resistor
25—120 ohms 1 watt resistor

CENTRALAB
10—50,000 ohm volume control, with switch

DUMONT
8—.00025 mf. mica condenser, isolantite

ATLAS
30—31 condenser block 40 mf. electrolytic 30 mf. electrolytic

MISCELLANEOUS
5—Octal sockets 2—5-prong sockets

Edited by Herman Yellin, W2AJL

Quarter-Wave "Grounded" Aerial

How can I couple a quarter-wave grounded antenna to the 15 watt 160 meter transmitter described in the July issue?—J. Seale, Longview, Texas.

A. The simplest method of coupling, if the distance between antenna and transmitter is short, is to tap the antenna about 28% up from the *ground* end of the antenna, and run a single wire feeder to a tap on the final amplifier tank coil. The feeder tap should be adjusted for optimum loading of the final.

Another method would be to tap the feeder to the antenna at the same distance above the ground, and bring the feeder down to a point a few feet above the ground and at a distance from the antenna equal to about 1½ times the distance up to the antenna feed-point. Tap the feeder to a "tank circuit" tuned to 160 meters at this point, and couple a low-impedance twisted-pair line (or concentric cable line) to the link coil at the transmitter.

Demagnetizing Watch

How can I demagnetize a watch which was subjected to a strong magnetic field?—P. Dubow, N. Y.

A. A watch or any other magnetized object can be very effectively demagnetized by putting it in a slowly decreasing alternating magnetic field. This can be obtained by using a large inductance such as a coil from a choke coil or speaker field and connecting it across an A.C. voltage. By slowly moving the object away from the coil, the field at the magnetized object will be slowly decreased.

Output Transformer Impedance

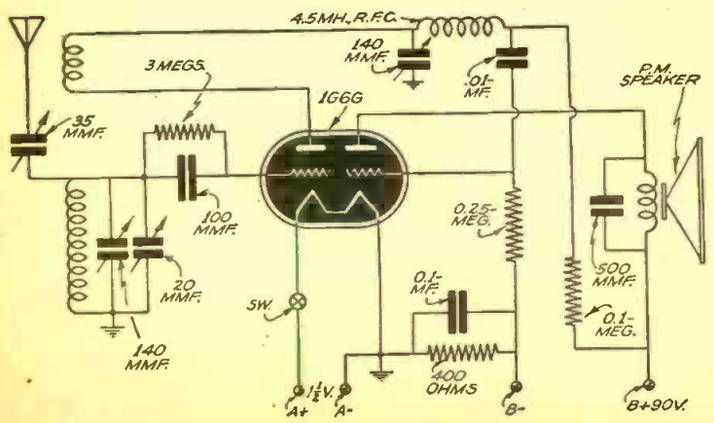
What is the impedance of the output transformer used in the high fidelity amplifier described on page 534 of the January issue?—R. Kenney, Chillicothe, Ohio.

A. The output transformer has an impedance of 5000 ohms. Plate voltages on the various tubes are as follows: 6L6G—285 volts, 6C8G—125 volts, 6J5—95 volts. Higher voltages on the 6L6G plates would serve to increase the power output, but for home use, the available power output is more than endurable.

Twinplex 1-Tube Receiver

Have you a diagram of the Twinplex receiver available?—H. Dortch, Greenway, Ark.

A. The Twinplex receiver using a dual triode tube, 1G6-G, was described in the April, 1940, issue. We reprint the diagram herewith. The coils can be any two-winding plug-in coils, while two tuning condensers are used, a 140 mmf. unit for *band-setting*, and a 20 mmf. unit for fine tuning or *bandspread*. If necessary, a 45 volt "B" battery can be used, at some sacrifice in volume, so that it might be necessary to use earphones on some of the stations. Regeneration is controlled by the 140 mmf. condenser connected between tickler and ground.



Hook-up for Twinplex receiver—best for headphones. (No. 1254.)

Broadcast Receiver

Can you furnish a diagram of a broadcast receiver, using the following tubes—25Z5, 43, and two 39/44?—D. J. Truby, Waukegan, Ill.

A. Your four tubes can be combined into a small and simple T.R.F. receiver, a diagram of which is shown. The two tuning condensers can be a two-gang unit designed for the two broadcast band coils. If you have a very low resistance field in your dynamic speaker, it can be substituted for the filter choke. If a P.M. speaker is used, merely omit the field shown in the diagram.

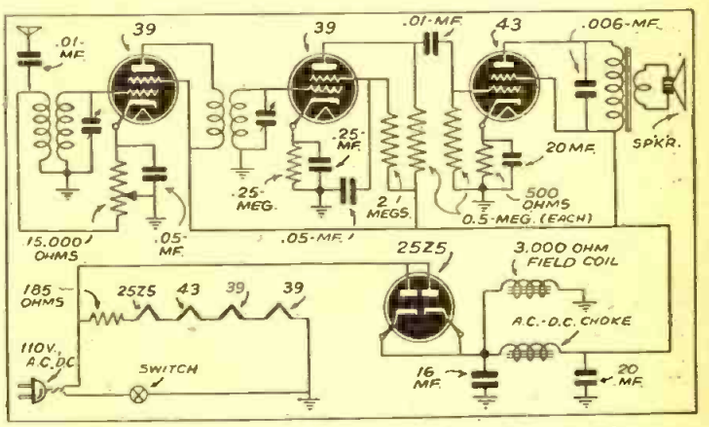


Diagram for 4-tube Broadcast receiver. (No. 1255.)

Midget Receiver

I have built the Novel Midget 3-Tube Receiver *described in the December issue and although it works quite well, it has one fault, and that is a bothersome A.C. hum.—D. Heustis, Laporte, Colo.*

A. This may be due to any one of several reasons. First, try reversing the line plug. Second, are the 6J7 and 6J5 tube filaments at the *grounded* side of the line? Also make sure that the 20 mf. filter condensers are wired in properly and are not defective. You might also check your wiring to make sure none of the power circuit wiring is close to the R.F. and audio tubes.

Tube Transposition

Can the metal tube 6J7 and 6K7 tubes be replaced with 6J7GT and 6K7GT tubes, without any changes in set wiring?—O. Gartman, Bristol, Conn.

A. In practically all cases, the regular metal tubes can be replaced with the GT series of bantam tubes. It is advisable to make use of a small shield over the bantam tube. Since the bantam 6J7GT and 6K7GT tubes have metal bases connected to the number one pin, the shield will make contact with the metal base and be automatically grounded. In some receivers, it may be necessary to realign the R.F. circuits in which the replacement has been made.

Amplifier Resistor Value

Regarding the diagram of the high fidelity amplifier accompanying the article on the Dezettel F-M receiver—what is the value of resistor R-29?—E. D. Burns, Danvers, Mass.

A. R-29, the feedback resistor, should be 1000 ohms, ½ watt, and the condenser in series with it is a ¼ mf. unit. A ¼ megohm resistor was omitted from the diagram and should be connected from the grid of the 6V6G to ground.

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.*

2-Tube Midget Set

Please tell me what type of tubes are used in the 2-tube portable midget set diagrammed on page 177 of the July, 1940, issue.—R. Brown, Tampa, Fla.

A. This portable set can use any two triode battery tubes such as the '30 or 1G4-G. If desired the two tubes can be combined into a single dual triode tube such as the '19' or 1G6-G tube.

Diathermy Coils

Could you give me some information on the coils used in the diathermy machine described in the February, 1940, issue?—W. Grove, Buffalo, N. Y.

A. L-1 consisted of 12 turns of No. 10 enameled wire, wound to a diameter of 2½ inches, while L-2, the output coil, had 6 turns of the same size wire inductively coupled to L-1.

Band-Spread

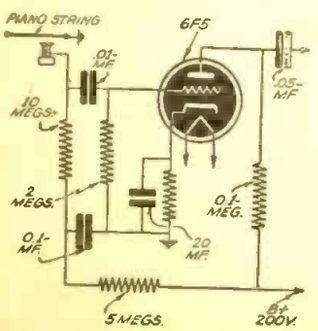
I have a Pilot A.C. Super-Wasp and would like to incorporate band-spread *in order to make tuning easier.—R. A. Carle, N. Y.*

A. Adding *band-spread* involves the use of additional condensers and will require some rebuilding, but there should be enough spare room in the receiver to enable you to accomplish this. The easiest method of providing band-spread for you will be to parallel the regular tuning condensers with about 20 mmf. units, and use these small condensers for *band-spread.*

Electrostatic Pickup

In electrifying an old piano by means of screws acting as electrostatic pickups under the strings, how are these screws connected to the amplifier?—H. T., Austin, Texas.

A. A short machine screw is mounted underneath and close to but insulated from the string. The screw and string form the plates of a small condenser and action is similar to that of the old *condenser-type* of microphone. The capacity and the voltage output varies as the string vibrates. Generally a separate pre-amplifier is used for each such electrified string. Notice that the string receives a D.C. polarizing voltage. Even order harmonics can be eliminated by mounting the screw near the center of the string, instead of close to the end of the string. The pre-amplifier shown is to be fed into the mixer stage of the amplifier being used.



Electrostatic pickup under string of instruments. (No. 1256.)

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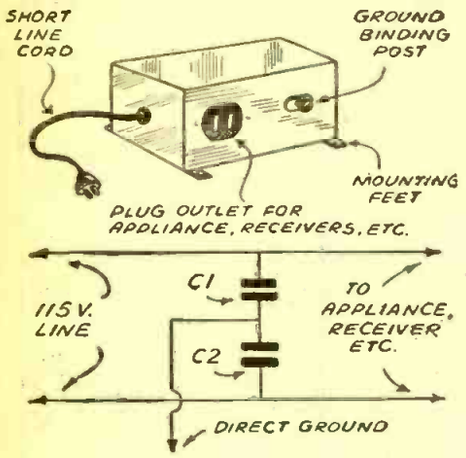
The Cover Kink
First Prize Winner

NOISE FILTER

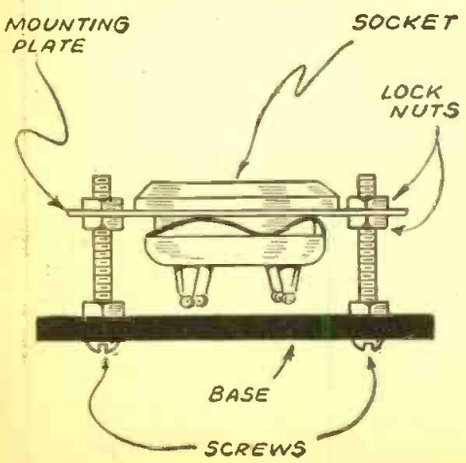
This kink is useful in cases of radio interference, especially in apartment houses or crowded communities where "hash" from sewing machines, electric razors and other appliances is troublesome. The condensers are procured from old Ford ignition coils, that can readily be picked up at junk yards or garages, if the experimenter does not

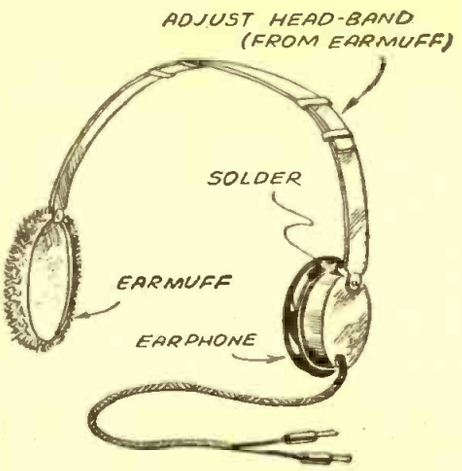


already have a couple on hand. Carefully pry up the top cover of the wooden box, melting some of the pitch if necessary, and remove the flat, paper-foil condenser, being careful not to injure the insulation or foil leads. The required number of condensers is connected as in the diagram, with one side to the 115 volt line and the other side to actual ground. If the interference is particularly severe, two condensers may be connected in series with the center tap taken between them. One word of warning though—always test old spark-coil condensers with a flash-light battery and lamp to see if they are shorted. If a defective unit is put into service it may short the line and blow a fuse. For safety's sake, it is wise to enclose the whole unit in a metal box with line receptacles at each end and a binding post for the ground connection.—*Don Mead, W1MLB.*

SOCKET MOUNTING

This kink will be found handy when mounting chassis type tube socket on breadboards, where bushings could not be had for immediate use. This is accomplished by replacing the bushings with lock nuts as shown in the accompanying diagram.—*Eufrocino Mania.*

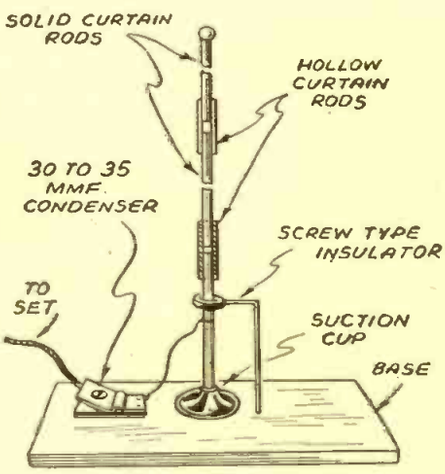




IMPROVED EARPHONE

This kink consists of a single earphone soldered on to the end of the head-band. The earmuff acts as a soft cushion which prevents the end of the head-band from rubbing against the head. It also helps to keep out noises that would disturb the user of this type phone ordinarily.

If the adjustable head-band that is usually found on earmuffs is used instead of the phone head-band, the earphone can be adjusted to any person's head.—*Bill Kotheimer.*

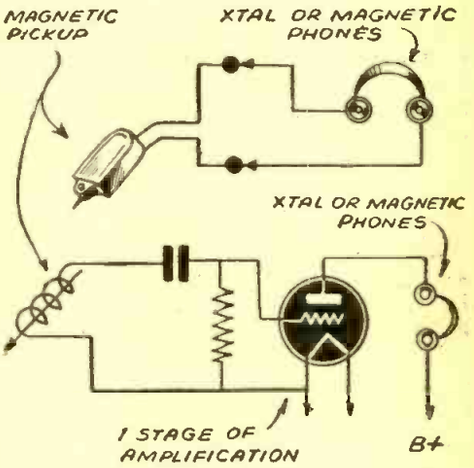


KNOCK-DOWN AERIAL

This aerial is built from a couple of telescopic curtain rods (3/16 to ¼ inch in diameter) by cutting the knobs from all ends but one solid rod, which serves as the top—the hollow rods can be used to couple the solid ones together, and allow an adjustment of approximately one foot at each joint. A rubber suction cup nailed to a piece of wood serves as a base for the bottom end. By bending a seven inch screw type standoff insulator two inches from the top, and screwing this into the baseboard so the eye is directly above the base socket, this will serve as a brace. A variable condenser in series with the lead-in will tune this aerial for maximum output.—*George Grabenstein.*

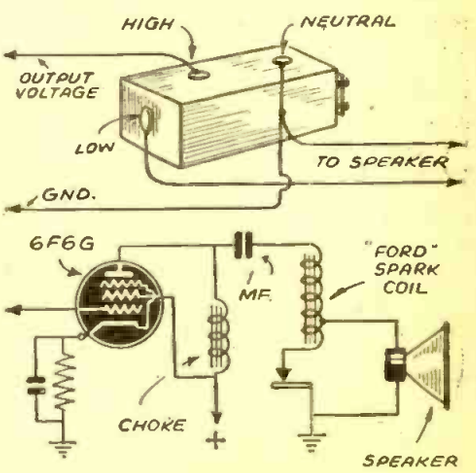
"PICK-UP" TESTER

Crystal as well as magnetic phono pick-ups are widely used today and the following simple method of testing them will be found useful. Magnetic pick-ups usually can be tested to see if they are okay by simply connecting a pair of magnetic or crystal headphones across the pick-up, while a record is being played. Crystal pick-ups, however, usually do not generate a sufficient voltage to properly operate a pair of phones, and in this case a simple one-stage amplifier should be used. In the plate circuit of the amplifier, which may employ an ordinary battery tube, a pair of magnetic or crystal phones can be connected.—*W. F. Cisson.*

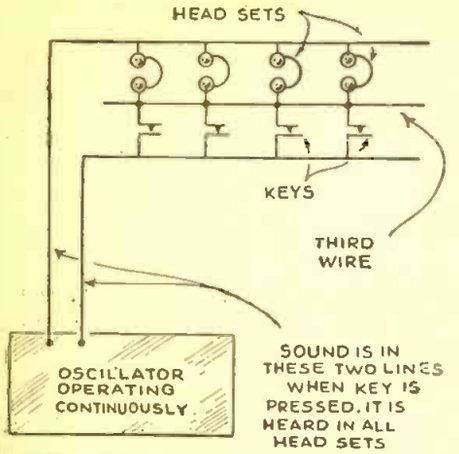


MAKE-SHIFT TRANSFORMER

Recently I purchased a small P.M. speaker with a voice coil of 2 ohms. Having no output transformer, I hunted around for a substitute. I finally discovered that a Ford spark coil was the answer. I attached the output of the tube to the output side (high voltage) of the induction coil and attached the speaker to the input (low voltage) side. This system worked perfectly with ample volume and good tone. It is not necessary to do anything to the vibrator.—*Harold Held.*



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 favorite to the Kink Editor

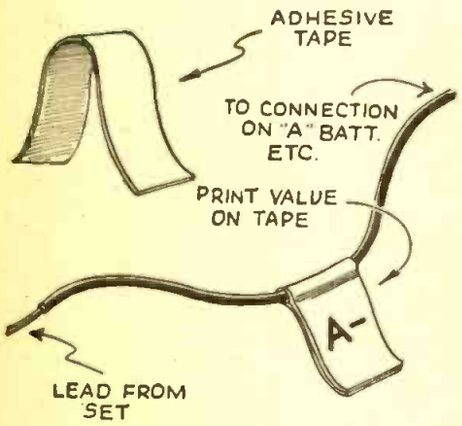


CIRCUIT FOR "BREAK-IN"

This is a simple circuit for using "break-in" when learning the code, or to permit two or more interested parties to operate. —*Richard Glenn, Orlando, Fla.*

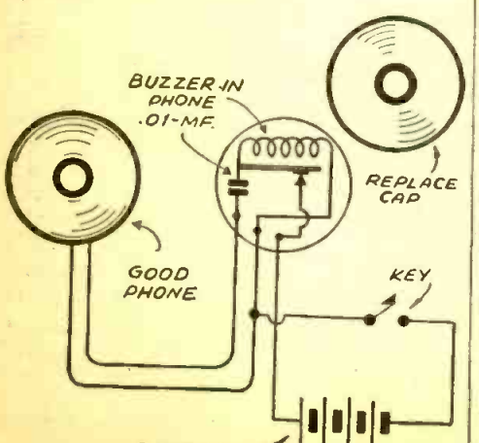
MARKING WIRES

Many times it is desirable to thoroughly identify certain wires in a cable leading from a radio set; the illustration shows a positive method of doing this. All you need is a small roll of adhesive tape. With a fountain pen you can then mark the piece of tape.—*Richard J. Nowowiejski.*

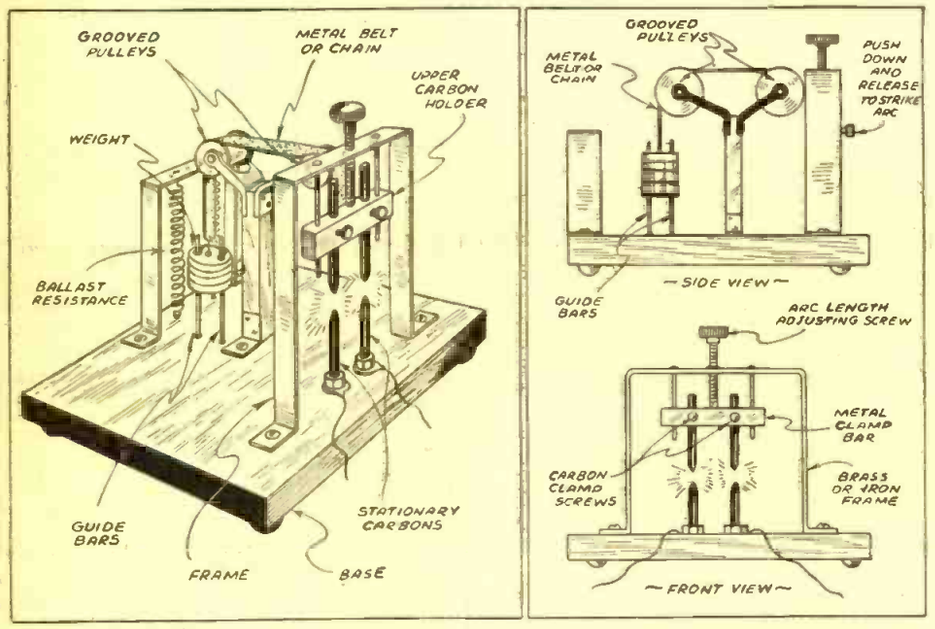


CODE PRACTICE SET

This set is made from a pair of old earphones. One of the phones is taken apart and a small buzzer is made to fit into the phone case. The ear cap is replaced and the phones worn in the usual manner. You don't disturb anyone with noise and outside disturbances do not bother you.—*John Prokipchak.*



Sun-Tan Arc Lamp



Simple design of home-made arc, suitable for "sun-tan" treatments, etc.

● THIS home-made arc lamp comprises two arcs connected in series with a ballast resistance of seven to ten ohms. The ballast may be made with No. 18 German silver wire, or iron wire may also be used. It is best when first trying out the arc to use more wire than you calculate you will need, and then to reduce the amount of wire in circuit by means of a sliding clip. The resistance may be wound over a piece of asbestos on a length of iron pipe, or a porcelain tube. In other cases the resistance wire is simply wound in small spirals, supported on porcelain or other insulators, stretching the coils so that the turns are separated by at least the diameter of the wire. The arc carbons may be regulated by a geared hand-feed, or other mechanism the constructor may work out.

With the resistance mentioned this arc is suitable for operation on 110 volts D.C. and it may be tried on A.C., but it usually works better on A.C. if an adjustable choke coil or impedance is used instead of a resistance.—*Bob Eichberg.*

How to Regulate Motor Speed

● IT is often desirable to vary the speed of small motors and several hints on how to do this are shown in the illustration. The speed of small motors may be varied by shunting the field with a magnet or even a piece of iron as shown in Fig. 1. After a few trials you will find the point or points at which the speed is varied to suit your particular requirements as the magnet or piece of iron is moved toward or away from the field frame.

The speed of small A.C. motors may be reduced by connecting a condenser in series with the motor as shown in Fig. 2. The larger the condenser the higher the speed of the motor and vice versa. A switch may be arranged so as to connect several different sized condensers in series in order to obtain a number of different speeds. In any case, the voltage rating of the condenser should be about 2½ times that of the circuit on which it is to be used.

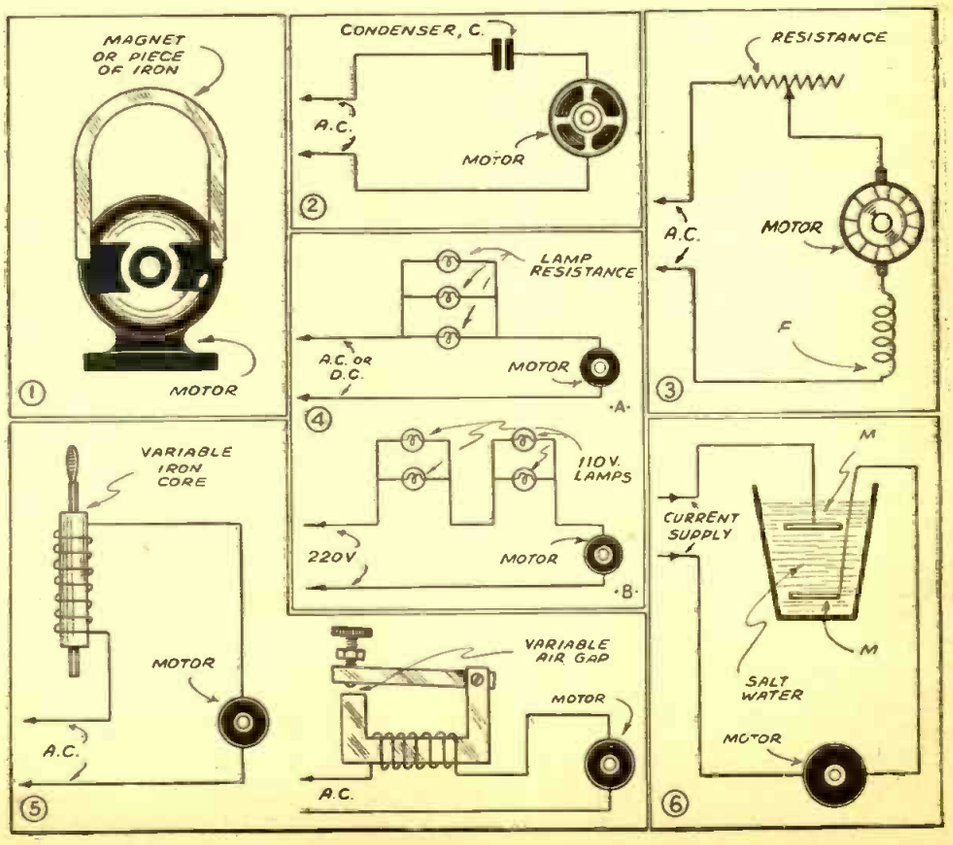
Fig. 3 shows how to regulate (reduce) the speed of a series motor by means of a variable resistance connected in series with it. Connecting a variable resistance across the field of such a motor will act to weaken the field and raise the speed of the motor.

The use of 110 volt lamps connected in series with a motor to reduce the speed is shown in Fig. 4. The greater the number of lamps connected in parallel, the more current the motor will receive and the greater its speed. On a 110 volt circuit use 110 volt lamps and in any case the voltage rating of the lamps used should correspond with the voltage of the supply line. On 220 volt circuits two banks of 110 volts lamps may be connected in series as shown in Fig. 4B.

For A.C. motors a very good speed regulator is shown at Fig. 5—here an adjustable choke or impedance coil is used. The impedance of the coil may be varied (and also the speed of the motor) by varying the number of turns connected in circuit at any moment, or the laminated iron core may be moved in and out of the coil. A combination of both methods may be used. The size of wire used on the choke coil will vary with the size of the motor, but for average small motors No. 14 to No. 16 copper wire, enameled or other insulation, may be used, using laminated iron core (built up from sheet iron or transformer core strips) about 1 inch square and 8 inches long. The coil comprises five to seven layers of wire, winding the coil over a fiber or other insulating tube in which the core may slide. The impedance of the coil may be varied by changing the length of the air gap in the laminated iron core, as shown at Fig. 5B, by means of a regulating screw or lever arrangement.

A water rheostat is one of the old standbys, especially where a temporary variable resistance is needed for test or other purposes. Fig. 6 shows how such a device is

Below—1—Shows how to vary speed of motor with a magnet. 2—Condenser reduces A.C. motor speed. 3—Resistance lowers A.C. motor speed. 4—Using lamps to reduce speed. 5—Variable choke coils used as speed regulators. 6—Water rheostat speed regulator.



connected in series with a motor to regulate its speed. Various speeds below normal value may be obtained in this way. Salt water is used in the tank, which may be a wooden barrel or pail and two metal plates M-M are submerged in the solution, the top plate being movable up or down, so as to vary the distance between the two plates and thus regulate the amount of resistance in series with the motor.

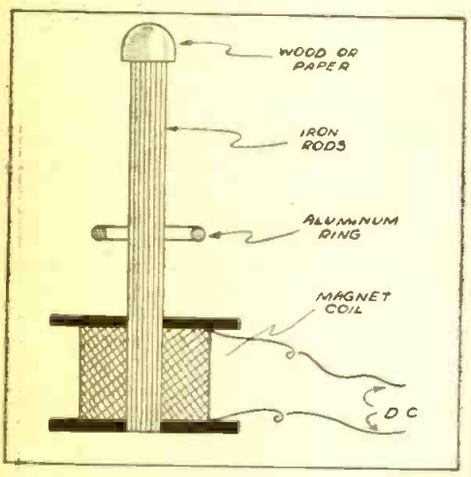
MORE ON PULL SWING!

An Important Article in the Next Issue gives some interesting details on an A-M audio system and modulator for the Pull-Swing F-M Transmitter—Messrs. Muniz & Oestreicher

THE JUMPING RING

● IF you have an old speaker field coil (or similar magnet coil) available this jumping ring experiment is very interesting and spectacular. Sufficient iron or steel rods are placed inside the coils to fill it, and a wood or paper ball mounted on top of the rods. A light aluminum ring is arranged to slide up and down the rods. When the direct current is passed through the coil the aluminum ring will move rapidly up the rods, and the stronger the field the more rapid the movement of the ring. The ring will remain elevated as long as the current is turned on.

With a suitable vibrator or other type switch, which will interrupt the current quite rapidly, the floating ring can be made to jump up and down in a very striking manner.



The aluminum ring jumps upward each time the current is passed through the coil.

ELECTRICAL ARTICLES WANTED!

● **THE Editors want articles on simple electric motors and methods of using them, electric meter test set-ups, high frequency furnaces, home-made battery chargers, home-made measuring instruments and bridges, etc. All articles accepted and published will be paid for at regular space rates. Be sure the photos are sharp and clear.**

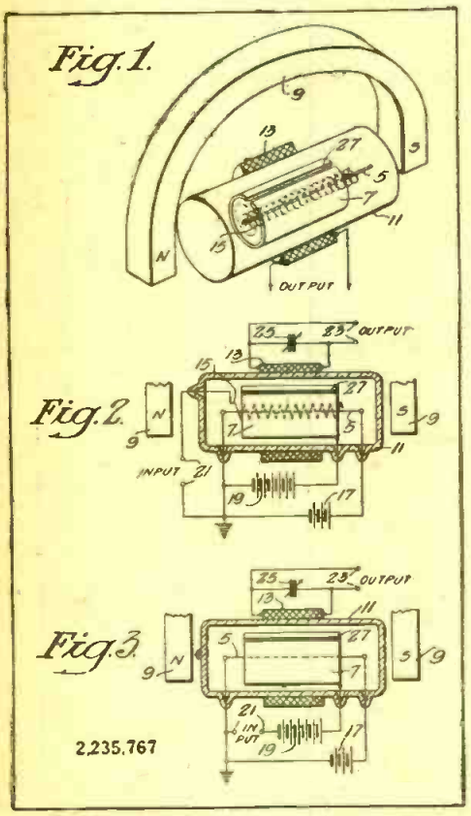
The Editors.

RECENT RADIO AND TELEVISION PATENTS

MAGNETRON TUBE

2,235,767—issued to David G. C. Luck, Oaklyn, N. J.

● THIS invention relates to magnetron tubes and more particularly to a method and means for coupling an output or load circuit to a thermionic tube of the magnetron type.



Note use of magnet to control electron stream.

Fig. 1 illustrates a magnetron of the single anode type. The tube consists of a cathode 5 which passes through a cylindrical anode 7, concentrically arranged about the cathode. A magnetic field substantially parallel to the axis of the cathode is produced by any suitable means, such as a horseshoe magnet 9, or the like. The cathode and anode electrodes are suitably mounted within a glass envelope 11. A solenoid 13 is placed around the glass envelope and is concentric with the anode electrode. If desired, a grid may be included in the tube structure, and may, for example, take the form of a helix 15 which is positioned concentrically about the cathode. No attempt has been made in the drawing to illustrate the method of mounting the various electrodes within the glass envelope, as this is well known to those skilled in the art.

Fig 3 is a schematic drawing to illustrate the application of a control voltage to the anode electrode in a magnetron which does not utilize a control grid.

CATHODE RAY TUBE

2,237,065—issued to François Joseph Gerard van den Bosch, London, England.

● THIS invention relates to cathode ray tubes. One object is to provide a cathode ray tube producing sufficient light for the picture to be projected by ordinary optical means onto a remote screen.

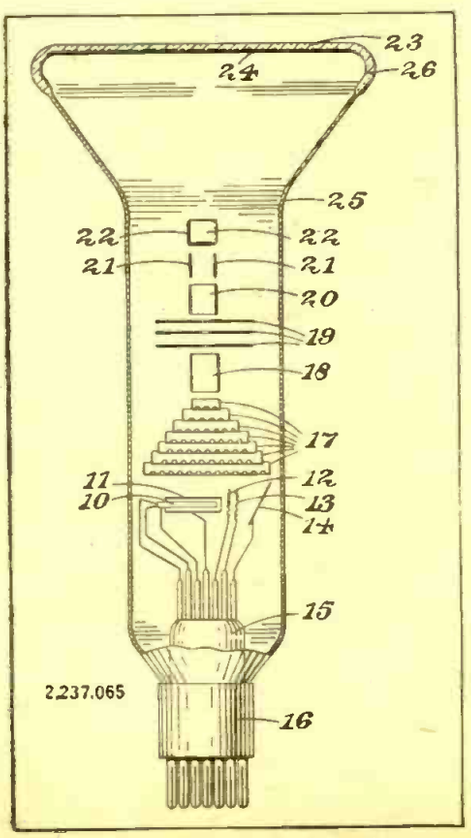
There is provided a cathode ray tube comprising a screen, formed of quartz glass and provided with a layer of a high melting point metal or metallic compound in finely divided form. This layer, under bombardment of the electrons, becomes highly incandescent and produces sufficient light for useful projection by optical means onto an external screen. The use of quartz glass enables the requisite cooling to be achieved.

In one construction, the cathode ray tube comprises, in addition to a primary cathode, at least one secondary cathode for providing a secondary electron emission which is directed onto the screen. The use of such electron multiplication is advantageous in that the life of the cathode is considerably longer than in cases where the primary source of electrons alone is used.

Referring to the single figure of the drawing, there is shown a cathode ray tube incorporating an electron multiplier of the form described in my co-pending application, Serial No. 276,883. An electrode assembly comprising a primary cathode 10, a tubular control electrode 11, control grids 12 and 13 and a reflector 14 is carried by a pinch 15 mounted on a plug base 16. A plurality of perforated secondary electron emitting electrodes 17 are provided constituting successive multiplier stages for primary electrons directed onto the first of these electrodes by the reflector 14.

The electron emission from the final one of these secondary cathodes is directed through a focussing cylinder 18 by means of a plurality of electrodes 19 operating as accelerators to provide an electronic beam which may be further focussed by another cylindrical electrode 20 to maintain a high concentration. The beam leaving the focussing electrode 20 and controlled for example by means of deflecting plates 21 and 22, impinges on a screen 23.

The screen 23 is formed of quartz glass and has on its inner surface a layer 24 of very finely divided tantalum carbide with which may be mixed a finely divided fluorescent material such as zinc sulphide.

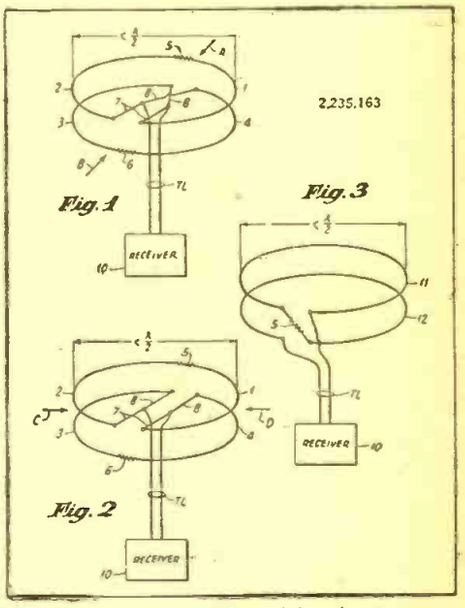


Television image projection tube.

BROAD BAND ANTENNA

2,235,163—issued to Harold O. Peterson, Riverhead, N. Y.

● THIS patent covers short wave antennas especially designed for receiving horizontally polarized waves, over a wide band of frequencies, such as those now used in television transmission. This antenna has a substantially circular directivity pattern in the horizontal plane. A further object is to provide a single contact antenna, suitable for the reception of television signals, all of which is obtained by providing a horizontally disposed double-loop antenna.



A simple design of broad band antenna.

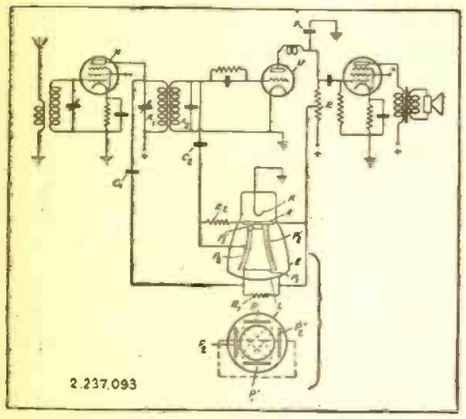
In order to make the antenna substantially aperiodic over a wide band of frequencies a damping resistance is provided, at a point on the loop remote from the connection of the transmission line to the loop. A damping resistance should have a value equal to the surge impedance of the loop.

The improved antenna may be constructed of two parallel horizontal loops, each loop having a damping resistance at one point in its circumference and having a transmission line connected at a directly opposite point. Preferably, the diameter of the improved loop antenna should be somewhat less than a half of the length of the operating wave. If a circular directive pattern is desired the two loops are connected in an additive relationship and if some directional effect is desired they may be connected in an opposed phase relationship. As a further modification a two turn horizontal loop antenna may be employed, having a damping resistance connected at its midpoint.

OPTICAL TUNING INDICATOR

2,287,093—issued to Otto Tuxen, Berlin, Germany.

● THE invention illustrated in the drawing shows the circuit organization of a three-circuit tuned radio frequency type of radio receiver, comprising grid-current detection and single-stage AF amplification, although it will be understood that the invention is also applicable to receivers of the *super-heterodyne* type. Between the RF amplifier tube H and the grid-current detector tube U is inserted a two-circuit tunable band-pass filter K_1, K_2. The RF potentials set up at the two circuits are fed through blocking condensers C1 and C2 to the pairs of deflector plates P1 and P2 of the cathode-ray or Braun tube E, the said plates not being grounded for RF and being disposed at right-angles to each other. The corresponding cooperating plates P'_1 and P'_2 are directly connected conductively with the perforated anode A and connected, like the conducting luminescent screen L of the tube to a suitably chosen tap of the anode load resistance R of the grid-current detector tube U.



Inasmuch as the RF had been filtered out by the filter F, it follows that the potential at the electrodes A, P'_1, P'_2 and L in respect to the grounded cathode K varies in accordance with the amplitude of the incoming RF.

DISSECTOR TUBE

2,235,477—issued to Philo T. Farnsworth.

● THE primary object here is to provide a dissector of the type wherein an electrical image of the field of view to be transmitted, is deflected over a scanning aperture, or other collector of electrons having an elementary area as compared with the area of the cathode. The dissector of this particular invention differs from most devices in its class, in that the electrical image is undistorted and in focus only immediately adjacent to the electron collector, and in that the other portions thereof may be so distorted as practically to lose their image characteristics.

The primary object of the invention is to provide a device, wherein the portion of the image undergoing dissection at any instant, is sharply in focus, regardless of the degree of deflection of the beam of electrons as a whole. Secondary objects are: To provide a means of dissection wherein the power required for focusing and deflecting the electron beam is greatly reduced; to provide a dissector tube wherein the optical window through which the optical image of the field of view is projected becomes, in effect, a portion of the anode without being made conducting; and to provide a system for the analysis or dissection of a television image wherein the required electrostatic and electromagnetic fields may be established with a sufficient degree of accuracy to provide sharp detail in the resultant picture without requiring structures of excessive bulk or additional complex corrective circuits.

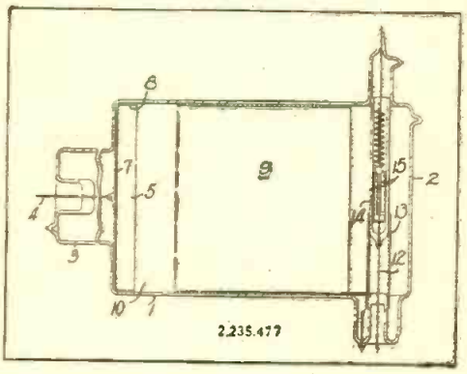
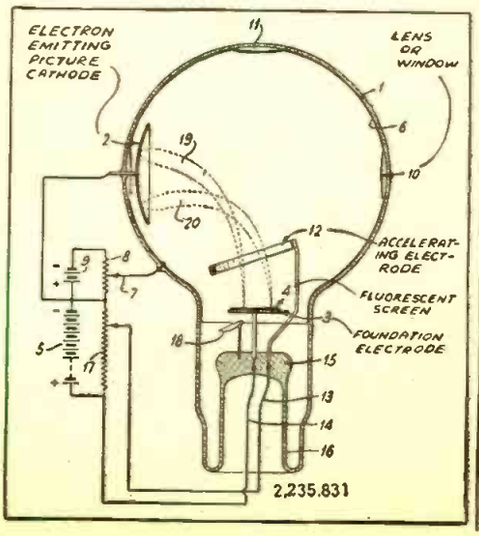


IMAGE CONVERTER TUBE

2,235,831—issued to Frederik Coeterier, Eindhoven, Netherlands.

● IT IS an object of this invention to provide an image converter tube, wherein the area of the converted image may be varied at will with respect to the area of the original optical image, while at the same time background illumination is minimized.

The electrons issuing from each point of the irradiated surface of the picture cathode of an image converter tube, are focused to form a picture of reduced area by establishing the electron discharge inside a spherical or substantially spherical electrode. The spherical electrode is preferably transparent or provided with windows for the passage of light. In operation the spherical electrode of the new tube is given a potential which is negative with respect to the picture cathode, so that the electrons which are emitted by the picture cathode (owing to the irradiation of the latter) are accelerated in the electric field between the cathode and the fluorescent screen and are concentrated on and directed to this screen, where they form a well-defined reduced reproduction of the picture projected on the cathode. Furthermore the picture may be sharply focused by varying the potential of the spherical electrode.



Short Wave DX Tips

Joe Miller

"DX" Editor

Time in E.S.T.

● SINCE our last article was written, we have learned it was intended for the June issue, 'stead o' May, so are writing this with as yet no response to our question concerning this feature. We again ask interested DXers to make known if they wish this feature continued, by their written response. We'll be glad to hear from everyone.

Till a response sufficient to warrant a more complete coverage is received, we will continue our temporary policy of taking only a small amount of the most interesting news into discussion. Here goes:

AFRICA

CAMEROONS—FIB, at Yaounde, a city in this French mandated colony, has been reported on 2 frequencies, 6.285 and 11.29 mc., and beginning their daily broadcast at 3:10 A.M. This from the NZDXRA, and no further data is known at present.

EGYPT—SUV, 10.05 mc., the well-known Cairo phone, can be watched daily, as it is now the key station used in relaying Xmsns for American rebroadcast from the African war zone. SUV is now heard 10:50 A.M.-1:10 P.M., and network pick-ups either 6:45 or 7:15 P.M. A very FB signal on the evening Xmsns.

ASIA

SINGAPORE, S.S.—ZHP1, 9.69 mc., and ZHP2, 6.175 mc., are now operating on a new sked daily of 7:30-9 A.M., approx., and best heard at the beginning of Xmsn. ZHP1 is still a good signal, despite approaching hot weather. Try for it.

CHINA—FFZ, 12.09 mc., located in Shanghai's International Settlement, and probably operated by the Free French, has verified the reception of Rog Legge, Binghamton, N. Y., and our congrats on this FB veri, OB! The station uses but 400 watts. QRA is: Station Radiophonique Française FFZ, 193 Ave. Joffre, Shanghai, China. Present sked is 11 P.M.-10 A.M. daily, and 11 P.M.-1 A.M., 5:30-10 A.M. Suns. Best sig is in early A.M., near 6 A.M.

INDIA—To those DXers who occasionally tune in the early A.M., now is a good time to check reception on the 4 major Indian Xmtrs to be heard in the "wee hours," as they are being well heard now. VUC2, 9.528 mc., Calcutta, and VUB2, 9.55 mc., Bombay, both operate 2-4 A.M. VUM2, 9.57 mc., Madras, is on 2:30-4 A.M., VUD3, 9.59 mc., from 1:30-3:30 A.M.

MANCHUKUO—MTCY, 9.545 mc., at Hsingking, may also be tuned in at same time as the Indians, as they have a Xmsn to N. Am. from 1:30-2:20 A.M., and can be received nicely, as they have a powerful Xmtr.

IRAQ—HNF, 9.78 mc., at Baghdad, may soon be off the air, with war operations practically surrounding them. Sked is reported as 9 A.M.-2 P.M. If still broadcasting, HNF may be heard near end of Xmsn. HNF on 7.08 mc., is also on this sked, according to a letter received by the NZDXRA from the Engineer-in-Charge, B. E. Zeki, of the Iraq State Broadcasting. Another signal, on 15.29 mc., heard irreg. from 9.25-9.45 A.M., may also be the same Xmtr on a summer frequency.

JAVA—PMA, 19.345 mc., at Bandoeng, a once fine catch when on commercial 'phone, is now to be easily heard on a regular broadcast of 7-8:15 A.M., with news at 7:45. PMA closes Xmsn with the Dutch National Anthem.

AMATEUR DX

Some good DX reported, but mostly from Latin America. The Philippines are the only "voice of Asia" in the ham bands these days. The South Americans can be heard evenings with little difficulty. KA's are being logged with less effort than heretofore, as now they are not drowned out by the once easy-to-receive Australian hams, who are now off the air due to war curtailment. If one tries from 6:30-8:30 A.M., approx., the KA's will be coming through on good DX days. We will list those recently logged —KA1AC, 14.10; KA1AK, 14.12; KA1AR, 14.10; KA1BB, 14.255; KA1CM, 14.070; KA1CW, 14.14; KA1GC, 14.14; KA1JH, 14.12; KA1ME, 14.15; KA1RX, 14.10; KA1AN, 14.14; KA1ND, 14.16; KA4LH, 14.11; KA6FB, 14.15; KA7FS, 14.26. Try for 'em, you can't miss getting a few, at least, and they count as Asia.

Other catches to be tuned for are KB6CBN, 14.25, in Guam, which may be heard in A.M.'s and recently reported by Rog Legge at 7:30. And Rog further reports KD4HHS, 14.24, at Swan Island, in the West Indies, operating quite regularly near 7 A.M., 9:30 A.M., and 6 P.M. QRA is: George Grover, U. S. Weather Bureau Station, Swan Island, West Indies, via New Orleans.

Despite QRM, the So. American hams are heard quite well on 7 mc., though this activity will be dying down till the fall. Try for OA7A, 14.10-14.13 mc., heard reg. 7-8 A.M. and eves., this being the Xmtr for the Wenner-Gren Expedition. Reports can be sent care of U. S. Consulate at Lima, Peru.

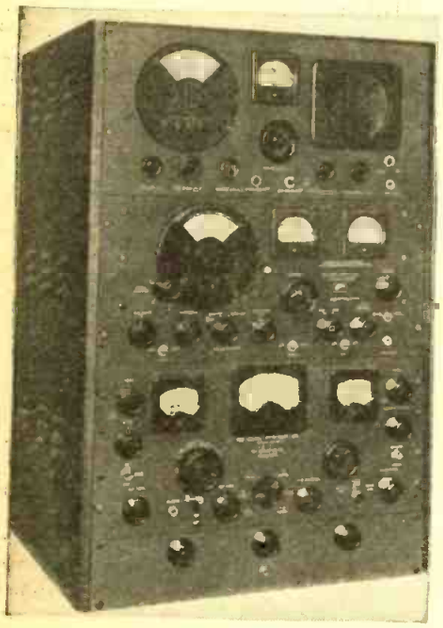
We would like to hear from all of you DXers still plying the dials, and will be glad indeed to get some reports on your DX.

Some of our local DXers have since deserted the ranks, and are now adding to the QRM on various ham bands. To name a few, Ralph Gozen is now W2NCG, Jack Buitekant is W2NKB, and Marty Garvey is W2MYR. They're now busy working all states 'stead o' verifying all continents. What a comedown! Tnx to Charles A. Morrison of the I.D.A., and to Roger Legge for their help on the above article. And 73 to all fellow DXers.—JOE MILLER.

NEW RADIO APPARATUS OF INTEREST

Wide-Range Receiver in One Cabinet

● A VERY compact, highly efficient radio receiving station, all in one streamlined cabinet and covering the remarkable range of 1.8 to 2730 meters, FM and AM, is here illustrated. It is supplied by the well-known Hallicrafters. The operator may use at any moment one, two, or all three units—through the separate antenna switch provided. The monitoring loudspeaker may be connected to any one of the sets at will; in addition, separate loudspeakers may be connected as required. A headphone monitoring jack ties into the output of any one of the three receivers.



This high-class receiver will appeal to all dyed-in-the-wool short wave listeners, as well as Hams and commercial stations; also it is the first we have come across which covers the range all the way from 1.82 to 2730 meters—(165 mc. to 110 kc.). FM-AM reception is provided on the frequency band from 110 kc. to 165 mc.

A few of the radio reception services made available by this extremely broad service all-around receiver are: time signals, coastal and ship telegraph and telephone, aircraft beacons, standard broadcast, relay broadcast, aviation, amateur, international short-wave bands, police, government, press and educational channels. FM broadcast and relay bands with high fidelity audio for best FM reception. The set measures 20½" wide, 30" high, 18" deep.

New RCA Tubes

● SEVERAL new tubes were recently introduced by RCA Manufacturing Co.—the 12H6, the twin diode, and the 117P7-GT, a rectifier beam power amplifier.

The 12H6 is a twin-diode similar to the 6H6, except for its heater radiating of 12.6 volts and .15 ampere. It is useful in sets having a 12.6 volt heater supply. As a rectifier, the A.C. plate voltage per plate (RMS) is 150 volts max. The D.C. output current per plate is 8 milliamperes max. The 117P7-GT is a rectifier—beam-power amplifier, similar to the 117N7-GT, but having somewhat lower power output capability. The rectifier unit (half wave) figures are:

Peak Inverse Voltage	350 volts max.
Peak plate current	450 ma. max.
D.C. heater-cathode potential—(with condenser input filter)	175 volts max.
A.C. plate voltage (RMS)	117 volts max.

The amplifier unit ratings are:

Plate voltage	117 max.
Screen voltage	117 max.
Plate dissipation	6 watts max.
Maximum signal power output	.85 watt

The new 6SS7 is a remote cut-off. R.F. amplifier pentode of the single-ended metal type having a 6.3-volt, 0.15-ampere heater. This new tube provides for a further degree of flexibility in the design of A.C./D.C. receivers utilizing single-ended metal types, where the total heater voltage of a complement of 0.15-ampere types heretofore available would exceed 117 volts.

The 12SN7-GT is a single-ended, twin-triode amplifier having separate cathode terminals for each triode unit. It is recommended for use in resistance-coupled circuits as a voltage amplifier or phase inverter. Since this tube has separate cathodes which are brought out to terminals in the base, this tube offers much greater flexibility from the circuit designer's standpoint than do other twin triodes having only a single cathode connection.

The RCA-931 is a new type of phototube in which the photocurrent produced at a light-sensitive cathode is multiplied many times by secondary emission occurring between nine successive dynodes within the tube. It is capable of multiplying feeble currents produced by weak illumination as much as 230,000 times. Focusing of the electron stream is accomplished electrostatically within the tube.

The 931 employs the S4 photosurface, which has higher sensitivity to blue-rich light than to blue-deficient light.

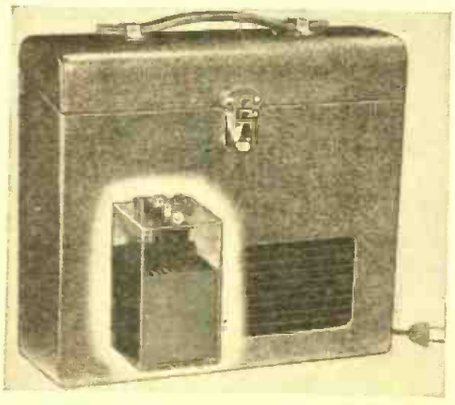
New Portable Has Rechargeable Battery

● A NEW luggage-type portable receiver (model LB-530) has just been announced to distributors and dealers by the General Electric Company, which operates on a rechargeable airplane-type storage battery and eliminates for all time the inconvenience and expense of dry-cell replacement. Heart of the new set is a plastic-encased non-spillable storage battery, and a built-in automatic battery charger. The new radio offers three alternatives to its owner at the turn of a switch—it may be played on battery alone; it may be operated on alternating-current and will bring in programs while the life of its battery is being renewed; it may be recharged swiftly and silently on A.C. without concurrent radio operation.

The new set has other features designed into it to make it the leader of a newly-announced line of portables. Two antennas—one a *beamascope* located more effectively than heretofore and the other a supplementary antenna for window mounting—give the set added usefulness, and an optional cable may be used to recharge the set from an automobile battery by connection through the cigar-lighter outlet.

It is the battery provision, however, which is calculated to arouse the highest interest in the radio field. The power box, a self-contained non-spillable unit in a steel case, consists of a two-volt storage battery, a 90-volt vibrator, battery charger, and transformer. The battery is of a new non-spillable type developed by Willard, and its plastic case is transparent. It contains about a spoonful of free liquid, and when necessary this supply may be renewed from an ordinary faucet. Automatic charge indicators, consisting of three colored floating balls, tell at all times the state of the battery and indicate when it needs charging. The vibrator is simple and reliable, proved in automobile service, while the battery charger is a copper-oxide rectifier. The back of the receiver unsnaps easily, giving access to the battery unit and its indicators. The supplementary antenna and cigar-lighter charging cable are stored in the rear compartment.

The beamascope antenna, for regular operation, is located in the lid of the new model, where it gives maximum performance under normal conditions and does away with the "directional" receptivity so characteristic of many portables. An



additional window antenna, which is standard equipment, may quickly and easily be attached to the window of a train or plane by means of rubber suction cups.

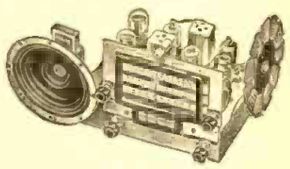
The receiver has five working tubes, and covers standard broadcast reception from 550 to 1750 kilocycles.

Radio Training Course Kit

● HERE'S a new 6-tube 2-band A.C.-D.C. "training-course" kit, Model B9820, that anyone can build, as the answer to all N. Y. A., radio school, and other student radio construction problems. It is supplied by Allied Radio Corporation.

This efficient superhet receiver kit has been especially designed for the radio student, experimenter, and builder. Easily assembled with a minimum of time and trouble, it requires merely a screwdriver, pliers, and soldering iron for its erection. A punched and drilled chassis base is supplied, together with thoroughly complete and simplified instructions in non-technical terms.

This 6-tube 2-band superhet kit incorporates the newest features and developments found in advanced radios, such as: Built-in Loop; Push-Button Tuning; Plastic Slide-Rule Dial; Variable Tone Control; AVC; 2½ watts Output; Phono,



Television and FM adapter connections. Tuning range for standard broadcasts is 535 to 1,720 kc., and 5.65 to 18.3 mc. for foreign and domestic short-wave. Uses latest multi-purpose tubes: 12A8GT, 12J5GT, 12K7GT, 12Q7GT, 35L6GT, and 35Z5GT. Employs a 6½" PM dynamic-type speaker for realistic reproduction.

New "Long-Life" Battery

● THE new Triumph battery is the same as the standard cell in size, shape, method of contact and voltage capacity but radically different in construction. It is packed and sealed in a dry state and activated only by striking the bottom of the case against any solid object. This action breaks an inner glass bulb, thereby releasing the electrolyte which energizes the cell. One hundred per cent strength is attained in less than a second. From that moment on, this cell has the same

characteristics as any other flashlight battery under the same conditions. It has no date and fears no age because deterioration does not begin the day it is manufactured . . . . it does not begin until the battery is used for the first time. For this reason, it makes no difference how long a dealer has had it on his shelf or how long one keeps a battery before using it for the first time. Until the occasion for use arises, the 100% efficiency of this battery is sealed within and kept intact.

Micro-Tubes

● THE radio experimenter who is particularly interested in building miniature receivers or transmitters of the "vest-pocket" type, will be interested to know that radio tubes (with grids and plates) no larger than the tiny pilot light on the ordinary radio receiver, are now available. The tubes are made by the Micro-Tube Laboratories and the tubes are furnished without bases. These tubes have filaments of the ⅛ (.625) volt, dull-emitter type. The filaments in these tubes are free from microphonic vibration, as the manufacturer points out, and the tubes were primarily designed for use with electrical hearing aid devices. Where three of these tubes are used in an audio amplifier, for use with a microphone, such as a hearing-aid device circuit, a series-parallel connection of the filaments of the three tubes is required, in order to operate directly from a 1.4 volt cell, without rheostat control.

The dimensions of one of the tubes is .36 by 1.1 inch maximum. Graphic curves and technical data such as the impedance values of the tubes, etc., is available from the manufacturer, or may be obtained by writing to the Service Department, RADIO & TELEVISION, 20 Vesey St., New York City.

Marine Radio Telephone

● A NEW marine radio telephone so flexible in design that at the flip of a switch a vessel can communicate with any shore station serving U. S. territorial waters—either inland or seaboard—has been announced by the Western Electric Company for use aboard towing, fishing and pleasure craft.

Known as the 226-D, the new instrument features instantaneous selection of any one of ten pre-tuned frequencies, quartz crystal control of both transmission and reception, extreme signal clarity, low noise, and semi-automatic operation.

Simplicity keynotes the new design. Installation involves connection only to antenna, ground and power supply. The compact cabinet lends itself to mounting on a bulkhead, shelf, a locker top or other convenient support. Only three control knobs appear on the panel and the transmitter goes on the air at the pressure of a finger on the handset button. Anyone can make a call with the new unit without previous instruction, although, because it involves radio transmission, the law requires the presence aboard of a licensed (3rd class) operator.

A single control is provided in the 226-D for shifting both the transmitter and receiver simultaneously to any one of ten frequencies. Nine of these may be utilized for ship-to-shore communication and the tenth reserved for ship-to-ship or coast guard. All controls are located on the front panel, where they easily may be reached.

The radio receiver is of the superheterodyne type embodying the latest developments in circuit design.

The handset, too, is the most advanced type available today. When not in use, it rests on a small hanger on the side of the cabinet. Returning the handset to its hanger automatically prepares the receiver for the next incoming call. Additional telephone instruments may be installed at selected locations about the vessel. A built-in loudspeaker monitors incoming calls, if desired, and both a selective calling device, which permits the shore station to ring the boat, and a precision radio-compass attachment are optional.

The 226-D operates on 110 volts, 60 cycles, A.C. which may be supplied by a small, inexpensive rotary converter.

Pen Oscillite

● THE radio experimenter as well as the service man will find particularly interesting this new pen oscillite—a vest-pocket instrument which may be used for circuit tracing, aligning I.F. and R.F. stages, checking audio amplifiers, A.V.C. action, antennas, peaking loops and auto antennas, locating "breaks" in concealed wiring, and many other tests.

Receiver sensitivity may also be checked with this new pocket test instrument. The device uses a single small flashlight cell for its source of excitation; the drain on the cell is only 20 ma., thus giving it a long life.

When the button on the instrument is pressed, oscillations are generated and are radiated from the metal tip. These waves are picked up by the antenna or other circuits of a receiver. The maximum output is approximately one and one-half million micro-volts, more than enough for any testing purpose. The radiation occurs only from the tip of the instrument and is very directional. Increasing the effective length of the radiating tip by clipping a piece of wire to it will increase the distance at which its signal can be picked up. Likewise the strength of signal induced in a receiver being tested may be attenuated by increasing the distance between the oscillite and the set under test.

Pushmike Adaptor and Stand

● A NEW "pushmike" adaptor and stand makes a valuable addition to the line of RCA microphone stands and accessories.

The new unit is ideal for mobile or portable operation of public address systems, or for other uses where it is desirable to cut the microphone in and out of the amplifier circuit at will. Sturdy in construction, the unit is finished in polished chromium and is available with or without a chromium-finished base. Without the base it may be used as a hand grip or in conjunction with a floor stand.

The switch adaptor is fitted with a heavy duty double pole-double throw low-capacity leaf switch, with a "push-to-talk" button that can be locked in the "talk" position with ease. As an adaptor it may be fitted to any stand with ⅝"—27 thread. By use of the proper thread changing adaptor, any RCA microphone can be attached to the switch and case.

New Recording Disc

● NEW economy recording disc in the 6½" size has been announced by the Howard Radio Co. This disc has the same superior type C black

coating used on this company's metal-base discs, which features low surface-noise and good reproduction of both high and low frequencies.

Electric Soldering Irons

● AMONG the many small as well as large types of new design electric soldering irons supplied by the Drake Electric Works, is the 100 watt iron here illustrated. This model 320 iron is particularly designed for the Radio Amateur and Experimenter. Its resistance unit is wound with Nichrome wire on amber mica. The iron is fitted

with a 6-foot heater cord, rubber plug and a small metal stand. By means of a small screw in the side of the heating unit, the copper tips may be renewed whenever necessary, and extra tips are available at small cost. Other styles and varieties of electric soldering irons for every conceivable purpose up to 200 watts capacity, are supplied by the same manufacturer.

Airplane Radio Dials

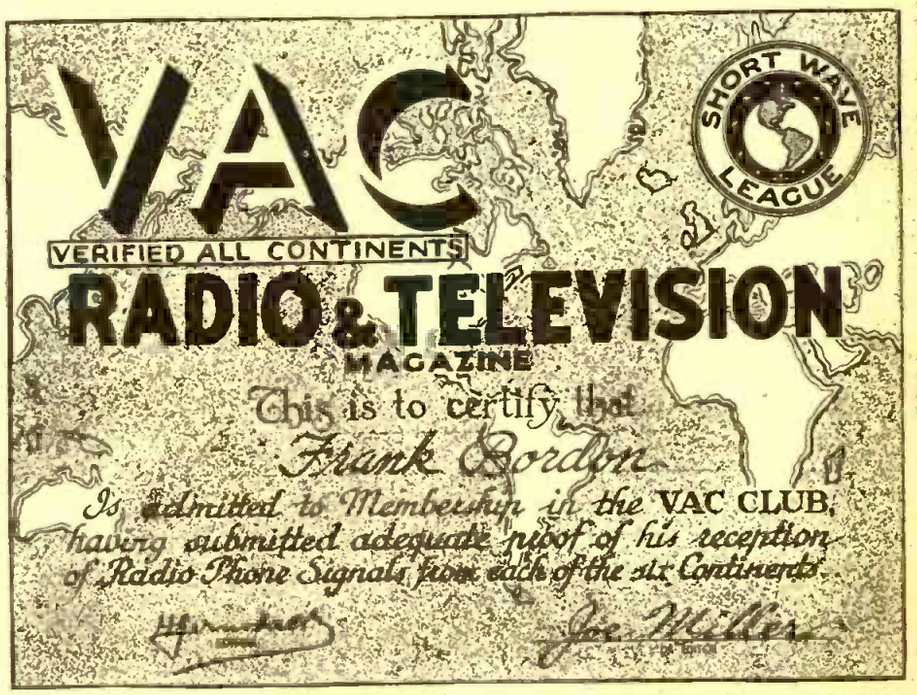
● A NEW line of metal radio dials of the airplane precision type are being featured by the Associated Metal Products. These dials are of the friction-drive type. Calibrated scales are translucent, printed with easy-to-read figures. The scales can be furnished for either clockwise or counter-clockwise condensers; the scale is protected by a convex glass crystal. The reducer bushing will accommodate either a ¼" or ⅜" condenser shaft. Two pilot light sockets are provided, placed so as to give an even distribution of light over the entire face of the scale. Each dial is furnished with an attractive bronze escutcheon plate.

Record Preserver

● "SLIK" has been put on the market by National Recording Supply Co., Hollywood, in 2 oz. bottles for home recorders. The preparation is a scientific concoction to preserve discs. It is said to minimize surface noise on acetate or nitro cellulose blanks by lessening the cutting point friction and lengthens needle life, while also disposing of accumulated static charges. The liquid is applied with a soft brush or cloth before recording.

Have You VAC?

● THE handsome 9" x 12" VAC Certificates are still available and will grace any DXer's wall. To be eligible for this DX honor, a phone QSL is needed from each of the 6 continents, Asia, Africa, Europe, Australia, North America and South America (Java and Philippines count as Asia). Send in these six QSL's with 25c for handling and costs; after checking, the QSL's will be returned with certificate. Address *VAC Editor*, RADIO & TELEVISION, *20 Vesey St., New York, N. Y.*



THE EDITORS WANT

good constructional articles (with clear photos and diagrams), Radio Receivers and other sets, especially "FM" Tuners and Adapters. We also are anxious to see constructional articles on Short Wave Receivers; also general articles on Antennas, etc.

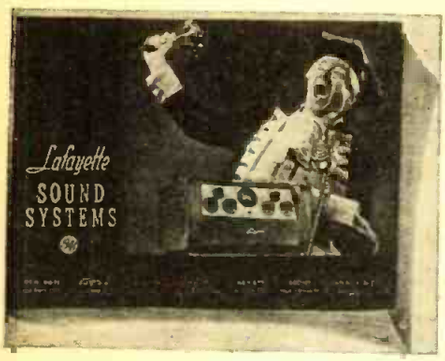
New Radio Catalogs

New Lafayette PA Catalog Presents 1941-42 Line

● A NEW 48-page catalog devoted exclusively to sound equipment and including the brand-new Lafayette line for 1941-42 has been issued by the Lafayette Radio Corp. Illustrated listings of some 25 amplifier models and approximately 75 completely coordinated sound systems, plus expanded lines of accessories, recorders, intercommunication equipment and custom-built systems for school, industrial and other specialized applications, make this catalog literally "the sound man's bible."

The new Lafayette amplifiers include separate standard and economy lines, the former available in ratings from 6 to 100 watts, the latter from 5 to 50 watts. In the standard line of "Super Stylined" amplifiers extreme flexibility of application is provided through incorporation of more input channels, greater equalization, optional built-in record-player equipment and optional built-in sound level meters.

A feature of the new catalog which makes it especially useful to the busy servicemen or sound specialist is the entirely new method of listing and describing equipment, with all salient facts presented in tabular form for quick reference. Technical specifications of all amplifiers are also presented in this form.



Radio Transmitting Tubes

● A NEW bulletin of the radio transmitting tubes supplied by the General Electric Company for amateur and other purposes is available at your radio dealer's, or on request from the Service Department of this magazine. The bulletin gives complete data as well as prices on radio transmitting tubes of the high vacuum, air-cooled type, as well as high vacuum, "forced" air-cooled types, and also water-cooled types. Other tubes listed and described are mercury-vapor rectifiers in various sizes.

Amplifier Manual

● THE new direct-coupled FM-AM amplifier manual by A. C. Shaney, chief engineer of the Amplifier Company of America, has just come to hand. The manual contains constructional data with diagrams and pictures on various types of amplifiers from 10 to 30 watts. Some of the amplifiers described in full detail are push-pull direct-coupled 10 and 30 watt amplifiers; recording playback amplifiers; an FM audio amplifier; and an audio spectrum control. Copies of the manual are available at 20c each.

Radio Warehouse Market

● AN interesting new catalog comes from the Radio Warehouse Market of Akron, Ohio. The catalog illustrates a line of useful radio supplies, including transformers, loudspeakers, phono pick-ups, variable resistors, tubes, transformers, and by-pass condensers, tone controls, antennas, etc.

Bliss Electrical School

● ONE of the new catalogs to reach the reviewer's desk is that from the Bliss Electrical School of Washington, D. C. This school, famous for many years for teaching all kinds of electrical subjects, has a very complete list of courses. The courses given are thorough and include mathematics, drafting and the various branches of practical engineering—including electrical and mechanical testing, machine shop work, etc. The catalog contains tuition and boarding rates. The students are given first-hand instruction with actual electrical apparatus; many interesting and valuable field trips in the vicinity of the school are made regularly; these include visits to electric power stations, etc.

Among the subjects taught in the various courses at the Bliss school are transmission of electrical power, station equipment, illumination, telephony, telegraphy, electronics, electric railways, electric elevators, dynamo design, etc. Electrical theory is presented to the students in the following manner: lectures, text study, lecture review, lecture report, and finally by conference.

New Sylvania Tube Complement Book

● A NEW Sylvania Radio Tube Complement Book, 1941 Edition, containing tube and panel lamp information for 16,730 radio models with 100,380 sockets is now being released by the Sylvania Radio Tube Division of the Hygrade Sylvania Corporation, Emporium, Penna. The price is 35c. Radio servicemen and dealers can obtain copies from their local jobber, or direct from Hygrade Sylvania Corporation.

The book has an attractive two-tone blue cover, contains 272 pages of tube replacement data, 586 trade names of receivers, including all current makes as well as those no longer being manufactured, and the names and business addresses of 190 receiver manufacturers. Included in this 1941 edition is the first and only compilation of panel lamp type designations.

The Sylvania Tube Complement Book is but one of a complete list of technical help material offered by Sylvania to the radio receiving trade. There is, also, the Sylvania Technical Manual (35c), the Tube Base Chart (free), the Sylvania Interchangeable Tube Chart (free), Tube Characteristics Sheet (free), Radio Service Hints, Vol. III (free), and the Technical Section of the Sylvania News.

How to Select a Sound System

● THE Allied Radio Corporation, through the medium of their new 1941 Spring and Summer Catalog, has eliminated the mystery usually associated with selecting the proper public address equipment for efficient results.

An easy-to-understand chart covers all applications, including churches, schools, auditoriums, carnivals, night clubs, taverns, skating rinks, athletic fields, outdoor meetings, armories, stadiums, etc. Complete information is specified for computing the area to be covered in square feet, wattage required in amplifier, size and make of speakers needed, and type of baffle to use.

A simplified explanation of the necessary public address components, such as microphones, amplifiers, and speakers, is provided with each type of equipment being summarized for the most effective usage. The company's Sound Engineering Division will provide competent advice, based on a careful study of individual problems, where necessary.

A catalog including the complete chart and instructions is available from them or Service Department, RADIO & TELEVISION, 20 Vesey St., New York City.

IN THE NEXT ISSUE!

How to Use the *End-Fed Zepp* for Receiving—with markedly improved results — by R. H. Newkirk, W9BRD.

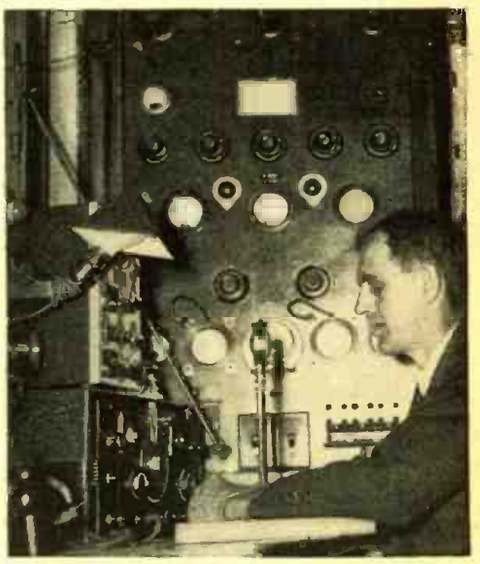
Paley Award Goes To Kansas Amateur

● MARSHALL H. ENSOR, 41-year-old radio amateur of Olathe, Kansas, has been chosen by a board of five distinguished judges for the William S. Paley Amateur Radio Award of 1940. Ensor will fly to New York for a presentation luncheon at the Waldorf-Astoria, June 2, where Mr. Paley, president of the Columbia Broadcasting System, will make the award of the trophy, a symbolic sculpture in silver.

The Paley Award is presented annually as a permanent honor "to that individual who, through amateur radio, in the opinion of an impartial Board of Awards, has contributed most usefully to the American people, either in research, technical development or operating achievement, and to be open to all amateur radio operators in the United States and Canada."

Ensor was chosen by the judges because of his service to the nation in voluntarily conducting courses in the fundamentals of radio over his own radio station, W9BSP, over a period of 10 years. During that time he has given code practice lessons on the air to thousands of young men on regular schedule, enabling them to pass their examinations for amateur radio licenses.

It is pointed out that this service in training citizens in the code and in basic radio theory as used in practice, has proved a valuable contribution to the nation's defense effort. In a mechanized army, and in civilian defense, too, there is greater accent on radio communication than ever before.



Marshall H. Ensor, radio amateur of Olathe, Kansas, who was chosen by a distinguished board of experts as this year's winner of the "William S. Paley Amateur Radio Award."

Night after night throughout each winter since 1929, Ensor has sat patiently by the radio transmitter he built himself, putting his lessons on the air with the regularity of a commercial network. He has developed his own system of instruction and written a thesis on it for a master's degree. Ensor's sister, Loretta, also a radio amateur with call letters W9UA, helps him with the work. They carried through last winter's course on schedule despite the death of their mother.

Ensor's contribution has not the spectacular quality of those amateurs who have stuck by their keys during flood and hurricane disasters, as the only contacts between the stricken area and the outside world. But the American Radio Relay League, leading amateur organization in the United States, says he has trained more amateurs than any other single individual.

Ensor is married, lives in a large, white frame house in Olathe, dominated by a high radio tower. He was born on June 22, 1899, in the region of Kansas City. The Ensors have lived in Olathe since 1909. Marshall graduated from the Olathe High School in 1917, and started to teach industrial arts there in 1918.

He built his first radio transmitter—a spark set—just before the last war, then took up the hobby again when the war was over. He has been a "ham" operator ever since. He was just too young to serve in the war.

LEARN THE CODE!

In the next issue there will be an interesting article by L. B. Robbins describing *How to Practice the Code*, by means of a blinker light, a buzzer or an oscillator.

What Do YOU Think?

(Continued from page 131)

HE MADE A FRIEND

Editor,

For about three years now I've been a subscriber to your FB (Fine Business) magazine. I thought it was about time I wrote to give you encouragement to keep up the good work.

About two years ago I wrote the editor in charge of SWL observer column to give me the address of an Iowa observer. Thanks to your editor, he helped me gain a new and everlasting friend. We carry on a regular correspondence and I go to visit him, personally, quite regularly.

I enjoy reading your magazine from cover to cover, and I look forward to receiving RADIO & TELEVISION each month.

I would like to have more correspondence with any fellow (or YL) interested in Ham and short wave radio. I promise to QSO 100%.

Here's to a better and still finer magazine.

HENRY HECKERT,
901 Howard St.,
Indianola, Iowa.

CODE OSCILLATOR WORKS SWELL

Editor,

Having read the article, "A Code Practice Oscillator," by Wm. D. Hayes in the February issue of RADIO & TELEVISION, I decided to build one.

Not having the cash for the 7OL7GT tube, I decided to use an old 12A7 tube and parts from my junk box.

The result was one swell oscillator. I assembled all parts on a board 8" x 8" x 1" including the key. I used an old 3-inch magnetic speaker. I think I paid 80 cents for it about two years ago. The strength of the signal is very strong, so strong in fact that I have been requested by the family to put some kind of a volume control on it. Hi! Hi! The pitch of the signal is easily varied from very high to quite low.

HAROLD L. JONES,
115 No. 4th St.,
Springfield, Ill.

TELEVISION ENTHUSIASM

Editor,

Why hasn't the public shown more enthusiasm towards television? Can it be the people have no desire for it whatsoever? On the contrary, they do want it and will pay for it, provided they can be assured they won't have to look at a *pictureless* television receiver. This was the case a while back when NBC went off the air for a few weeks. The few people who do own receivers must have lost a little faith in television when this happened. Then, too, there is no guarantee that a receiver won't be out of date in a few months or even a few weeks. I believe the blame for this condition can be traced to the various television stations and set manufacturers. Had they agreed a few years back to set certain standards as to methods of transmission, number of lines, etc., more sets would have been sold. This would have attracted sponsors, thereby giving the television stations a little return for the many millions of dollars so far invested. They could have guaranteed their sets to be up-to-date for say about three years and during this time tried to improve transmission methods and circuit designs. When the three years were up, they could have placed before the public any new improvements and rewritten a new set of standards.

ALFRED SMITH,
111-16 Inwood Street,
Jamaica, New York.

(The new F.C.C. television program seems to answer your objections.—Editor)

(Continued on page 191)

Solutions to Puzzle Diagram on Page 174

1. The variable resistance shown connected in series with variable condenser in antenna circuit should be a fixed inductance.
2. The A.V.C. lead is connected on the right side instead of the left side of fixed condenser 1.
3. Padding condenser 2 is not necessary.
4. Condenser 3 should be connected between the resistance and the tuned circuit "O," and not in the position shown.
5. The screen grid of the 1A7 tube is shown connected to the A.V.C. lead, instead of to the B plus.
6. The iron core choke coil indicated in the A.V.C. lead should be a resistance instead.
7. The diode lead from the 1H5 is connected to the wrong side of the potentiometer; no A.V.C. action can take place.
8. The inductance shown in the filter between the B– and the A– leads is superfluous.
9. The resistance shown in series with the voice coil of the loud-speaker is not needed.
10. The output transformer as indicated has an air core instead of iron core.

BOOK REVIEW

UNDERSTANDING RADIO, by Watson, Welch & Eby. Stiff cloth covers, size 6 x 8¾ inches, 604 pages, illustrated. Published by McGraw-Hill Book Corp., New York, N. Y.

This book is one of the finest radio treatises which has come to the reviewer's attention and every student of radio who wants a book which he can study at home (and wherein he hopes to find a thorough and extremely clear explanation of the various facts taking place in electrical circuits) will find this book invaluable. The authors have taken special pains to make sketches and diagrams which really mean something and for the illustrations alone this book deserves the highest praise.

The first part of the book deals with radio waves and wave travel. A list of the technical terms appearing in the text is given at the end of each chapter. A valuable section is devoted to "Wave-Form" pictures, whereby the student is introduced to simple oscillograph curves, showing the nature of the current passing through various types of circuits. This is important, as one of the weakest points in the average radio or electrical man's education the reviewer has found, is that he knows very little about the "wave-form" of the current passing through various circuits.

Succeeding chapters explain the Principles of the Vacuum Tube, Radio Tuning Circuits, Receiving Sets (Using Direct Current Tubes), Phones and Loudspeakers, Power-Supplies, etc.

Short-wave sets are thoroughly explained and illustrated with special diagrams, also oscillators and radio transmitters, including radio-telephone transmitters. A very excellent section deals with aerials, and then we come to an important chapter on ultra-short wave sets. Closing chapters cover "Looking Ahead in Radio," commonly used radio terms, together with a very thorough and useful index.

THE FINEST RADIO BOOK

FREE

WE EVER OFFERED—
the 1940-41 Radio-Television Reference Annual
With $1.00 subscription to
RADIO & TELEVISION

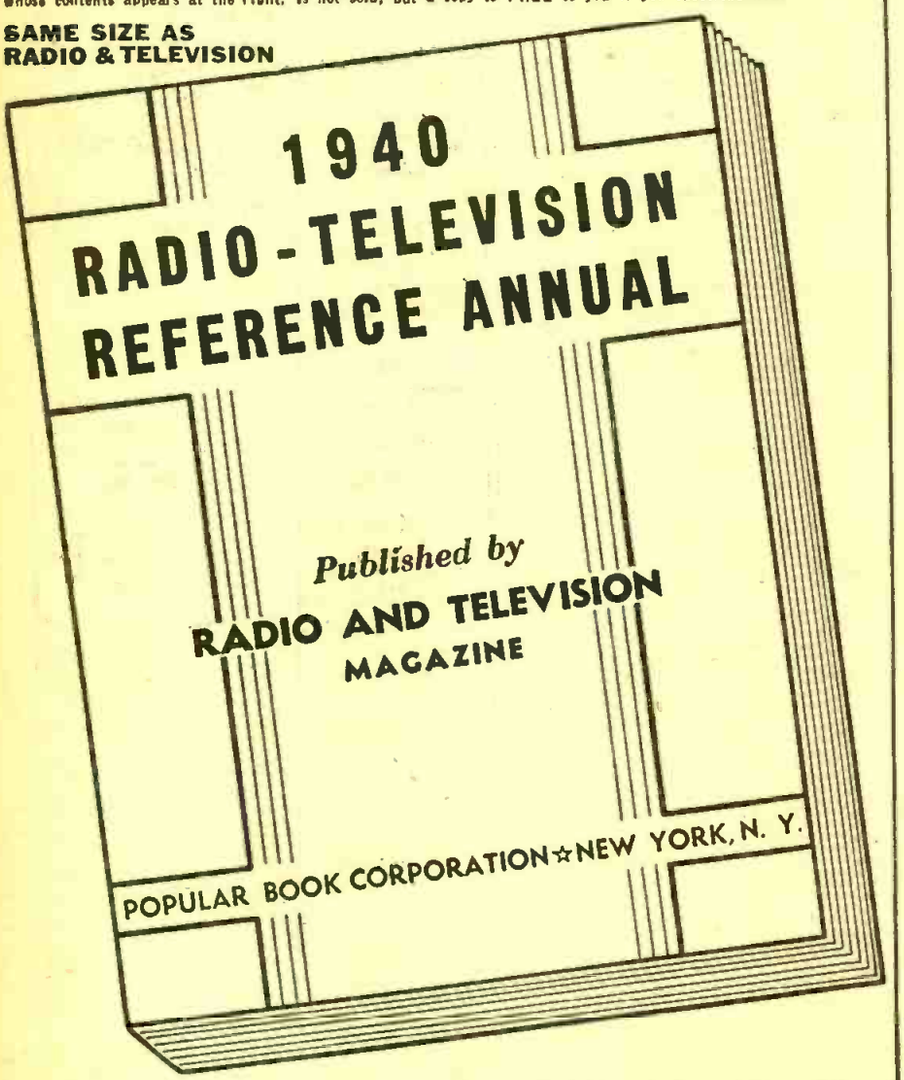
WITH our compliments, we want to send a copy of the 1940 RADIO-TELEVISION REFERENCE ANNUAL to you FREE, if you will simply take advantage of RADIO & TELEVISION magazine's special subscription offer NOW. This offer is being made for a limited time only.

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



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 Coil 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 Midget 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.

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Fan Mail Censored Twice

It isn't bad enough that the censors open all letters coming from warring countries, but some of those from the neutral Irish Free State are censored twice, according to Marion Chambers, shown here with a batch of mail addressed to WGEO and WGEA artists. As the letters which Miss Chambers holds demonstrate, the Irish Free State censor slits one end of the envelope, then seals it up again. Afterward the British censor slits the other end, reads the letter again. That this is not always done is shown by many of the letters on the table.

What Do YOU Think?

(Continued from page 189)

BRAIN WAVES

Editor,

I found many stimulating suggestions and useful information in your magazine. Permit me, therefore, to correct an error in one of your articles in my own field of work.

Reviewing a brain wave recorder by Dr. Frederick Lamere in a recent number, you state that the medical profession in this country has never become enthusiastic about it. This is not correct, since Electroencephalography (brain wave recording) has a recognized place in the diagnostic procedures in neurology. American scientists have largely contributed in this field. It has an established value in the recognition of epilepsy and in brain tumor localization. Many hospitals and private physicians in this country use it as a routine procedure. Lately it has played a part in testing pilots for the R.A.F. in Canada, and I believe also here, the main purpose being to recognize latent epilepsy.

One of the best apparatus for the recording of electrical brain waves available commercially is made in U. S. A., constructed by an American engineer.

The main requirements of such an apparatus is an amplification of potentials of 10 to 100 microvolts with an input noise level of not over 2 microvolts, with a frequency response from 1 to about 500 cycles per second, and with sufficient power output to activate a stylus writer. Here is a task for your ambitious readers!—*Dr. Sergei Feitelberg.*

Index to Advertisers

(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.)

Readers' Editorials

(Continued from page 133)

SWL INTOLERANCE

● ARTICLE after article has been written concerning amateur intolerance toward the SWL and "would-be" Ham. But it's time we turned the tide.

Is it not true that many amateurs become intolerant as a result of the continuous pestering for QSL's from the "short-wave listener." If an amateur does not verify a report, he has his fine reasons (expense, etc.) and should not be called a so-and-so.

Then, too, anyone who is really in earnest about getting his "ticket," and provided he does his part, will surely obtain some help from the real Ham down the street.

A better understanding friendship between the Hams and SWL's will mean more amateur operators (don't worry, there'll be plenty of frequencies for 'em), greater recognition from the Federal Communications Commission and general public; also a greater and stronger army of trained radio operators to aid in public emergencies and national defense.

FRANCIS STERLE,
3981 Osceola Road,
Calumet, Michigan.

RADIO'S NUCLEUS

● AS we leave the electrical and enter the radio age, more and more radio engineers and technicians will be in demand. The government, research laboratories, broadcasting corporations; all will be clamoring for new and more highly skilled radio technicians and engineers. The best way to start a future radio engineer or technician on his way to a successful career is to GET HIM STARTED NOW in "Amateur Radio," where he will learn its fundamentals and can tell whether or not he would like to make radio his lifetime work. Why not try to get the future nucleus of our radio industry interested in radio NOW, so that we may be able to use them later, when there is a demand and need for them?

ROY HEMPEL, W8VWS,
3707 Blanche Road,
Cleveland Heights, Ohio.

WHY WASTE TIME?

● WHEN one sits down in the shack with his favorite radio publication in hand, he becomes quite disgusted with the too frequent appearance of the familiar squawk of the Short Wave Listener, that the hams are not answering his SWL cards.

The reason why they are not answered has been discussed intermittently ever since I can remember. This has little or nothing to do with basic Amateur Radio. As far as the average radio man is concerned, the SWL card is merely the fancy or hobby of an embryo ham.

Don't get me wrong—I'm not condemning a person for sending these cards, for I have sent a few myself, and it is probably all right for a pastime; but why all the fuss and bother over a small and unimportant matter such as this?

The Short Wave Listener gathers from the sending and receiving of cards nothing of technical radio importance. If the would-be-ham is *so* interested in radio, why is he not studying theory or practising code? Radio jobs today are not filled by one who can make out an SWL card, but by men who are technically fit; who know theory; and have experience.

I say, "Enough of this." Down with the SWL cards and make way for more study in the handbooks!

MELVIN E. SHEPHERD,
Melcher, Iowa.

ZENITH RADIO SET PRIZE

The handsome portable receiver (Model 6G601M) here shown is awarded to Eldred Winn for his editorial. This is a three-way portable and operates on 110 volts A.C. or D.C. and also on self-contained battery. The set uses six tubes and is enclosed in a handsome portable case, with a hinged lid which protects the dial when it is folded in the closed position.

FORM RADIO GROUPS

● RADIO appeals to young and old. However, it is difficult for newcomers to catch on to both the spirit and the science of radio. They need guidance and instruction.

Amateurs in other hobbies have formed themselves into groups and teach the rudiments of the game to those just entering. Thus small boat owners have the Power Squadron, which conducts courses once a week in elementary piloting and navigation.

We know the trials we went through and the errors we committed. Why don't we form similar groups that could meet in each large city and town, and give instruction in the theory and practice of radio-operating technique, etc.?

This is not to be an academic training, but just fellows cooperating to help others in their love of radio. What'd you say?

MELVIN KRAMER,
1104 Asburt Ave.,
Asbury Park, N. J.

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S. MORTON DECKER

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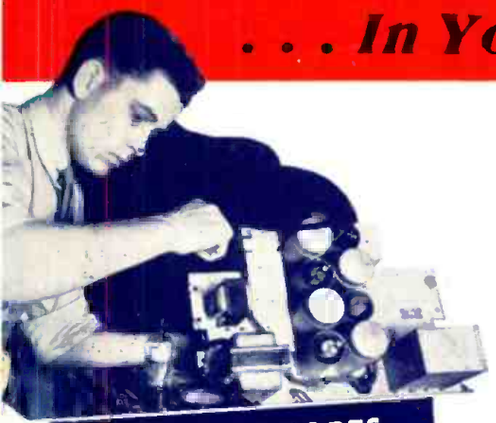

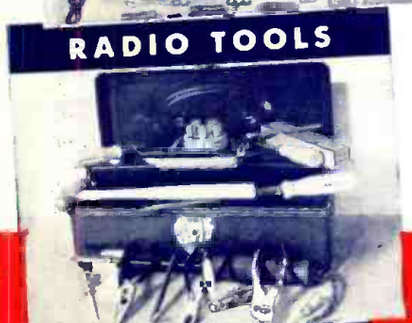

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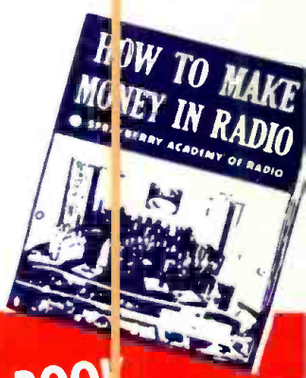

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