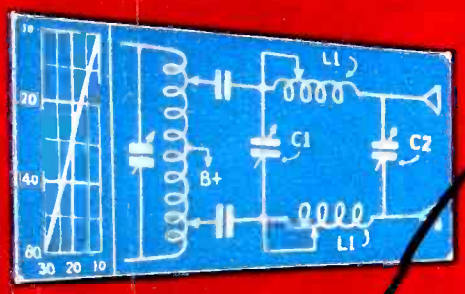
SHORT WAVE CRAFT

March 36

HUGO GERNSBACK
Editor

SPECIAL HAM NUMBER

WORLD'S LARGEST SHORT WAVE CIRCULATION



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THE RADIO EXPERIMENTER'S MAGAZINE

Best and lowest priced WORLD GLOBES FOR SHORT WAVE LISTENERS

THESE remarkable, new globes printed in a variety of popular colors are indispensable to short-wave fans. Notable among the many features of these world globes, is that they give life-time service. Short-wave fans are enabled to determine correct time in various centers of the world with the aid of these globes; distances from city to city can be accurately established.

There is a graduated "Meridian" scale on many of the globes. Another feature is the moveable hour scale found at the north pole—this facilitates determining the hour in any part of the world.

You will be thrilled when you put the globe to actual use—measuring distances from New York to Moscow; from Cape Town to Tokio; from Los Angeles to Dio de Janeiro; etc. A flat map is deceptive for measuring, but take a small string and stretch it across the globe, from city to city, and you have the correct distances.

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The colors on our fine handmade or Library globe maps are refined and delicate. Nevertheless, the two types have an essential characteristic in common—their rich color harmony, in which each color of equal strength blends into a harmonious color unit.

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The ball is mounted in a fully graduated, semi-meridian. The solid walnut base has been gracefully patterned to harmonize with the interior of home or office. The base is sturdily constructed.

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U. S. Army Airdrome,
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(S) S. H. Buchanan,
Radio Operator.

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SHORT WAVE CRAFT

HUGO GERNSBACK
Editor

H. WINFIELD SECOR
Managing Editor

GEORGE W. SHUART, W2AMN
Associate Editor

Contents for March, 1936

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A 3-Tube Battery Receiver for the FAN, by Keith W. Free.

Flying the Broadcast and the "Short Wave," by Henry W. Roberts.

Tuning the I.F. Amplifier in S-W Superheterodynes.

No. 1 of a Series on W2AMN's Phone—CW All-band Transmitter.

A Metal 2-Tuber that Goes Places, by Harry D. Hooton, W8KPX.

A New S-W Receiver for All-Purpose Reception, by George W. Shuart, W2AMN.

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OUR COVER

● This month the cover picture shows an up-to-date "impedance-matching" antenna coupler which is fully described with diagrams and coil data on page 652.

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HUGO GERNSBACK, EDITOR

H. WINFIELD SECOR, MANAGING EDITOR

Radio Amateurism

An editorial by HUGO GERNSBACK

● THERE seems to exist still a good deal of misinformation as to radio amateurs or *Hams* in general. The public, and even radio "fans" and others interested in radio still have queer notions as to what radio amateurism really stands for. To those and others, the following may be of interest.

Radio amateurism really dates back to 1912 when the radio transmitting amateur became formally recognized by the United States government through its Federal Radio Commission. Previous to that time there was no regulation to speak of, and radio amateurs could practically choose their own wavelengths, their own amount of power, all of which threatened to cause disruption of the then already crowded ether lanes.

A number of drastic bills were put up to Congress, and it looked as though the independent radio experimenter was likely to be literally wiped off the earth! Feeling that heroic measures were in order, the writer in an editorial in his former magazine MODERN ELECTRICS suggested to the law-makers that the radio amateur be restricted to a wavelength below 200 meters, and that he was not to use more than 1 kilowatt power. Practically the writer's entire recommendation set forth in that editorial of the Feb. 1912 issue of MODERN ELECTRICS was subsequently adopted by the law-makers at Washington, and incorporated almost word for word in the Radio Act of 1912. For many years thereafter the amateur enjoyed his new-found privileges now legalized, while all transmitting was done below 200 meters at a power which did not exceed 1 kilowatt.

The law-makers at that time when the writer was lobbying in Washington thought the "joke" would be on the amateur, because at that period everyone was agreed that the wavebands below 200 meters were of no use whatsoever.

It is ironical to think that subsequent events proved that the wavelengths below 200 meters were really to become the *most important in radio!* Indeed, they became so tremendously important that the radio amateurs were forced to give up, time and again, certain wavelengths till today, when they are left in possession of only the following wavelands: 160, 80, 40, 20, 10 and 5 meter bands, with experimental work in phone or television allowable on ¾ meter.

During all these years the amateurs did not stand still, but proceeded to make excellent use of the facilities given them by the government. It is a mistaken notion to think that the vast body of amateurs are only there for a single purpose, and that is to tap out messages to each other, and to "clutter up the air with useless messages,"—the latter a view all too often taken by those ignorant of the real purpose behind radio amateurism.

In the first place, in order to be a radio amateur you must have an intelligence considerably *above the average.* You have to be a good radio man, you must know how to operate a radio station, and know how to send and receive code. It is true that amateurs do send messages to each other over the entire globe, but it is also true that in doing so they have greatly enriched the radio art with scientific data that we might not have had otherwise. Such scientific items as fading, sun-spot activity, the relation of the moon to the earth in their tidal effects, atmospheric phenomena, terrestrial magnetic disturbances, etc., and many others, have all been investigated by amateurs and reported on.

In case of disaster such as earthquakes, fires, floods, and many other cataclysms, amateurs have often made the front page of our daily newspapers, by rendering vital assistance to the authorities and municipalities.

At the beginning of the World War, thousands of radio amateurs volunteered their services in the Signal Corps and allied branches of the Army and Navy, and hundreds of them distinguished themselves in service for their country.

In peace times, a service of which few laymen ever hear of, is that of sending *free of charge* messages all over the country for friends and acquaintances who may require such service now and then. These radiograms, no matter what the distance, are always delivered free, but they do not compete with commercial telegraph companies, and no paid messages are ever accepted by amateurs.

But let no one think that radio amateurism is just a toy or a pleasant sport. You can not be a radio amateur unless you can work hard, and unless you keep up to date with the latest advances in radio, nor can you be a good amateur if you are one of those who expect to get to bed at 10 o'clock every night. Most amateurs think nothing of quitting their keys or microphones at 2 or 3 o'clock in the morning, and thousands of them frequently get up at 3 a.m. or earlier when special transmissions are to be forwarded or relayed. Radio amateurism keeps you on the jump and tests your mettle. It also gives a good indication of what kind of stuff you are made of.

It is significant that a vast percentage of radio leaders in the various branches of the radio industry today, were either radio amateurs at one time, or are still amateurs, even though these men may now have vast responsibilities.

Radio amateurism is today a proven test ground for the radio engineer, and the radio executive of tomorrow. To be a radio amateur conveys with it a great responsibility, and that is why radic amateurs are the serious-minded men we know them to be—the radio leaders of tomorrow.

SHORT WAVE CRAFT IS PUBLISHED ON THE 1st OF EVERY MONTH

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From HAM Waves to "Artificial Fever"

S-W "views" from German "Ham" Station—5-meter waves call child at play—Latest S-W "fever" treatment of Tuberculosis.

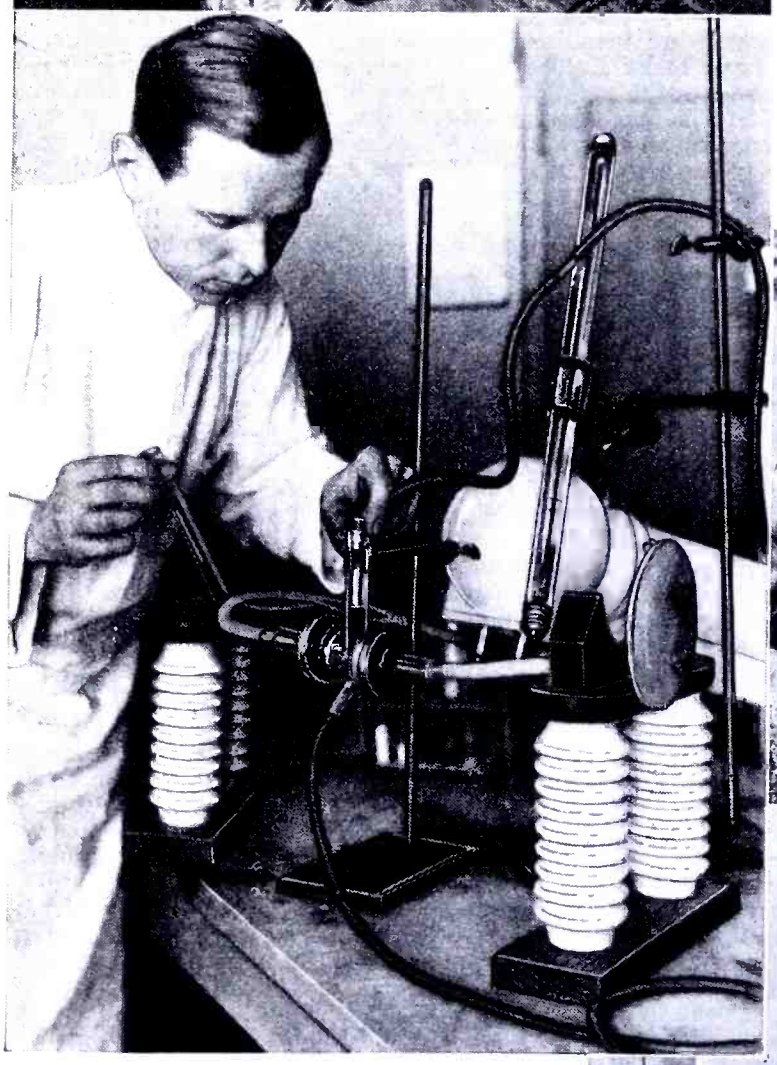
Our picture shows a view of the sending set of a Berlin, Germany, "Ham." On the right is the receiver and loudspeaker; in front—the Morse key and the station journal; in the background the transmitting apparatus.

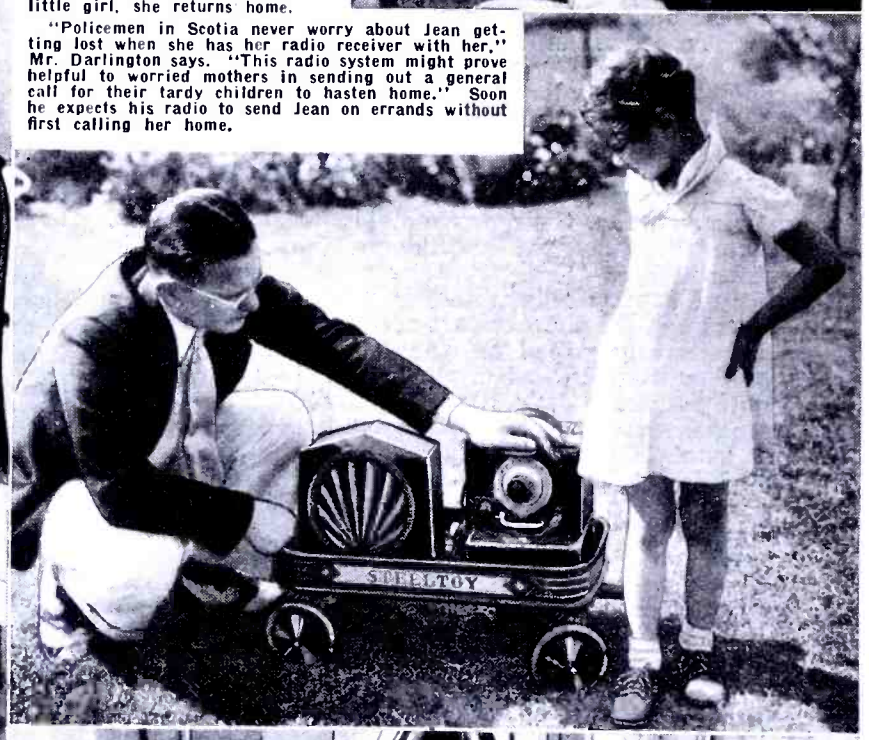
This comparatively young organization of German short-wave amateurs has about thirty-five hundred members, all of whom are allowed to receive; only 1/10 of them have permission to transmit messages.

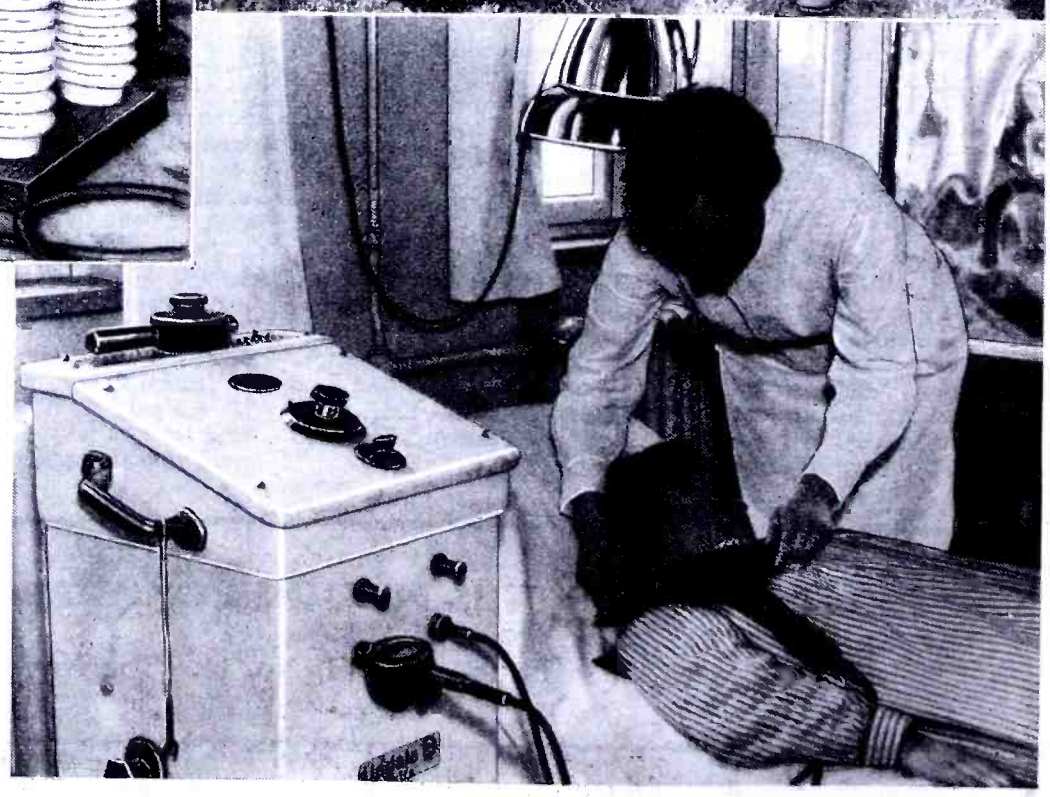
ENGINEER CALLS DAUGHTER ON 5 METERS: Jean Darlington, five-year-old daughter of a G.E. Co. engineer, who has been identified with acoustical equipment since her earliest days when her daddy built in her bedroom a system which automatically turned on a phonograph to quiet her on waking moments, now uses a small portable shortwave radio to keep in touch with her father when she is away from home.

Like Mary with her lamb, no matter where little Jean wanders the radio is sure to go. She trails it behind her in a small cart. When the engineer desires to call her from play in the neighborhood of Scotia, N.Y., he puts through a call with his amateur transmitter on 5 meters. The receiver is permanently tuned to his station and is in constant operation so that his daughter hears him as soon as he begins talking. Being an obedient little girl, she returns home.

"Policemen in Scotia never worry about Jean getting lost when she has her radio receiver with her," Mr. Darlington says. "This radio system might prove helpful to worried mothers in sending out a general call for their tardy children to hasten home." Soon he expects his radio to send Jean on errands without first calling her home.







Above:—Testing blood samples in field of short waves. Particularly painstaking was the preparation for the healing of lung tuberculosis by ultra-short waves. Many doctors spent a long time in the laboratory studying blood samples which had been infested with tuberculosis bacilli and then exposing them to the most varied wave lengths to discover the effective wave length, as shown above.

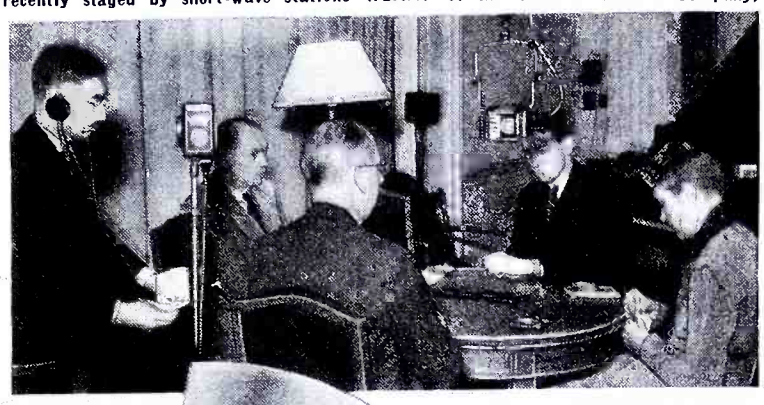
Right:—The procedure in the treatment of lung tuberculosis is to place the electrodes, which are now more useful since they have been placed in bags (insulated covers) on the chest and the back of the patient as the photo illustrates. A great deal of research is being carried on in this country, as well as abroad on the efficacy of short-wave diathermy for such diseases as tuberculosis.

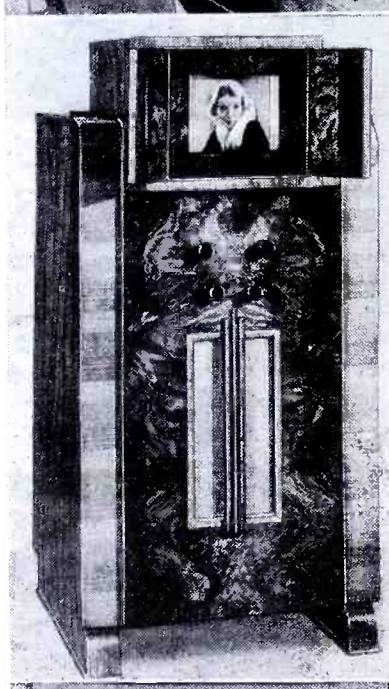
Short-Wave Snap-Shots

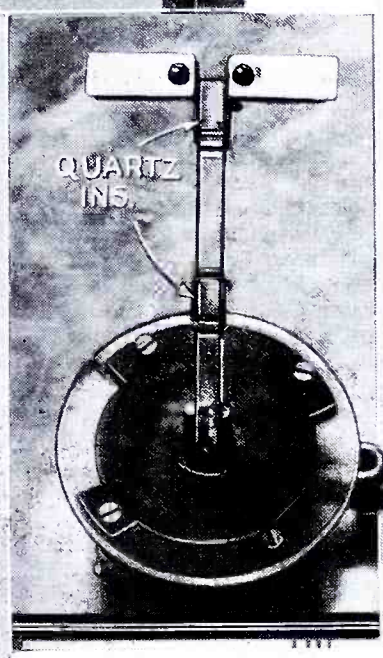
New short-wave developments—broadcast from Army Tank —S-W "Bridge" match—10 cm. demountable reflector —Dutch Television—.1 meter portable "directive" transmitter and receiver.

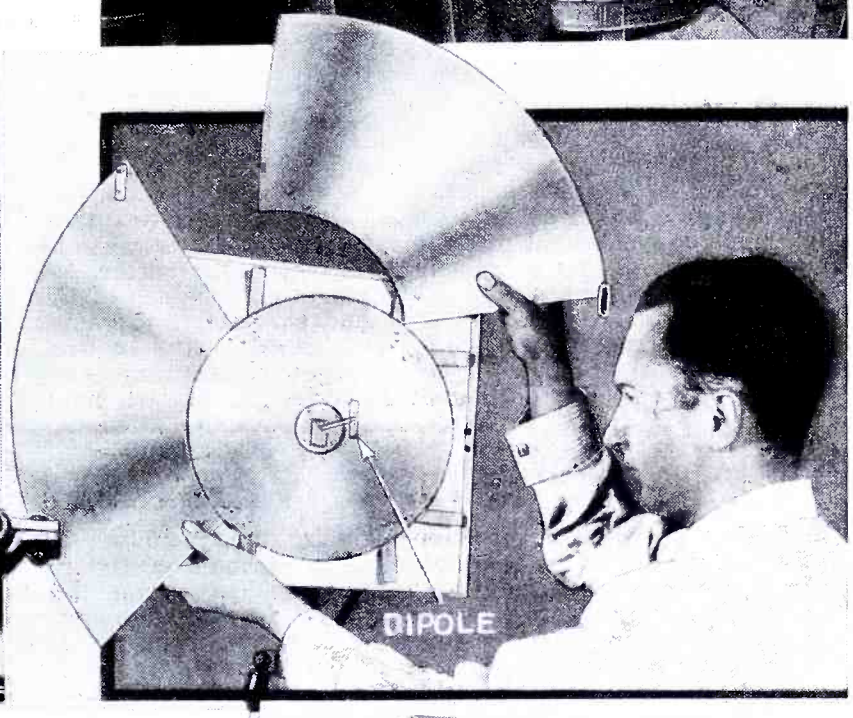
Left: Mobile ultra-short-wave station brings war report into the homes of American radio listeners. Broadcast reporters travelling with a tank into the fire lines (during the Army manoeuvres near Pine Camp) report about the exciting story of an air attack. The ultra short wave transmitter of the tank is used for the transmission of the report to the next reception station, from where it was rebroadcasted to the radio listeners.

Mr. and Mrs. Ely Culbertson are shown here during one of the tenser moments in an international-radio contract-bridge match recently staged by short-wave stations W2XAF of the General Electric Company, Schenectady, and LSX of Transradio Internacional, Buenos Aires, S. A. Two official "dummies" made the plays called for by the opponents 6000 miles away in South America and Geoffrey Mott-Smith, bridge commentator (left), gave radio listeners the world over a "card-by-card" description of the contest in which the North American team, captained by Culbertson defeated the Argentine aggregation by 1030 points.





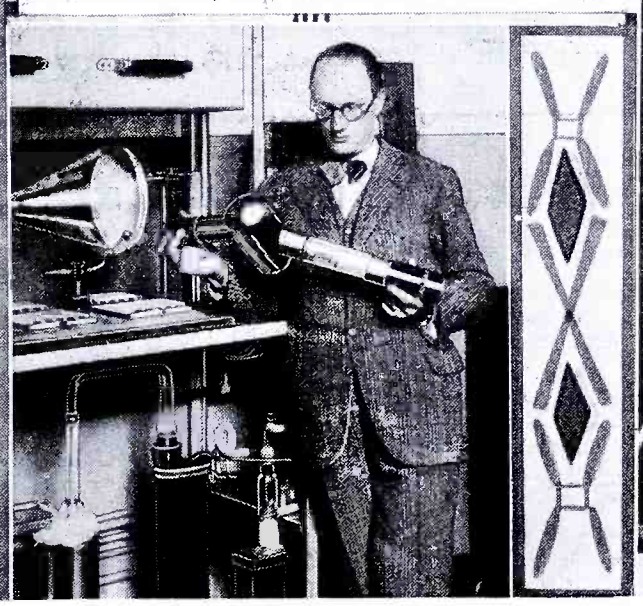




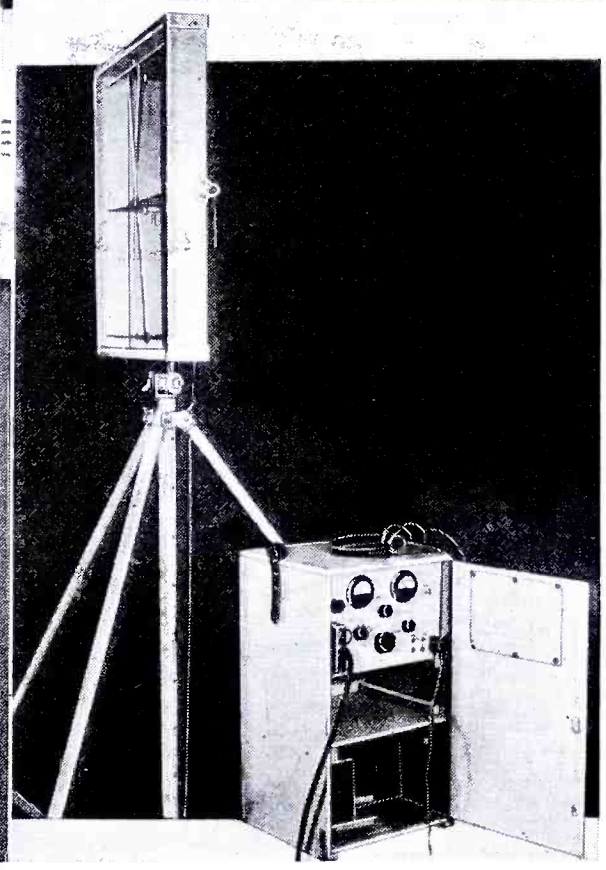
TELEVISION IN HOLLAND: The television receiver shown above has been designed by the television laboratory of the famous Dutch Radio Tube Company, Philips of Eindhoven, Holland. The image reproduced has a size of 6.5 by 7 inches. The television pictures reproduced are of black and white color. The price of the receiver, complete with sound and image reproduction is $500.00.

10 centimeter waves di-pole antenna: Above shows a very interesting antenna as is used for the transmission and reception of 10 centimeter waves. Since these waves are of quasi-optical nature, that means they may be received usually at a distance only as far as the actual sight goes, and since they are reflectable like a light beam thousands of these transmitters may be operated in a small area without mutual disturbance. Notice the small pieces of quartz between the di-poles which insulate the di-poles.

Demountable mirror for 10 centimeter waves: Since the Ultra-Ultra-Short-Waves (often also called "decimeter waves") are highly directional, in form of a very concentrated beam, all armies are at present very busy to utilize the new waves for short distance communication. Photo at right above shows an easily portable 10 centimeter transmitter equipped with a demountable concentration mirror, which is stored in the box behind.

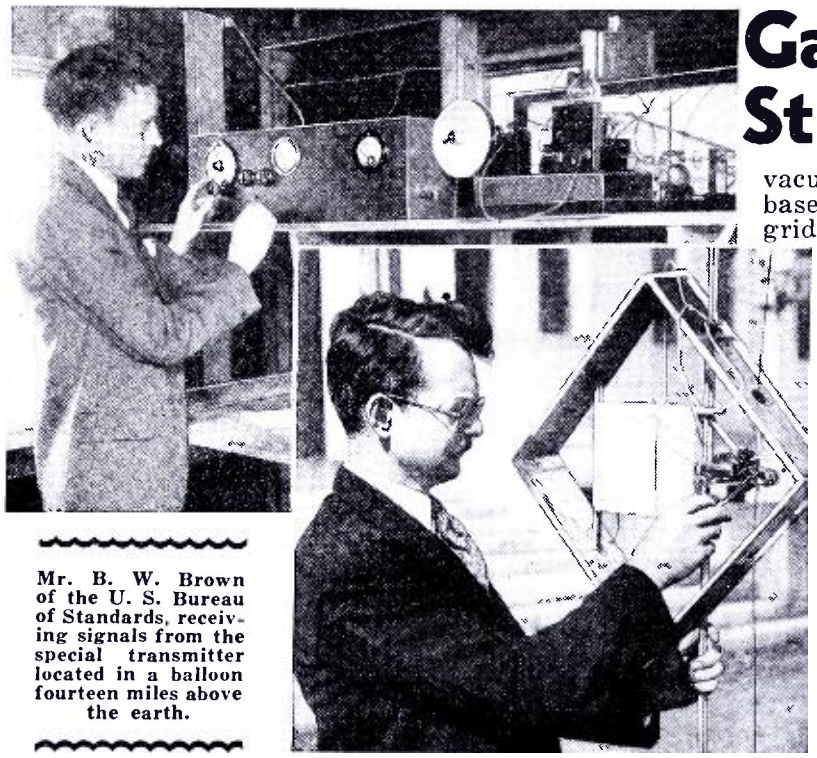


Right. TELEVISION IN ITALY—The famous Italian television inventor Mr. Arturo Castellani with his very sensitive television image pickup tube at present used in the Milano television studio for direct transmission. The glass bulb of quite unusual shape is the so-called Télépantoscope, a combination between a photo-electric cell and a cathode ray tube. The beam of the cathode ray tube is used to draw a powerful "electron-stream" out of the photo-sensitive-layer of this tube.



Extreme right: Portable 11 cm. transmitting and receiving station of type used by German army for point-to-point radiophone communication. Interception of the signals is mitigated by the fact that the waves radiated are sent in a specific direction due to the special reflector antenna employed.

Gathering Data from the Stratosphere on 5 meters

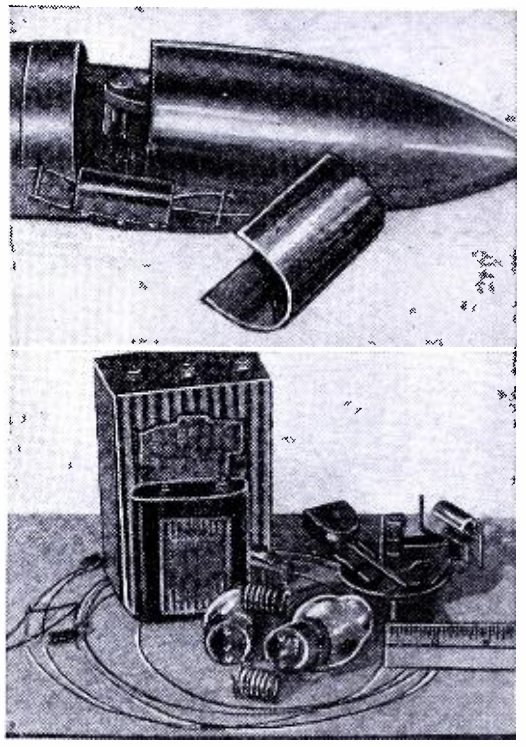


Mr. B. W. Brown of the U. S. Bureau of Standards, receiving signals from the special transmitter located in a balloon fourteen miles above the earth.

The Balloon Transmitter

● ALTITUDES as great as fourteen miles and distances of over eighty miles have been covered in new meteorological surveys conducted in and made possible by especially designed 5-meter transmitters and receivers. The complete radio apparatus attached to the balloon weighs less than two pounds, and recent preliminary trials have proved to be successful with this extremely low-power transmitter. A special series of characters are transmitted for each of the following: humidity, temperature and barometric pressure. The special transmitter which is attached to the balloon, is shown in the photographs to the right. Examining these carefully, we see that the oscillator consists of two small vacuum tubes with their bases removed, and the grid and plate of coils fastened directly to the tubes with, we presume, cement of some sort. The mechanical portion which takes care of transmitting the special impulses for the various data is shown just behind the tubes. Also, in the photograph we see how the entire apparatus is enclosed in the streamline or torpedo-shaped metal housing.

A special direction-finding device is used with the ground receiver, which enables the operators to tell at any instant when impulses are being sent the distance between the balloon and the receiving station, and also its altitude. Formerly, such investigations were done through the aid of an airplane. This new system has the advantage over the older method, because the free balloon may be sent on a flight whether unfavorable (*Continued on page* 682)



Appearance of ultra-short wave apparatus used for transmitting weather signals to earth from balloon.

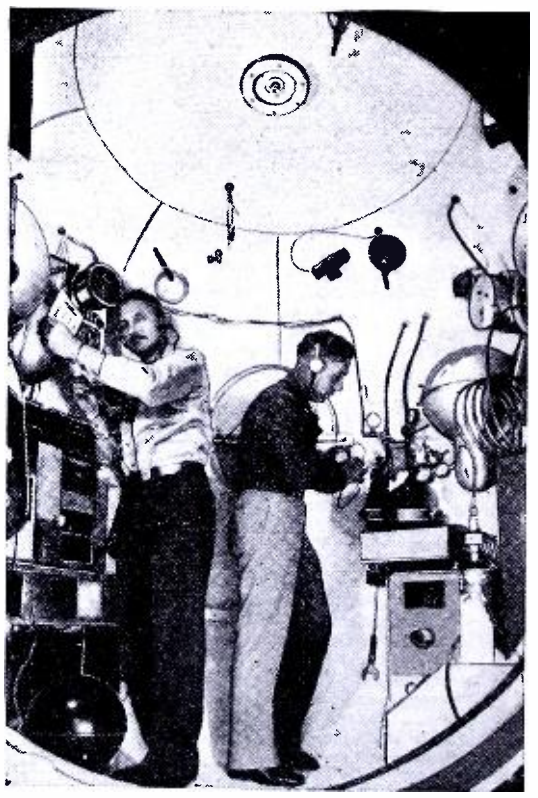
How Short Waves Served Strato Flight

● THE elaborate arrangements which were made far in advance to keep the Army balloonists in touch with the earth during the recent record-breaking stratosphere flight were amply justified by the complete success of the radio transmission and reception. Every piece of apparatus functioned at full efficiency from the "take-off" until the gondola again rested on the ground some eight hours later.

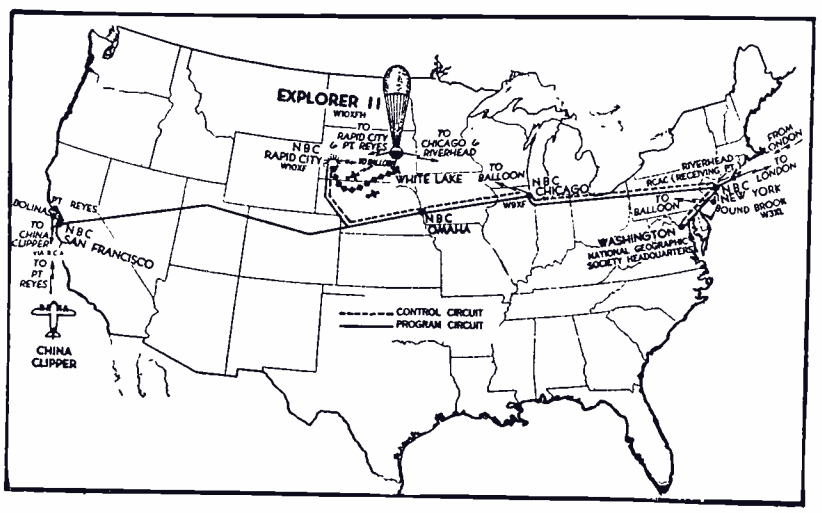
During the entire flight a *radio circuit* was operated which connected a dozen points on the ground, including three *short-wave* transmitters and four receiving points from coast to coast. In addition to messages relayed at frequent intervals to the balloon from various places on this circuit, there were eight broadcasts from the gondola during the day, including one with an NBC program executive flying in the giant *China Clipper* over the Pacific off the California coast, and one with London. Fading during the late afternoon two-way conversation between the balloon and the Clipper due to atmospheric conditions was the only deviation from a perfect sending and pick-up record.

The big Explorer II was equipped with a specially designed RCA short-wave transmitter and receiver, each constructed with a view to giving the best performance with a minimum of size and weight. The transmitter was a 7-tube type with a capacity of eight watts. The set was crystal controlled, with a dual equipment of two crystals slightly staggered, enabling stable operation at 13046 and 13055 kc. The station call letters were W10XFH. Power was obtained from 36 A and B dry batteries which served both for the sending and receiving apparatus. The battery compartment was 15"x14"x8" deep.

(*Continued on page* 684)

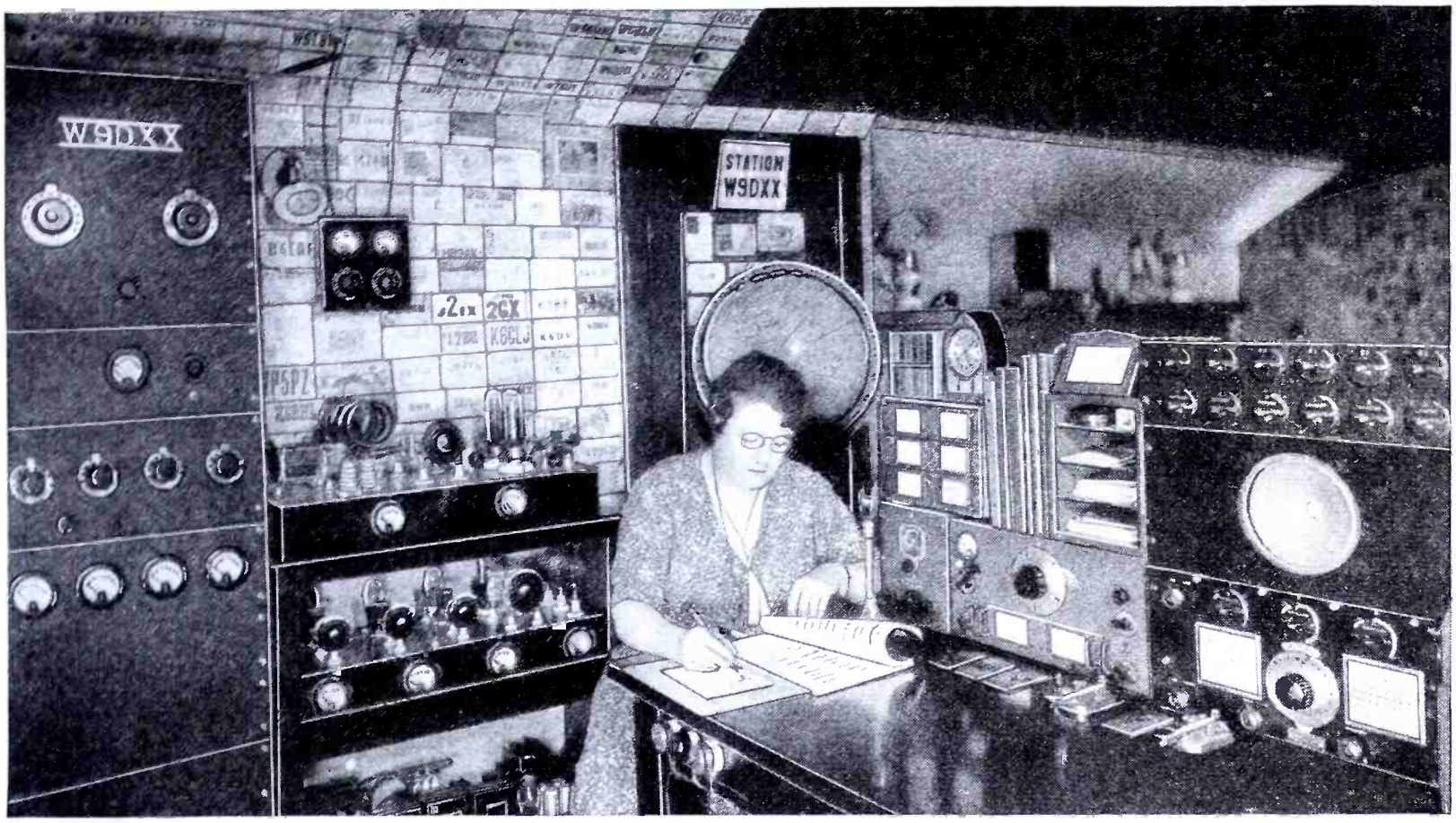


Capt. A. W. Stevens (left), and Capt. Orvil Anderson are pictured in the gondola of their Army-National Geographic Stratosphere Balloon.



Forty radio engineers and approximately six thousand miles of extra wire lines, in addition to the usual network facilities of the National Broadcasting Company, were used for the intricate broadcasts to and from the Stratosphere balloon, linking it with the "China Clipper" flying off the coast of California, and also with an editor's desk in London.

This map at left shows the special full-talk control circuit, over which all points could talk to each other at once, and also the multiplicity of short-wave sending and receiving stations and land wires used to handle the broadcast, one of the most unusual in the history of radio.



This month's Prize Winner—Amateur radio station W9DXX, located at Chicago, Ill.; the station is owned and operated by a very well-known "YL," Mrs. Alice R. Bourke

Come on Girls! JOIN OUR "YL" CONTEST

$5.00 For Best "YL" Photo

● Several months ago we announced our $5.00 "YL" prize photo contest, and we did not publish any "YL" photos for a month or two as the editors did not receive any worthwhile entries.

Photo entries for this contest must be in the Editor's hands by the 15th of second month preceding date of publication. In the event of a "tie," equal prizes will be awarded to each contestant so tying. We are glad to present photos herewith of three outstanding "YL" operators, and particularly the prize-winning picture of Mrs. Alice R. Bourke's station located in Chicago.

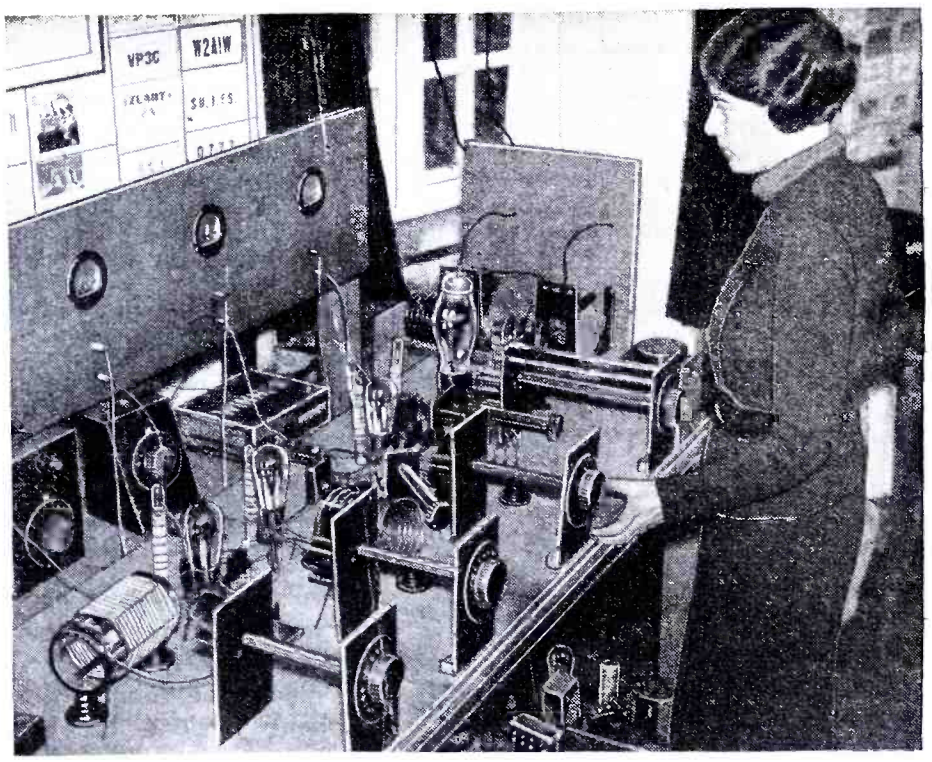
To the extreme left is a new 14 mc. transmitter, which operates on phone and C.W. A pair of Eimac 150 T tubes is in the final stage, and furnishes 300 watts on phone, and 750 watts for C.W. To the right is the 7 mc. transmitter, which uses a pair of 203A tubes, push-pull, in final, operating at 600 watts. From left to right, operating table holds a Turner crystal microphone. Peak pre-selector, National HRO and a National AGSX.

A small portion of the station QSL collection is shown. A fair amount of DX has been worked, among the countries being CE, CM, D, EA, EZ, F, G, GI, HB, HH, HJ, K4, K5, K6, LU, LY, NY, OA, OE, ON, TI, VE, VK, VO, VP2, VP4, VP5, W (all 48 states), X, and ZL.

In addition W9DXX has been heard in EI, HC, K7, PA, SP, U and ZT.

W9DXX was licensed in April, 1930, but did not go on the air until about two years ago. Mrs. Bourke obtained her Class-A license in October, 1935.

Mrs. Maurice D. Jones, 2407 Central Ave., Alton, Ill., co-operator with Mr. Jones of amateur station W9ILH.



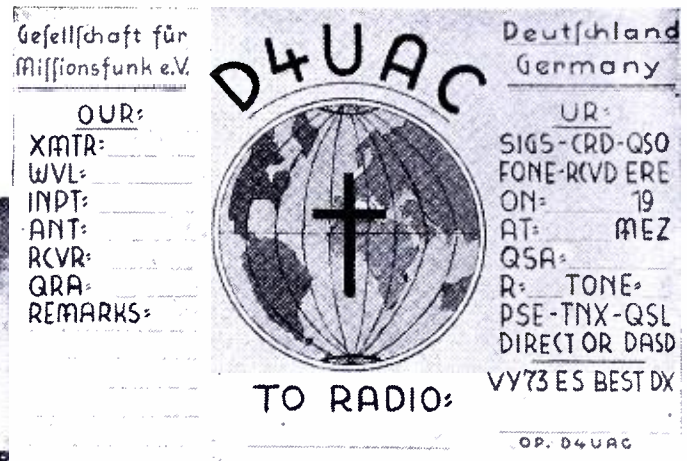
An English "YL"—Miss Nellie Corry who is shown tuning up her transmitter. Note the insulated extension handles joining the condensers to the dials.

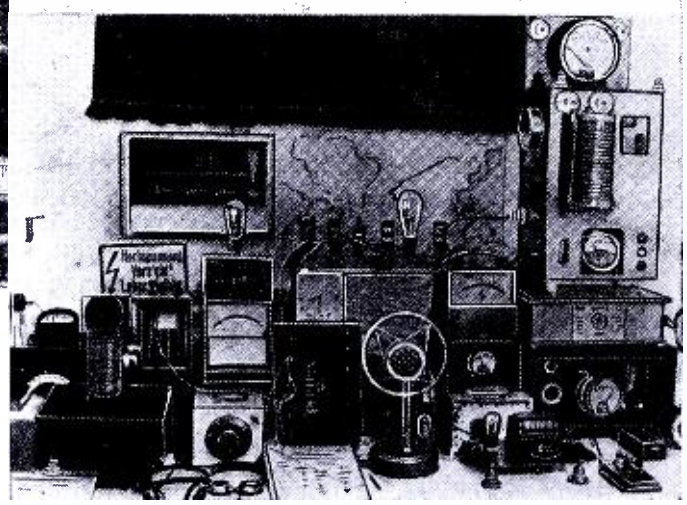
● Miss Nellie Corry, of Walton-on-the-Hill, Surrey, England, is an amateur radio enthusiast. She is one of the few women amateur transmitters in Great Britain and her call sign G2YL has been heard in many parts of the world. Curiously enough the letters "YL" are the international call sign for Young Lady, so when a radio station picks up G2YL the operator knows he is in communication with a woman amateur. Miss Corry has talked with Australia on a ten meter wavelength and power of only 50 watts, and herself picked up stations operated by amateurs in America, Australia and New Zealand.

This HAM Station Serves Missions

Left.—Engineer Robert Wunder, Director of Station D2BD, which is used to carry on tests with mission station apparatus for efficiency and range. Right:—The QSL card of the "Society of Missions-Radio"; call D2BD, formerly D4UAC.
Lower Right: General view of the phone transmitter.

Left: A few of the QSL-Cards from oversea countries and particularly from "foreign mission posts."
The House of the "Society of Missions-radio" at Niederndobrach, Germany. At the left of the picture may be seen one of the antenna masts.





● A very interesting Ham and special experimental short wave phone and code station is that here illustrated and operating under the new call D2BD, the former call having been D4UAC. This station is located in Niederndobrach near Kulm, Germany, and is operated under the management of Mr. Robert Wunder. This station not only carries on experiments in short-wave code and phone communication with mission centers in foreign countries, but also prospective missionaries are given training in short-wave transmission and taught how to operate and tune the apparatus. Its Ham activities are proven by the great number of QSL cards shown in one of the photos. Part of the research carried out under the direction of Mr. Wunder is for the purpose of ascertaining which are the best types of short-wave transmitters and receivers for use in mission centers.

Important points to be taken in consideration are centered on the fact that a great many of these stations are to be operated in countries with tropical climate. Another point of great importance in the design of short-wave stations for use in *mission* houses, is the solution of the current supply problem. As far as the bridging of short distances is concerned, only *portable* stations with a small output seem to be the best-fitted communication devices; in all other cases, especially when *telephony* links are desired, larger stations will be used wherever possible.

Some Facts About the Transmitter

The antenna consists of a single wire about 320 feet, that is installed between two wooden towers each with a height of 60 feet. A wire of about ¼ wavelength, which it is easy to adjust to proper length, is used as a counterpoise.

There is also a normal *ground* line available; it is connected in the usual manner with the sub-soil water but it is used only in special cases. Since the natural frequency of the antenna in use is about 420 meters it is exited at one of its harmonics. In case inductive coupling (or "current coupling") is applied any odd harmonics can be used.

Here's a short-wave experimental station that is really outstanding—Tests over distances of thousands of miles have been carried on with "Ham" stations, in an effort to determine which type of apparatus was best suited for mission stations in distant lands.

For example: If the antenna is to be utilized for a transmission in the 80 meter band, the 5th harmonic is used; for transmission in the 40 meter band, the 11th, and for transmission in the 20 meter band, consequently the 19th or the 20th harmonics.

In case the antenna cannot be tuned by means of electrical auxiliaries (condenser, or coils) to the proper length desired, the actual length of the antenna is changed. Facilities to obtain the change of the actual antenna length without undue trouble are provided. The state of resonance of the antenna is indicated by an ammeter cut into the antenna at the center of its current loop.

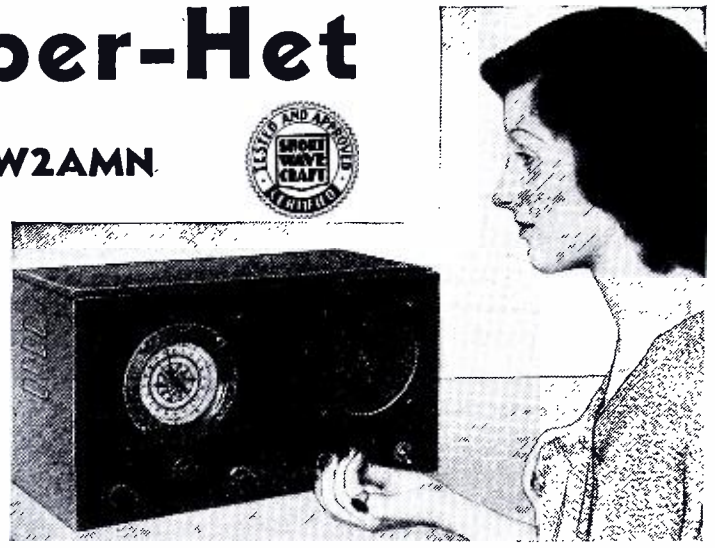
Results of the Experiments Made

One of the first communication experiments made over short distances have been executed by means of a small *portable* transmitter, rated at only one watt output. This transmitter was supplied with a normal 150 volt dry-cell battery as the source of the plate current. The heater current was supplied by a 4 volt storage battery. A small power output tube, such as is often used for German broadcast receivers of medium size, was the frequency generator tube. The circuit employed was the so-called "selbst erregende Rückkopplungs Schaltung von Meissner" (self-exciting feed-back circuit originated by Meissner). The wavelength used for these experiments was about 85 meters. The current indicated on ammeter cut into the antenna circuit was about 0.1 ampere.

The transmitter was automatically put into operation at certain times of the day by means of a clock with a time-switch. (*Continued on page* 676)

The "H and F" Super-Het Receiver

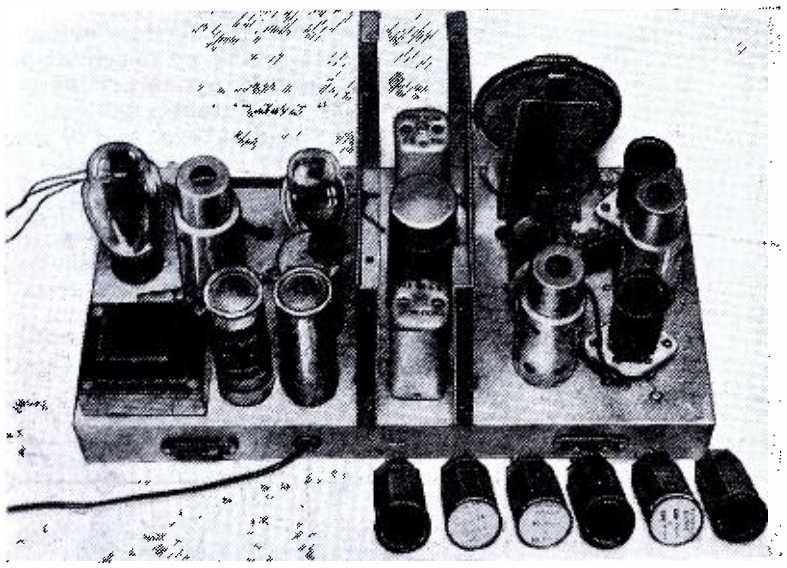
By George W. Shuart, W2AMN



This receiver is very simple to operate.

We are pleased to present this article by Mr. Shuart describing an up-to-the-minute 5-Tube short-wave superheterodyne of the "communications" type, suitable for the Ham or Fan. It is very selective and very sensitive, even on the very high frequencies. It has a "beat oscillator" and operates a loud speaker.

● WHILE the manufacturers strive to see how many tubes they can put into their receivers, the experimenter is trying to get the most for his money by using a few tubes and doubling up their duties.



This view clearly shows the placement of the various parts and general layout.

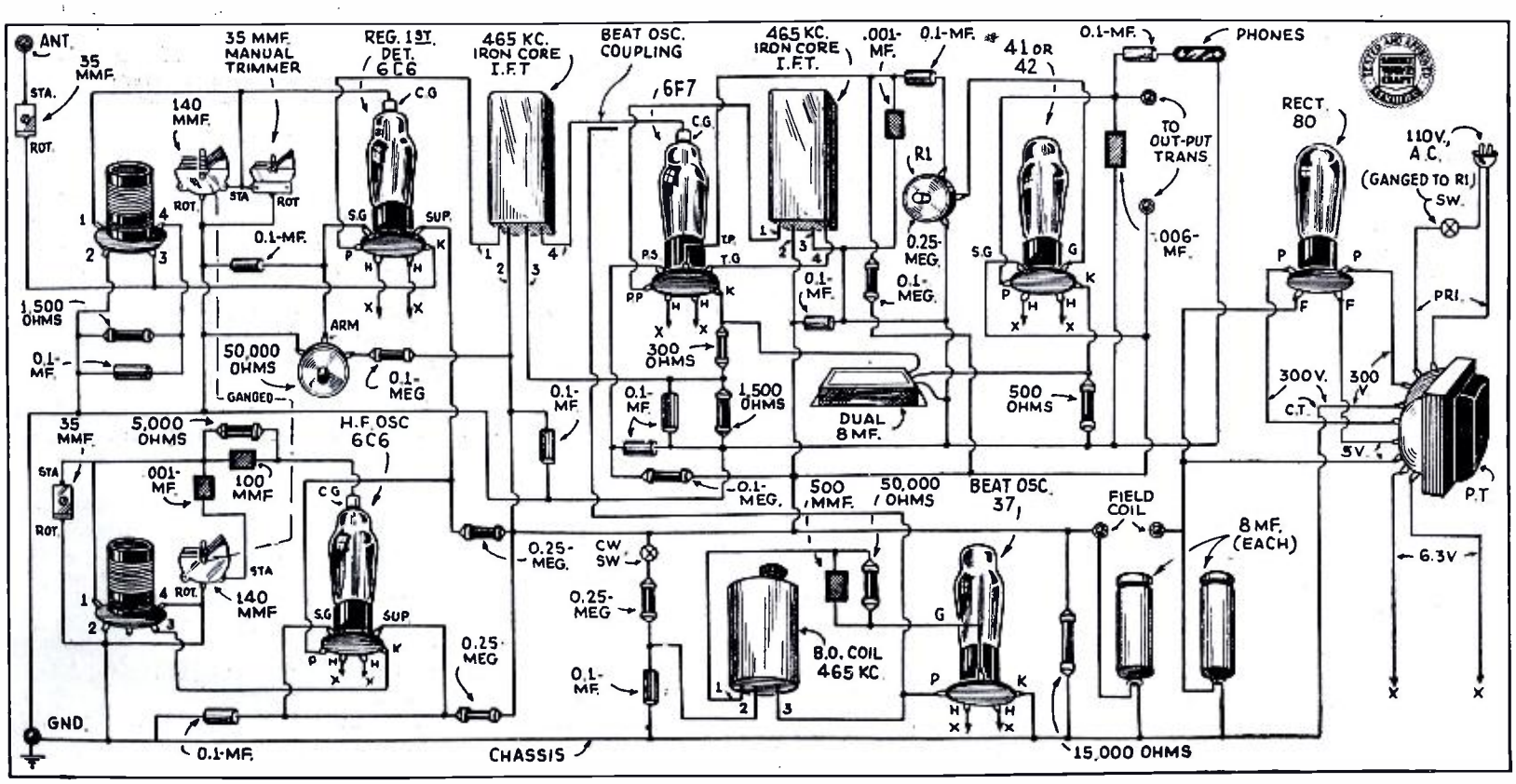
We have had superhets with from two to 10 tubes for the experimenter to choose from. Studying all of them we arrived at the conclusion that a really good set could be built with five or six tubes. This receiver must have everything that the multi-tube sets have. The "better" sets have *preselection*, that is, *amplification ahead of the first detector*. This is done to offset the inefficiencies of the conventional detector, and last but not least, the broad-tuning detectors are used to offset the difficulties in getting sharply tuned circuits to "track" over the entire shortwave spectrum. Of course a manufactured receiver is supposed to be perfect and simple to tune. On the other hand the experimenter will tolerate a few minor adjustments when operating his receiver, if he has saved a few dollars, and many hours in labor, in the cost of construction.

Has Regeneration in First Detector Stage

This receiver has no R.F. amplification ahead of the first detector, but it has *regeneration* in the *first detector stage*, and this regeneration provides sensitivity which will only be found in two stages of tuned R.F. amplification, and the image response of the regenerative detector is reduced to a negligible degree. This discrimination against images is only obtainable through very loose antenna coupling and a very selective tuned circuit.

When a very sensitive and selective detector is used, the coupling between the high frequency oscillator and the detector must be such that the tuning of one will have no effect upon the other. In order to accomplish this we have used the scheme used in a superhet described by the writer in the July 1933 issue of *Short Wave Craft*. The output of the oscillator is connected to the suppressor grid of the detector. Perfect shielding is accomplished in this manner

(*Continued on page* 680)

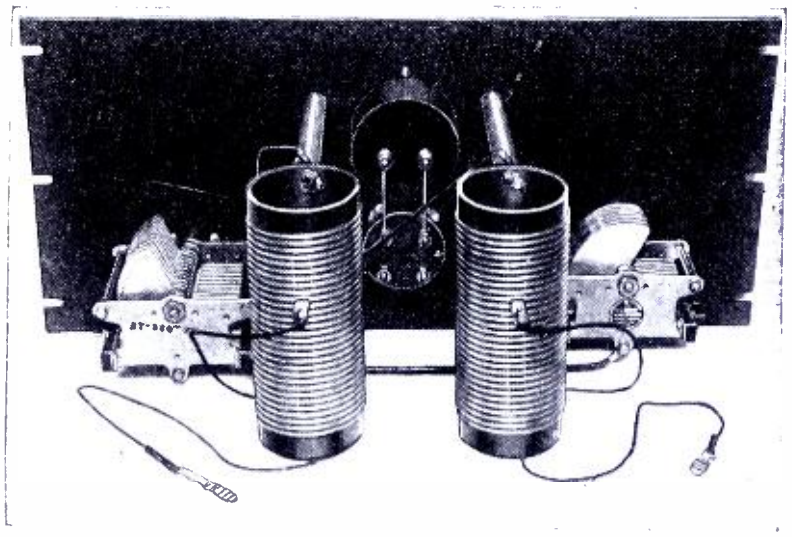


Wiring diagram for the 6-tube super-het

Impedance Matching Antenna Coupler

It has been said, and with a great amount of truth, that 75% of the success of a Ham station lies in the effectiveness of the antenna. The unit illustrated on our front cover and here described, properly tunes and matches the antenna feeder system to the amplifier of your transmitter.

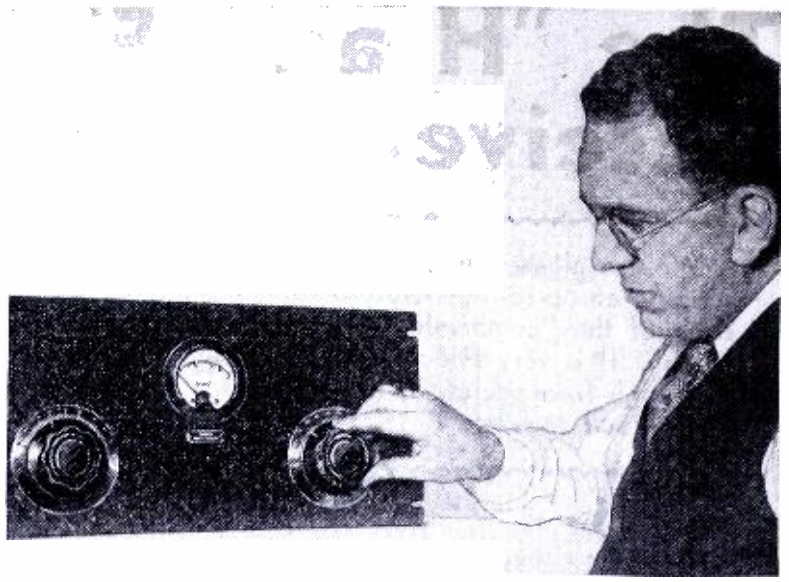
● FOR those who cannot erect, for some reason, the so-called perfect antenna consisting of carefully matched feeders and all the rest of the "trimmings," this antenna tuning device is a lifesaver. By referring to the drawing, we find that two coils and two condensers—all variable—are used, together with two fixed coupling condensers. This antenna tuning system can be adjusted so as to provide



Rear view showing the coils, condensers and meters of the "antenna matching" device.

a nearly perfect match between the antenna feeding system or antenna proper, and the plate circuit of the final amplifier in your transmitter. Many users of this type of matching network have reported an increase in actual antenna power of 30 to 50% over that obtainable with the older methods of tuning. This instrument not only provides a method of tuning the antenna or feeder system, but also provides a variable coupling, together with a proper match of impedance.

The instrument as shown in the photographs, is mounted on a steel panel intended for rack mounting. Two high-voltage .006 mf. condensers are used between the tuner and

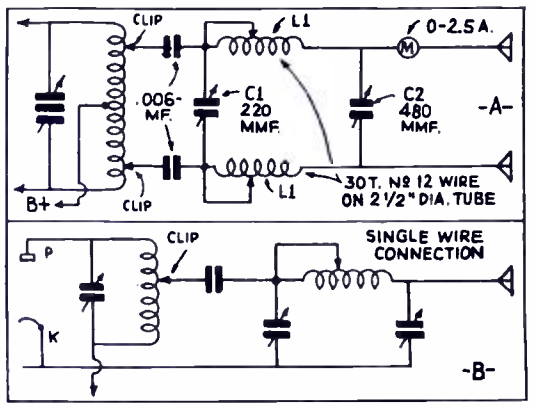


A properly tuned and matched antenna system means real "DX."

the plate tank and the transmitter. This is to keep any direct plate voltage from appearing on the feeders or in the antenna. This is absolutely necessary and an excellent precaution against personal injury should anyone accidentally come in contact with some part of the antenna system. The input condenser C1, as shown in the diagram, is 220 mmf. Then we have 2—30-turn coils. These are wound with No. 12 tinned copper wire on a 2½ inch diameter tube. The spacing between the turns is approximately equal to the diameter between the wire. Each coil is provided with a "shorting clip" which permits any portion of the coils to be "shorted out" if necessary. The number of turns used, of course, depend upon the length of the feeder system and the frequency on which the transmitter is operating. When operating on 160 meters, with a system of this type, the entire coils are used.

For 80 meters, about two-thirds of the windings are used; for 40, about half, and for 20, about one-quarter the total number of turns. Adjustment of an instrument of this type, even though it accomplishes a great many things, is surprisingly simple. The transmitter should be tuned

(*Continued on page 692*)



Wiring diagram of the antenna tuning network.

Note the attractive appearance of Alberto Passini's QSL card. ←

News from an Italian Ham

● THE accompanying photo shows the experimental short-wave transmitting station owned and operated by Alberto Passini of Genoa, Italy. Mr. Passini is considered to be one of the best known short-wave experimenters and Hams in Italy. His call letters are I1KA. The transmitter is a MOPA with crystal control, and is rated at 5 watts. He employs a Zeppelin type antenna, and the receiver used is the Schnell. Mr. Passini is a member of an American short-wave organization; the neat appearance of his station is apparent from a study of the photo at the right. This is a real "experimental"

(*Continued on page* 679)

Alberto Passini of Genoa, Italy, and his A1 "Ham" station.

Practical Hints for the HAM

By H. G. McEntee, W2FHP

● THERE are a great many tricks, kinks, ideas, or whatever you wish to call them, in use by different builders, which would probably be more widely used if they were thought of by everyone. All of us have our "pet" schemes and ways of doing things. It is the purpose of this article to give a few ideas used by the writer which may be of interest to fellow hams. No effort has been made to arrange these in any special order, but they are simply written down as they came to mind.

Lead-Covered Cable a Boon

Set-builders in general and most "hams" in particular have had the experience of audio oscillation in amplifiers, and, while it is possible to get rid of this annoyance, it is often a long, mean job. On the next "high gain" job you build, try using lead-covered cable for the *hot* grid and plate leads. This cable can be obtained with either one or two conductors, is very easy to work with, and makes a very neat job of the wiring. It is often a help to run all filament and heater leads with the double cable. This will often prevent troublesome "hums" in a high gain outfit. The lead covering may be broken by simply running a knife around it at the point desired. The lead will break smoothly with a few bends, back and forth, and the undesired end will slip off easily. The wire is not very tight in this cable, and a long section of covering may be removed easily.

Illuminated Meter Dials

With all the cry for indirectly illuminated airplane dials these days, it seemed desirable to try making meters on the same idea. Since it was impossible to get celluloid or other translucent dials, the only way left was to cut a slot in the top of the case for the light to shine through. This may be understood from fig. B. The meter movement must be removed from the case and a slot about ¾"x⅜" wide cut in the top of the case, as close to the flange of the case as possible. The hole may be cut by first drilling three or four ⅛" holes and then connecting them and widening them out with files. When the first hole is drilled, the glass holding ring, of very thin brass, will be loosened, and it must be removed and a section cut out the length of the slot. The ring is sprung outward, so it will hold its place when pushed in against the glass. When the slot is smoothed out, a piece of celluloid or cellophane must be glued over it to keep dust out of the meter works.

The pilot lamp must be mounted as close to the meter flange as possible, and if the meter is to be mounted on a thick panel, the latter should be gouged out, if possible, to allow the lamp to go as far forward as it can, in this way illuminating the dial directly.

If, for any reason, direct illumination by a bulb for every meter is impractical, a mirror may be used above the slot, so that the dial is lighted by reflection.

Pilot Lamps

This writer has a failing for pilot lights and indicators for every possible use. Many of these are very necessary, while it must be admitted that some are used "just for looks." However, no one will deny that battery-operated equipment needs some sort of signal light. Very often this is omitted because of the extra, undesirable drain from the filament batteries. In such cases, the tiny ¼ watt neon bulbs may be used across the plate batteries. They light on about 70 volts and .25 Ma.

Another pilot lamp scheme utilizes the bulb as a potential dropping resistor in the filament circuit. The bulb is simply placed in series with the filaments, in place of a resistor. The 60 or 100 ma. bulbs are best for this if only one or two 60 ma. tubes are to be used. A shunt resistor is usually needed depending on the number of tubes used, the battery voltage and the type pilot light. Fig. 1 C shows a simple connection used in a preamplifier with a 100 ma. pilot lamp, a 3 v. battery and a single 60 ma. tube. In any case the resistor is adjusted until the tube gets the proper voltage. In this particular case the pilot lamp glows at about half brilliancy.

Covering Sides and Rear of Racks

When making rack type mountings of small size, the builder usually wished to have the sides covered to keep prying fingers out, but a circulation through both sides and back is necessary to let the heat out. A fine material for such side covering is to be had in the perforated sheet iron carried by hardware stores, and often used to make *radiator covers*. This is about 1/32" thick and quite inexpensive. It may be painted any color to suit the builder.

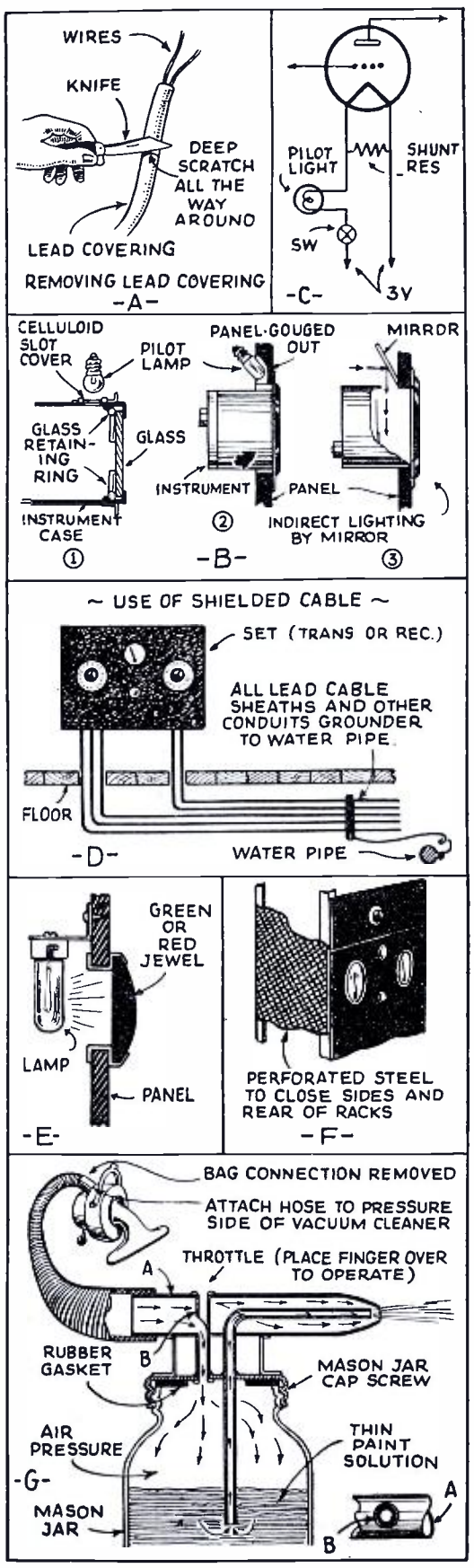
When painting, it is much easier to spray the covering on, rather than to brush it. A simple atomizer made of two tubes may be used providing the operator has plenty of "wind." The paint should be thinned by the addition of suitable solvent, as ordinary paint as it comes in the can is usually too thick to be sprayed easily. The spraying is a rather wasteful procedure, since a lot of paint goes through the holes and lands on whatever is on the other side, but it is the only quick way to obtain a good smooth finish. A sheet of paper placed against or near the inside of the perforated metal will keep the paint off of the bulbs and other apparatus.

The writer hopes that the above schemes will enable readers to build better apparatus with less work. No originality is claimed for them but for the most part they have not appeared in print as far as is known.

Apparently many builders do not appreciate the fine qualities of a material called *pressed wood* for use in making panels on radio apparatus. The material is composed of wood pulp held together with a binder and, in the grade called "tempered" pressed wood is quite hard and yet easy to work. It is hard enough to take a thread and yet can be cut by an ordinary wood saw or other wood tools. A very fine finish may be put on the surface by giving it several coats of lacquer, sanded between each

(*Continued on page* 691)

In this article, the amateur and prospective amateur will find a number of useful hints which will improve his station in efficiency and appearance, the two most vital considerations of any station.



In the diagram, we have various methods of mounting dial lights, uses for shielded cable, screening for enclosing a transmitter, and most important of all, a home-made spray for painting panels, screening and other hardware.

Complete transmitter, including the "SG3" and the amplifier, all ready for operation.

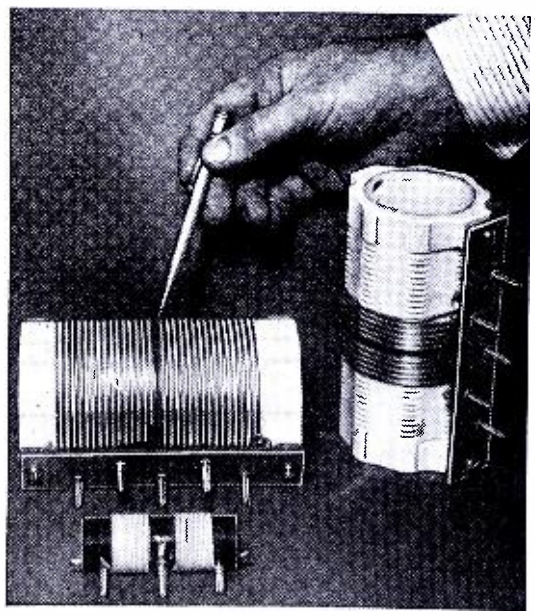
An AMPLIFIER for "SG3" Transmitter

By George W. Shuart, W2AMN

This amplifier, which is designed for use with the "SG3" transmitter described in the January issue, uses two "low-power" pentodes in push-pull, requires no neutralizing or fussy adjustments, and has an output of approximately 50 watts! The entire transmitter, as pictured above, provides a modern, "up-to-the-minute" all-band transmitter for any Ham station.

● THE "SG3" transmitter described in the January issue has become so popular that the writer decided to build an amplifier for it—so here it is!

The transmitter as you probably remember used all receiving parts. The tubes were the type 89 *receiving* tubes—a small tube with a mighty wallop! We see that others have followed and are sponsoring the 89, fb—we hope everyone gives them a try. Consisting of all screengrid tubes as the "SG3" does, we figured that the amplifier should also use a similar tube. So, we decided to use the big brother of the 89—the 802, 23 or 25. The 802 and the 25 having the 6.3 volt heaters are the proper ones to use of course, unless you happen to be blessed with a pair of 23's; in that case apply the 2.5 volt heater voltage and be happy.



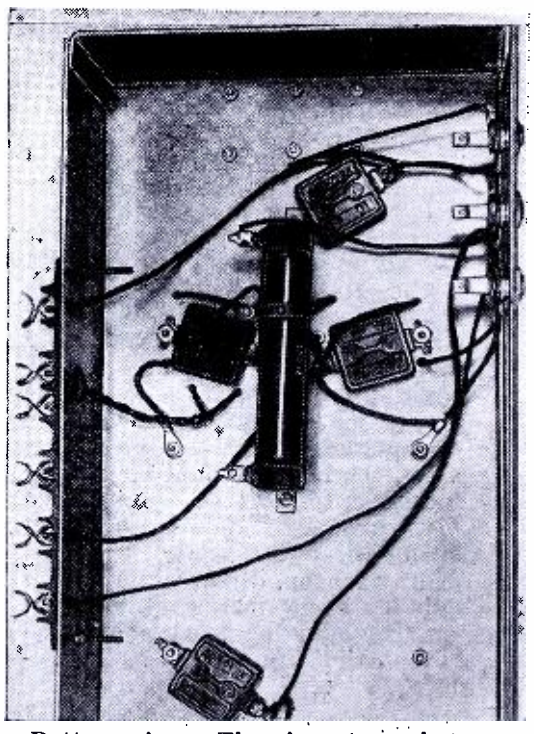
The plug-in coils for the grid and plate circuits.

Parts List for Push-Pull Amplifier

1—split-stator, 100 mmf. per section, condenser, Hammarlund.
1—dual 100 mmf. midget receiving condenser, Hammarlund.
3—.001 mf. 1,000 volt mica condensers, Aerovox.
1—.0001 mf. mica condenser, Aerovox.
1—20,000 ohm, 75 watt adjustable resistor, I.R.C.
3—single closed-circuit jacks, Bud.
2—phone plugs, Bud.
3—"grooved" 80-meter coil forms, Bud.
1—plug base assembly for plate coil, Bud.
1—jack base assembly for plate coil, Bud. (Bases have 5 pins, micalex insulation)
9—No. 809 plugs, Bud.
3—standoff insulators with jacks to fit above plug, Bud.
2—6-prong isolantite sockets, Hammarlund.
1—chassis 7x14x3 inches, I.C.A.
1—3x14x⅛ inch bakelite panel for chassis, I.C.A.
2—pentode tubes (802, RK25 for 6.3 volts, RK 25 for 2.5 volt heaters).

Naturally the pair of pentodes do not require 20 watts of excitation, which the "SG3" is capable of providing. To make things work out properly we reduced the plate voltages to the "SG3" which is now the exciter unit and improved the over-all efficiency of the whole transmitter. 300 volts is sufficient for both the oscillator and the push-pull 89's.

The new pushpull pentode amplifier was constructed on a chassis which is an exact duplicate of the one used for the "SG3" transmitter. This makes a convenient as well as neat arrangement. *Link coupling* is used between the two units and both the grid and plate coils are of the plug-in variety. The bakelite panel on the front of the chassis appears quite empty; however, an insulating mounting was needed



Bottom view. There's not much to see here, but simplicity and the correct placement of parts are essential.

for the meter jacks and if one should desire it, a separate meter may be used for the amplifier so that both units may be metered at the same time, although the single meter seemed to serve very nicely.

50 Watts Output!

While these new pentodes are only rated at some sixteen watts output, it is possible to obtain around 50 watts from two of them connected in push-pull, by just pushing them a trifle. Not much more input than the makers recommend, 65 watts is plenty, and the life of the tube will in no wise suffer according to the evidence during tests on the air.

We have endeavored to keep the constructional details as simple as possible and a glance at the photos of the top and bottom views of the amplifier will more than convince anyone that it is a simple and low-cost 50 watt amplifier. The grid coils consist of a two-section coil wound on a 1 inch diameter bakelite tube. This coil plugs into two Bud jack-type stand-off insulators and the coil is equipped with plugs of the same manufacture, to fit the jacks. The amplifier plate coil is also of the plug-in type of modern design. This coil is wound on a large ceramic coil form with No. 12 tinned copper wire. Each form is fitted with a five-pin plug-base and fits into a similar Bud jack-base; the small jacks and plugs are mounted on a micalex insulating strip. These are already drilled and assembled and prove to be a real convenience. All five contacts are needed because there are three terminals required for the plate coil and two more for the link which couples the plate circuit to the antenna tuning unit.

Coil Data

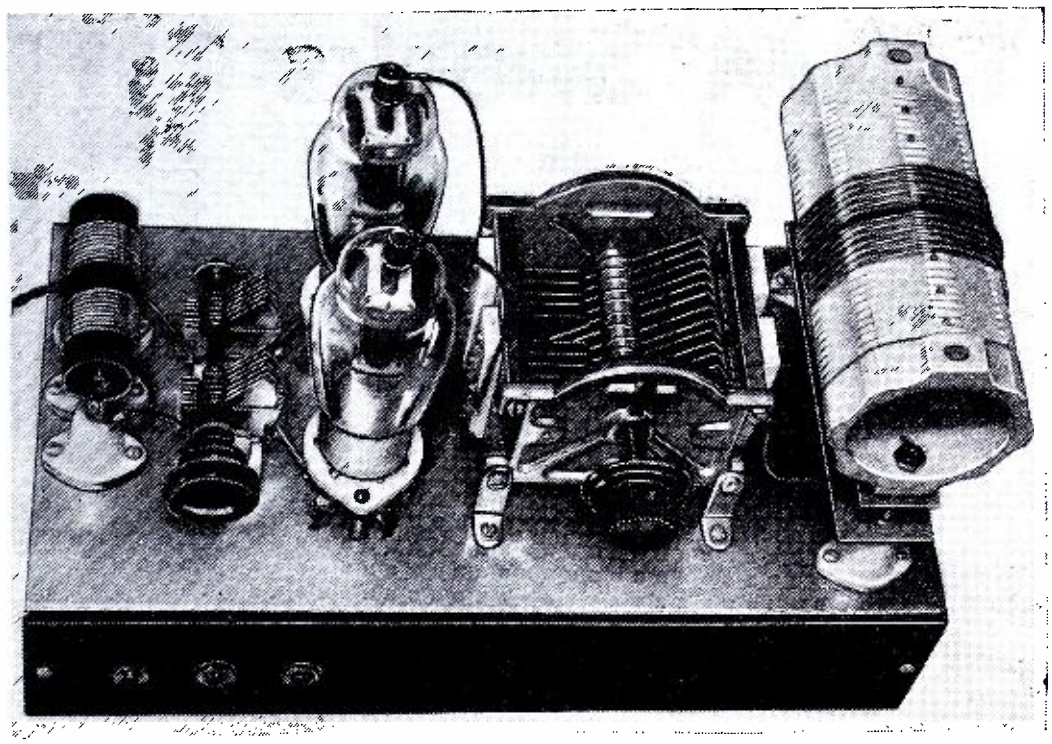
There are 34 turns on the 80 meter coil and 18 turns on the 40 meter coil and 10 turns on the 20 meter coil. The plate circuit of the amplifier is low "C" for highest efficiency. A split stator Hammarlund tuning condenser is used, having 100 mmf. capacity per section, and is set somewhere around one-half the maximum capacity for all bands except the 80, where it is operated at about two-thirds capacity.

In the grid circuit we have also a split stator tuning condenser, that is, we have used a dual 100 mmf. midget receiving condenser. The data for the grid coils is given in the appended coil table. The space between the two sections of the grid coil is just enough to allow the jack pin to come between them in the center of the form; about ¼ inch.

The link which connects the two stages together consists of two turns of heavy hook-up wire, wrapped around the center of the grid coil and twisted up to the point where it connects to the exciter link terminals. For antenna coupling we use a single turn link of the same wire and this is wrapped around the plate coil, right in the center, and fits between two turns of the coil; the turns of the plate coil being spaced about one-sixteenth of an inch.

External Battery Bias Used

In the amplifier we have used external battery bias and we strongly recommend this method. It may be just a slight bit more expensive in the beginning than the so-called *automatic* or *self-bias*, but in the long run, so to speak, it is more positive and economical because we need not worry about "losing" the amplifier tubes should the oscillator fail! Small batteries will last a long time because the grid current is very low—around 8 to 10 mills (M. A.)—and does not have a great effect upon the life of the batteries. We also used a separate midget 45 volt battery for the suppressor voltage, although this may be taken from the power-supply as shown in the diagram.



Top view of the amplifier showing how the various parts are placed on the chassis.

DATA FOR GRID COIL

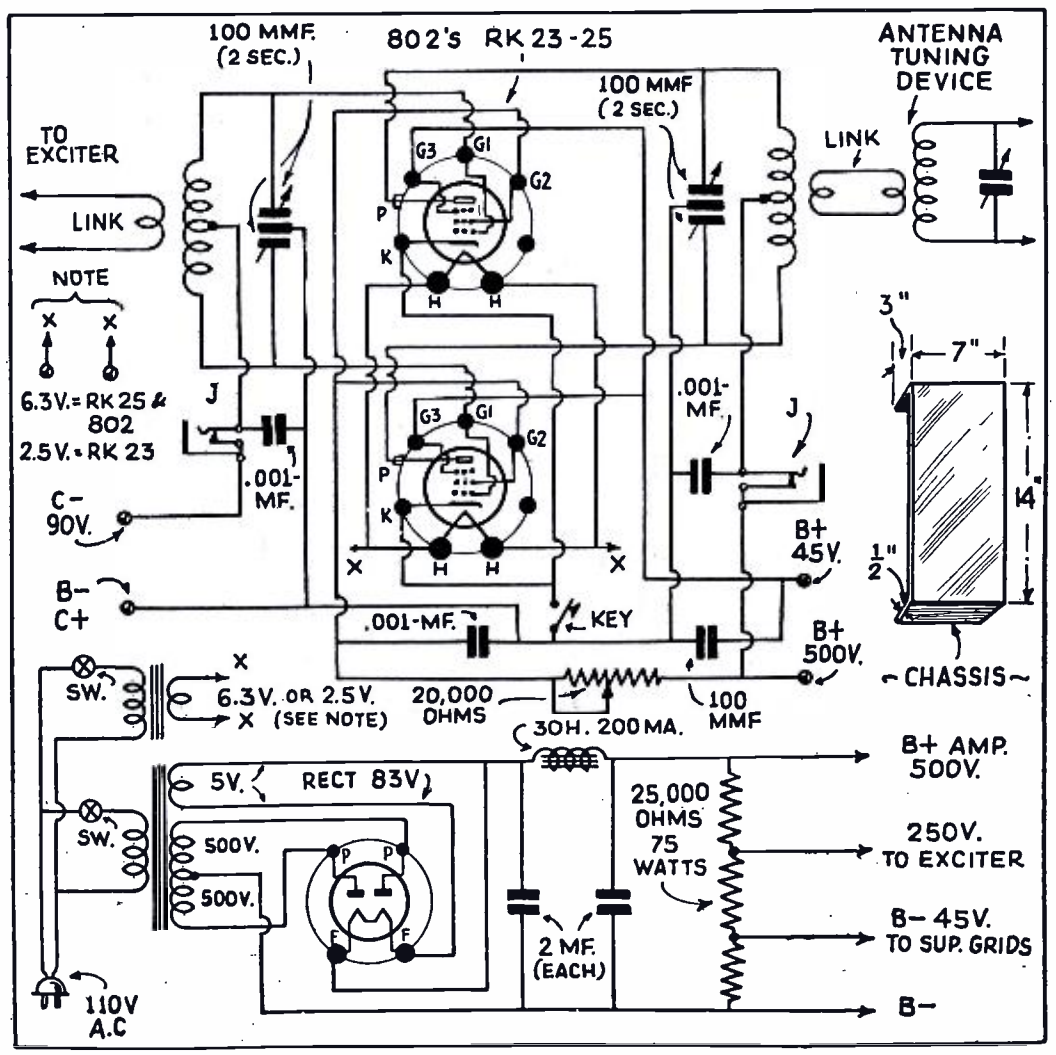
Band	Turns	Wire
80 meters	72	No. 26 D.S.C.
40 meters	32	No. 20 D.C.C.
20 meters	14	No. 20 D.C.C.

All coils are center-tapped and wound on a 1-inch bakelite tube.

Tuning the Amplifier

The tuning of the amplifier is exactly the same as the "SG3" and needs no detailed explanation. The grid condenser should be adjusted to give the desired grid current, which should be 8 to 10 milliamperes for highest output, and with 500 to 600 volts on the plates at around 100 to 125 mills (M. A.) with full antenna load.

With the (*Continued on page* 688)

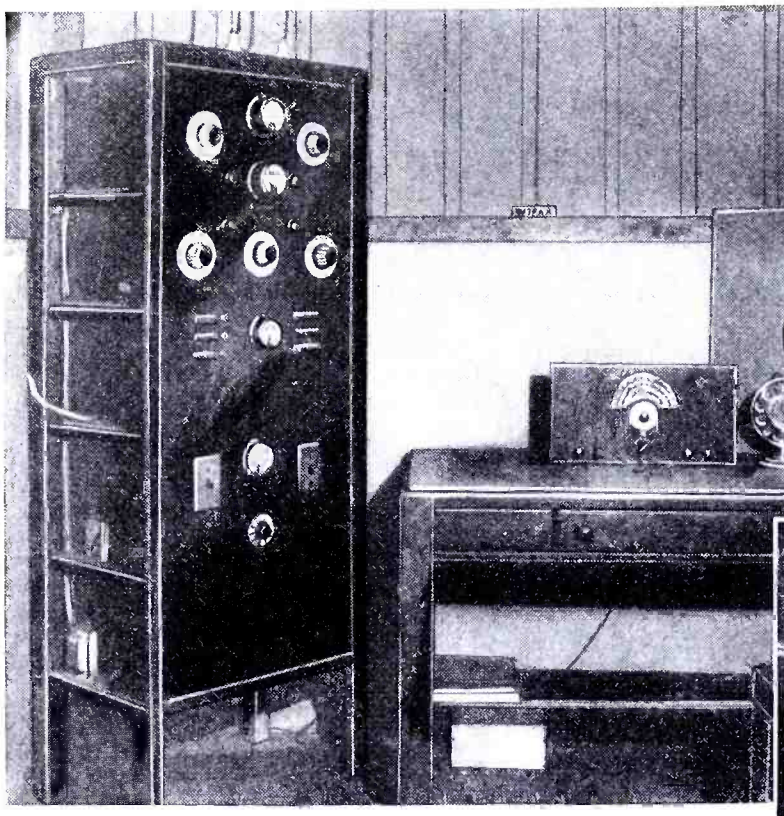


Schematic wiring diagram of the pentode amplifier.

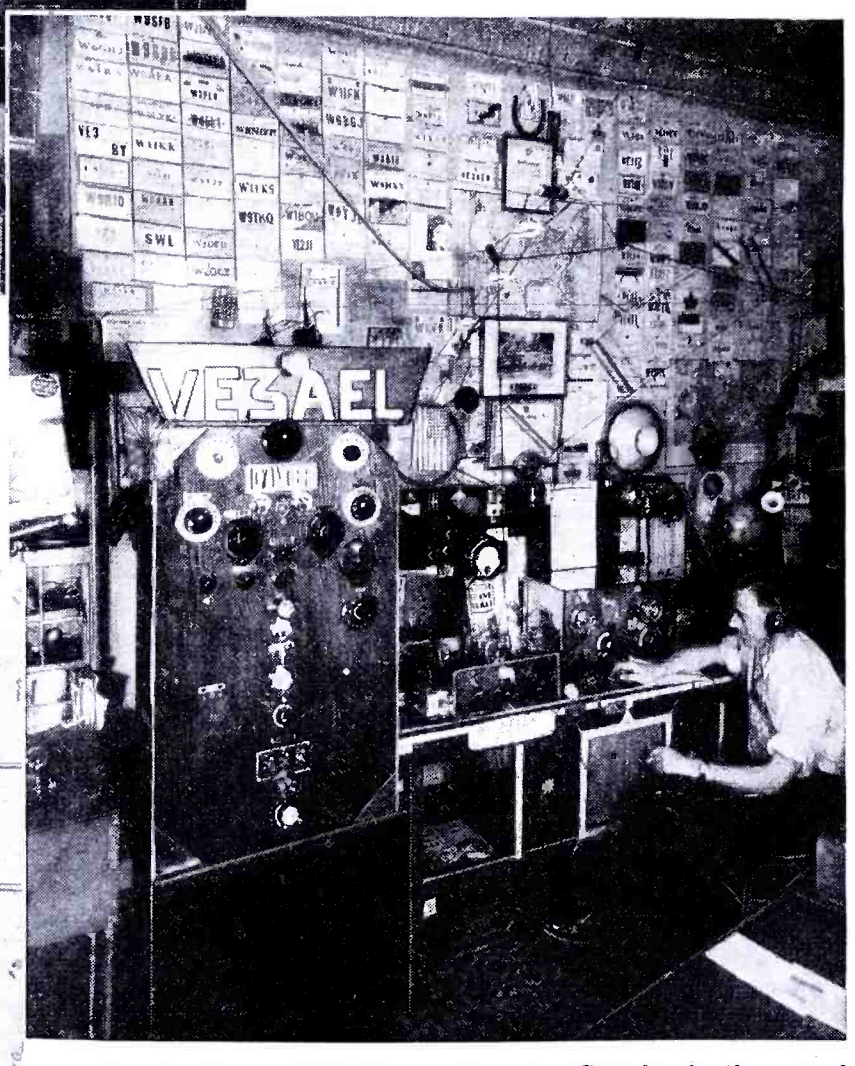
"HAM" Shacks What Am!

Detailed descriptions of these "cracker-jack" Ham stations will be found on opposite page. Don't forget, a prize is awarded each month for best "Ham" station photo!

Above—This month's prize-winning Ham station photo, owned and operated by Jack Lee, Lake Hopatcong, N.J. This is a dandy station, and it is operated under the amateur station license call W3CWG. Mr. Lee operates on practically all wavelengths, including the 5-meter band.

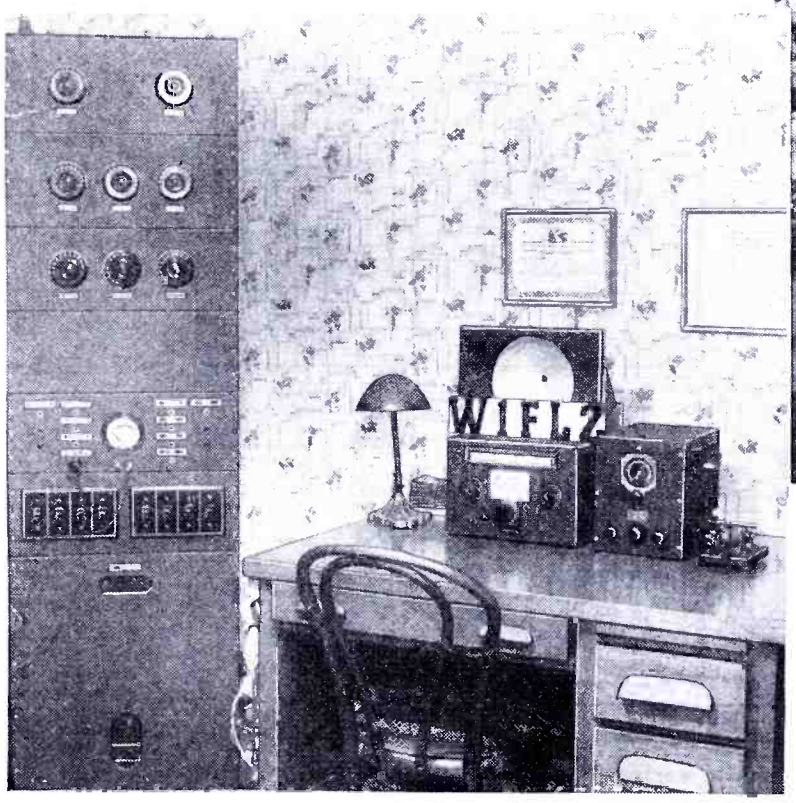


The photo above shows the excellent amateur transmitting and receiving station W7EAA at Tekoa, Wash., owned and operated by Lloyd S. Hale. The speech equipment includes a crystal microphone, and together with the other apparatus used by Mr. Hale, this station should "step out" in fine shape.



Harold Knox, VE3AEL, of Toronto, Canada, is the proud owner of the station shown above. This is sure some outfit, and it appears that Mr. Knox has a sample of about everything ever built in radio, including all kinds of loudspeakers, receivers and what-not. The great mystery is—how do the waves know their way out of the station? Well boys, VE3AEL has invited you to come up and see him some time. If we find the time, maybe we'll join you.

Photo at left—the very neat Ham station operated by C. S. Knowlton at Roslindale, Mass.



SHORT WAVES and Our Readers Forum. • • • LONG RAVES

Description of "Ham" Stations on opposite page.

Jack Lee, W3CWG, Lake Hopatcong, N.J., This Month's Prize Winner

Editor, SHORT WAVE CRAFT:

I have been a reader of *Short Wave Craft* for about three years now. In fact I used to get it when it was published once every two months. I have also tried and used quite a few of your circuits and ideas.

Well at last I have taken a picture of my "rig."

W3CWG at present is located on the shores of "Beautiful" Lake Hopatcong, which is situated in the heart of the mountains in the northern half of New Jersey.

First interest in radio was started with "broadcast" band dxing. After that a brief period as an S.W.L. until I couldn't put it off any longer—then the "ticket"!

The call letters were assigned in December, 1932, and the location was then Succasunna, N. J.

The first "rig" used was a 210 self-excited Hartley, on 80 meter C.W. From then improvements began and the outfit changed to the conventional 46 job and phone was tried. This started the ball rolling until the present "rig"—which lines up as follows: a 47 crystal oscillator, 841 buffer (or doubler), a 210 second buffer (or doubler), and a pair of RK20's in push-pull in the final amplifier, running at 200 watts input on both phone and C.W. The audio end consists of a double-button mike, a 57 first stage, a 56 second stage and a pair of 2A3's in push-pull "class A," driving four 210's in push-pull parallel "class B," as modulators. The final amplifier of course is combination plate and screen-grid modulated.

Operation is carried on, on 20 meter, 75 meter and 160 meter phone and 20, 40, 80, and 160 meter C.W.

The usual amount of "DX" (distance) has been "worked" on all bands. Asia and Africa are still needed for W.A.C. on phone. Three reports have been received verifying transmissions heard in Great Britain on 160 meters.

The receivers are an RCA model 140 for phone work and an SW5 for C.W.

A small amount of work is done on 56 mc. (5 meters) with a transceiver in my car. This "rig" uses a 76 and two 42's.

Jack Lee, W3CWG,
Lake Hopatcong, N.J.

(*Ups-a-daisy, Jack; sure a swell Ham "shack"—makes us itch to grab the key, and see what she'll do.—Editor*)

Lloyd S. Hale, W7EAA, Has Neat Station

Editor, SHORT WAVE CRAFT:

Herewith photo of my amateur station, which I would like to enter in your contest.

The transmitter uses a 47 crystal oscillator, 46 first buffer or doubler, 210 second buffer, and a 203A final amplifier. The speech equipment includes a *crystal* microphone, two stage pre-amplifier, into a 56, push-pull 56's, push-pull 2A3's, into class "B" 830B's. The input to the final amplifier is 150 watts. A Zepp antenna is used.

(*Continued on page* 703)

S.W.C. Started Him in Short Waves

Editor, SHORT WAVE CRAFT:

At last I am sending a photo of my station. I feel that I must show my feelings toward your wonderful magazine. Well, I can assure you that my success in radio is duly credited to your magazine. A few years ago, I picked up one of your books and *that was my real start*, and now I own my own radio store, xmitter and all, thanks to *Short Wave Craft*, hi! Now, since the photo was taken, I have built a much finer receiver. I got my *ticket* on Jan. 2, 1935. My xmtr as follows: Frame or rack made from a couch bed, steel frame. Panel is 3 ply wood, hand-polished, outfit as follows: 2A5 xtal 10 buffer is pair 10 P.P. Mod. two 56's 50, pr. 10. The rig is sure vy fb., Collins couples and Zepp antenna 133 ft. long. On the operating table, which I made, is my 10 meter phone job—hi-hi! Well, I cannot claim very much DX on that band, but worked a W4 and have lots of fun with locals. It is self-excited, two 2A3 P. P. oscillator, modulator two 56 speech amp. three 45's. in par. mods. Well, I am on forty meters C.W. most of my time but sure like ten. Now my receiver; I now have two fine ones, both eight-tubes capable of five meters to five hundred, excellent for DX. Have heard every country in the world, hi-hi-hi! The tubes in receiver as follows: 3-58's in par. tuned stage, 58 Det., 56 first A.F.—2-2A5's P.P. both sets same one as a "spare" because the one has been in use for 18 months, about 10 hrs. per day.

The circuits differ a little; they are built from my own ideas and some from your magazine. I use an 8" speaker over my store doorway to give the public a thrill. I also have a 14" speaker fitted under table; also 2 magnetic speakers on back of table; also note the Monitor on back of table. These receivers both are perfect on ten meters with full loud speaker volume. The xmtr antenna has been changed since this photo. Now I have a very fine

(*Continued on page* 686)

A Flash from W1FLZ, Roslindale, Mass.

In the center of the desk is a National FB7A receiver; to the right is a Peak preselector which is coupled to the FB7A. (This makes a very fine combination.) The MacKey is shown next to the preselector, this key has a flexible cord attached, making it very easy to place the key in the correct position for sending. Above the receiver, partly hidden by the station call, is a magnetic speaker. The receiving antenna is a 20 meter doublet.

The tubes used in the transmitter are: 47 xtal oscillator, 46 first doubler, 841 second doubler, or first amplifier, '03A in the final. Crystals for this "rig" are 7072 kc. and 7174 kc., both can be used to operate on ten meters. The output of the second doubler on this frequency is eight watts.

The first deck of the transmitter holds the 1000-1500 volt supply, which uses 866's as rectifiers. This is the plate supply for the '03A, primary keying is used. Next deck 3-83's in bridge rectification, this supplies the other three stages. Each pack has a separate 110 volt A.C. line. All plate lines, 110 volt lines and meter are fused.

Toggle switches are visible on the front of the panel, used for switching in the filaments, plate supplies, etc. Four of switches are not in use at present but will come in handy. The fourth deck holds the bias batteries, which can not be seen. A milliammeter is also shown on this deck with jacks on either side; all plate and grid currents are measured by inserting the meter plug in the desired jack. The two dark spots on the left and right of the meter panel are red and green jewel lamps indicating filament and plate supplies. The fifth deck is blank; I hope to put the necessary speech equipment on this deck to plate modulate the '03A, but not yet a-while. Hi! The three remaining decks are self-explanatory. Oscillator—Doubler—Doubler or Amplifier—Grid tuning of '03A (link coupled)—Neutralizer—Final tank. Collins antenna system, takes up the top deck; all other adjustments are made from the back which is open, sides are enclosed. Sky-wire is a Zepp 66'6" and 45' feeders.

The rack is six feet high and 19½ inches wide, 12" deep. Three-ply panels, five-ply shelving 18"x12", uprights 6'x2"x¾" and the runs for the decks to slide or rest on are 12"x1"x¾". All decks are shielded with sheet copper, aluminum in R.F. section.

C. S. Knowlton,
24 Sunset Hill Road,
Roslindale, Mass.

(*A swell layout, C.S.K., and you should enjoy many fine QSO's with this transmitter and receiver.—Editor.*)

A "Live" Ham Station—W5BZX

Here's the owner and operator of "live" Ham station, W5BZX, of El Reno, Okla.

THE RADIO AMATEUR

Conducted by Geo. W. Shuart

Radio Amateur Course

7th Lesson—Explanation of Antennas and Feeders

For the Amateur Transmitting Station

● ONE of the most important parts of any short-wave station, transmitting or receiving, is the *antenna*. In this, the *Seventh Lesson*, of our *Radio Amateur Course*, we will endeavor to point out in simple English the nature of each type of antenna and its various uses.

The "Half-Wave" Antenna

It is an established fact that a wire will resonate at a wave-length twice as great as the actual length of the antenna in meters. This is called in radio circles a *half-wave* antenna. On the other hand, certain antennas, which are apparently one-quarter wave-length long, may be used when operating against *ground* (Earth.) This is shown in Figure 1A. The current and voltage distribution along an antenna of this type, which is commonly called the *Marconi antenna*, is shown by the curves I and E. We notice that the point of maximum voltage is at the *ungrounded* end, while the point of maximum current is at the *grounded* end. In Figure B and C, we show how this type of antenna may be tuned and coupled to a transmitter or receiver. In Figure D, we show a method of operating a Marconi antenna with an *untuned* transmission line. This transmission line is connected on to the antenna a short distance from the grounded end. Usually, this distance should be equal to 28% of the length of the antenna which, as stated before, is one-quarter of the wavelength. In Figure 2A, we have the well-known *one-half wave* antenna. The length of this antenna in feet for any given frequency is expressed by the following formula:

$$L = \frac{492,000}{F} \times K = \text{feet}$$

Where L is the length of the antenna in feet, and F is the frequency in KC., and K is the correction factor. Below 3,000 kc., K=.96. From 3,000 to 28,000 kc., K=.95, and above 28,000, K=.94.

Points of Maximum Voltage and Current

In Figure 2A, we find that the point of *maximum current* is in the *center* of the antenna, and the point of *maximum voltage* is at the *ends* of the antenna. This *half-wave* antenna is undoubtedly the most popular of all types.

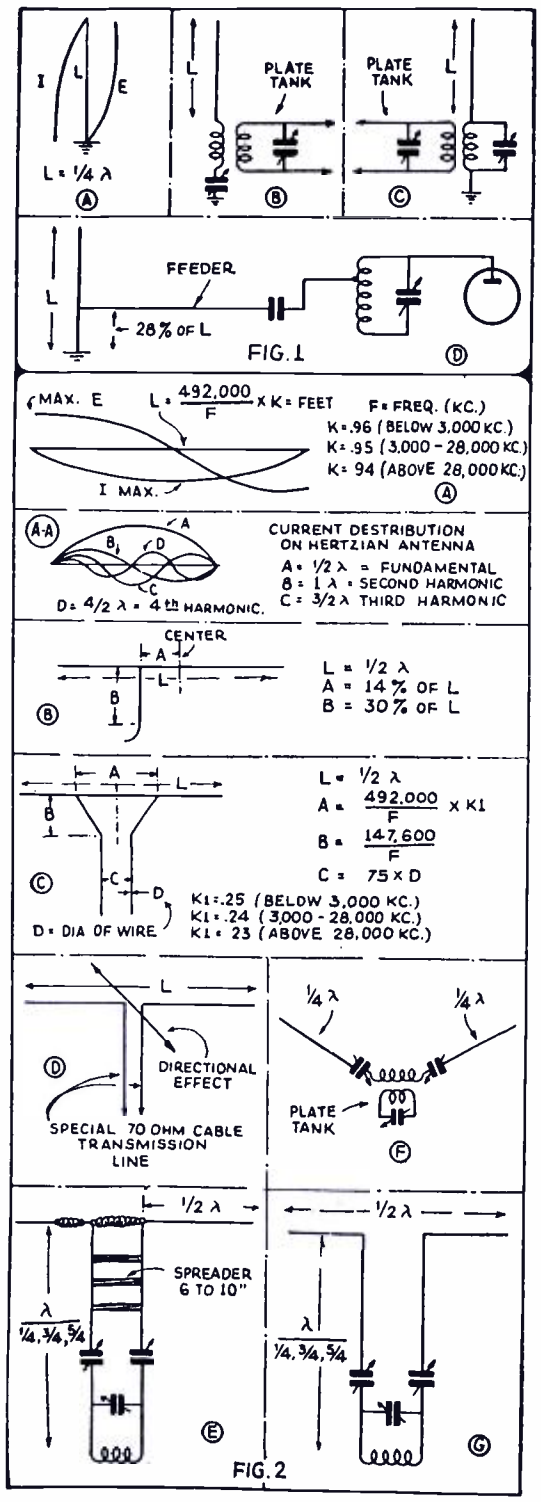
In Figure AA, we find the entire current distribution group for an antenna a half-wavelength long, one wavelength long, 1½ wavelengths long, and two wavelengths long. This corresponds to a single antenna operated on any one of three amateur bands. If it were cut to operate as a half-wave antenna on 80 meters, for instance, it would be a full wave antenna on 40 meters, and the current distribution would be shown by curve B. It would then be said that the antenna was operating on the second harmonic, as a full-wave antenna. If the same antenna were operated on the 20-meter band, the curren distribution, as shown by curve D, indicates that it is operated on its fourth harmonic, and the antenna would be two wavelengths long. Now, curve C shows the current distribution when the antenna is operated on its third harmonic, or when there are three half waves standing on the antenna. For instance, if we wish to construct an antenna operated on its third harmonic in the 40-meter band, the antenna would have a length of three half waves or 60 meters. Third harmonic antennas are not very popular because the average Ham desires an antenna as short as possible. Antennas are usually fed or excited at either the point of high current, a point of maximum voltage when tuned feed lines are used. For instance, in the Zeppelin type antenna where the feeders are connected to the end of the antenna for a point of high voltage, the antenna is said to be voltage-fed. In the doublet type, where the feeders are connected to the center of the antenna, i.e., a half-wave antenna, it is said to be current-fed. Antennas fed at the center are only current-fed when they are a half wavelength or an odd number of half wavelengths long. This is clearly shown by the curves A and C in Figure AA. If an antenna had a current distribution as shown by Fig. B or D and was fed in the center, it would be said to be voltage-fed. Another method of exciting an antenna, which will be described later, is by an untuned transmission line matched in impedance to the antenna at any point which may provide the necessary impedance match. In Fig. 2—B, C and D, we have this sort of an antenna.

In Figure 2B, we have what is known as the *single wire matched-impedance* feed system which consists of a single wire attached to the flat-top *slightly off center*. The distance (A) between the center of the antenna and the point where the feeder is attached, is equal to 14% of the total length of the antenna flat top. With this type of antenna, the feeder should be run at right-angles to the flat-top for a distance of at least 30% of the length of the antenna. In Figure 2C, we have the two-wire feed matched impedance antenna, using a 600 ohm transmission line. The dimensions are:

$$A = \frac{492,000}{F} \times K_1$$

$$B = \frac{147,600}{F}$$

and $C = 75 \times D$. K_1=.25 for frequencies below 3,000 kc., .24 from 3,000 to



Details of the Marconi and Hertzian type antennas showing the voltage and current distribution.

28,000 kc. and .23 for all frequencies above 28,000 kc., and D is the diameter of the wire. In other words, the spacing between the two feeders should be equal to 75 times the diameter of the wire. This antenna should also have its feeder system running at right angle to the flat top for a considerable distance. Tests have proven that when a half-wave antenna is split in the center (Fig. 2D) it represents an impedance of 70 ohms at this point. Recently, various cables have been introduced on the market having a characteristic impedance of 70 ohms. This type of cable can be connected directly to the center of a half-wave antenna.

In Figure 2E, we have the very popular *half-wave Zepp* antenna which is voltage fed by a pair of "folded-up" feeders. The length of the feeder systems, in this case, is quite important because they form part of the antenna, although they do not radiate because the fields about the two wires cancel, being 180 degrees out of phase. In Figure 2F, we have the half-wave antenna *current-fed* (meaning the antenna is fed at a point of maximum current) in the center with a coil and two tuning condensers used for tuning the antenna to exact resonance with the transmitter frequency. The disadvantage of this type antenna, of course, is that the *radiating* portion of the antenna is usually brought directly into the transmitter room.

In Figure 2G, we have the half-wave antenna with a tuned feeder system connected to its center. This is also a *current-fed* antenna system when the total flat top length is equal to one-half wavelength. The feeders of this system will have approximately the same dimensions as those for the Zeppelin antenna, i. e., they can be 1/4, 3/4, 5/4, etc., any odd number of quarter waves in length. All of these half-wave Hertzian antennas are quite directional in directions at right angles with the plane of the antenna; in other words, should an antenna point north and south, it would be directional east and west.

Aerial Constructional Details

The most important elements of any antenna systems are its height and insulation. The Hertzian antennas, regardless of the type or how it is energized, should be as high as possible. The average height above ground for best results should be at least 1/4 wavelength. Insulation, wherever used, should be glass or preferably glazed, porcelain or isolantite, and the insulation at the ends of the antenna should be from 8 to 12 inches. In draping the feeders about the "shack," all sharp bends should be avoided. Wherever a bend is necessary, it should be well rounded out rather than making a sharp angle. Another important part of an antenna system is the method of coupling to the transmitter. In Figure 3A, we have the usual connections for the two wire-matched impedance antenna. In Figure 3B, we have the *single-wire* antenna connected to a single-ended power amplifier. Both of these antennas should be connected through condensers in order to keep D. C. plate voltages out of the antenna system. In Figure 3C, we have the well-known *impedance-matching* network, wherein two variable condensers and two coils are used for tuning and matching a two-wire feed system to the transmitter with a tuning device of this type, and the

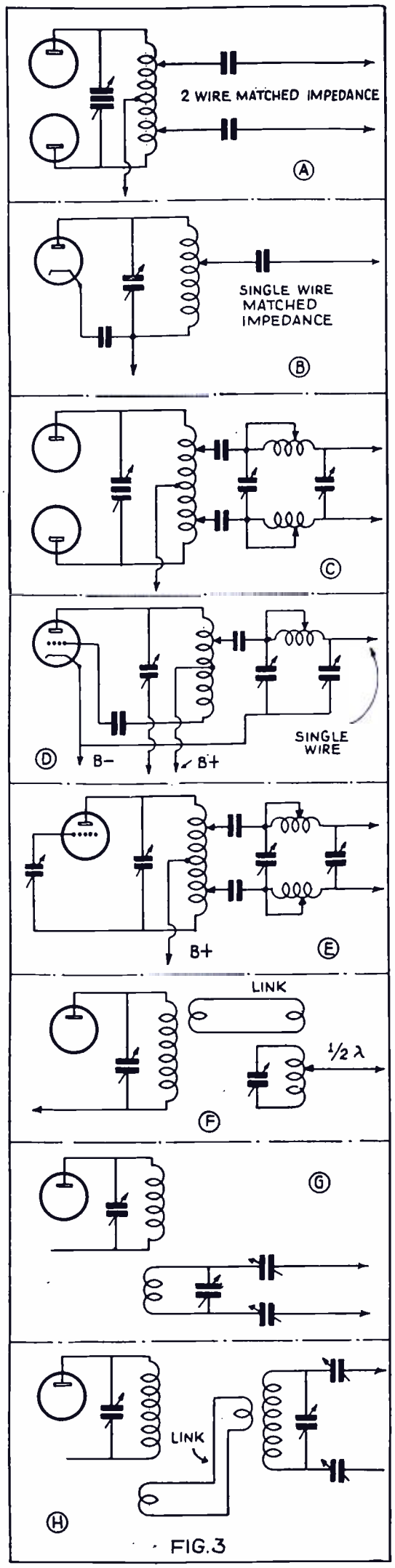


FIG. 3

Methods of tuning and coupling antennas to the final amplifier of your transmitter; also "impedance-matching" networks which provide a great increase in the efficiency of the antenna system.

correct impedance match which it provides between the antenna feeders and the amplifier have proven to be very efficient, and many times increase the effective radiated power of the transmitter a goodly percentage.

In Figure 3D, we have the same type of antenna-matching device except that only a single coil is used. This is for coupling a single feed system or a single wire of any convenient length to a single-ended amplifier. The two-wire feeder system can be coupled to the single-ended amplifier merely by making both ends of the tank coil *hot*. This is done by feeding the B plus or the low R.F. potential portion to the center of the coil. This is clearly illustrated in Figure 3E. Many amateurs have reported excellent results with a well-known German antenna wherein a separate tuned circuit is used to couple the antenna to the transmitter. In Figure 3F, we show the Fuchs antenna link-coupled to the plate coil of the amplifier. With this type of antenna a very loose coupling is needed, otherwise it would be almost impossible to get the antenna into resonance with the transmitter frequency. In Figure 3G, we have the usual inductive coupling where the antenna coil is coupled to the low, potential end of the plate coil and the transmitter. Coupling is varied

Our next lesson No. 8, will explain various types of "Modulators" and the correct type of modulator for a given R.F. amplifier. The choice of modulator and speech amplifier tubes is an important one and no Ham should miss reading the eighth lesson.

by changing the distance between the two coils. This type of feeder system may also be link-coupled to the amplifier, as shown in Figure 3H.

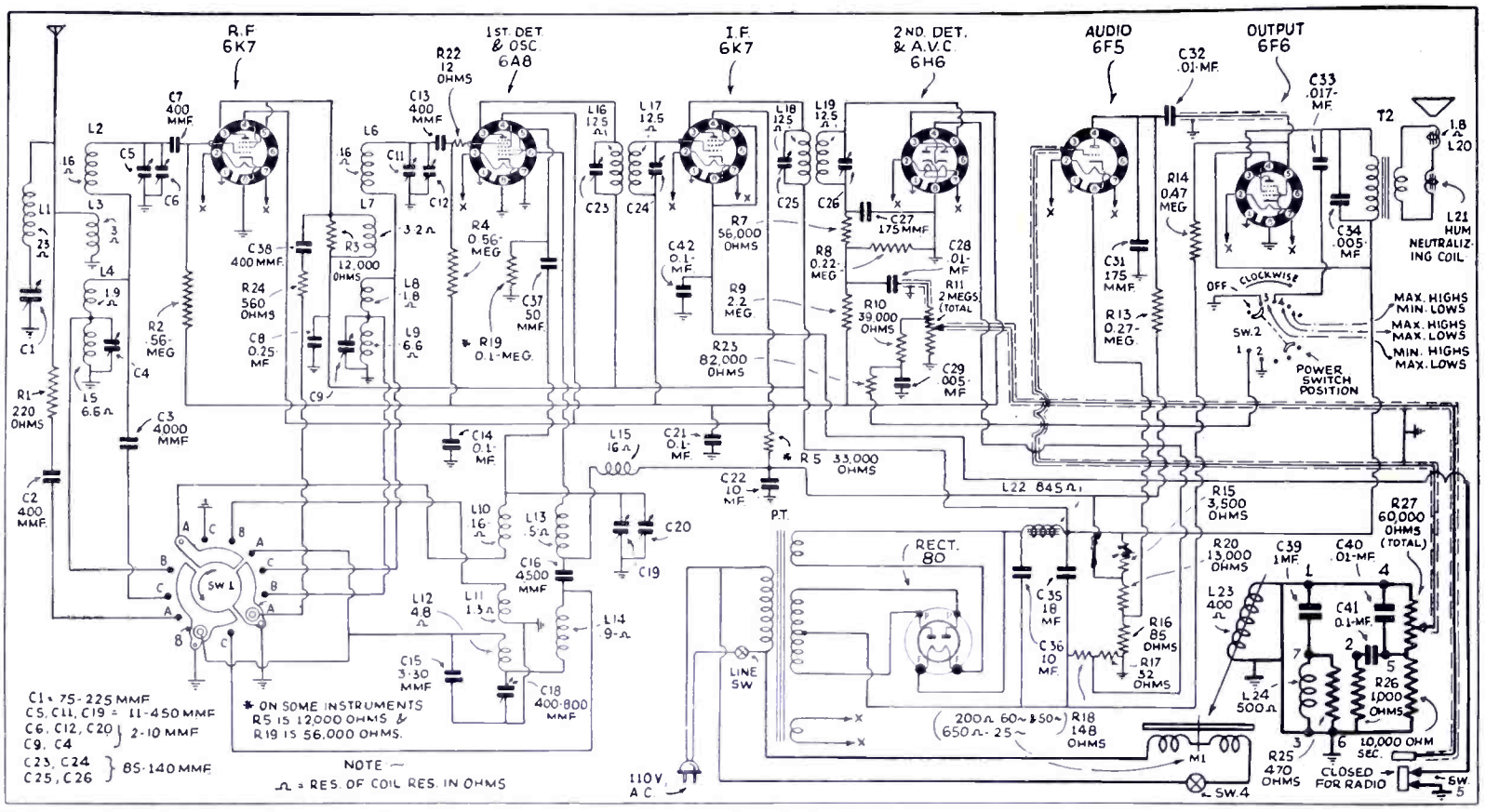
All types of tuned coupling, except impedance-matching networks, should be tuned to exact resonance and the coupling made loose rather than close coupling with a detuned antenna. This takes in the usual systems used with the Zepp and doublet type antennas, which are tuned with a coil and condenser combination.

The plate circuit of the amplifier should also be reset to resonance after each antenna adjustment, except where the matching network is used.

(In Lesson 2 we stated that the current always flows in a direction **opposite** *to the electron flow. The current referred to is, of course, current as taught for a great number of years, flowing from positive to negative. The electron, as proven in recent years drifts from negative to positive. The effect of this electron drift is in reality the* **only** *flow, and the current mentioned for the benefit of those who are accustomed to thinking in the terms of current flow (from positive to negative) is entirely hypothetical.—Editor)*

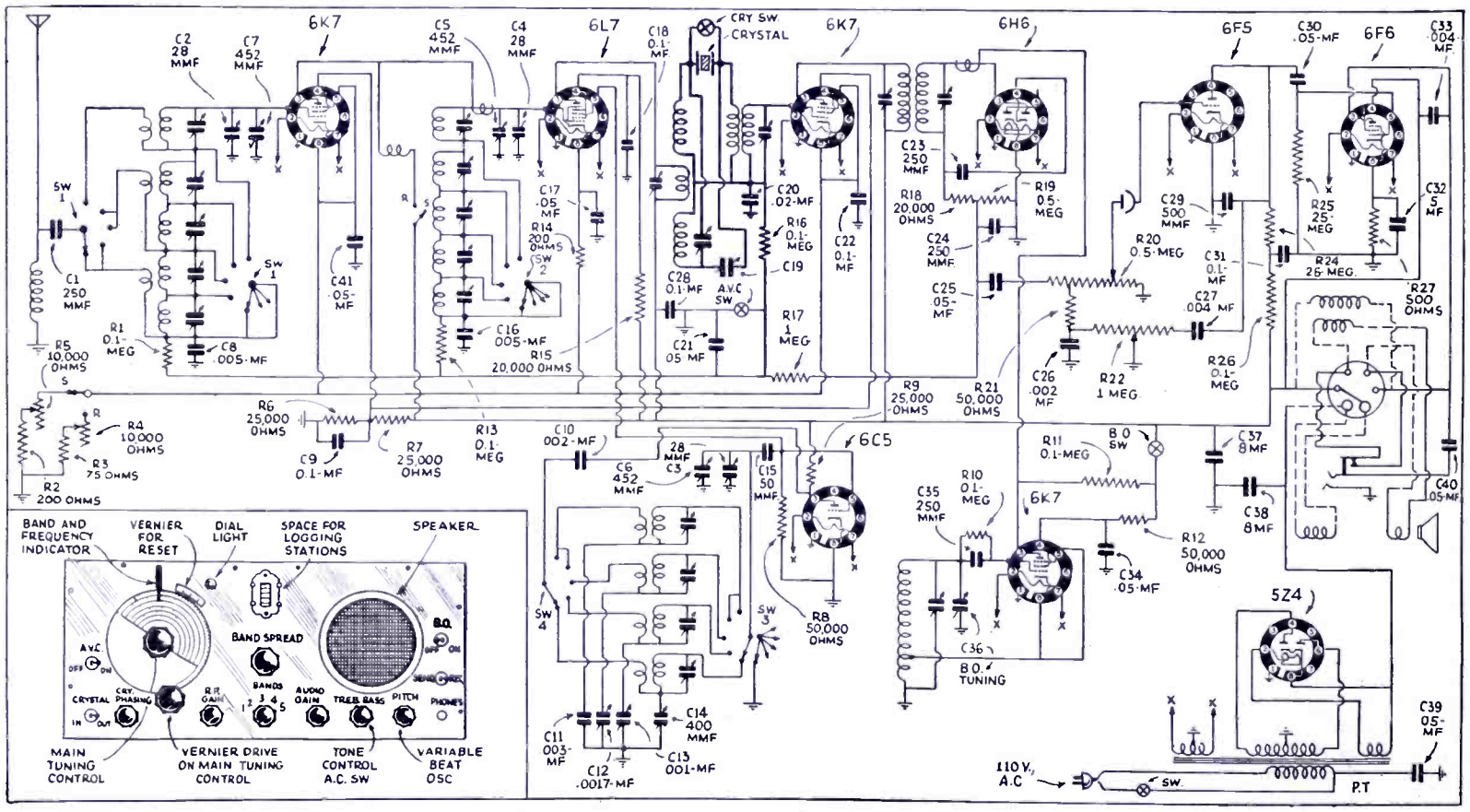
Diagrams of S-W Commercial Receivers

R.C.A. Victor, Model D7-7. 7-Tube, 3-Band, A.C. Radio-Phonograph



This receiver has a switch providing three frequency ranges, viz., 540-1625 kc.; 1625-5700 kc.; 5700-18,000 kc. (total range 16.6 to 555 meters). I. F. frequency 460 kc. The electric phonograph pickup is interesting, the pickup itself being of the high-impedance magnetic type, the impedance of which is 1400 ohms at 1000 cycles. Other features—Junior "Magic Brain," Super-het operation, etc. Metal tubes are used for amplifying and detecting purposes. Set is supplied for operation on 105-125 V. A.C. Circuits, also 150 and 220 V. A.C., and for frequencies of 25, 50 or 60 cycles.

New 1936, Model S-9, Super Skyrider, 5-Band Receiver



This 9-tube receiver has a switch which enables the operator to tune in instantly on any one of five bands, covering from 545 to 48,000 kc. (6.24 to 555 meters). This receiver uses 9 metal tubes; the use of the 6L7 as a special injector tube provides very smooth operation of the receiver. Note the crystal, which provides "single-signal" reception for CW code. The set is designed for 110 volt 60 cycle A.C. circuit.

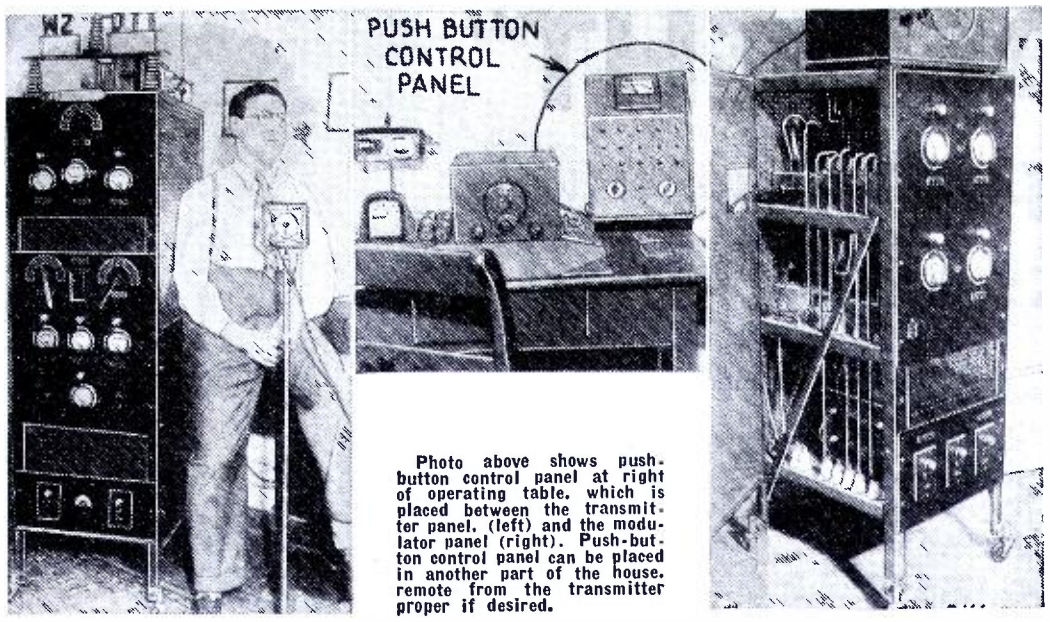


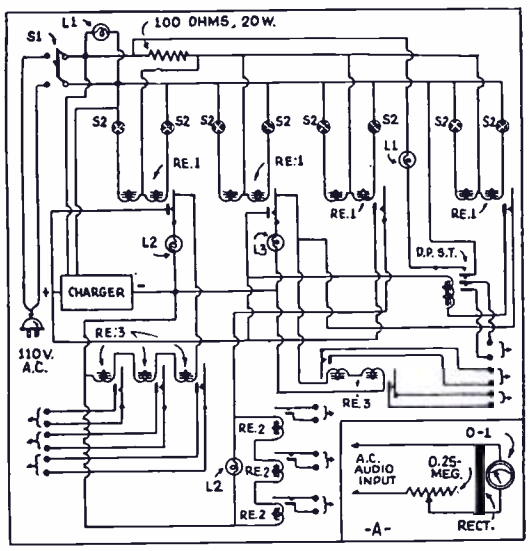
Photo above shows push-button control panel at right of operating table, which is placed between the transmitter panel, (left) and the modulator panel (right). Push-button control panel can be placed in another part of the house, remote from the transmitter proper if desired.

Commercial radio transmitters practically all use some form of push-button control panel, combined with a "gain" meter, so that the transmitter can be controlled from a desk or table placed in a separate room if desired. The push-button control panel described by Mr. Abrams can be built at a nominal cost, and will bring your transmitting station up-to-date.

Photos at left show the appearance of Mr. Abrams' very neatly constructed amateur transmitting and receiving station, located in the heart of New York City, and operated under the call letters W2DTT. The idea here described by Mr. Abrams can, of course, be changed or amplified in many different ways, to suit the exact requirements of any Ham.

Push-Button Controlled Transmitter

By Alvin Abrams, W2DTT



Wiring diagram for the push-button controlled transmitter as here described by Mr. Abrams.

● WHEN an amateur station has some ten or twelve circuits to be controlled, it is well to plan some electrical switching arrangement that will automatically throw in or out several circuits at one time. A switchboard was designed with this in mind, modelled somewhat after *broadcast* station installations.

If you want to turn on the transmitter it is only necessary to push a button, release it for the receiving position, push another button, release it and the transmitter is in operation.

The heart of the control board is in the use of 5 relays of the mechanical-holding type. They are obtainable for a modest price.

Another desirable feature incorporated in the control board is the use of a rectifier type milliammeter, to indicate the correct voice intensity when using radio-telephony.

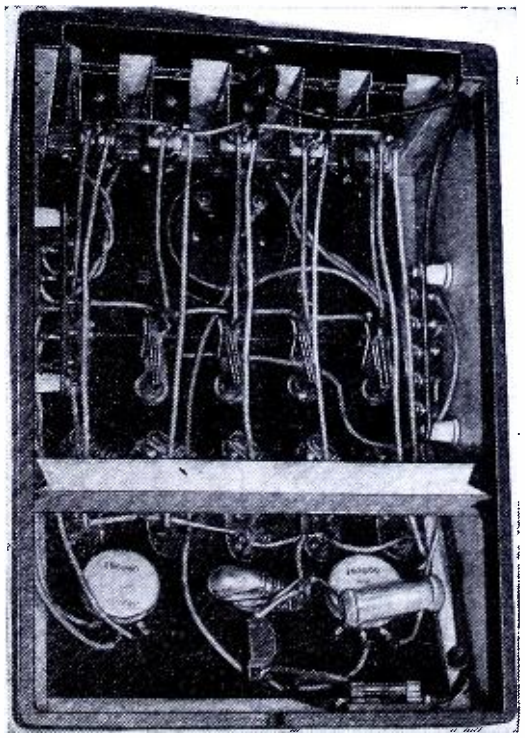
Construction

The relays are designed to operate on 10 to 15 volts A. C. or D. C. and either a step-down transformer or a 100-ohm, 20 watt resistor in series with the 110 volt line may be used. The latter method was selected because of its lighter weight and smaller size.

For our particular purpose a tube checker case is employed, measuring 9¼ inches wide, 13¾ inches long, and 6 inches deep. It was selected because of the sloping front; however any other size that approximates these dimensions can be used.

The switches are arranged so that the "on" buttons are located at the top, and the "off" buttons at the bottom. A green pilot light indicator is used to indicate the condition of each circuit. At the bottom of the panel, in the center, a double-pole, single-throw "lock" switch is used and when this is open the relays will not function.

A candelabra pilot light bulb is conveniently located above the lock and tells at a glance if the lock is closed or open.



Bottom view of the push-button control panel showing neat arrangement of wiring and relays.

Closeup of the push-button control panel and "gain" meter (speech level indicator).

There are 5 pairs of buttons on the panel, one set being used for Receiving Code, one for Transmitting Code, one for Receiving Phone, and one for Transmitting Phone (turning on the modulator, etc.) One set is not used, but is placed on the panel for future use.

The *level indicator* (meter) uses a full-wave metallic rectifier and a 250,000 ohm rheostat in series with the A. C. input side. This resistor controls the sensitivity of the meter, and is located on the left-hand side of the panel. The "gain control" is located on the right hand side. This potentiometer governs the output of the modulator and should not be confused with the sensitivity control, which only affects the meter. The D. C. relays are energized by a Tungar charger; a 6 volt storage battery may be substituted.

Operation

The *meter* should be adjusted by varying the sensitivity control so that the needle kicks up well past the half way mark. The *gain control* should be adjusted so that the proper percentage of modulation is obtained. Several re-

(*Continued on page* 692)

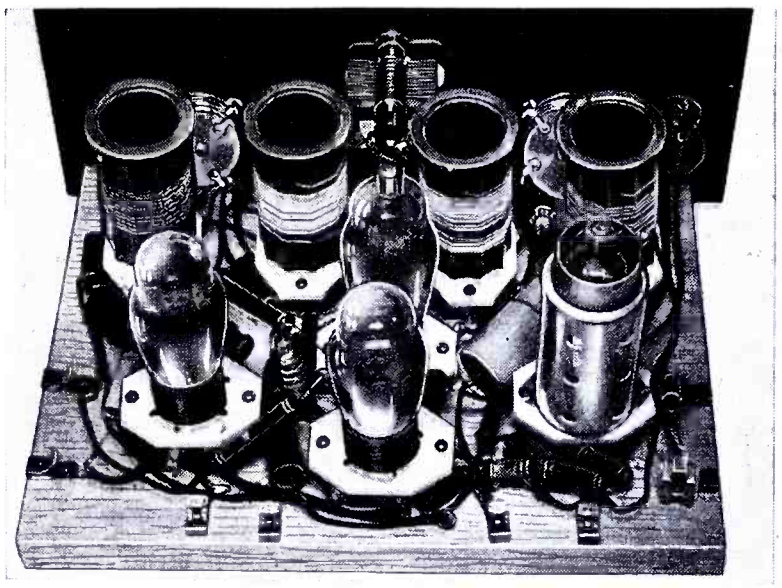
"FAN'S DELIGHT" Receiver—Flip of a Switch Selects the Band!

By Ernest Kahlert

Here's a short-wave receiver employing plug-in coils, but with a switch for each coil, thus enabling the operator to jump from one band to another without removing a coil. It is designed to work with either power-supply or a storage battery and B batteries.

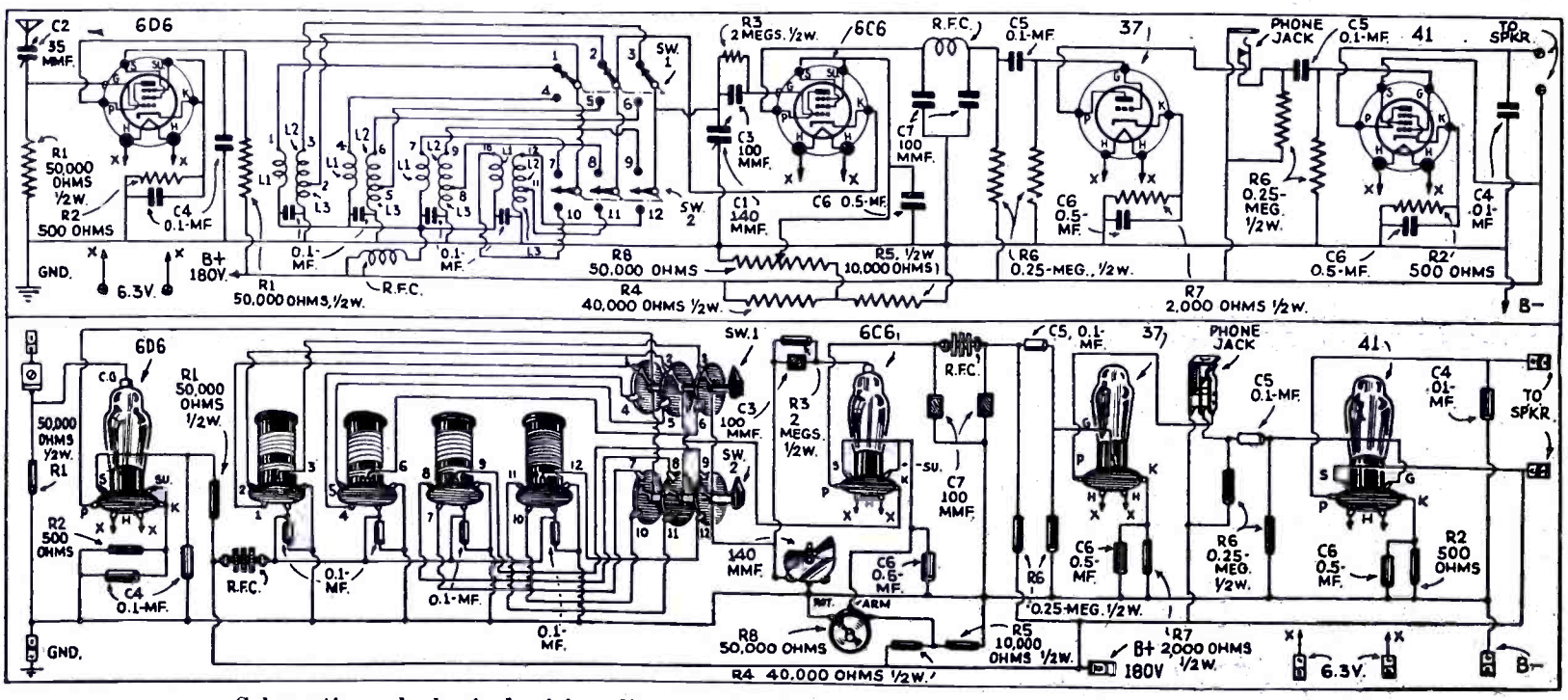
"All set" to tune in those foreign stations with the new "Fan's Delight" receiver.

● SWITCH-COIL type receivers have become increasingly popular these past few months. This popularity is well deserved as there is nothing like a smooth-operating, low-loss "switch-coil" job, for as the cigarette advs. say—"accent on enjoyment." This four-tube receiver is one of those that "fill the bill" in fine shape for the S-W "Fan." The most important items in the set are the coil switches. If these are of high capacity between contacts the set will not work satisfactorily. The switches used in this case are of the three-pole, double-throw type having three positions, the center position being *off*. These have been operated on with tin-snips; the switches were taken apart and every bit of excess metal removed to reduce the capacity between parts. The width of the contacts was pared in half and the piece containing the extra hole was cut off. The contacts are then held on to the switch with one screw. This might seem to make a flimsy switch but if the operation is carefully done, there will be little trouble encountered in this respect. The soldering lugs on the switch are also cut in half. If one does not wish to go to this trouble one can use two rotary switches with the requisite number of contacts similar to the switch in the "Switch Coil 2." It is absolutely necessary to use *low-capacity* switches, the home-made ones shown or else rotary switches will be OK. The coils themselves are wound on Hammarlund XP-53 coil forms. The length of the coils are slightly greater than the diameter due to the spaced windings. This shape, as laboratory tests have shown, results in greatest coil gain. The coil gain also increases as the size of the coils increase. For this reason it is always best to use as large coils as the mechanical design of the set will permit. A disadvantage of switch coil tuning units is that usually extra small coils have to be used; in this receiver that is overcome. The tuning condenser is a 140 mmf. Hammarlund midget and in conjunction with the four coils covers from 15 to 200 meters.



Rear view of the 4-band "Fan" receiver.

The four tubes used are *a* 6D6, (*Continued on page* 678)

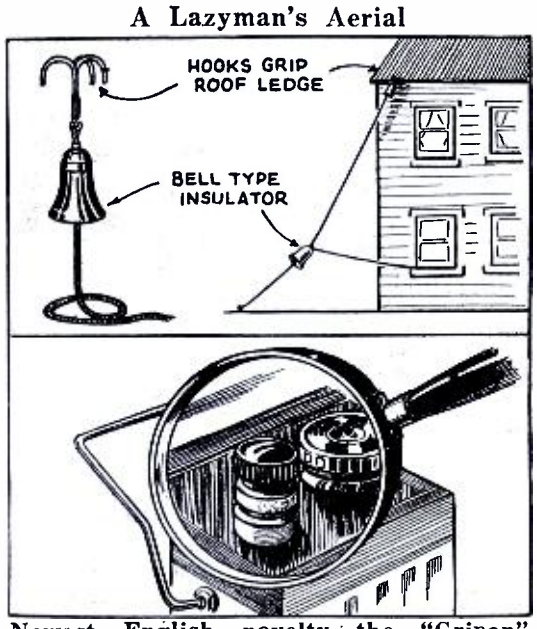


Schematic and physical wiring diagrams for both experienced and inexperienced S-W Fans.

WORLD-WIDE SHORT-WAVE REVIEW

—Edited By C. W. PALMER

A Lazyman's Aerial



Newest English novelty—the "Gripon" aerial; also the "self-greasing" non-corroding storage battery terminal.

● HERE'S the aerial for you fellows who do not appreciate the task of setting up that 150 ft. (hi) pole in the back yard these frosty mornings.

All you have to do is take the end firmly in hand—give a mighty heave (heave ho my lads!) and hope (?) that it will catch in the eaves or some other substantial obstruction on the roof!

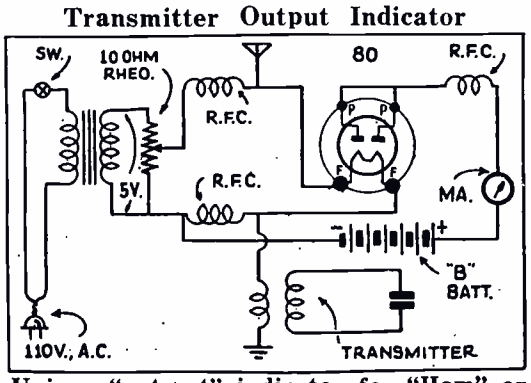
Oh well—the chances of hitting a passing pedestrian if it doesn't catch are pretty slim anyway—so here goes!

But in all seriousness, this is a new type of aerial support which will actually hold without the necessity of driving lag bolts or 10 penny nails. It was shown in a recent issue of *Amateur Wireless* (London).

And just in case you still use batteries for either the receiver or transmitter, here is another example of English ingenuity—a "self-coating-with-grease" battery terminal. Just think, there is no need, now, to have corroded battery terminals—all you need is to have your battery equipped with these "grease-cup" terminals (mail it post-paid the Chadwell Heath, Essex, England and if you are an optimist, you may expect to get it back fitted with these new self-lubricating binding posts) and you will never have to spend another evening scraping the corrosion from the battery terminals. And for an extra three-pence, the advertiser will include hot and cold running water and a good rest to you sir!

But enough of this humor (?)—anyone who uses storage batteries will appreciate the usefulness of this terminal which resists corrosion. Its too bad they are not made in this country—ye Editor might even buy one!

Transmitter Output Indicator



Unique "out-put" indicator for "Ham" or other transmitters.

● The Editors have endeavored to review the more important foreign magazines covering short-wave developments, for the benefit of the thousands of readers of this magazine who do not have the opportunity of seeing these magazines first-hand. The circuits shown are for the most part self-explanatory to the radio student, and wherever possible the constants or values of various condensers, coils, etc., are given. Please do not write to us asking for further data, picture-diagrams or lists of parts for these foreign circuits, as we do not have any further specific information other than that given. If the reader will remember that wherever a tuned circuit is shown, for instance, he may use any short-wave coil and the appropriate corresponding tuning condenser, data for which are given dozens of times in each issue of this magazine, he will have no difficulty in reconstructing these foreign circuits to try them out.

A Monitor and Frequency Meter

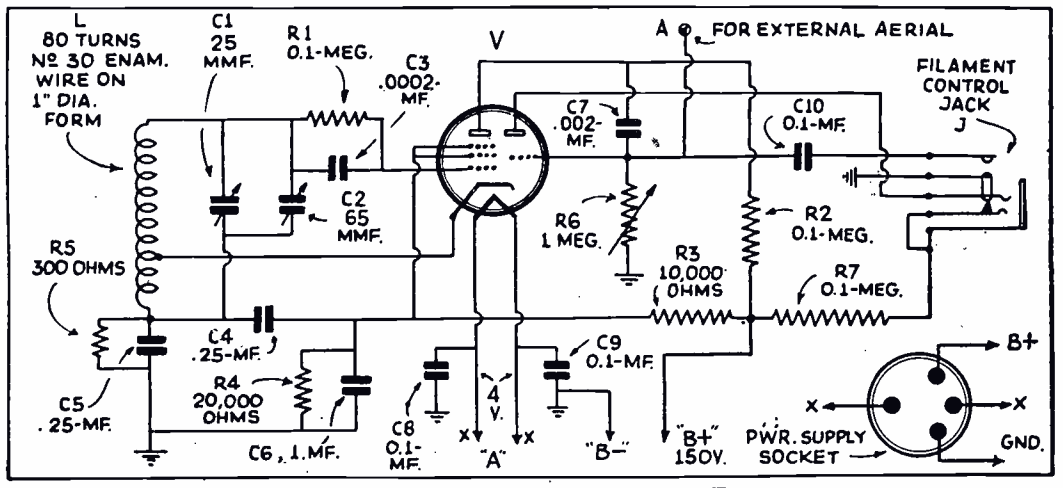
● ONE of the most useful units in the amateur station is a station monitor. And if the unit is also a frequency meter, its usefulness is even greater.

The latest issue of the *T. & R. Bulletin* (London) contained just such an instrument which has been used for some time in station G2WD—an English amateur. A tube of the 6F7 type (though of English make) is used in an electron-coupled circuit, shown in the sketch here. The screen-grid and suppressor grid are tied together to increasing the shielding effect.

The pentode section is used as the oscillator, while the triode section is resistance coupled to the oscillator and acts as a detector for monitoring purposes.

The oscillatory circuit is so designed that its fundamental frequency is well within the 3.5 mc. amateur band with an overlap at each end. The unit is calibrated by making a graph for the fundamental band and then multiply by 2 when working on 7 mc. or by 4 if working on 14 mc. etc. This graph is made by spotting marker stations on a piece of graph paper and filling in the spaces between these spots.

In making such an instrument, especially if it is to be used as a frequency meter must be made very rugged—and it is advisable to use batteries for plate and grid supplies even if A.C. is used for the filament. However a plate supply unit can be employed if care is used to keep the voltage supplied to the unit constant.



Hams will be interested in this Monitor and Frequency Meter.

● A UNIQUE type of antenna current instrument for the amateur transmitter was described in a recent issue of *Radio Revista* (Buenos Aires).

It operates with a rectifier tube, a source of filament current and a plate supply. The emission of electrons from the filament of a "hard" rectifier is almost directly proportional to the filament current. Thus, if a rectifier is connected as shown in the sketch, and the filament is adjusted to a predetermined temperature by noting the plate current flow with the transmitter off, and then the transmitter is turned on, the additional heating produced by the R.F. current flow will increase the current reading in the meter in the plate circuit of the rectifier. Thus, a scale or graph can be made corresponding to output current variations.

Or, if desired, the instrument can be used simply as a comparative unit, but by always starting with the same current and noting the relative increase when the transmitter is on.

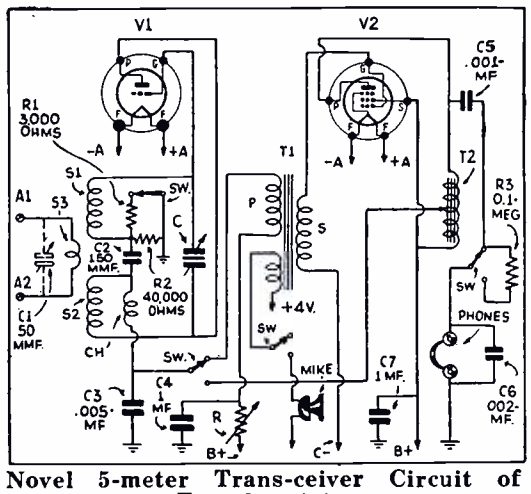
This type of indicator has advantages over the usual hot-wire and thermal instruments, in that it is instantaneous in action —not being sluggish like the former; and it is comparatively inexpensive since it needs only a type 80 or similar hard rectifier and a D.C. M.A. meter. *(OK if you can keep RF out of the power line.—Ed.)*

A French 5-Meter Transceiver

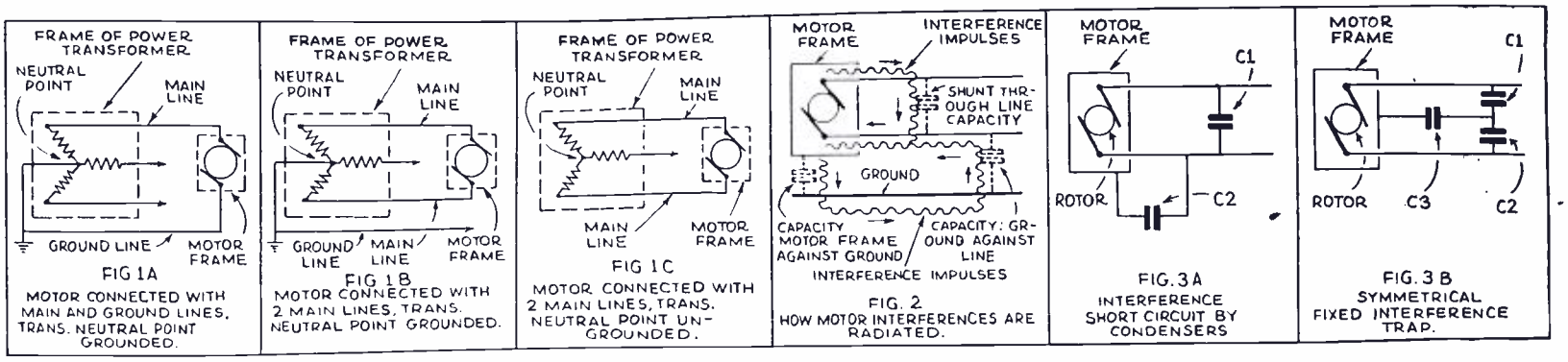
● A TYPICAL 5-meter transceiver, as used in France was published recently in *L' Antenne* (Paris). This unit was designed by F810—a French amateur—and used by several other well-known hams such as 8FI, 8FX and 8HO.

The transceiver utilizes two tubes a triode and a screen-grid type. The triode is

(Continued on page 701)



Novel 5-meter Trans-ceiver Circuit of French origin.



Above—diagrams show how to ground A.C. motor frame, so as to eliminate electrical interference sometimes caused by such motors.

Eliminating Radio Interference From A. C. Motors

By Wilhelm E. Schrage

Alternating current motors are used by the thousands for operating all sorts of household and other equipment and they are frequently the cause of very annoying electrical interference with radio reception. The author here describes a number of different cures for such interference.

● IN the first article dealing with the elimination of radio interference several hints on how to eliminate radio noise caused by D.C. apparatus were given. The following gives a description of several approved interference "extinguisher" circuits to be used in all cases where interference is caused by A.C. devices.

Strange as it may seem, there are a great many so-called "engineers" who stick to their belief that successful interference elimination in A.C. networks is mainly a question of *lucky conditions.*

A Belief Must Be Destroyed

A reasonable person will not, of course, condemn these engineers at once, but rather look for the reason why such a ridiculous opinion could be formed. The author worked for more than six months curing radio interference in one of the largest newspaper buildings in the world, and found that something was behind this belief. This "something" is the fact that very often too little attention is paid to the grounding of A.C. networks which are to be made free of radio interference. This is astonishing because no Institute of Technology diploma is necessary to understand what a grounded or an ungrounded A.C. network means and involves. It is really so simple that any amateur with little training can understand it in a few minutes.

Grounded or Ungrounded Is the Question

First, bear in mind that there are three main systems which are often used in the average networks.

To begin with, in Fig. 1a, one terminal of the interference-producing motor is directly connected with the grounded line, often referred to as the "neutral point of the three wire systems." This terminal is thus at *ground* potential. The other terminal is connected directly to one of the main lines, therefore being at full voltage or potential above ground. The second case, as shown in Fig. 1b, is also simple; both terminals of the motor being connected to the two main lines are at the full voltage above ground. The same conditions exist in the network diagram Fig. 1c, but with the difference that the neutral point of the power transformer is not grounded, and, therefore, a *grounded* line is not available. This makes the elimination of noise quite a bit more difficult.

How Interference Travels

After becoming acquainted with the usual systems, we might pay some attention to the normal A.C. motor, and the method by which such an instrument radiates interference. As shown in Fig. 2, a part of the interference travels along the lines (wires) until the line capacity is sufficient to attenuate (dissipate) it.

However, this is only one course which the radio interference takes. Another part of the interference is traveling into the ground by means of the motor-casting capacity-to-ground, then it is led back to the source by means of the line-to-ground-capacity. Experience has shown that the *ground interference* causes the most trouble, and we might easily understand why the ground question is of great importance if successful elimination of radio interference in A.C. networks is desired.

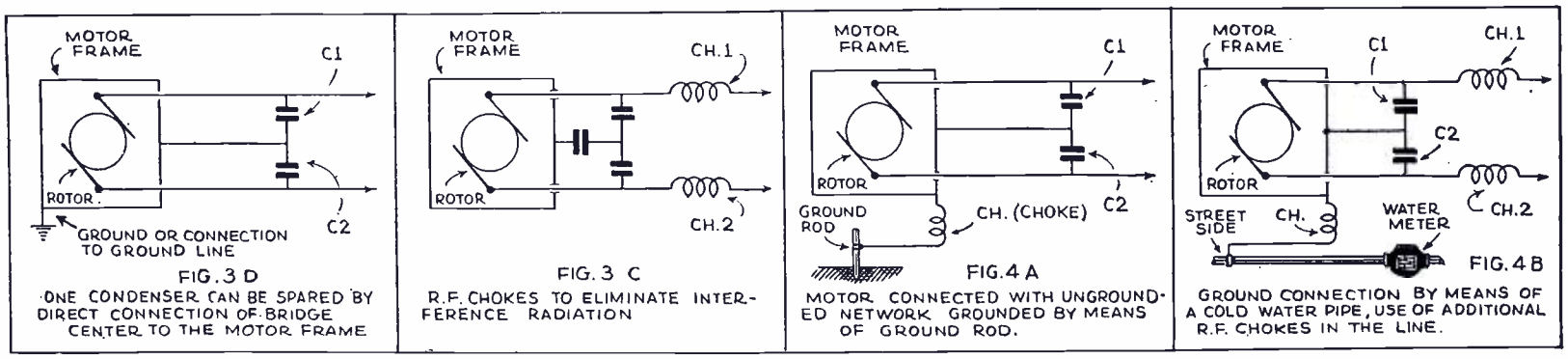
Providing Easy Ways to Avoid Interference

It is theoretically very simple to keep this interference from getting into the radio set via the line, by means of condensers, as shown in Fig. 3a; if the capacity of C1 is greater than the line capacity, condenser C2 having a much larger capacity than the motor casting-to-ground, and the ground-to-line may induce the interference impulses not to jump to earth.

Emergency Systems Have to Be Symmetrical

However, this *extinguisher* circuit

(*Continued on page* 699)



These diagrams show how to arrange a symmetrical fixed interference trap on an A.C. motor; also how to connect R.F. chokes to eliminate interference radiation.

SHORT WAVE SCOUTS . . .

TWENTY-FOURTH "TROPHY CUP"

Presented to

SHORT WAVE SCOUT

ALBERT J. YOUNG

Port of Spain, Trinidad, B. W. I.

For his contribution toward the advancement of the art of Radio

by

SHORT WAVE CRAFT

Magazine

24th TROPHY WINNER

71 Stations—All Foreign!

Each month *Short Wave Craft* awards a trophy to one of its readers for his or her efforts in pulling in a great number of foreign stations and obtaining verification cards. The twenty-fourth trophy is awarded to Mr. Albert J. Young, Port of Spain, Trinidad, B. W. I. All of the 71 stations received and verified, were located outside of Mr. Young's native country. This is an excellent total and Mr. Young is to be congratulated for his efforts.

The receiver used was a Crosley 1935 Centurion 10-tube superheterodyne, and with it was used a duplex doublet antenna of the same manufacture with a span of 80 feet. The center lead-in was 20 feet long, and the antenna had an over-all height of 30 feet. Mr. Young claims no headphones were used, nor was it necessary to seek the aid of a booster or preselector .

NORTH AMERICA

W1XK—9,570 kc.—Boston, Mass.
W8XK—21,540 kc.—Westinghouse Station, Pittsburgh, Pa.
W8XK—15,210 kc.—Westinghouse Station, Pittsburgh, Pa.
W8XK—11,870 kc.—Westinghouse Station, Pittsburgh, Pa.
W8XK—6,140 kc.—Westinghouse Station, Pittsburgh, Pa.
W3XAL—17,780 kc.—National Broadcasting Co., Bound Brook. N.J.
W3XAL—6,100 kc.—National Broadcasting Co., Bound Brook N.J.
W2XAD—15,330 kc.—International General Electric Company, Schenectady, N.Y.
W2XAF. 9,530 kc.—International General Electric Company, Schenectady, N.Y.
W3XAU—9,590 kc.—Philadelphia, Pa.
W3XAU—6060 kc.—Philadelphia, Pa.
W8XAL—6060 kc.—Crosley Radio Corp., Cincinnati, Ohio.
CJRX—11,720 kc.—Canadian Radio Commission Winnipeg, Canada.

(*Continued on page* 691)

Honorable Mention Awards

Joseph Malast, Buffalo, N.Y.
James H. French, Chicago, Ill.
W. Dixon, Baltimore, Md.

● ON this page is illustrated the handsome trophy which was designed by one of New York's leading silversmiths. It is made of metal throughout, except the base, which is made of handsome black Bakelite. The metal itself is quadruple silver-plated, in the usual manner of all trophies today.

It is a most imposing piece of work, and stands from tip to base 22½". The diameter of the base is 7¾". The diameter of the globe is 5¼". The work throughout is first-class, and no money has been spared in its execution. It will enhance any home, and will be admired by everyone who sees it.

The trophy will be awarded every month, and the winner will be announced in the following issue of SHORT WAVE CRAFT. The winner's name will be hand engraved on the trophy.

The purpose of this contest is to advance the art of radio by "logging" as many short-wave phone stations, amateurs excluded, in a period not exceeding 30 days, as possible by any one contestant. The trophy will be awarded to that SHORT WAVE SCOUT who has logged the greatest number of short-wave stations during any 30-day period.

Trophy Contest Entry Rules

● THE rules for entries in the **SHORT WAVE SCOUT Trophy Contest** have been amended and 50 per cent of your list of stations submitted must be "foreign." The trophy will be awarded to the **SHORT WAVE SCOUT** who has logged the **greatest number** of short-wave stations during any 30 day period; (he must have at least 50 per cent "foreign" stations). This period need not be for the immediate month preceding the closing date. The complete list of rules appeared in the September issue of this magazine.

In the event of a tie between two or more contestants, each logging the same number of stations (each accompanied by the required minimum of 50 per cent "foreigns") the judges will award a similar trophy to each contestant so tying. Each list of stations heard and submitted in the contest must be sworn to before a Notary Public and testify to the fact that the list of stations heard were "logged" over a given 30 day period, that reception was verified and that the contestant personally listened to the station announcements as given in the list.

Only commercial "phone" stations should be entered in your list, no "amateur transmitters" or "commercial code" stations. This contest will close every month on the first day of the month, by which time all entries must be in the editors' hands in New York City. Entries received after this date will be held over for the next month's contest. The next contest will close in New York City February 29.

The winner each month will be the person sending in the greatest number of **verifications. Unverified** stations should **not** be sent in, as they will not count in the selection of the winner. At least 50 percent of the verifications sent in by each listener must be for stations located **outside** of the country in which he resides! In other words, if the contestant lives in the United States at least 50 percent of his "veries" must be from stations **outside** of the United States. Letters or cards which do not specifically verify reception, such as those sent by the Daventry stations and, also by commercial telephone stations, will not be accepted as verifications. **Only letters or cards which "specifically" verify reception of a "given station," on a given wave length and on a given day,** will be accepted! In other words it is **useless** to send in cards from commercial telephone stations or the Daventry stations, which state that **specific** verifications will **not** be given. Therefore do not put such stations on your list for entry in the trophy contest!

SHORT WAVE SCOUTS are allowed the use of any receiving set, from a one-tuber up to one of sixteen tubes or upwards, if they so desire.

When sending in entries, note the following few simple instructions: Type your list, or write in ink, **pencilled matter is not allowed.** Send verification cards, letters and the list all in one package, either by mail or by express prepaid; **do not split up the package.** Verification cards and letters will be returned, at the end of the contest, to their owners; the expense to be borne by **SHORT WAVE CRAFT** magazine.

In order to have uniformity of the entries, when writing or typing your list, observe the following routine: USE A SINGLE LINE FOR EACH STATION; type or write the entries IN THE FOLLOWING ORDER: Station call letters; frequency station transmits at; schedule of transmission, if known (all time should be reduced to Eastern Standard which is five hours behind Greenwich Meridian Time); name of station, city, country; identification signal if any. Sign your name at the bottom of the list and **furthermore state the type of set used by you to receive these stations.**

WHAT'S NEW In Short-Wave Apparatus

The short-wave apparatus here shown has been carefully selected for description by the editors after a rigid investigation of its merits

The new HRO Jr. promises to become very popular with our "Ham" friends—it may also be used for general short-wave reception by "Fans."

The HRO Junior

By Arthur H. Lynch

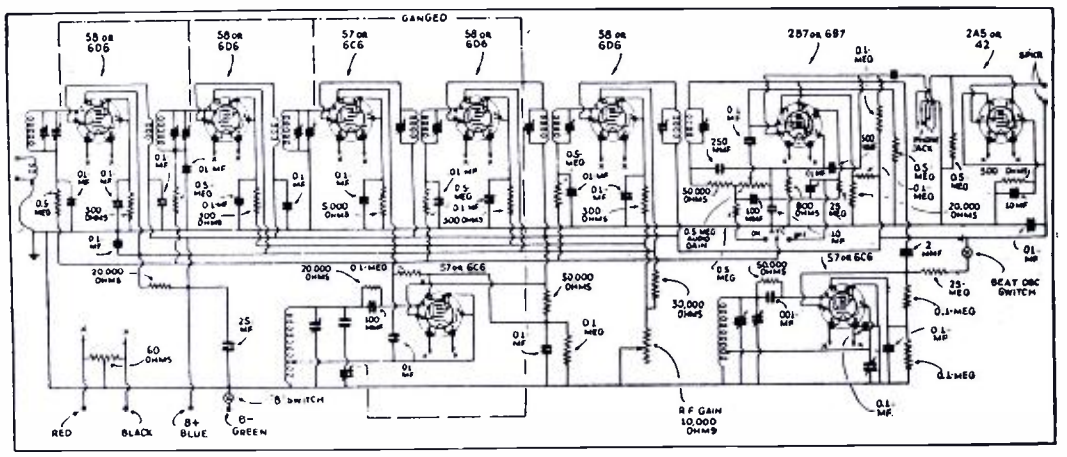
● A NEW receiver which will have more than an ordinary appeal for amateur operators and short-wave broadcast listeners alike has just been announced. This receiver incorporates the same circuit and the same number of tubes as the now famous HRO Communications type receiver. Some of the features found in the HRO have been eliminated in this new receiver because they are not necessary for certain types of reception and their elimination has resulted in a very material reduction in the price.

The new receiver is provided with *continuous band-spread* and the spreading of stations on the dial is greater than is possible with the FB7A and FBXA receivers when band-spread coils are employed.

Ideal for Amateur Operators

The receiver will be supplied with one coil assembly, covering all the frequencies in the 10 and 20 meter amateur bands, as well as all the frequencies between. This assembly is made as a part of the unit for the reason that it is necessary to match these coils to the receiver at the factory and they will, therefore, not be interchangeable. Coil assemblies for the other bands, however, do not require this factory matching and may be picked up from regular stock, at any time and they are interchangeable.

A distinct advantage of this arrangement is found in the fact that the original coil assembly and one other coil assembly will permit the amateur radio phone operator to cover all of the bands in which he is interested, by the use of two coil assemblies and it will permit the operator who is interested in CW to take care of his requirements with the original coil assembly and one other. For the phone operator, the assembly provided with the receiver will cover, in addition to interfering frequencies, the 10 and the *(Continued on page 693)*



Wiring diagram of the new HRO Jr. superhet receiver. (No. 516)

The Cosman Four Has Band-Switch

By Herman Cosman

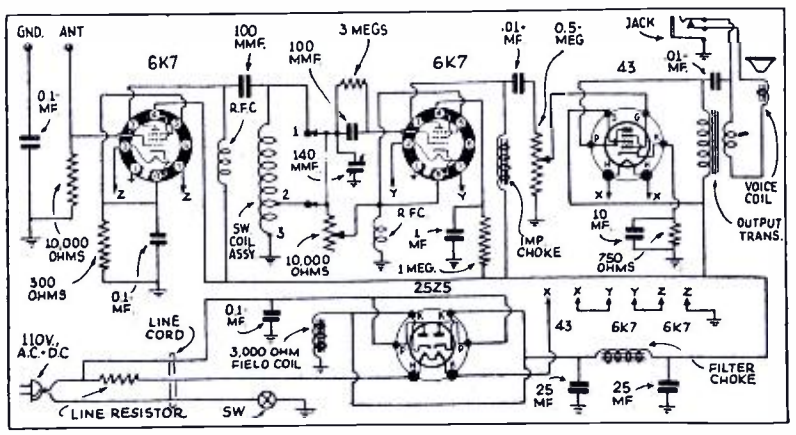
● REGENERATIVE receivers have always been popular with short-wave enthusiasts because of their efficient operation and ease of construction. This receiver will operate on either A.C. or D.C. efficiently. All equipment necessary to build this model is of standard design and can be purchased from almost any radio outlet.

Two of the new type 6K7 metal tubes are used to provide greater "gain." One is employed in the R.F. stage and feeds into the second electron-coupled regenerative detector. A 43 type power pentode tube is used in the output stage, with a 25Z5 acting as a rectifier. The power supply circuit consists of two 25 mf. (200 D.C. working volts) electrolytic condensers, and a 23 henry filter choke. An additional .1 mf. condenser is connected across the line to eliminate modulation hum.

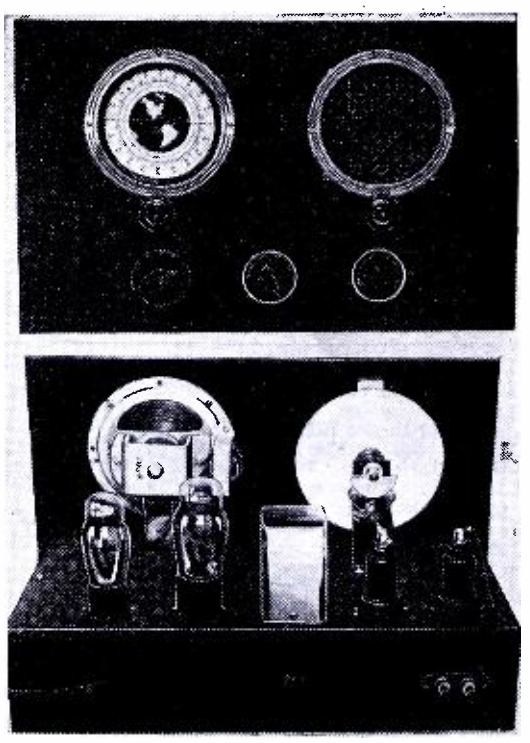
The simple *continuous band-spread* arrangement used will aid in tuning in the congested amateur bands. For this purpose there is employed a 25 mmf. variable condenser in parallel with the 140 mmf. main tuning condenser.

Examining the circuit still further will disclose the fact that a phone jack has been inserted to provide headphone reception. A standard five-band switch coil assembly is used to cover the bands from 15 to 550 meters. It must be

(Continued on page 703)



Here's the hookup at the left for the Cosman-4, suitable for general short-wave reception.



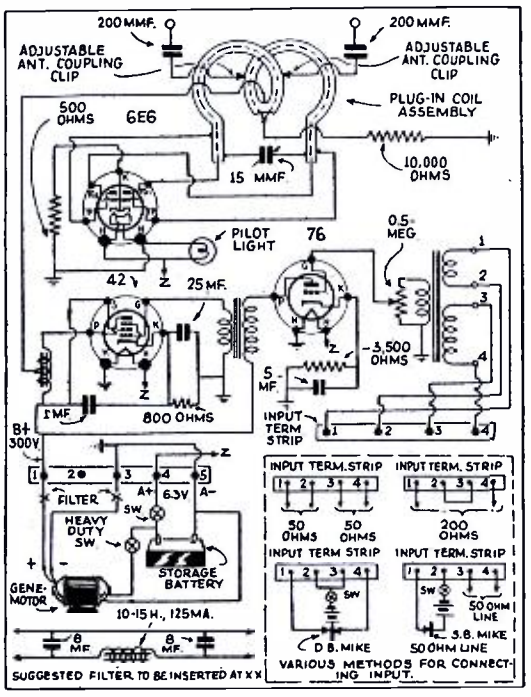
Photos above show front and rear views of the Cosman-4. This set has a switch to change the bands. (No. 517)

Names and addresses of manufacturers of apparatus described on this and following pages furnished upon receipt of 3-cent stamp; mention No. of article.

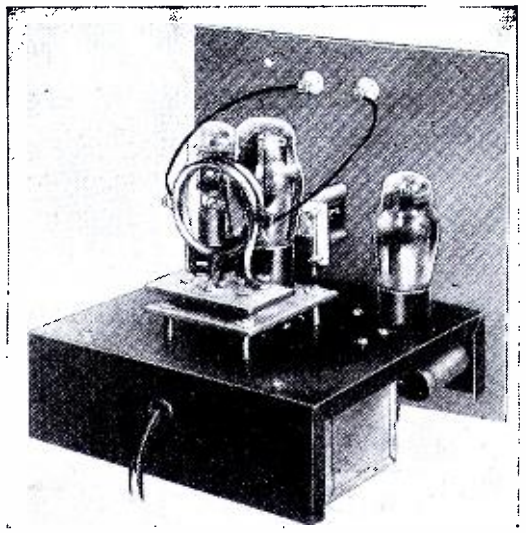
Outside view of the new Lafayette 5-Meter Mobile Transmitter. (No. 518)

A NEW 5-Meter Transmitter

By Frank Lester, W2AMJ



The hookup of the parts used on the 5-Meter Mobile Transmitter is very simple to follow as the above diagram shows—and it sure does "step out and go places."



Here we have a chance to note the very neat appearance and good design of the 5-Meter Transmitter.

● THIS new 5-meter transmitter is a highly efficient "mobile" five-meter phone transmitter that was developed to cover a definite amateur requirement—a portable transmitter—and yet have maximum flexibility as regards usage. However, in working towards this end, several new and desirable features were incorporated.

Designed for Fixed or Mobile Stations

After recognizing the demand for this type of transmitter our problem became one of designing a unit which could be operated in an automobile on the move, or at a fixed station having either commercial current or a storage battery. This was accomplished by employing a dynamotor converter operating from a six-volt storage battery to furnish the 300 volts at 100 milliamperes, necessary for the high voltage. Filament supply is obtained from the same storage battery driving the motor element of the dynamotor.

With 100-volt, 60-cycle alternating current available, a power supply is substituted for the dynamotor unit. Like the latter unit this supply should be capable of furnishing approximately 300 volts at the specified current drain, and in addition, 6.3 volts for filament supply.

An Excellent Emergency Transmitter

With the power problem handled in this manner we have a transmitter that can be operated in an automobile using the car's battery, or in a fixed station using either a storage battery or commercial current. Incidentally, being independent of commercial current, it also makes an excellent emergency transmitter. A roving station comprising this transmitter, a suitable receiver and the converter, can be installed in a car and moved from "point-to-point" for communication maintenance, *regardless of power line conditions.*

(*Continued on page* 695)

Latest Design In Superheterodynes

By Louis Pouy

● PRESENT day receiver design is a far-flung cry from that of some few years ago. Nowadays if a set does not employ the superheterodyne circuit, metal tubes, more than one reception band, automatic volume control and push-pull output—it is not considered to have the requisite fine features that tend to make up an efficient receiver. Thus, a glance at the present circuit gives an idea of the latest superheterodyne, which features all of the most desirable features that are essential for variety reception, good pick-up and high-quality reproduction.

Not only are the conventional broadcast programs (200 to 550 meters) available with this receiver, but "police" and "amateur" calls and "foreign" short-wave reception as well. The programs of three bands are always at the finger-tips of the listener, a selector switch permitting instant selection of the band desired. The tuning ranges of the three bands are: 175 to 550 meters, 55 to 175 meters and 15 to 55 meters. While CW code signals are not available with this receiver, the amateur enthusiast will find that the phone reception is plentiful, truly a delight to listen to. Remarkable sensitivity and selectivity are the factors which are responsible for this set's amazing efficiency on all three bands.

Real distance-getting and fine tuning are facilitated by the dual ratio 4-inch airplane tuning dial which is employed. Hair-splitting tuning is essential, all short-wave men will agree, on the short-waves, and this is made possible by the use of a separate knob which controls the 250-1 ratio, and which actuates a second-pointer. For ordinary broadcast a knob which allows a 25-1 ratio tuning is employed. All figures on the dial are large and clearly legible, besides actually locating the dial position of the station by frequency.

The receiver is thoroughly shielded in every sense of the word. Thus, the critical "Fan" will find that not only are metal tubes employed throughout, but each coil,

(*Continued on page* 695)

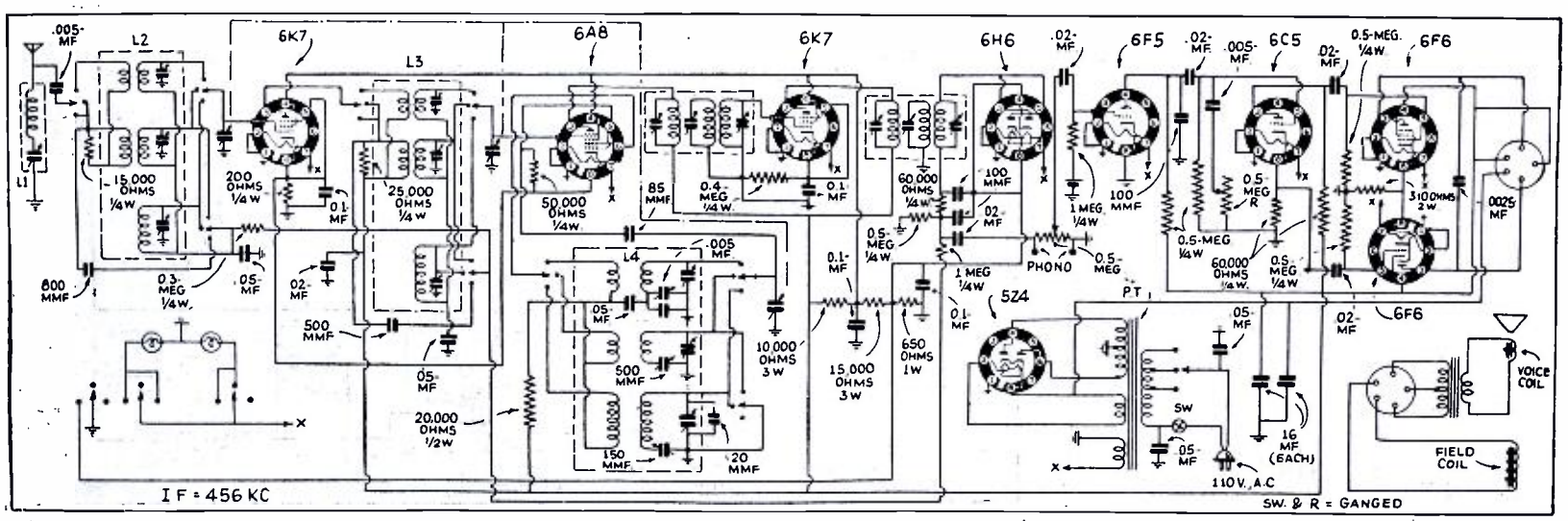
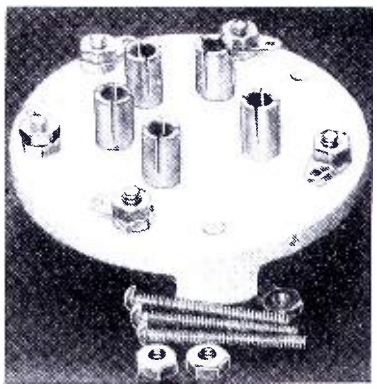


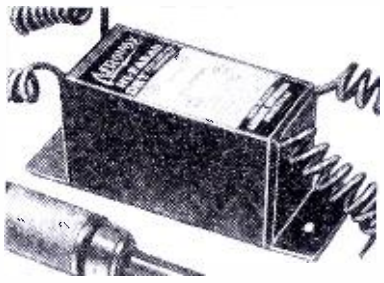
Diagram for the new Roland 9-tube superheterodyne receiver, intended for general short-wave reception, European S-W broadcasts, etc. (No. 519)

Names and addresses of manufacturers of apparatus described on this and following pages furnished upon receipt of 3-cent stamp; mention No. of article.

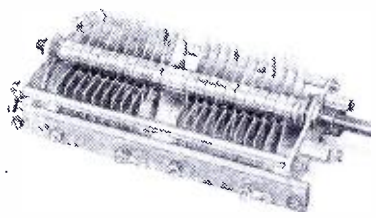
NEW APPARATUS FOR THE HAM



High Power Pentode Socket, H36.



Compact Electrolytic Condenser, H37.



Lightweight Transmitting Condenser, H38.

New Socket for Power Pentodes, H36

For the new 200 watt power pentodes, recently put on the market by the various tube manufacturers, such as the 803 and the 28, the Bud Radio Co. have designed a very efficient socket. It is constructed around a high-grade ceramic base, and has five positive-gripping, wedged-type pin sockets. All parts are nickel-plated brass and of heavy enough construction to reduce losses to a minimum.

Compact Multiple Condenser, H37

The Aerovox Corp. have recently introduced a new compact multiple type electrolytic condenser. These are made in 450 volt operating voltage rating, and 525 volt peak surge. Its relative size can be realized by comparing it with the size of the screw-driver. They are mounted in heavy cardboard containers, and designed to give long, useful service.

Transmitting Condenser H38

For those who desire lightweight and efficient split-stator transmitting condensers, this new and well-designed condenser should be extremely valuable. It has a capacity of 100 mmf. per section. The plates are all highly polished with rounded edges, assuring a very high break-down voltage. The insulation losses have been kept down to a minimum through the use of only two narrow strips of micalex which support the stators. This is well suited to high-efficiency "low C" amplifiers, especially on the higher frequencies.

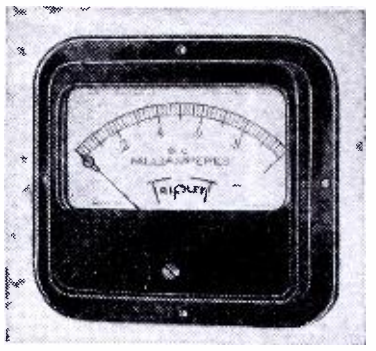
Square Panel Meter, H39

The Triplett Electrical Instrument Co., have recently introduced a new line of meters, being totally different in appearance from the usual round meter. These new so-called "square" meters, have an over-all width of 4½ inches, are 3 15/16 inches high, and designed to mount into a round hole 2¾ inches in diameter. They are made in both A.C. and D.C. models for various purposes and will lend a pleasing appearance to any piece of radio or electrical equipment wherein meters are necessary. The photograph clearly shows the general design and character of the new square meter.

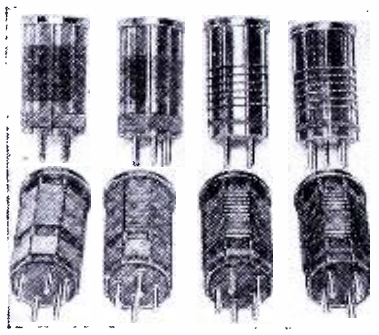
Super-het Plug-in Coils, H40

Amateurs and experimenters have long experienced difficulty in constructing coils for super-heterodyne receivers because for proper tracking, the two coils should be of different sizes. Bud Radio, Inc., are manufacturing a complete set of 8 plug-in coils, 4 for the oscillator and 4 for the first detector, covering a range of from 13 to 200 meters. They have the proper number of turns and assure a fair degree of accuracy in tracking. These coils are wound on small forms having an over-all body length of 2¼ inches, and a diameter of 1¼ inches. They are designed

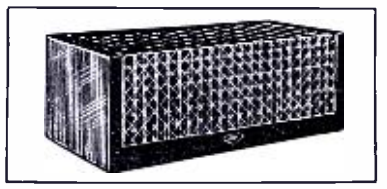
(*Continued on page* 703)



New Square Type Meters, H39.



Super-het Coil Kit, H40.



Amplifier Foundation, H41.

New 6 Metal Tube T.R.F. Receiver

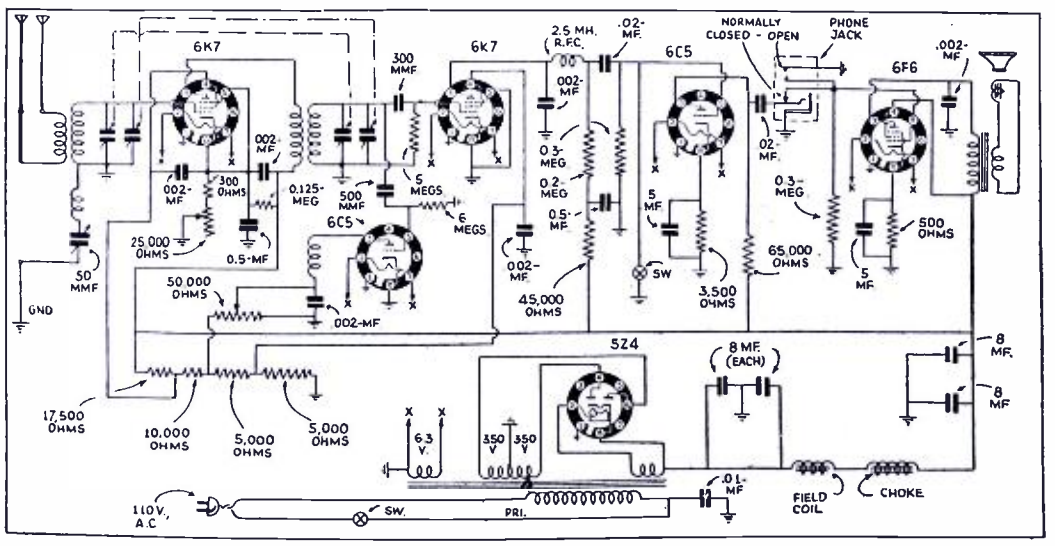
● IT IS unquestionably true that the most widely used short-wave receiving set today is of the regenerative type, employing one stage of tuned radio frequency. With the advent of the new metal tubes, it is now possible to build a tuned R.F. receiver which not only surpasses the performance of its older brethren, but provides the latest in high gain T.R.F. receivers. The new Royal "Pro 6" has a great many features not found in the average receiver of its type. First of all, it is built in a very heavy steel cabinet, measuring 8 inches high, 8¾ inches deep, and 19 inches long. Within this cabinet, and on the chassis, is mounted everything concerned with the receiver. No separate power-supply, filters, speakers or boosters are necessary. Six *legitimate* metal tubes are used; one is a 6K7 used in a "high-gain" R.F. stage, which has an inductive padder and provisions for either a "doublet" or "antenna-ground" combination. The gain control for this R.F. stage is located in the cathode lead. This stage is inductively coupled to the detector, which is also a 6K7. The 6K7 detector, however, is not of the self-regenerating type but has a *second* tube which is a 6C5 triode so connected that regeneration is brought about independently of the detector, providing *maximum stability* and *smoothness of regeneration control* not found in the average set. From this detector, we go into the first audio stage which is resistance-capacity coupled. This is also a 6C5 triode.

When the receiver is used in communication, a switch connected between the grid of this tube and ground permits the set to be shut off when "standing by" or *transmitting*. In the plate circuit of this first audio amplifier is connected a phone jack, permitting the use of earphones independently of the power amplifier. The second resistance-capacity coupled amplifier stage is a 6F6 pentode. These two stages of audio amplification, together with the high R.F. gain of the receiver, permit full loud speaker reception on even the weakest signals.

The power-supply consists of the usual transformer and a 5Z4 metal-shielded rectifier. Sufficient filtering is used to render the power supply *humless*. The receiver uses plug-in coils which can be obtained for a complete range of 9¾ to 625 meters. *Constant band-spread* is provided over the entire short-wave spectrum through the use of a separate tuning dial, permitting *band-spread* at *any* particular frequency within the range of the receiver.

This article has been prepared from data supplied by courtesy of the Harrison Radio Co.

The next issue—will be a special "Fan" number, with plenty of articles of interest to the "Ham".



Very efficient, smooth-working circuit developed for the Harrison Royal "Pro 6." (No. 520)

Names and addresses of manufacturers of apparatus on this and following pages furnished upon receipt of 3 cent stamp; mention No. of article.

CORRECTED AND REVISED Monthly

Short-Wave Stations of the World

Complete List of Broadcast, Police and Television Stations

We present herewith a revised list of the short-wave broadcasting, experimental and commercial radiophone stations of the world. This is arranged by frequency, but the wavelength figures are also given for the benefit of readers who are more accustomed to working with "meters."

All the stations in this list use telephone transmission of one kind or another and can therefore be identified by the average listener.

Herewith is also presented a very fine list of police as well as television stations. **Note: Stations marked with a star ★ are the most active and easily heard stations and transmit at fairly regular times.**

Please write to us about any new stations or other important data that you learn through announcements over the air or correspondence with the stations themselves. A post card will be sufficient. We will safely return to you any verifications that you send in to us. Communications of this kind are a big help.

Stations are classified as follows: C—Commercial phone. B—Broadcast service. X—Experimental transmissions.

Around-the-Clock Listening Guide

Although short-wave reception is notorious for its irregularity and seeming inconsistency (wherein lies its greatest appeal to the sporting listener), it is a good idea to follow a general schedule as far as wavelength in relation to the time of the day is concerned. The observance of these simple rules will save time.

From daybreak till 3 p.m. and particularly during bright daylight, listen between 13 and 19 meters (21540 to 15800 kc.).

To the east of the listener, from about 1 p.m.-8 p.m., the 25-35 meter will be found very productive. To the west of the listener this same band is generally found best from about 8 p.m. until 9 a.m. (After dark, results above 35 meters are usually much better than during daylight.) These general rules hold for any location in the Northern Hemisphere.

Short-Wave Broadcasting, Experimental and Commercial Radiophone Stations

NOTE: To convert kc. to megacycles (mc.) shift decimal point 3 places to left: Thus, read 21540 kc. as 21.540 mc.

21540 kc. W8XK
-B- 13.93 meters
WESTINGHOUSE ELECTRIC
PITTSBURGH, PA.
7-9 a.m.; relays KDKA

21520 kc. W2XE
-B- 13.94 meters
ATLANTIC BROADCASTING CORP.
485 Madison Ave., N.Y.C.
Irregular 8 a.m.-12 n.

21420 kc. WKK
-C- 14.01 meters
A. T. & T. CO.
LAWRENCEVILLE, N. J.
Calls Argentina, Brazil and Peru, daytime

21080 kc. PSA
-C- 14.23 meters
RIO DE JANEIRO, BRAZIL
Works WKK Daytime

21060 kc. WKA
-C- 14.25 meters
LAWRENCEVILLE, N. J.
Calls England
noon

21020 kc. LSN6
-C- 14.27 meters
HURLINGHAM, ARG.
Calls N. Y. C.
8 a. m.-5 p. m.

20700 kc. LSY
-C- 14.49 meters
MONTE GRANDE
ARGENTINA
Tests irregularly

20380 kc. GAA
-C- 14.72 meters
RUGBY, ENGLAND
Calls Argentina, Brazil, mornings

19900 kc. LSG
-C- 15.08 meters
MONTE GRANDE, ARGENTINA
Tests irregularly, daytime

19820 kc. WKN
-C- 15.14 meters
LAWRENCEVILLE, N. J.
Calls England, daytime

19650 kc. LSN5
-C- 15.27 meters
HURLINGHAM, ARGENTINA
Calls Europe, daytime

19600 kc. LSF
-C- 15.31 meters
MONTE GRANDE, ARGENTINA
Tests irregularly, daytime

19355 kc. FTM
-C- 15.50 meters
ST. ASSISE, FRANCE
Calls Argentine, mornings

19345 kc. PMA
-B,C- 15.51 meters
BANDOENG, JAVA
Calls Holland early a.m.
Broadcasts Tues., Thur., Sat., 10:00-10:30 a.m. Irregular

19220 kc. WKF
-C- 15.60 meters
LAWRENCEVILLE, N. J.
Calls England, daytime

19160 kc. GAP
-C- 15.66 meters
RUGBY, ENGLAND
Calls Australia, early a.m.

18970 kc. GAQ
-C- 15.81 meters
RUGBY, ENGLAND
Calls S. Africa, mornings

18830 kc. PLE
-C- 15.93 meters
BANDOENG, JAVA
Calls Holland, early a. m.

18620 kc. GAU
-C- 16.11 meters
RUGBY, ENGLAND
Calls N. Y., daytime

18345 kc. FZS
-C- 16.35 meters
SAIGON, INDO-CHINA
Phones Paris, early morning

18340 kc. WLA
-C- 16.36 meters
LAWRENCEVILLE, N. J.
Calls England, daytime

18310 kc. GAS
-C- 16.38 meters
RUGBY, ENGLAND
Calls N. Y., daytime

18270 kc. ETA
-C- 16.42 meters
CHIEF ENGINEER
P. O. Box 283, ADDIS ABABA, ETHIOPIA
Irregularly

18250 kc. FTO
-C- 16.43 meters
ST. ASSISE, FRANCE
Calls S. America, daytime

18200 kc. GAW
-C- 16.48 meters
RUGBY, ENGLAND
Calls N. Y., daytime

18135 kc. PMC
-C- 16.54 meters
BANDOENG, JAVA
Phones Holland, early a. m.

18115 kc. LSY3
-C- 16.56 meters
MONTE GRANDE, ARGENTINA
Tests irregularly

18040 kc. GAB
-C- 16.63 meters
RUGBY, ENGLAND
Calls Canada, morn. and early aftn.

17810 kc. PCV
-C- 16.84 meters
KOOTWIJK, HOLLAND
Calls Java, 6-9 a. m.

17790 kc. GSG
-B- 16.86 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
6-8:45 a.m.

17780 kc ★W3XAL
-B- 16.87 meters
NATIONAL BROAD. CO.
BOUND BROOK, N. J.
Relays WJZ, Daily exc. Sun. 9 a.m.-1 p.m.

17775 kc. PHI
-B- 16.88 meters
HUIZEN, HOLLAND
Used irregularly

17760 kc. ★W2XE
-B- 16.89 meters
ATLANTIC BROADCASTING CORP.
485 Madison Ave., N.Y.C.
Irregular 11 a.m.-1 p.m.

17760 kc. DJE
-B- 16.89 meters
BROADCASTING HOUSE
BERLIN, GERMANY
8-11:30 a.m.

17760 kc. IAC
-C- 16:89 meters
PISA, ITALY
Calls ships, 6:30-7:30 a. m.

17310 kc. W3XL
-X- 17.33 meters
NATIONAL BROAD. CO.
BOUND BROOK, N. J.
Tests Irregularly

17120 kc. WOO
-C- 17.52 meters
A. T. & T. CO.,
OCEAN GATE, N. J.
Calls ships

17080 kc. GBC
-C- 17.56 meters
RUGBY, ENGLAND
Calls Ships

16270 kc. WLK
-C- 18.44 meters
LAWRENCEVILLE, N. J.
Phones
Arg., Braz., Peru, daytime

16270 kc. WOG
-C- 18.44 meters
OCEAN GATE, N. J.
Calls England,
morning and early afternoon

16240 kc. KTO
-C- 18.47 meters
MANILLA, P. I.
Calls Cal., Tokio and ships
8-11:30 a.m.

16233 kc. FZR3
-C- 18.48 meters
SAIGON, INDO-CHINA
Calls Paris and Pacific Isles

15880 kc. FTK
-C- 18.90 meters
ST. ASSISE, FRANCE
Phones Saigon, morning

15810 kc. LSL
-C- 18.98 meters
HURLINGHAM, ARGENTINA
Calls
Brazil and Europe, daytime

15760 kc. JYT
-X- 19.04 meters
KEMIKWA-CHO, CHIBA-KEN, JAPAN
Irregular in late afternoon and early morning

15660 kc. JVE
-C- 19.16 meters
NAZAKI, JAPAN
Phones Java 3-5 a.m.

15620 kc. JVF
-C- 19.2 meters
NAZAKI, JAPAN
Phones U.S., 5 a.m. & 4 p.m.

15415 kc. KWO
-C- 19.46 meters
DIXON, CAL.
Phones Hawaii 2-7 p.m.

15370 kc. ★HAS3
-B- 19.52 meters
BUDAPEST, HUNGARY
Broadcasts Sundays, 9-10 a.m.

15355 kc. KWU
-C- 19.53 meters
DIXON, CAL.
Phones Pacific Isles and Japan

15330kc.★W2XAD
-B- 19.56 meters
GENERAL ELECTRIC CO.
SCHENECTADY, N. Y.
Relays
WGY daily, 2-3 p.m.
Sun. 10:30 a.m.-4 p.m.

15310 kc. GSP
-B- 19.6 meters
DAVENTRY
B.B.C., BROADCASTING HOUSE,
LONDON, ENGLAND
Irregular

15280 kc. DJQ
-B- 19.63 meters
BROADCASTING HOUSE
BERLIN, GERMANY
12:30-2 a.m.

15270 kc. ★W2XE
-B- 19.65 meters
ATLANTIC BROADCASTING CORP.
485 Madison Av., N.Y.C.
Relays
WABC daily, 1-6 p.m.

15260 kc. GSI
-B- 19.66 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
12:15-2:15 p.m.

15250 kc. W1XAL
-B- 19.67 meters
BOSTON, MASS.
Irregular, in morning

15245 kc. ★
-B- 19.68 meters
"RADIO COLONIAL"
PARIS, FRANCE
Service de la Radiodiffusion
98, bis, Blvd. Haussmann
6.55-11 a.m.

15220 kc. ★PCJ
-B- 19.71 meters
N.V. PHILIPS' RADIO
EINDHOVEN, HOLLAND
Sun. 8-11 a.m.
Also Tues. 3-6 a.m.,
Wed. 7-11 a.m.

15210 kc. ★W8XK
-B- 19.72 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
PITTSBURGH, PA.
9 a.m.-7 p.m.
Relays KDKA

15200 kc. ★DJB
-B- 19.74 meters
BROADCASTING HOUSE
BERLIN, GERMANY
3:45-7:15 a.m., 8-11:30 a.m.

15180 kc. GSO
-B- 19.76 meters
DAVENTRY
B.B.C., BROADCASTING HOUSE,
LONDON, ENGLAND
Irregular

15140 kc. ★GSF
-B- 19:82 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
6-8:45, 9-10:15 a.m.

15120 kc. ★HVJ
-B- 19.83 meters
VATICAN CITY
ROME, ITALY
10:30 to 10:45 a.m., except Sunday
Sat. 10-10:45 a.m.

15090 kc. RKI
-C- 19.88 meters
MOSCOW, U.S.S.R.
Phones Tashkent near 7 a.m. and relays RNE on Sundays irregularly

15070 kc. PSD
-C- 19.91 meters
RIO DE JANEIRO, BRAZIL
Calls N.Y., Buenos Aires and Europe, daytime

(All Schedules Eastern Standard Time)

15055 kc. WNC
-C- 19.92 meters
HIALEAH, FLORIDA
Calls Central America, daytime

14980 kc. KAY
-C- 20.03 meters
MANILA, P. I.
Phones Pacific Isles

14950 kc. HJB
-C- 20.07 meters
BOGOTA, COL.
Calls WNC, daytime

14600 kc. JVH
-B.C- 20.55 meters.
NAZAKI, JAPAN
Phones Europe 4-8 a.m.
Irregular 12 m-1 a.m.

14590 kc. WMN
-C- 20.56 meters
LAWRENCEVILLE, N. J.
Phones England
morning and afternoon

14535 kc. HBJ
-B- 20.64 meters
RADIO NATIONS,
GENEVA, SWITZERLAND
Broadcasts irregularly

14530 kc. LSN
-C- 20.65 meters
HURLINGHAM, ARGENTINA
Calls N.Y.C. afternoons

14500 kc. LSM2
-C- 20.69 meters
HURLINGHAM, ARGENTINA
Calls Rio and Europe daytime

14485 kc. TIR
-C- 20.71 meters
CARTAGO, COSTA RICA
Phones Cen. Amer. & U.S.A.
Daytime

14485 kc. HPF
-C- 20.71 meters
PANAMA CITY, PAN.
Phones WNC daytime

14485 kc. TGF
-C- 20.71 meters
GUATEMALA CITY, GUAT.
Phones WNC daytime

14485 kc. YNA
-C- 20.71 meters
MANAGUA, NICARAGUA
Phones WNC daytime

14470 kc. WMF
-C- 20.73 meters
LAWRENCEVILLE, N. J.
Phones England
morning and afternoon

14440 kc. GBW
-C- 20.78 meters
RUGBY, ENGLAND
Calls U.S.A., afternoon

13990 kc. GBA
-C- 21.44 meters
RUGBY, ENGLAND
Calls
Buenos Aires, late afternoon

13610 kc. JYK
-C- 22.04 meters
KEMIKAWA-CHO, CHIBA-KEN, JAPAN
Phones California till 11 p. m.

13585 kc. GBB
-C- 22.08 meters
RUGBY, ENGLAND
Calls
Egypt & Canada, afternoons

13415 kc. GCJ
-C- 22.36 meters
RUGBY, ENGLAND
Calls Japan & China early morning

13390 kc. WMA
-C- 22.40 meters
LAWRENCEVILLE, N. J.
Phones England
morning and afternoon

13345 kc. YVC
-C- 22.48 meters
MARACAY, VENEZUELA
Calls Hialeah daytime

13075 kc. VPD
-X- 22.94 meters
SUVA, FIJI ISLANDS
Daily exc. Sun. 12:30-1:30 a.m.

12840 kc. WOO
-C- 23.36 meters
OCEAN GATE, N. J.
Calls ships

12825 kc. CNR
-B, C- 23.39 meters
DIRECTOR GENERAL
Telegraph and Telephone Stations, Rabat, Morocco
Broadcasts, Sunday, 7:30-9 a. m.

12800 kc. IAC
-C- 23.45 meters
PISA, ITALY
Calls Italian ships, mornings

12780 kc. GBC
-C- 23.47 meters
RUGBY, ENGLAND
Calls ships

12396 kc. CT1GO
-B- 24.2 meters
PAREDE, PORTUGAL
Sun. 10-11:30 a.m., Tues., Thur., Fri. 1:00-2:15 p.m.

12290 kc. GBU
-C- 24.41 meters
RUGBY, ENGLAND
Calls N.Y.C., afternoon

12235 kc. TFJ
-B.C- 24.52 meters
REYKJAVIK, ICELAND
Phones England mornings,
Broadcasts Sun. 1:40-2 p.m.

12150 kc. GBS
-C- 24.69 meters
RUGBY, ENGLAND
Calls N.Y.C., afternoon

12000 kc. RNE
-B- 25 meters
MOSCOW, U. S. S. R.
Sun. 6-9, 10-11 a.m.,
Mon. 9-10 p.m., Wed. 6-7 a.m.

11991 kc. FZS2
-C- 25.02 meters
SAIGON, INDO-CHINA
Phones Paris, morning

11955 kc. ETB
-C- 25.09 meters
ADDIS ABABA, ETHIOPIA
See 18270 kc.

11950 kc. KKQ
-X- 25.10 meters
BOLINAS, CALIF.
Tests, irregularly, evenings

11940 kc. FTA
-C- 25.13 meters
STE. ASSISE, FRANCE
Phones CNR morning,
Hurlingham, Arge., nights

11880 kc. ★
-B- 25.23 meters
"RADIO COLONIAL"
PARIS, FRANCE
4-5 a.m., 11:15 a.m.-6:05 p.m.

11870 kc. ★W8XK
-B- 25.26 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
PITTSBURGH, PA.
5-9 p.m,
Fri. till 12 m
Relays KDKA

11860 kc. GSE
-B- 25.29 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
9 a.m.-12 n.

11830 kc. W2XE
-B- 25.36 meters
ATLANTIC BROADCASTING CORP.
485 MADISON AVE., N. Y. C.
Relays WABC 6-8 p.m.

11820 kc. GSN
-B- 25.38 meters
DAVENTRY
B.B.C., BROADCASTING HOUSE,
LONDON, ENGLAND
Irregular

11810 kc. ★2RO
-B- 25.4 meters
E.I.A.R.
Via Montello 5
ROME, ITALY
6:15-9 a.m., 9:15-11 a.m., 11:30 a.m.-12:15 p.m.

11800 kc. CO9WR
-X- 25.42 meters
P. O. Box 85
SANCTI SPIRITUS, CUBA
4-6, 9-11 p.m.
9 a.m.-12 n.

11790 kc. W1XAL
-B- 25.45 meters
BOSTON, MASS.
Sun. 5-7 p.m.

11770 kc. DJD
-B- 25.49 meters
BROADCASTING HOUSE,
BERLIN, GERMANY
12-4:30 p.m.

11750 kc. ★GSD
-B- 25.53 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
12:15-4 p.m.

11730 kc. PHI
-B- 25.57 meters
HUIZEN, HOLLAND
Daily exc. Tues. and Wed. 8-10 a.m., Sat. and Sun. 8-11 a.m.

11720 kc. ★CJRX
-B- 25.6 meters
WINNIPEG, CANADA
Daily, 8 p. m.-12 m.

11715 kc.
-B- 25.61 meters
"RADIO COLONIAL"
PARIS, FRANCE
6:15-9 p.m.
11 p.m.-1 a. m.

11710 kc. ★HJ4ABA
-B- 25.62 meters
P. O. BOX 50,
MEDELLIN, COLOMBIA
11:30 a.m.-1 p.m., 6:30-10:30 p.m.

11680 kc. KIO
-X- 25.68 meters
KAHUKU, HAWAII
Tests in the evening

11560 kc. VIZ3
-X- 25.95 meters
AMALGAMATED WIRELESS OF AUSTRALASIA
FISKVILLE, AUSTRALIA
Calls Canada evening and early a.m.

11413 kc. CJA4
-C- 26.28 meters
DRUMMONDVILLE, QUE., CAN.
Tests with Australia irregularly in evening

11200 kc. XDJQ
-B- 26.79 meters
BOX 2825,
MEXICO CITY, MEX.
Daily 5:30-6:30 p.m., 10 p.m.-12 m. Relays XEW.

11050 kc. ZLT4
-C- 27.15 meters
WELLINGTON, N. ZEALAND
Phones Australia and England early a.m. Also broadcasts irregularly on Sunday, 9-10 a.m.

11000 kc. PLP
-B-C- 27.27 meters
BANDOENG, JAVA
Relays NIROM programs 5:30-11 a.m. Irregular on Sundays

10770 kc. GBP
-C- 27.85 meters
RUGBY, ENGLAND
Calls
Sydney, Austral. early a. m.

10740 kc. ★JVM
-B.C- 27.93 meters
NAZAKI, JAPAN
Tues. and Fri. 2-3 p.m., Mon. and Thurs. 4-5 p.m.

10675 kc. WNB
-C- 28.1 meters
LAWRENCEVILLE, N. J.
Calls Bermuda, daytime

10670 kc. ★CEC
-C- 28.12 meters
SANTIAGO, CHILE
Broadcasts Thurs., Sun. 8:30-9 p.m., Daily 7-7:15 p.m.

10660 kc. JVN
-B.C- 28.14 meters
NAZAKI, JAPAN
Phones Europe 3-8 a.m.
Mon. and Thurs. 4-5 p.m.
Daily 12 m-1 a.m.

10550 kc. WOK
-C- 28.44 meters
LAWRENCEVILLE, N. J.
Phones
Arge., Braz., Peru, nights

10520 kc. VLK
-C- 28.51 meters
SYDNEY, AUSTRALIA
Calls Rugby, early a.m.

10430 kc. YBG
-C- 28.76 meters
MEDAN, SUMATRA
5:30-6:30 a. m., 7:30-8:30 p. m.

10420 kc. XGW
-C- 28.79 meters
SHANGHAI, CHINA
Calls Manila and England, 6-9 a. m. and California late evening

10410 kc. PDK
-C- 28.80 meters
KOOTWIJK, HOLLAND
Calls Java 7:30-9:40 a. m.

10410 kc. KES
-X- 28.80 meters
BOLINAS, CALIF.
Tests evenings

10350 kc. LSX
-C- 28.98 meters
MONTE GRANDE, ARGENTINA
Tests Irregularly 8 p.m.-12 midnight.

10330 kc. ★ORK
-B-C- 29.04 meters
RUYSSELEDE, BELGIUM
Broadcasts 2:30-4 p.m.

10300 kc. LSL2
-C- 29.13 meters
HURLINGHAM, ARGENTINA
Calls Europe, evenings

10290 kc. DIQ
-X- 29.18 meters
KONIGSWUSTERHAUSEN, GERMANY
Broadcasts irregularly

10260 kc. PMN
-C- 29.24 meters
BANDOENG, JAVA
Calls Australia 5 a.m.

10250 kc. LSK3
-C- 29.27 meters
HURLINGHAM, ARGENTINA
Calls Europe and U. S., afternoon and evening

10220 kc. PSH
-C- 29.35 meters
RIO DE JANEIRO, BRAZIL

10140 kc. OPM
-C- 29.59 meters
LEOPOLDVILLE, BELGIAN CONGO
Phones around 3 a.m.

10055 kc. ZFB
-C- 29.84 meters
HAMILTON, BERMUDA
Phones N. Y. C. daytime

10042 kc. DJJ
-C- 29.87 meters
ZEESEN, GERMANY
Works with Central America and broadcasts irregularly 2-4 p.m.

9950 kc. GCU
-C- 30.15 meters
RUGBY, ENGLAND
Calls N.Y.C. evening

9890 kc. LSN
-C- 30.33 meters
HURLINGHAM, ARGENTINA
Calls New York, evenings

9870 kc. WON
-C- 30.4 meters
LAWRENCEVILLE, N. J.
Phones England, evening

9860 kc. ★EAQ
-B- 30.43 meters
P. O. Box 951
MADRID, SPAIN
Daily 5:15-9:30 p.m.;
Saturday also 12 n.-2 p.m.

9840 kc. JYS
-X- 30.49 meters
KEMIKAWA-CHO, CHIBA-KEN, JAPAN
Irregular, 4-7 a. m.

9800 kc. LSE
-C- 30.61 meters
MONTE GRANDE, ARGENTINA
Tests Irregularly

9790 kc. GCW
-C- 30.64 meters
RUGBY, ENGLAND
Calls N.Y.C., evening

9760 kc. VLJ-VLZ2
-C- 30.74 meters
AMALGAMATED WIRELESS OF AUSTRALIA
SYDNEY, AUSTRALIA
Phones Java and N. Zealand early a.m.

9750 kc. WOF
-C- 30.77 meters
LAWRENCEVILLE, N. J.
Phones England, evening

9710 kc. GCA
-C- 30.89 meters
RUGBY, ENGLAND
Calls Arge. & Brazil, evenings

9675 kc. DJI
-C- 31.01 meters
ZEESEN, GERMANY
Works with Africa and broadcasts irregularly 5-7 p.m.

9635 kc. ★2RO
-B- 31.13 meters
E.I.A.R., ROME, ITALY
M., W., F., 6-7:30 p.m.
Tues., Thurs., Sat. 6-7:45 p.m.
Daily 1:30-5 p.m.

9625 kc. ★CT1AA
-B- 31.17 meters
LISBON, PORTUGAL
M., W., F. 6-7:30 p.m.
Tues., Thurs., Sat. 6-7:45 p.m.
Daily 1:30-5 p.m.

9595 kc. ★HBL
-B- 31.27 meters
LEAGUE OF NATIONS
GENEVA, SWITZERLAND
Saturdays, 5:30-6:15 p. m.
Mon. at 1:45 a.m.

9590 kc. HP5J
-B- 31.28 meters
APARTADO 867
PANAMA CITY, PANAMA
11:45 a.m.-1 p.m., 7:30-10 p.m.

9590 kc. ★VK2ME
-B- 31.28 meters
AMALGAMATED WIRELESS, LTD., 47 YORK ST.
SYDNEY, AUSTRALIA
Sun. 1-3, 5-11 a.m.

9590 kc. W3XAU
-B- 31.28 meters
NEWTOWN SQUARE, PA.
Relays WCAU
12 N-7:50 p.m.

9580 kc. ★ GSC
-B- 31.32 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
4:15-5:45, 6-8, 10-11 p.m.

9580 kc. ★VK3LR
-B- 31.32 meters
Research Section,
Postmaster Gen'ls. Dept.,
61 Little Collins St.,
MELBOURNE, AUSTRALIA
3-7:30 a.m. except Sun.
also Fri. 10:30 p.m.-2 a.m.

9570 kc. ★W1XK
-B- 31.35 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
SPRINGFIELD, MASS.
Relays WBZ, 7 a.m.-1 a.m.
Sun. 8 a.m.-1 a.m.

9565 kc. VUB
-B- 31.36 meters
BOMBAY, INDIA
11 a.m.-12:30 p.m., Wed., Thurs., Sat.

9560 kc. ★DJA
-B- 31.38 meters
BROADCASTING HOUSE,
BERLIN
5:00-9:15 p.m.
12:30-2 a.m.
8-11:30 a.m.

9540 kc. ★DJN
-B- 31.45 meters
BROADCASTING HOUSE
BERLIN, GERMANY
12:30-2 a.m.
3:45-7:15 a.m.
8-11:30 a.m.
5:00-10:45 p.m.

9530 kc. ★W2XAF
-B- 31.48 meters
GENERAL ELECTRIC CO.
SCHENECTADY, N. Y.
Relays WGY 4 p.m.-12 m.
Sun. 4:15 p.m.-12 m.
Sat. 12 n.-12 m.

9525 kc. LKJ1
-B- 31.49 meters
JELOY, NORWAY
5-8 a.m., 11 a.m.-6 p.m.

9518 kc. ★VK3ME
-B- 31.54 meters
AMALGAMATED WIRELESS, Ltd.
G. P. O. Box 1272L,
MELBOURNE, AUSTRALIA
Daily exc. Sun. 4-7 a.m.

9510 kc. ★GSB
-B- 31.55 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
10:30 a.m.-12 n.
12:15-4, 4:15-5:45 p.m.

9501 kc. ★PRF5
-B- 31.58 meters
RIO DE JANEIRO, BRAZIL
Irregularly 4:45-5:45 p.m.

9428 kc. ★COCH
-B- 31.8 meters
2 B ST., VEDADO,
HAVANA, CUBA
Daily 8 a.m.-7 p.m.
Sun. 11 a.m.-12 n.,
8:30-9:30 p.m.

9415 kc. PLV
-C- 31.87 meters
BANDOENG, JAVA
Phones Holland around 9:45 a.m.
Broadcasts Tues. and Thurs., Sat. 10-10:30 a.m. Irregularly

9330 kc. CJA2
-C- 32.15 meters
DRUMMONDVILLE, CANADA
Phones England irregularly

9280 kc. GCB
-C- 32.33 meters
RUGBY, ENGLAND
Calls Can. & Egypt, evenings

9170 kc. WNA
-C- 32.72 meters
LAWRENCEVILLE, N. J.
Phones England, evening

9125 kc. ★HAT4
-B- 32.88 meters
"RADIOLABOR,"
GYALI-uT, 22
BUDAPEST, HUNGARY
Sunday 6-7 p.m.

(All Schedules Eastern Standard Time)

9060 kc. TFK
-C- 33.11 meters
REYKJAVIK, ICELAND
Phones London afternoons.
Broadcasts irregularly.

9020 kc. GCS
-C- 33.26 meters
RUGBY, ENGLAND
Calls N.Y.C., evenings

9010 kc. KEJ
-C- 33.3 meters
BOLINAS, CAL.
Relays NBC & CBS
Programs in evening irregularly

8795 kc. HKV
-B- 34.09 meters
BOGOTA, COLOMBIA
Irregular; 6:30 p.m.-12 m.

8775 kc. PNI
-C- 34.19 meters
MAKASSER, CELEBES, N.I.
Phones Java around 4 a. m.

8760 kc. GCQ
-C- 34.25 meters
RUGBY, ENGLAND
Calls S. Africa, afternoon

8730 kc. GCI
-C- 34.36 meters
RUGBY, ENGLAND
Calls India, 8 a. m.

8680 kc. GBC
-C- 34.56 meters
RUGBY, ENGLAND
Calls ships

8665 kc. CO9JQ
-X- 34.62 meters
CAMAGUEY, CUBA
5:30-6:30, 8-9 p.m. daily except Sat. and Sun.

8590 kc. YNVA
-B- 34.92 meters
MANAGUA, NICARAGUA
8-10:30 p.m.

8560 kc. WOO
-C- 35.05 meters
OCEAN GATE, N. J.
Calls ships irregular

8400 kc. HC2AT
-B- 35.71 meters
CASSILLA 877
GUAYAQUIL, ECUADOR
8-11 p.m.

8380 kc. IAC
-C- 35.8 meters
Pisa, Italy

8220 kc. ZP10
-B- 36.4 meters
ASUNCION, PARAGUAY
7-9 p.m.

8214 kc. HCJB
-B- 36.5 meters
QUITO, ECUADOR
7-11 p.m., except Monday
Sun. 11 a.m.-12 n.; 4-10 p.m.

8185 kc. PSK
-C- 36.65 meters
RIO DE JANEIRO, BRAZIL
Irregularly

8036 kc. CNR
-B- 37.33 meters
RABAT, MOROCCO
Sunday, 2:30-5 p. m.

7975 kc. HC2TC
-B- 37.62 meters
QUITO, ECUADOR
Thurs., Sun. at 8 p.m.

7901 kc. LSL
-C- 37.97 meters
HURLINGHAM, ARGENTINA
Calls Brazil, night

7880 kc. JYR
-B- 38.07 meters
KEMIKAWA-CHO, CHIBA-KEN, JAPAN
4-7:40 a. m.

7854 kc. HC2JSB
-B- 38.2 meters
GUAYAQUIL, ECUADOR
8:15-11:15 p.m.

7799 kc. ★HBP
-B- 38.47 meters
LEAGUE OF NATIONS,
GENEVA, SWITZERLAND
5:30-6:15 p. m., Saturday

7715 kc. KEE
-C- 38.89 meters
BOLINAS, CAL.
Relays NBC & CBS
Programs in evening irregularly

7630 kc. ZHJ
-B- 39.32 meters
PENANG, MALAYA
Daily 7-9 a.m.
also Sat. 11 p.m.-1 A.M. (Sun.)

7620 kc. ETD
-C- 39.37 meters
ADDIS ABABA, ETHIOPIA
See 18270 kc.

7550 kc. TI8WS
-B- 39.74 meters
"ECOS DEL PACIFICO"
P. O. BOX 75 PUNTA ARENAS, COSTA RICA
6 p.m.-12 m.

7510 kc. ★JVP
-B,C- 39.95 meters
NAZAKI, JAPAN
Tues. and Fri. 2-3 p.m.

7400 kc. HJ3ABD
-B- 40.54 meters
P. O. Box 509
BOGOTA, COLOMBIA
Daily 12-2 p. m.; 7-11 p. m.
Sunday. 5-9 p. m.

7380 kc. XECR
-B- 40.65 meters
FOREIGN OFFICE,
MEXICO CITY, MEX.
Sun. 6-7 p.m.

7281 kc. HJ1ABD
-B- 41.04 meters
CARTAGENA, COLO.
Irregularly, evenings

7100 kc. HKE
-B- 42.25 meters
BOGOTA, COL., S. A.
Tue. and Sat. 8-9 p. m.; Mon. & Thurs. 6:30-7 p. m.

7080 kc. VP3MR
-B- 42.68 meters
GEORGETOWN, BRI. GUIANA, S.A.
Sun. 7:45-10:15 a.m.
Mon. 3:45-4:45 p.m.
Tues. 4:45-6:45 p.m.
Wed. 4:45-7:45 p.m.
Thur. 5-6:45 p.m.
Sat. 4:45-7:45 p.m.

7030 kc. HRP1
-B- 42.67 meters
SAN PEDRO SULA, HONDURAS
Reported on this and other waves irregularly in evening

7000 kc. HJ1ABK
-B- 42 meters
CALLE, BOLIVIA,
PROGROSO-IGUALDAD
BARRANQUILLA, COLOMBIA
Sun. 3-6 p.m.

6996 kc. PZH
-B- 42.88 meters
P. O. BOX 18,
PARAMIRABO, DUTCH GUIANA
Sun. 9:36-11:36 a.m.
Mon. and Fri. 5:36-9:36 p.m.
Tues. and Thur. 8:36-10:36 a.m., 2:36-4:36 p.m.
Wed. 3:36-4:36, 5:36-9:36 p.m.
Sat. 2:36-4:36 p.m.

6976 kc. HCETC
-B- 43 meters
TEATRO BOLIVAR
QUITO, ECUADOR
Thurs. till 9:30 p.m.

6905 kc. GDS
-C- 43.45 meters
RUGBY, ENGLAND
Calls N.Y.C. evening

6860 kc. KEL
-X- 43.70 meters
BOLINAS, CALIF.
Tests irregularly
11 a. m.-12 n.; 6-9 p. m.

6814 kc. HIH
-B- 44.03 meters
SAN PEDRO de MACORIS
DOMINICAN REP.
12:10-1:40 p.m., 7:30-9 p.m.,
Sun. 3-4 a.m. 4:15-6 p.m.

6755 kc. WOA
-C- 44.41 meters
LAWRENCEVILLE, N. J.
Phones England, evening

6750 kc. ★JVT
-B,C- 44.44 meters
NAZAKI, JAPAN
KOKUSAI-DENWA KAISHA, LTD., TOKIO
Broadcasts 12 m.-1 a.m., 4-8 a.m.

6710 kc. ★TIEP
-B- 44.71 meters
LA-VOZ DEL TROPICO
SAN JOSE, COSTA RICA
APARTADO 257, Daily 7-10 p.m.

6672 kc. YVQ
-C- 44.95 meters
MARACAY, VENEZUELA
Broadcasts Sat. 8-9 p.m.

6660 kc. ★HC2RL
-B- 45.05 meters
P. O. BOX 759, GUAYAQUIL, ECUADOR, S. A.
Sunday, 5:45-7:45 p. m.
Tues., 9:15-11:15 p. m.

6650 kc. IAC
-C- 45.11 meters
PISA, ITALY
Calls ships, evenings

6618 kc. ★PRADO
-B- 45.33 meters
RIOBAMBA, ECUADOR
Thurs. 9-11:45 p.m.

6611 kc. RV72
-B- 45.38 meters
MOSCOW, U. S. S. R.
1-6 p. m.

6600 kc. YV5AM
-B- 45.45 meters
"ECOS de LLANO"
SAN JUAN de LOS MORROS, VENEZUELA
Testing in evening

6550 kc. TIRCC
-B- 45.77 meters
RADIOEMISORA CATOLICA COSTARRICENSE
SAN JOSE, COSTA RICA
Sun. 12:45-2:30, 6-7, 8-9 p.m.

6528 kc. HIL
-B- 45.95 meters
SANTO DOMINGO, D.R.
Sat., 8-10 p.m.

6520 kc. ★YV6RV
-B- 46.01 meters
VALENCIA, VENEZUELA
12 n.-1 p.m., 6-10 p.m.

6500 kc. HJ5ABD
-B- 46.15 meters
MANIZALES, COL.
12-1:30 p. m., 7-10 p. m.

6482 kc. HI4D
-B- 46.28 meters
SANTO DOMINGO, DOMINICAN REPUBLIC
Except Sun. 11:55 a.m.-1:40 p.m.; 4:40-7:40 p.m.

6450 kc. HJ4ABC
-B- 46.51 meters
"LA VOZ de CAMBEBE,"
IBAQUE, COLOMBIA
7:30-11 p.m.

6447 kc. HJ1ABB
-B- 46.53 meters
BARRANQUILLA, COL., S. A.
P. O. BOX 715,
11:30 a. m.-1 p. m.; 5-10 p. m.

6425 kc. W9XBS
-X- 46.7 meters
NATL. BROAD. CO.
CHICAGO, ILL.
Relays WMAQ. Irregular

6410 kc. TIPG
-B- 46.8 meters
APARTADO 225,
SAN JOSE, COSTA RICA
"LA VOZ DE LA VICTOR"
12 n.-2 p.m., 6-10 p.m.

6375 kc. YV4RC
-B- 47.06 meters
CARACAS VENEZUELA
4:30-10:30 p.m.

6316 kc. HIZ
-B- 47.5 meters
SANTO DOMINGO
DOMINICAN REPUBLIC
Daily except Sat. and Sun.
4:40-5:40 p. m.; Sat., 9:40-11:40 p. m.; Sun., 11:40 a. m.-1:40 p. m.

6230 kc. OAX4G
-B- 48 meters
Apartado 1242
LIMA, PERU
Daily 7-10:30 p.m.
Wed. 6-10:30 p.m.

6198 kc. CT1GO
-B- 48.4 meters
Portuguese Radio Club,
PAREDE, PORTUGAL
Sun. 11:30 a.m.-1 p.m.
Daily exc. Tues. 7:20-8:30 p.m.

6185 kc. HI1A
-B- 48.5 meters
P. O. BOX 423, SANTIAGO, DOMINICAN REP.
11:40 a. m.-1:40 p. m.
7:40-9:40 p. m.

6175 kc. HJ2ABA
-B- 48.58 meters
TUNJA, COLOMBIA
1-2; 7:30-9:30 p.m.

6170 kc. HJ3ABF
-B- 48.62 meters
BOGOTA, COLOMBIA
6-11 p.m.

6160 kc. ★YV3RC
-B- 48.7 meters
CARACAS, VENEZUELA
11 a.m.-2 p.m., 4-10:30 p.m.

6155 kc. CO9GC
-B- 48.74 meters
BOX 137, SANTIAGO, CUBA
9-10 a.m., 11:30 a.m.-1:30 p.m., 3-4:30 p.m., 10-11 p.m., 12 m.-2 a.m.

6150 kc. CSL
-B- 48.78 meters
LISBON, PORTUGAL
7-8:30 a.m., 2-7 p.m.

6150 kc. ★CJRO
-B- 48.78 meters
WINNIPEG, MAN., CANADA
8 p. m.-12 m.
Sun. 3-10:30 p. m.

6150 kc. HJ5ABC
-B- 48.78 meters
CALI, COLOMBIA
Daily 11 a.m.-12 n., Sun. 12 n.-2 pm., Daily except Sat. and Sun. 7-10 p.m.

6140 kc. ★W8XK
-B- 48.86 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
PITTSBURGH, PA.
Relays KDKA
9 p.m.-1 a.m.

6130 kc. COCD
-B- 48.92 meters
"La Voz del Aire"
CALLE G y 25, VEDADO, HAVANA, CUBA
Relays CMCD 11 a.m.-12 n., 7-10 pm., Sun. 12 n.-4 p.m.

6130 kc. ZGE
-B- 48.92 meters
KUALA LUMPUR,
FED. MALAY STATES
Sun., Tue., and Fri.,
6:40-8:40 a. m.

6120 kc. ★W2XE
-B- 49.02 meters
ATLANTIC BROADCASTING CORP.
485 MADISON AVE., N. Y. C.
Relays WABC, 8-11 p.m.

6120 kc. XEFT
-B- 49.02 meters
VERA CRUZ, MEX.
11 a.m.-4 p.m., 7:30 p.m.-12 m.
Sat. also 6:30-7:30 p.m.
Sun. 11 a.m.-4 p.m., 9 p.m.-12 m.
Relays XETF

6115 kc. HJ1ABE
-B- 49.05 meters
CARTAGENA, COL.
P. O. Box 31
Mon. 10 p.m.-12 m.
Daily 7:30-9 p.m.

6110 kc. ★CHNX
-B- 49.1 meters
P.O. BOX 998
HALIFAX, N.S., CANADA
Daily 9 a.m.-12:30 p.m., 4-10 p.m.

6110 kc. ★GSL
-B- 49.10 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
2:30-5:45, 10-11 p.m.

6110 kc. VUC
-B- 49.1 meters
CALCUTTA, INDIA
Daily except Sat., 3-5:30 a. m., 9:30 a. m.-noon;
Sat., 11:45 a. m.-3 p. m.

6105 kc. HJ4ABB
-B- 49.14 meters
MANIZALES, COL., S. A.
P. O. Box 175
Mon. to Fri. 12:15-1 p. m.;
Tues. & Fri. 7:30-10 p. m.;
Sun. 2:30-5 p. m.

6100 kc. ★W3XAL
-B- 49.18 meters
NATIONAL BROADCASTING CO.
BOUND BROOK, N. J.
Relays WJZ
Monday, Wednesday, Saturday, 5-6 p.m., Sun. 12 m-1 a.m.

6100 kc. ★W9XF
-B- 49.18 meters
NATL. BROAD. CO.
Relays WENR, Chicago

6097 kc. ZTJ
-B- 49.2 meters
AFRICAN BROADCASTING CO.
JOHANNESBURG, SOUTH AFRICA.
Sun.-Fri. 11:45 p.m.
12:30 a.m. (next day)
Mon.-Sat. 3:30-7 a.m.
9 a.m.-4 p.m.
Sun. 8-10:15 a.m.; 12:30-3 p.m.

6090 kc. ★CRCX
-B- 49.26 meters
TORONTO, CANADA
Daily 6 p.m.-12 m., Sun. 12 n -12m

6090 kc. VE9BJ
-B- 49.26 meters
SAINT JOHN, N. B., CAN.
7-8:30 p. m.

6085 kc. 2RO
-B- 49.3 meters
E.I.A.R.
ROME, ITALY

6083 kc. VQ7LO
-B- 49.31 meters
NAIROBI, KENYA, AFRICA
Mon.-Fri. 5:45-6:15 a.m., 11:30 a.m.-2:30 p.m. Also 8:30-9:30 a.m. on Tues. and Thurs. Sat. 11:30 a.m.-3:30 p.m. Sun. 11 a.m.-2 p.m.

6080 kc. CP5
-B- 49.34 meters
LAPAZ, BOLIVIA
7-10:30 p. m.

6080 kc. HP5F
-B- 49.34 meters
Carlton Hotel
COLON, PANAMA
11:45 a.m.-1:15 pm., 7:45-10 p.m.

6080 kc. W9XAA
-B- 49.34 meters
CHICAGO FEDERATION OF LABOR
CHICAGO, ILL.
Relays WCFL
Sunday 11:30 a. m.-9 p. m. and Tues., Thurs., Sat., 4 p. m.-12 m.

6079 kc. DJM
-X- 49.34 meters
BROADCASTING HOUSE
BERLIN
Tests 3-5 p.m.

6072 kc. OER2
-B- 49.41 meters
VIENNA, AUSTRIA
9 a.m.-5 p.m.

6070 kc. HJ4ABC
-B- 49.42 meters
PERIERA, COL.
9:30-11:30 a.m., 7-8 or 9 p.m.

6070 kc. VE9CS
-B- 49.42 meters
VANCOUVER, B. C., CANADA
Sun. 1:45-9 p. m., 10:30 p. m.-1 a. m.; Tues. 6-7:30 p. m., 11:30 p. m.-1:30 a. m. Daily 6-7:30 p. m.

6065 kc. HJ4ABL
-B- 49.46 meters
MANIZALES, COL.
Daily 11 a.m.-12 n., 5:30-7:30 p.m. Sat. 5:30-10:30 p.m.

6060 kc. ★W8XAL
-B- 49.50 meters
CROSLEY RADIO CORP.
CINCINNATI, OHIO
6:30 a.m.-8 p.m.; 11 p.m.-1 a.m.
Relays WLW

6060 kc. W3XAU
-B- 49.50 meters
NEWTOWN SQUARE, PA.
Relays WCAU, Philadelphia
8 p.m.-11 p.m.

6060 kc. OXY
-B- 49.50 meters
SKAMLEBOAEK, DENMARK
1-6:30 p.m.

6050 kc. ★GSA
-B- 49.59 meters
DAVENTRY,
B.B.C., BROADCASTING HOUSE, LONDON, ENGLAND
6-8 p.m.

6045 kc. HJ3ABI
-B- 49.63 meters
BOGOTA, COLO.
Irregular in evening

6042 kc. HJ1ABG
-B- 49.65 meters
BARRANQUILLA, COLO.
12 n.-1 p.m., 6-10 p.m.
Sun. 1-6 p.m.

6040 kc. W4XB
-B- 49.67 meters
MIAMI BEACH, FLA.
Relays WIOD 12 n.-2 p.m., 5:30 p.m.-12 m.

6040 kc. PRA8
-B- 49.67 meters
RADIO CLUB OF PERNAMBUCO
PERNAMBUCO, BRAZIL
1-3 p.m., 4-7:30 p.m. daily

6040 kc. ★W1XAL
-B- 49.67 meters
BOSTON, MASS.
Tues., Thurs. 7:15-9:15 p.m.
Sun 5-7 p.m.

6040 kc. YDA
-B- 49.67 meters
N.I.R.O.M.
TANDJONGPRIOK, JAVA
5:45-6:45 p.m., 10:30 p.m.-1:30 a.m.

(All Schedules Eastern Standard Time)

6030 kc. ★HP5B
-B- 49.75 meters
P. O. BOX 910
PANAMA CITY, PAN.
12 n.- 1p.m., 7-10:30 p.m.

6030 kc. VE9CA
-B- 49.75 meters
CALGARY, ALBERTA, CAN.
Thurs. 9 a.m.-2 a.m. (Fri.); Sun. 12 n.-12 m.
Irregularly on other days from 9 a.m.-12 m.

6020 kc. CQN
-B- 49.83 meters
MACAO, CHINA
Mon. and Fri. 3-5 a.m.

6020 kc. ★DJC
-B- 49.83 meters
BROADCASTING HOUSE, BERLIN
12 n.-4:30 p.m., 5-10:45 p.m.

6020 kc. HJ3ABH
-B- 49.83 meters
BOGOTA, COLO.
APARTADO 565
7-11 p.m.

6020 kc. XEUW
-B- 49.82 meters
AV. INDEPENDENCIA. 98,
VERA CRUZ, MEX.
8 p.m.-12:30 a.m.

6018 kc. ZHI
-B- 49.9 meters
RADIO SERVICE CO.,
20 ORCHARD RD.,
SINGAPORE, MALAYA
Mon., Wed. and Thurs 5:40-8:10 a.m. Sat. 10:40 p.m.-1:10 a.m. (Sun.) Every other Sunday 5:10-6:40 a.m.

6010 kc. ★COCO
-B- 49.92 meters
P.O. BOX 98
HAVANA, CUBA
Daily 9:30 a.m.-1 p.m., 4-7 p.m., Sun. 8-10 p.m.
Sat. also 11 p.m.-12 m.

6005 kc. HJ1ABJ
-B- 49.96 meters
SANTA MARTA, COLO.
6-11 p.m. except Wed.

6005 kc. VE9DN
-B- 49.96 meters
CANADIAN MARCONI CO., MONTREAL, QUE., CANADA
Saturdays at 11:30 p.m.

6000 kc. TGWA
-B- 50 meters
GUATEMALA CITY, GUAT.
12 n-1 p.m., 6:30-7:30 p.m. 10-11 p.m. Sat. also from 12 m.-6 a.m. (Sun.)

6000 kc. RV59
-B- 50 meters
MOSCOW, U. S. S. R.
Daily 3-6 p.m.

5990 kc. ★XEBT
-B- 50.08 meters
MEXICO CITY, MEX.
P. O. Box 79-44
8 a.m.-1 a.m.

5985 kc. HJ2ABC
-B- 50.13 meters
CUCUTA, COLOMBIA
6-9:30 p.m.

5980 kc. XEVI
-B- 50.17 meters
MEXICO CITY, MEX.
Mon., Wed., Fri., 2-3 p.m., Tues. 7-8, Thurs. 7-9, Sat. 8-9 p.m., Sun. 12 m-1 p.m.

5980 kc. HIX
-B- 50.17 meters
SANTO DOMINGO, DOMINICAN REP.
Sun. 7:40 a.m.; Tues. and Fri. 11:10 a.m., 4:40 and 8:10 p.m.; Mon., Wed., Thurs. and Sat. 11:10 a.m. and 4:40 p.m.

5970 kc. HJN
-B- 50.26 meters
BOGOTA, COL.
6-11 p.m.

5968 kc. HVJ
-B- 50.27 meters
VATICAN CITY (ROME)
2-2:15 p. m., daily. Sun., 5-5:30 a. m.

5950 kc. HJ4ABE
-B- 50.42 meters
MEDELLIN, COLO.
Daily 11 a.m.-12 n., 6-10:30 p.m.

5940 kc. TG2X
-B- 50.5 meters
GUATEMALA CITY, GUAT.
4-6, 9-11 p.m.

5885 kc. HCK
-B- 50.98 meters
QUITO, ECUADOR, S. A.
8-11 p.m.

5880 kc. YV8RB
-B- 51.02 meters
"LA VOZ de LARA"
BARQUISIMETO, VENEZUELA
6-10 p.m.

5875 kc. HRN
-B- 51.06 meters
TEGUCIGALPA, HONDURAS
7-9 p.m.

5860 kc. HI1J
-B- 51.19 meters
SAN PEDRO de MACORIS, DOM. REP.
6-8:40 p.m.

5853 kc. WOB
-C- 51.26 meters
LAWRENCEVILLE, N. J.
Calls Bermuda, nights

5850 kc. ★YV5RMO
-B- 51.28 meters
CALLE REGISTRO. LAS DELICIAS APARTADO de CORRES 214
MARACAIBO, VENEZUELA
11 a.m.-1 p.m., 5:30-10 p.m.

5825 kc. TIGPH
-B- 51.5 meters
SAN JOSE, COSTA RICA
6:15-11 p.m.

5800 kc. ★YV2RC
-B- 51.72 meters
BROADCASTING CARACAS
CARACAS, VENEZUELA
Sun. 8:30 a.m.-10:30 p.m.
Daily 11 a.m.-1:30 p.m., 4-9:30 p.m.

5790 kc. JVU
-C- 51.81 meters
NAZAKI, JAPAN
Broadcasts 2-7:45 a.m.

5780 kc. OAX4D
-B- 51.9 meters
P.O. Box 853
LIMA, PERU
Mon., Wed. & Sat. 9-11:30 p.m.

5720 kc. YV10RSC
-B- 52.45 meters
"LA VOZ de TACHIRA,"
SAN CRISTOBAL, VENEZUELA
6-11:30 p.m.

5713 kc. TGS
-B- 52.51 meters
GAUTEMALA CITY, GUAT.
Tues., Thurs., and Sun. 6-8 p.m.

5500 kc. TI5HH
-B- 54.55 meters
SAN RAMON, COSTA RICA
Irregularly 3:30-4, 8-11:30 p.m.

5410 kc. ZCK
-B- 55.45 meters
HONGKONG, CHINA
Relays ZBW
Daily 11:30 p.m.-1:15 a.m.
Mon. and Thurs. 3-7 p.m.
Tues., Wed., Fri. 6-10 a.m.
Sat. 6-11 a.m.

5077 kc. WCN
-C- 59.08 meters
LAWRENCEVILLE, N. J.
Phones England irregularly

5025 kc. ZFA
-C- 59.7 meters
HAMILTON, BERMUDA
Calls U.S.A., nights

5000 kc. TFL
-C- 60 meters
REYKJAVIK, ICELAND
Calls London at night.
Also broadcasts irregularly

4975 kc. GBC
-C- 60.30 meters
RUGBY, ENGLAND
Calls Ships, late at night

4820 kc. GDW
-C- 62.24 meters
RUGBY, ENGLAND
Calls N.Y.C., late at night

4752 kc. WOO
-C- 63.1 meters
OCEAN GATE, N. J.
Calls ships irregularly

4600 kc. HC2ET
-B- 65.22 meters
Apartado 249
GUAYAQUIL, ECUADOR
Wed., Sat., 9:15-11 p.m.

4470 kc. YDB
-B- 67.11 meters
N.I.R.O.M.
SOERABAJA, JAVA
10:30 p.m.-1:30 a.m., 5:30-11 a.m., 5:45-6:45 p.m.

4320 kc. GDB
-C- 69.44 meters
RUGBY, ENGLAND
Tests, 8-11 p. m.

4273 kc. RV15
-B- 70.20 meters
KHABAROVSK, SIBERIA, U. S. S. R.
Daily, 3-9 a.m.

4272 kc. WOO
-C- 70.22 meters
OCEAN GATE, N. J.
Calls ships irregularly

4098 kc. WND
-C- 73.21 meters
HIALEAH, FLORIDA
Calls Bahama Isles

4002 kc. CT2AJ
-B- 74.95 meters
PONTA DELGADA, SAO MIGUEL, AZORES
Wed. and Sat. 5-7 p. m.

3543 kc. CR7AA
-B- 84.67 meters
P. O. BOX 594
LOURENCO MARQUES, MOZAMBIQUE, E. AFRICA
1:30-3:30 p.m., Mon., Thurs., and Sat.

3490 kc. YDH3
-B- 85.96 meters
BANDOENG, JAVA
Daily except Fri., 4:30-5:30 a. m.

3040 kc. YDA
-B- 98.68 meters
N.I.R.O.M.
TANDJONGPRIOK, JAVA
5:30-11 a.m.

(All Schedules Eastern Standard Time)

Police Radio Alarm Stations

CGZ	Vancouver, B.C.	2342 kc.
CJW	St. Johns, N.B.	2390 kc.
CJZ	Verdeen, Que.	2390 kc.
KGHA, KGHB, KGHC	Portable-Mobile In State of Wash.	2490 kc.
KGHG	Las Vegas, Nev.	2474 kc.
KGHK	Palo Alto, Cal.	1674 kc.
KGHM	Reno, Nev.	2474 kc.
KGHN	Hutchinson, Kans.	2450 kc.
KGHO	Des Moines, Iowa	1682 kc.
KGHP	Lawton, Okla.	2466 kc.
KGHQ	Chinook Pass, W.	2490 kc.
KGHR	(Mobile) in Wash.	2490 kc.
KGHS	Spokane, Wash.	2414 kc.
KGHT	Brownsville, Tex.	2382 kc.
KGHU	Austin, Tex.	2442 kc.
KGHV	Corpus Christi, Tex.	2382 kc.
KGHW	Centralia, Wash.	2414 kc.
KGHX	Santa Ana, Cal.	2490 kc.
KGHY	Whittier, Cal.	1712 kc.
KGHZ	Little Rock, Ark.	2406 kc.
KGJX	Pasadena, Cal.	1712 kc.
KGLX	Albuquerque, N.M.	2414 kc.
KGOZ	Cedar Rapids, Iowa	2466 kc.
KGPA	Seattle, Wash.	2414 kc.
KGPB	Minneapolis, Minn.	2430 kc.
KGPC	St. Louis, Mo.	1706 kc.
KGPD	San Francisco, Cal.	2466 kc.
KGPE	Kansas City, Mo.	2422 kc.
KGPF	Santa Fe, N.Mex.	2414 kc.
KGPG	Vallejo, Cal.	2422 kc.
KGPH	Oklahoma City, Okla.	2450 kc.
KGPI	Omaha, Neb.	2466 kc.
KGPJ	Beaumont, Tex.	1712 kc.
KGPK	Sioux City, Iowa	2466 kc.
KGPL	Los Angeles, Cal.	1712 kc.
KGPM	San Jose, Cal.	2466 kc.
KGPN	Davenport, Iowa	2466 kc.
KGPO	Tulsa, Okla.	2450 kc.
KGPP	Portland, Ore.	2442 kc.
KGPQ	Honolulu, T.H.	1712 kc.
KGPR	Minneapolis, Minn.	2430 kc.
KGPS	Bakersfield, Cal.	2414 kc.
KGPW	Salt Lake City, Utah	2406 kc.
KGPX	Denver, Colo	2442 kc.
KGPZ	Wichita, Kans.	2450 kc.
KGZA	Fresno, Cal.	2414 kc.
KGZB	Houston, Tex.	1712 kc.
KGZC	Topeka, Kans.	2422 kc.
KGZD	San Diego, Cal.	2490 kc.
KGZE	San Antonio, Tex.	2482 kc.
KGZF	Chanute, Kans.	2450 kc.
KGZG	Des Moines, Iowa	2466 kc.
KGZH	Klamath Falls, Ore.	2442 kc.
KGZI	Wichita Falls, Tex.	2458 kc.
KGZJ	Phoenix, Ariz.	2430 kc.
KGZM	El Paso, Tex.	2414 kc.
KGZN	Tacoma, Wash.	2414 kc.
KGZO	Santa Barbara, Cal.	2414 kc.
KGZP	Coffeyville, Kans.	2450 kc.
KGZQ	Waco, Tex.	1712 kc.
KGZR	Salem, Ore.	2442 kc.
KGZT	Santa Cruz, Cal.	1674 kc.
KGZU	Lincoln, Neb.	2490 kc.
KGZV	Aberdeen, Wash.	2414 kc.
KGZW	Lubbock, Tex.	2458 kc.
KGZX	Albuquerque, N.Mex.	2414 kc.
KGZY	San Bernardino, Cal.	1712 kc.
KIUK	Jefferson City, Mo.	1674 kc.
KNFA	Clovis, N.Mex.	2414 kc.
KNFB	Idaho Falls, Idaho	2458 kc.
KNFC	SS Gov. Stevens, (Wash.)	2490 kc.
KNFD	SS Gov. J. Rogers, (Wash.)	2490 kc.
KNFE	Duluth, Minn.	2382 kc.
KNFF	Leavenworth, Kans.	2422 kc.
KNFG	Olympia, Wash.	2490 kc
KNFH	Garden City, Kans.	2474 kc.
KNFI	Mt. Vernon, Wash.	2414 kc.
KNFJ	Pomona, Cal.	1712 kc.
KNFK	Bellingham, Wash.	2490 kc.
KNFL	Shuksan, Wash.	2490 kc.
KNFM	Compton, Cal.	2490 kc.
KNFN	Waterloo, Iowa	1682 kc.
KNFO	Storm Lake, Iowa	1682 kc.
KNFP	Everett, Wash.	2414 kc.
KNFQ	Skykomish, Wash.	2490 kc.
KNFR, KNFS, KNFT, KNFU, KNFV, KNFW	Mobile in State of Wash.	2490 kc.
KNFX	Alpowa Camp, Wash.	2490 kc.
KNFY	Ilwaco, Wash.	2490 kc.
KNFZ	Hells Crossing Camp, Wash.	2490 kc.
KNGA	Satus Pass Camp, Wash.	2490 kc.
KNGB	Yakima, Wash.	2490 kc.
KNGC	Vancouver, Wash.	2490 kc.
KNGD	Walla Walla, Wash.	2490 kc.
KNGE	Cleburne, Tex.	1712 kc.
KNGF	Sacramento, Cal.	2422 kc.
KNGH	Dodge City, Kans.	2474 kc.
KNGJ	El Centro, Cal.	2490 kc.
KNGK	Duncan, Okla.	2450 kc.
KNGM	Rapid City, S. Dak.	2450 kc.
KNGN	Norfolk, Nebr.	2490 kc.
KNGO	Portable, Okla.	2450 kc.
KNGP	Shreveport, Pa.	2430 kc.
KNGQ	Wenatchee, Wash	2490 kc.
KNGR	Spokane, Wash.	2490 kc.
KNGT	Muskogee, Okla.	2450 kc.
KNGU	Yakima, Wash.	2414 kc.
KNGV	Salina, Kans.	2422 kc.
KNGW	Brownwood, Tex.	2458 kc.
KNGX	Portable, Los Angeles	1712 kc.
KNGY	Lodi, Calif.	2414 kc.
KNGZ	Ephrata, Wash.	2490 kc.
KNHA	Mobile, Wash.	2490 kc.
KNHB	Green Bay, Wis.	2382 kc.
KNHC	Ada, Okla.	2450 kc.
KNHD	Redwood Falls, Minn.	1658 kc.
KNHE	Fort Smith, Ark.	2406 kc.
KNHF	Denton, Tex.	1712 kc.
KNHG	Prescott, Ark.	2430 kc.
KNHM	Fargo, N. Dak.	2442 kc.
KSW	Berkeley, Cal.	1658 kc.
KVP	Dallas, Tex.	1712 kc.
VDM	Halifax, N.S.	1690 kc.
VYR	Montreal, Can.	1706 kc.
VYW	Winnipeg, Man.	2396 kc.
WCK	Belle Island, Mich.	2414 kc.
WEY	Boston, Mass.	1630 kc.
WKDT	Detroit, Mich.	1630 kc.
WKDU	Cincinnati, Ohio	1706 kc.
WMDZ	Indianapolis, Ind.	2442 kc.
WMJ	Buffalo, N.Y.	2422 kc.
WMO	Highland Park, Mich.	2414 kc.
WMP	Framingham, Mass.	1666 kc.
WNFP	Niagara Falls, N.Y.	2422 kc.
WPDA	Tulare, Cal.	2414 kc.
WPDB	Chicago, Ill.	1712 kc.
WPDC	Chicago, Ill.	1712 kc.
WPDD	Chicago, Ill.	1712 kc.
WPDE	Louisville, Ky.	2442 kc.
WPDF	Flint, Mich.	2466 kc.
WPDG	Youngstown, Ohio	2458 kc.
WPDH	Richmond, Ind.	2442 kc.
WPDI	Columbus, Ohio	2430 kc.
WPDK	Milwaukee, Wis.	2450 kc.
WPDL	Lansing, Mich.	2442 kc.
WPDM	Dayton, Ohio	2430 kc.
WPDN	Auburn, N.Y.	2382 kc.
WPDO	Akron, Ohio	2458 kc.
WPDP	Philadelphia, Pa.	2474 kc.

"WHEN TO LISTEN IN" Appears on page 689

(Continued on Page 687)

SHORT WAVE LEAGUE

HONORARY MEMBERS

Dr. Lee de Forest
John L. Reinartz
D. E. Replogle
Hollis Baird
E. T. Somerset
Baron Manfred von Ardenne
Hugo Gernsback
Executive Secretary

SHORT WAVE SCOUT NEWS

Dr. Smith, Chester, Vt., Reports

● NEW stations heard this month:

DJM, 6079 kilocycles. Zeesen. Is best heard from 4 to 5 p.m., E.S.T., with a program in English for listeners in Africa. Has same program as DJC, so do not confuse the two.

VE9HX, 6110 kc., Halifax. Back on the air. (Now called CHNX—Editor.)

YV-12-RM, Emisora 24 de Julio, Maracay, Venezuela, 6300 kc.

HI4B, La Voz de la Marina, 6480 kc., Santo Domingo, D.R.

HI-1-F. New station being heard best from 6:30 to 7 a.m., on 6140 kc. Do not know if call is correct, as it is hard to understand. At Santiago de los Caballeros.

XEUW. Heard Dec. 1, special program, heard from 4 to 5 a.m., not very distinct.

HJ4ABP, Emisora Philco, Medellin, 6135 kc., between COCD and W8XK, so quite hard to tune in. Heard well before W8XK comes on air.

TI8WS, Puntarenas, Costa Rica, 7550 kc. Heard one evening.

CMA 3, Habana, commercial station, 15,500 kc. Heard one p.m. in contact with Riverhead.

Stations heard here for first time:

PMN, Bandoeng, 10260 kc. On several Sundays around 8 a.m., faintly.

PLP, Bandoeng, 11000 kc. Same.

JVT, Tokio, 6750 kc., faintly from 7 to 7:30 a.m. Carrier not even heard until 7.

OER-2, Vienna, 6072 kc. Heard several afternoons from 4 to 5 p.m. Do not confuse with DJM, as OER-2 also announces in German.

PRA-8, Pernambuco, 6040 kc. Heard around 5 p.m.

TGX, Guatemala City. Being heard on 5.74 kc., nightly.

XEVI, Mexico City, 5.98 kc. Opens with "Sweet Mystery of Life." Best heard Thursday, 10-11 p.m.

VP3MR, 7080 kc., Georgetown, British Guiana. Heard one Sat. evening from 7 to 9 p.m., with excellent signal.

Verifications received:

VE9HX, HH2S, HJ4ABC (Ibague, they say they have same call letters as HJ4ABC Pereira, because they were not assigned to the latter). HP5F, W-10-XFH, DJJ, OAX4D, OCJ-2, HIZ, YV2RC (5800).

ALAN E. SMITH, M.D.
(17th Trophy Winner)
Chester, Vt.

Report from Cleveland, Ohio

● I have received a verification of ETD, Addis, Ababa, Ethiopia, and their address is Ministeré des Postes, Téle'graphes et Telephones, Service-Radiotelegraphique, Addis Ababa, Chief engineer is Frank A. Hammar, P.O.B. 283, Addis Ababa, Ethiopia.

They have four stations at Addis Ababa, as follows:

	Kc.	Meters
ETA	18,270	16.42
ETB	11,955	25.097
ETD	7,620	39.37
ETG	5,880	51.02

Working hours for telegraphy:

ETA.....0600 to 1900 G.M.T.
ETB.....1900 to 2330 G.M.T.
Telephony—Irregular.

ETD—39.37 m. on phone that I have verified also sent in—ETB & ETA; hope to receive soon.

These stations are located at Akaki, near Addis Ababa.

Here are some of the stations received at this post during the past 20 days.

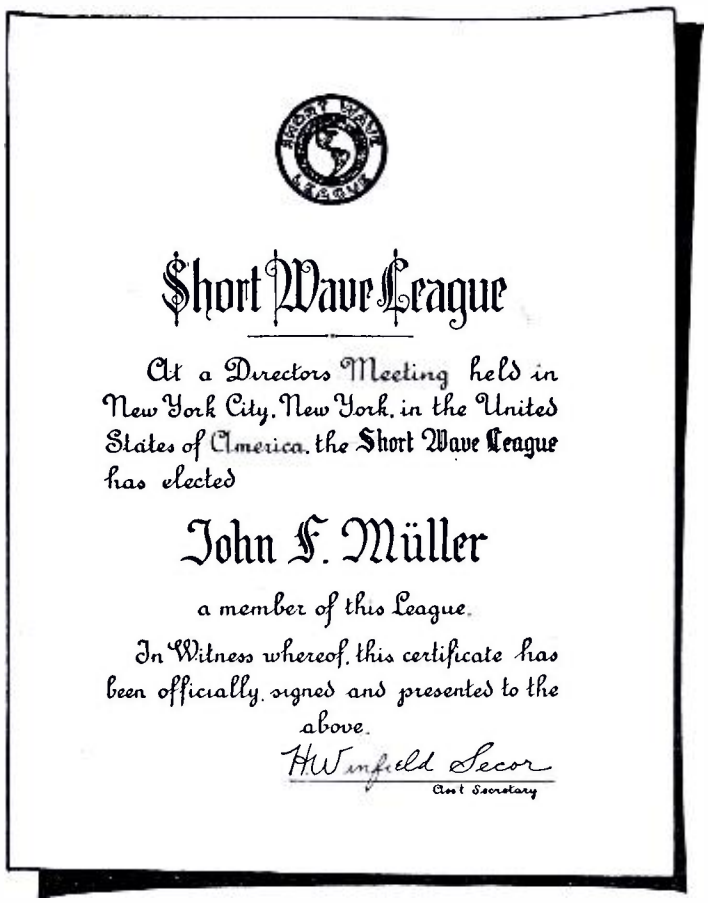
all E. S. T.

Call	W.L. Megs.	Recv.	Cond.	Date	Time
CEC	10.67	Very good		Nov. 28	7 to 7:30 p.m.
W4XB	6.04	Fair		Dec. 1	6:45 to 7:30 p.m.
HAT4	9.12	Good		Nov. 24	6 to 7 p.m.
XEFT	6.12	Fair		Nov. 23	1:20 to 2 p.m.
HP5H	6.07	Fair		Nov. 23	8:45 to 9 p.m.
SPW	13.63	Poor		Nov. 29	12 noon to 12:30 p.m.
JVF	15.61	Weak		Nov. 28	9:10 p.m.
XBJQ	11.20	Good		Nov. 29	10:30 to 11 p.m.
ORK	10.33	Fair		Nov. 23	2 to 2:30 p.m.
HRN	5.87	Good		Nov. 29	8 to 9 p.m.
YNDA	8.59	Good		Nov. 27	7:40 to 8 p.m.

Veries—Received LUGAP, W10XF, ETD, CEC, COCD, PHI, PCJ, JVM, 2RO, G2NH, HAT-4, XECR and history book of Mexico free to anyone who asks for it.

There is a new station located on the Isle of Tahiti, in the South Seas on 7.1 Megs. broadcast every Tues. & Fri. starting at 11 P.M. Have not been able to get call, it starts with FZ or F3.

WM. C. PALMER,
R2 Ward Rd., Brooklyn Stn.,
Cleveland, Ohio.



This is the handsome certificate that is presented FREE to all members of the SHORT WAVE LEAGUE. The full size is 7¼" x 9½".

See page 634 Feb. issue how to obtain certificate.

Angelo Centanino, Freeport, Pa., Reports

● As most of the listening by short-wave "fans" is being done on the 49 and 31 meters band, this report will be for stations on these bands.

HJN comes in very good on their new wave of about 5.97 meg., 6:00 to 11:00 p.m.

(*Continued on page* 697)

Here's Your Button

The illustration herewith shows the beautiful design of the "Official" Short Wave League button, which is available to everyone who becomes a member of the Short Wave League.

The requirements for joining the League are explained in a booklet, copies of which will be mailed upon request. The button measures ¾ inch in diameter and is inlaid in enamel—3 colors—red, white, and blue.

Please note that you can order your button AT ONCE—SHORT WAVE LEAGUE supplies it at cost, the price, including the mailing, being 35 cents. A solid gold button is furnished for $2.00 prepaid. Address all communications to SHORT WAVE LEAGUE, 99-101 Hudson St., New York.

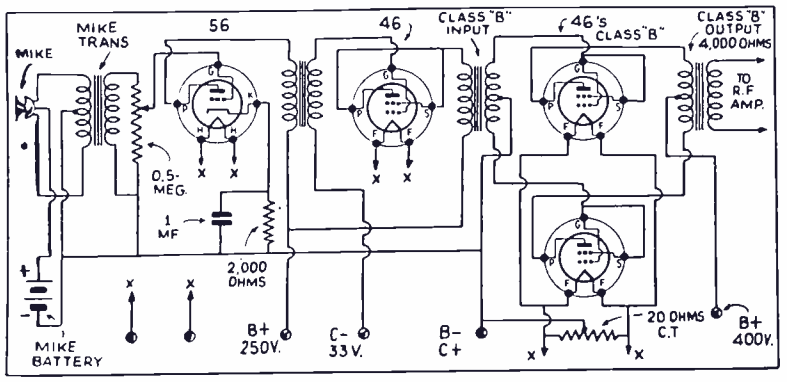
• • • Short Wave

HF-35 TRANSMITTER

Merrill Parker, La Grange, Ore.

(Q) I would like to build a suitable modulator for the HF-35 transmitter which was described in the December, 1935, issue of *Short Wave Craft*.

(A) The modulator best suited to the HF-35 transmitter should have at least 25 watts output. Therefore, we have shown a Class B modulator, using a 56 speech amplifier, a 46 triode driver, and 2-46's in Class B. The conventional double-button microphone should be used unless additional speech amplification is incorporated in the modulator.



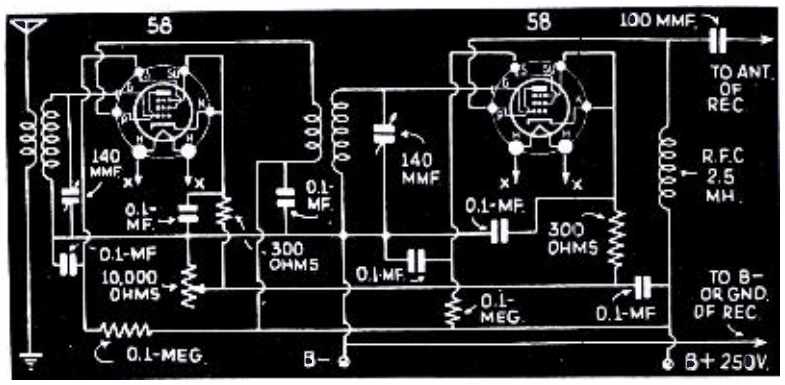
Modulator for Ham transmitter.

2-STAGE PRE-SELECTOR

Kenneth Huttelmayer, Terre Haute, Ind.

(Q) I have a Stewart-Warner converter and would like to add a 2-stage pre-selector to it. Would you be kind enough to print such a diagram employing 2 type 58 tubes? This should cover from 19 to 200 meters.

(A) We have printed a diagram of a 2-stage pre-selector which should eliminate any image response which you may now be encountering, and also bring up the sensitivity of your receiver considerably. Standard 2-winding, 4-prong plug-in coils are used.



Two stages of preselection using 58's.

33 AUDIO AMPLIFIER

Ernest Helfer, Ponteix, Saska.

(Q) Please print a diagram in your next Question Box of an audio amplifier using a type 33 pentode. This amplifier is to be used in conjunction with the 3-tube battery-operated Doerle receiver.

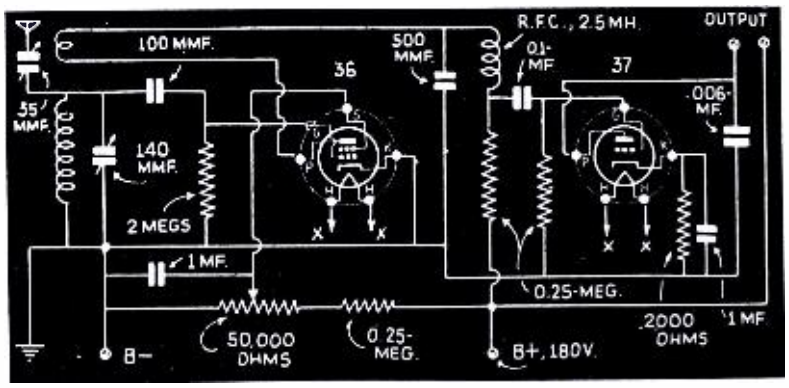
(A) The input terminals in the diagram shown, should be connected to the present output or phone of your Doerle receiver. The output connections of the amplifier, of course, will be connected to the speaker. The .006 mf. confenser in the plate circuit aids considerably in cutting down the general hissing and crackling sounds coming through the amplifier, as well as making it more suitable in all respects.

2-TUBE RECEIVER

William Santro, Worcester, Mass.

(Q) I would be much obliged if you would print a diagram of a short wave receiver using 6.3-volt tubes and 4-prong 2-winding plug-in coils. The detector should be regenerative 36 with a resistance-coupled 37 audio amplifier.

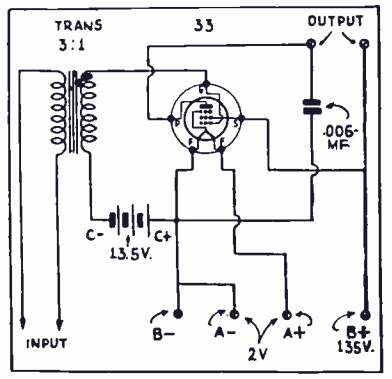
(A) The diagram we have printed is a standard one and can be used with many types of tubes. For instance, a 24 and a 27 could be used, providing the proper heater voltage was applied. The regeneration is controlled by varying the screen-grid voltage. Make sure that the antenna condenser has a low minimum capacity in order that it may be adjusted to eliminate "dead-spots."



Two-tube receiver using a 36 regenerative detector in a 37 resistance-coupled audio amplifier.

COILS FOR OSCILLODYNE

Paul Buhler, Toledo, Ohio.



Pentode amplifier for battery set.

(Q) I would like some information on how to construct coils for the 1-tube Oscillodyne.

(A) Standard coil data, as given in the January *Question Box*, can be used for the Oscillodyne. However, the tickler windings should have approximately three times the number of turns specified. Although the original "Oscillodyne" uses a 100 mmf. condenser, this will have to be changed to one having 140 mmf. capacity when the standard coil data is used.

2-STAGE AUDIO AMPLIFIER

W. B. Wahlstrand, Duluth, Minn.

(Q) Kindly print a diagram of a "high fidelity" 2-stage audio amplifier using a 56 and a 2A5.

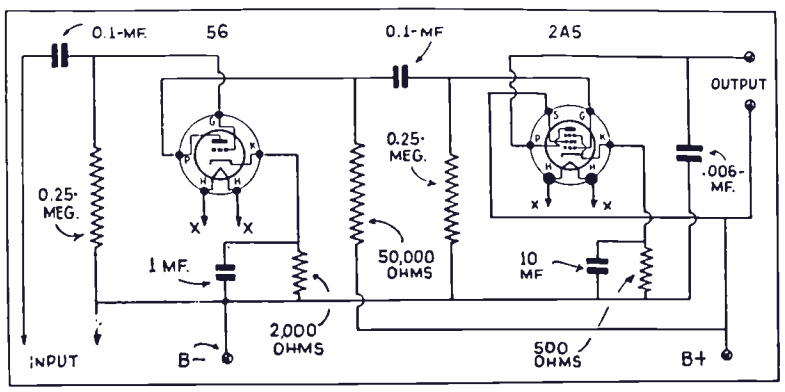
(A) We are printing the diagram of the 56 and 2A5 amplifier, but this should not be termed "high fidelity." While the quality of such an amplifier may be generally considered good, no single pentode output amplifier can produce really high fidelity.

CORRECT ANTENNA LENGTH

L. Johnson, Oakland, Calif.

(Q) I would like to transmit on both 80, 40 and 20 meters. Would you please provide me with the proper antenna dimensions.

(A) For cooperation on 80, 40 and 20 meter amateur bands, we can recommend a Zeppelin type antenna with a flat-top of 132 feet. The feeders should be between 50 and 60 feet long and spaced approximately 6 inches apart.



Two-stage audio amplifier using 56 and 2A5.

HOW TO OBTAIN NUMEROUS VOLTAGES FROM POWER-SUPPLY

Charles W. Sharpe, Kirkwood, Mo.

(Q) What value of voltage divider should be used in order to obtain various voltages ranging from 35 to 350 volts from a 350 volt 100 ma. power supply?

(A) We suggest that you use a 15,000 ohm 35-watt wire-wound resistor with as many variable sliders as you may require. Each slider, as shown in the diagram, should be adjusted to give the proper voltage. In cases where a power-supply of this type is used in general experimental work, each tap on the voltage divider should be "by-passed" with a condenser having a capacity of from .5 to 1 mf.

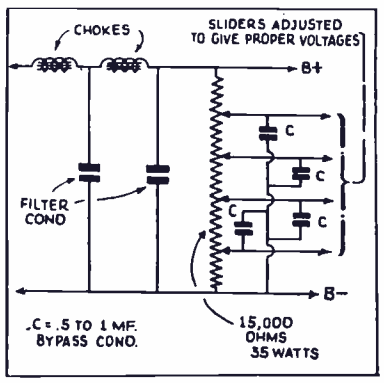
If this power supply is used with the receiver which has by-pass condensers already connected in the circuits, the condenser C will not be needed. It is only where no by-passing is present that these stabilizing condensers are necessary.

AUDIO AMPLIFIER

Robert Dortziger, Cicero, Ill.

(Q) I would like to have an audio amplifier; both stages are to use type 45 tubes. I already have an amplifier using a single 45. I am interested in getting more volume. This should operate a magnetic speaker.

(A) We do not recommend that you use 45's in both stages. The best arrangement would be 56 driving a 45. Also, we recommend a dynamic speaker.



How to obtain various voltages from power supply.

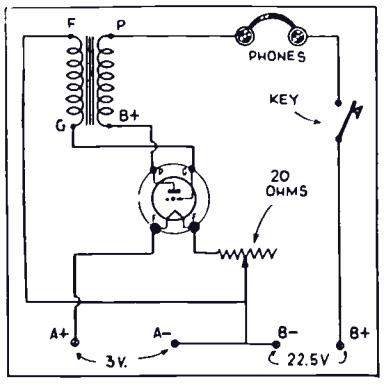
QUESTION BOX

EDITED BY GEORGE W. SHUART, W2AMN

● Because the amount of work involved in the drawing of diagrams and the compilation of data, we are forced to charge 25c each for letters that are answered directly through the mail. This fee includes only hand-drawn schematic drawings. We cannot furnish "picture-layouts" or "full-sized" working drawings. Letters not accompanied by 25c will be answered in turn on this page. The 25c remittance may be made in the form of stamps, coin or money order.

Special problems involving considerable research will be quoted upon request. We cannot offer opinions as to the relative merits of commercial instruments.

Correspondents are requested to write or print their names and addresses clearly. Hundreds of letters remain unanswered because of incomplete or illegible addresses.



Code practice oscillator.

CODE-PRACTICE OSCILLATOR

John MacDonald, Brooklyn, N.Y.

(Q) I am learning a code, and have been informed that a simple *code-practice* instrument may be built with an old audio transformer and a 230 tube. Will you be kind enough to print the diagram?

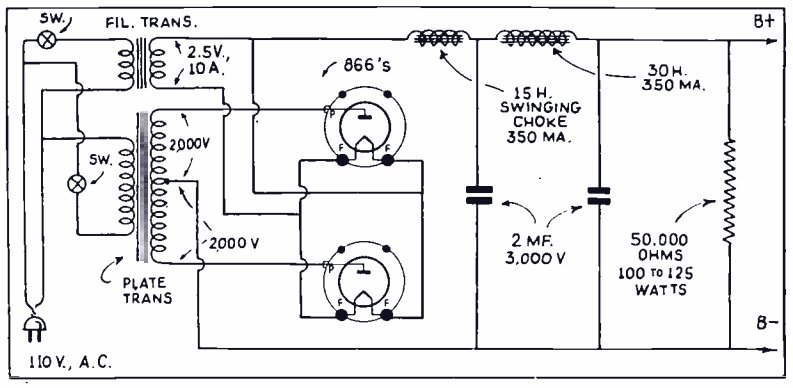
(A) For many years the circuit diagram shown, has been used in code-practice oscillators, and it is safe to say that the majority of Hams have learned the code through the aid of this device. When connecting it up, make sure that the transformer connections, as shown in the diagram, are followed otherwise oscillation may not occur. The key is placed in series with the ear phones.

2,000 VOLT POWER SUPPLY

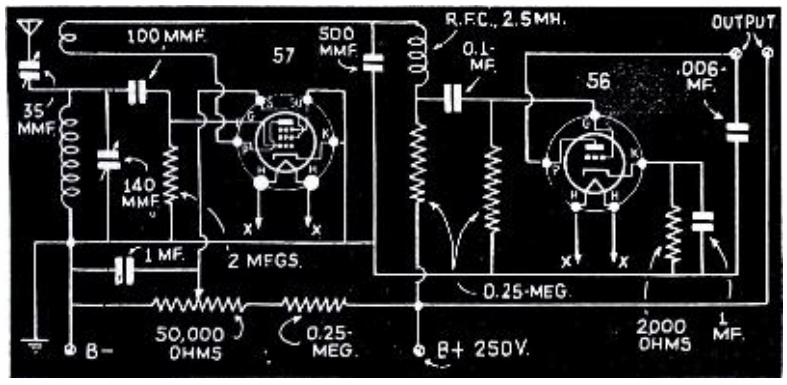
James Hurt, Louisville, Ky.

(Q) Will you publish in your Question Box a diagram of a power-supply which will deliver 2,000 volts pure D.C.? I have a transformer that is rated to deliver 1,000 volts 1,500 volts, or 2,000 volts at 300 ma., and I want to use separate filament transformer.

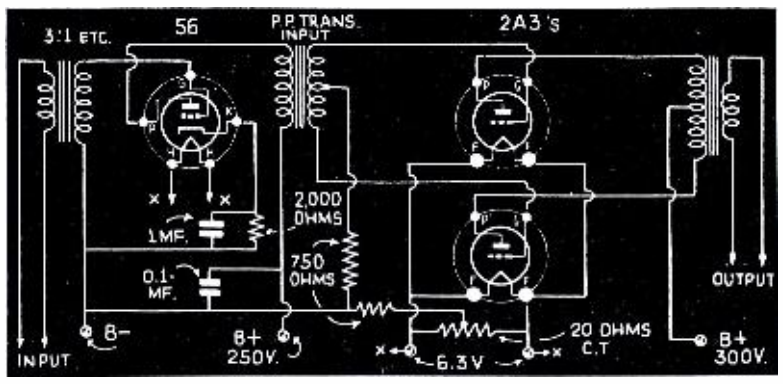
(A) We have shown a power-supply diagram using 2-866 mercury vapor rectifiers. Choke input is used. and the input choke is a 15 henry swinging choke. The bleeder or output resistor should, by all means, be used in order to prevent damage to the condensers. This should have 50,000 ohms resistance and rated from 100 to 125 watts. In operation, the filaments of this power supply should be lighted at least two or three minutes before the switch to the high voltage transformer primary is closed. Warning: A power supply of this type is dangerous and no adjustments should be made unless the plate transformer primary switch is open.



2,000 volt power supply for Ham transmitter.



Two-tube regenerative receiver using a 57 and a 56.



High-quality audio amplifier using 2A3's in push-pull.

S.G. DETECTOR AND ONE STAGE OF A.F.

Stewart Dickson, Vancouver, B.C.

(Q) I contemplate building a new receiver for general short-wave reception and would like to have you print a diagram in your Question Box of one having a 57 regenerative detector and a 56 amplifier.

(A) We have shown the proper connections for a 57 regenerative detector resistance-coupled to a 56 audio amplifier.

REGENERATIVE R.F. AMPLIFIER

F. E. Casey, Hopemont, W. Va.

(Q) I would like to add a stage of R.F. to my present receiver, and in order to obtain maximum efficiency, I am informed regeneration should be used. Kindly show such a diagram using a 24A tube.

(A) Regeneration does unquestionably provide a great amount of sensitivity when used in an R.F. amplifier, although it adds an extra control, i.e., regeneration control, it is well worth while. We have shown a diagram using standard 2-winding coils. If 3-winding coils are used, the dotted connections should be followed

When using a doublet antenna it connects to both terminals of the antenna coil; the coil is not grounded.

UP-TO-DATE 2-TUBE TRANSMITTER

James Merrill. Sioux City, Iowa.

(Q) I would like to build a transmitter, crystal-controlled and up-to-date in every respect, not using more than two tubes in the R.F. portion. I leave the choice of apparatus to you.

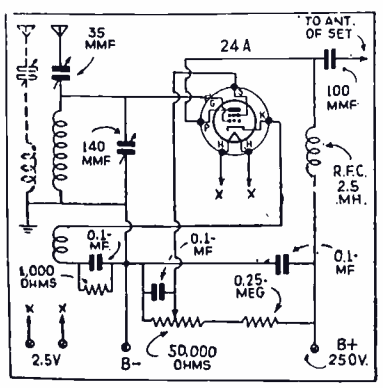
(A) We believe that for a low-power transmitter, the circuit diagram shown in the drawing would be a hard one to beat. In it we have used one of the new screen-grid pentodes as an electron-coupled oscillator and the "good old 210" as the amplifier. These can be operated on any two amateur bands with a single crystal, by simply tuning the plate circuit of the oscillator to twice the crystal frequency when "doubling" is required.

AUDIO AMPLIFIER USING 2A3'S

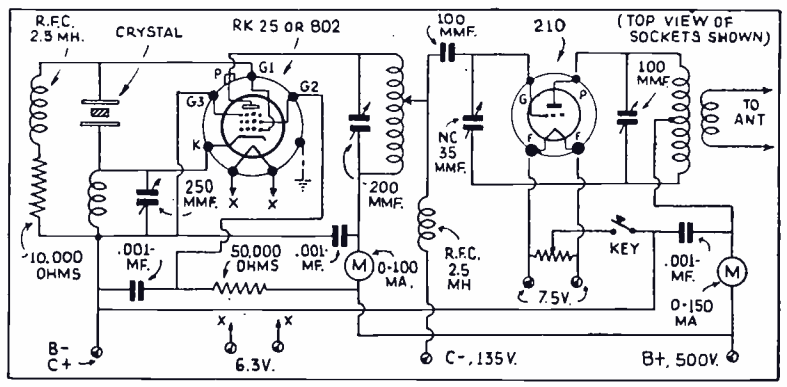
S. W. C. Reader. Greensboro, Ala.

(Q) I would like to build an amplifier using 2A3's in push-pull with a 56 driver. Would you please be kind enough to furnish the necessary schematic diagram?

(A) You will find the diagram on this page, and we are sure that the quality will be excellent. The 2A3's are noted for their exceptional quality. A good dynamic speaker should be used.



Regenerative R.F. amplifier for short wave set.



Two-tube crystal-controlled transmitter using a pentode oscillator and a type 10 amplifier.

This HAM Station Serves Missions

(*Continued from page* 650)

Frequency Change Automatically Obtained

The automatically operated "keying" device has been redesigned to affect an alternate change of the transmitter frequency. After one dash signal on a wavelength of 85 meters is radiated, the automatic device connects a small condenser parallel to the condenser of the tuning circuit, and increases the wavelength of the transmitter to 150 meters.

The transmitter alternately radiates now during the first second a dash signal on 85 meters and during the consecutive second another dash signal on a wavelength of 150 meters, etc.

85 or 150 meters?

In a distance of about 2 miles both frequencies respective wavelengths could be received with about equal field strength. However, at a distance of about 4.5 miles, the 150 meters signal seemed to be much stronger than the one on 85 meters.

This observation was confirmed at a distance of 8 miles. At this distance the field strength of the 150 meters signals remained absolutely constant over a long time period, while the signals transmitted on 85 meters already showed inclination of a slight fading.

Experiments With 83.3 Meters

In addition to these experiments over short distances, long distance communication experiments have also been made, but on a wavelength of 83.3 meters. The transmitters used for the *long-distance* experiments have been of course of larger output (between 15 and 100 watts). The average distance bridged during daytime was about 375 miles. During the night distances of about 1100 miles (Helsingfors, Finland) could be bridged. Transmissions over greater distances could not be effected regularly.

Experiments With 20 Meters

Entirely different results have been obtained with transmission on 20 meters. According to theory there is to be expected a "dead zone" around the transmitter covering a zone of about 500 miles radius. Actually no verification cards have been received from the specially notified reception posts in this area, but verification cards have been received from Reykjavik (Iceland), from Egypt, South and North America.

Verification cards received from all parts of the world testify to the fact that the 20 meter wave transmitted with only 100 watts by D2BD bends or refracts in such a way, that at a distance of about 600 miles, relatively good reception results are obtained. The best reception results however, have been obtained at a distance between 1,200 and 2,000 miles.

Above 2,000 miles the field strength decreases gradually. There have been some reception reports concerning daytime transmission coming from distances up to 4,000 miles, and verification cards indicating a reception of over 8,000 miles during nighttime, but regular results as mentioned before have been obtained mostly at distances of between 1,200 and 2,000 miles.

40 Meters Embrace the Globe

Especially interesting results have been obtained by experiments with the 40 meters wavelength. Daytime transmissions executed with a few watts output bridged easily 600 miles. The same transmitter operated after sunset effected clear and powerful reception over distance of about 12,000 miles (Australia, New Zealand), but at certain times, and in direction east, only. However, this communication link was often available for a restricted time only, and changed shortly afterwards into a complete cut off. But 12 hours later similar long distances could as easily be bridged, but this time only in direction west.

"Fan's Delight" Receiver

(*Continued from page* 662)

a 6C6, a 37, and a 41. The 6D6 serves as an untuned R.F. stage with a resistance in the grid circuit and provides a stable input for the detector, resulting in *smooth regeneration.* The 6C6 is used as an electron-coupled detector which is now the byword for stability. A 50,000 ohm potentiometer in the screen-lead controls the regeneration; a small voltage-divider giving the necessary 20 to 30 volts the optimum screen voltage for greatest detector sensitivity. The 37 is used for the first audio stage, resistance-coupled to a 41 pentode and is used to "push" a speaker.

The phone jack in the plate circuit of the 37 allows the use of phones and plenty of volume is obtained at both points—the phones or speaker.

In this case a bakelite panel and a wooden base-board are used instead of the more conventional aluminum panel and chassis. This was thought desirable as for more "gain" the coils were wound on large forms and spread out, thus entailing slightly longer leads. If the aluminum were used it would be liable to bring up the inter-circuit capacity to an undesirable extent. The bakelite panel is 7 inches by 12 inches and the wooden baseboard 8 inches by 11 inches. This size seems to strike a medium between overcrowding and long leads, although when wiring it would be preferable if there were several miles between each part so one wouldn't burn parts with the iron when soldering. Looking from the front one can see the tuning dial in the center of the panel, one of the coil switches at the right with the phone jack and the other coil switch at the left with the *regeneration-control* potentiometer. No, the dial is not one of the old "Marco's" but one like them put out by ICA.

Looking down from the top the tuning condenser can be seen on the panel, with the coils mounted in a line behind it. The tube with the shield is the 6D6 R.F. tube although the shield is not necessary. To the right of this is the 6C6 detector, with the 37 audio immediately behind it and to the right of these is the 41 audio tube. The coil and tube sockets are Hammarlund isolantite sockets necessary for rigidity and insulation, and these are mounted on the spacers that come with them. One should be sure to use good long screws to hold the sockets down firmly. Eight Fahnestock spring clips are used for aerial, ground, and plate and filament supply. All the condensers and resistors are mounted by their wire leads. One should make sure to test these before wiring them in, a fact stated many times before and well worthy of further reiteration. A faulty resistor or condenser can impair the operation of a set if it is half-way defective and yet give good enough results so that trouble from such a sort is entirely unsuspected. It is far better to be suspicious beforehand.

Attention should also be paid to making good connections. A *hot, well-tinned* soldering iron easily takes care of this. The coils do not have to be wound with any particular care as they do in a super or a TRF job, where very fine alignment and tracking is necessary. So long as the proper number of turns are wound there is no need to worry about accurate spacing and such is the toleration of the detector that it is not "fussy" about "half-turns" of wire. If one uses a prong code different from the one used here, there will be discrepancies. It is necessary, however, to carefully check when wiring in the switches as many contacts offer good chances for errors.

When wiring in the switches it will be found that it is necessary to remove the tuning condenser from the set. Then, when all connections are made below, the tuning

condenser can be put back in the set and wired in the circuit. When all the wiring is complete and checked one can put in the tubes and coils, attach plate and filament supply and aerial and ground and explore the tremendous expanse of the short waves. If the stated precautions have been taken and a good power-supply with plenty of filter "choke" and good size electrolytics is used, the set ought to operate "OK" at "first try."

Of course one always has to become well acquainted with a set to secure maximum performance and there are always several minor wrinkles that has to be ironed out with any new set. One should be particular about the aerial and ground; the aerial should be as long and as high as possible and the ground lead as short as possible; steam radiators are not nearly so good as water pipes as a "ground." The midget padding condenser provides for antenna adjustment and this should be set for greatest signal strength. The speaker used in this particular case is one of those new permanent magnet dynamics.

Parts List

Condensers:

C1—140 mmf. Hammarlund midget tuning condenser.
C2—35 mmf. Hammarlund midget padding condenser.
C-3—.0001 mf. mica postage stamp condenser, Aerovox.
C4—.01 mf. midget paper tubular condenser, Cornell Dubilier.
C5—.1 mf. midget paper tubular condenser, Cornell-Dubilier.
C6—.5 mf. paper tubular condenser, Cornell-Dubilier.
C7—.0001 mf. mica "postage-stamp" condenser, Aerovox.

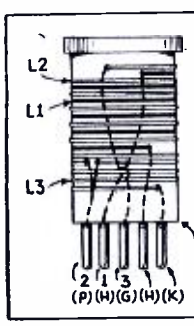
Resistors:

R1—50,000 ½ watt, I.R.C.
R2—500 ½ watt, I.R.C.
R3—2 meg. ½ watt, I.R.C.
R4—40 000 ohm ½ watt, I.R.C.
R5—10,000 ohm ½ watt, I.R.C.
R6—250,000 ohm ½ watt, I.R.C.
R7—2,000 ohm ½ watt, I.R.C.
R8—50,000 ohm potentiometer, Electrad.
RFC—Hammarlund CH-X chokes. (2.5 MH.)
4—5-prong sockets and forms for coils; Hammarlund.
4—sockets for tubes; Hammarlund.
2—3-pole double-throw (preferably triple-gang rotary switches.)

Coil Winding Table

No.	L1	L2	L3	
1	4	6	4	30 D.C.C.
2	6	11	4	30 D.C.C.
3	10	21	4	30 D.C.C.
4	16	35	5	32 D.S.C.

Mean dia. of 1 turn—1⅜ inch. Max. dia. across 2 ribs of 10 sided shape (Hammarlund form) 1½ inches. Length of form 2½ inches.



~ COIL DATA ~

COIL	L1	L2	L3
№1	4 TURNS	6 TURNS	4 TURNS
№2	6 "	11 "	4 "
№3	10 "	21 "	4 "
№4	16 "	35 "	5 "

COIL №s. 1, 2 & 3 = 30 D.S.C. WIRE
COIL №. 4 = 32 D.S.C. WIRE
(COIL №. 1 SHOWN)

Drawing above shows coil winding data and connections of windings to pins.

News from an Italian Ham

(*Continued from page* 652)

short-wave station as is evidenced by the fact that plenty of meters are on hand for making measurements of every description. Calibrated oscillators of several types are available for making the various short-wave measurements, and some of these are seen in the photo, as well as the station "mike", and a few of the QSL cards received by Mr. Passini from the stations he has contacted in various parts of the world.

The "H and F" Super-Het

(Continued from page 651)

and only the electron stream to the plate of the detector is modulated. The detector dial can be swung back and forth through resonance without the slightest affect on the tuning of the oscillator, even on the highest frequencies.

Iron Core Transformers Used

The entire intermediate frequency portion of this receiver is built around a single tube, the 6F7. This tube is, as most of you know, composed of a triode and a pentode all in the same glass envelope. We use this tube as the *I.F. amplifier* and the *second detector*. Only one stage is used and to obtain the greatest possible amplification the new Miller *Iron core I.F. transformers are used.* Let us say right here, that anyone who has not tried these new iron core I.F. transformers is in line for a real surprise when he does. With this arrangement we were able to obtain greater selectivity than that obtainable with two stages, using the conventional transformers. The gain of course was not quite as great as two separate stages, simply because the "over-all" gain of 6F7 pentode is less than a 58 or 6D6. However, there is enough amplification to serve the purpose. In using the 6F7 as a "combination" I.F. amplifier and second detector, the grids are biased separately by using two resistors in series with the cathode and returning the grid of the pentode to the mid-point of the resistors and the grid of the triode to the B minus. These connections are the heart of the I.F. unit and *must* be made as shown in the diagram!

Operates Speaker!

From the second detector we go into a 42 or 41 pentode, the 42 provides slightly greater audio volume, which is capable of operating a loud speaker. For CW code reception a separate oscillator is used. The second detector could have been made to oscillate but the saving of one tube is not worth while. The separate tube provides stability and flexibility not obtainable otherwise. Coupling between the beat oscillator and the I.F. amplifier is very simple and effective. From the plate of the beat oscillator we run a wire into the I.F. section of the receiver and this wire is placed at a distance of about ¾ths. of an inch from the grid lead of the pentode section of the 6F7. This distance should be varied slightly until proper heterodyning is obtained. Too close coupling will result in the I.F. stage being blocked (overloaded) by the output of the oscillator.

The high frequency portion of the receiver is just as simple as the low frequency end. The two tuned circuits are ganged and suitable padding is provided. The coils are wound especially for superheterodyne receivers and have the proper turns so that the two circuits will "track" (match) nearly perfectly. By connecting a .001 mf. condenser in series with the oscillator tuning condenser and a 35 mmf. condenser across it, we are able to adjust the two circuits so that the detector trimmer, during operation, does not have to be changed more than three or four points on the dial.

Bandspread is obtained through the use of a dual ratio vernier dial and all the "Ham" bands are spread amply for comfortable tuning.

The cabinet and chassis used is of the factory type and the dimensions are as follows: 16¼" long, 8¾" high, 8¼" deep. This particular cabinet is the one used for the 5-tube Doerle receiver. The lower left hand knob is the detector trimmer. Next comes the dual ratio dial, and farther to the right is the detector regeneration control, then the audio volume control, and finally, on the extreme right, the beat oscillator switch. In this cabinet we have two partitions, forming a small compartment in the center. It is in this compartment that two iron core I.F. transformers and the

6F7 are located. On the right hand side behind the speaker, we have the beat oscillator and its adjustable coil, the power transformer, rectifier tube and audio amplifier.

The plug-in coils used, are standard Bud "super-het" coils and cover a range of from 13 to 200 meters. The ticklers are somewhat larger than necessary, therefore, if you do not construct the coils, turns should be removed from the ticklers until the number specified in the coil table remain.

Parts List for Super-het

1—140 mmf. dual condenser, Bud.
2—35 mmf. midget condensers, Bud.
1—35 mmf. midget padding condenser, compression type, Hammarlund.
10—.1 mf. by-pass condensers, Cornell-Dubilier.
1—.0001 mf. mica condenser, Cornell-Dubilier.
1—.0005 mf. mica condenser, Cornell-Dubilier.
2—8 mf. electrolytic condensers, inverted can type, Cornell-Dubilier.
1—dual, 8 mf. electrolytic condenser, Cornell-Dubilier.
1—.001 mf. mica condenser, Cornell-Dubilier.
1—.006 mf. mica condenser, Cornell-Dubilier.
3—¼ meg, ½ watt resistors, insulated type, I.R.C.
2—1500 ohm ½ watt resistors, insulated type, I.R.C.
1—15,000 ohm 35 watt resistor, I.R.C.
3—100,000 ohm ½ watt resistors, insulated type, I.R.C.
2—50,000 ohm ½ watt resistors, insulated type, I.R.C.
1—300 ohm ½ watt resistors, insulated type, I.R.C.
1—50,000 ohm potentiometer, Electrad.
1—¼ meg. potentiometer, Electrad.
2—6-prong isolantite sockets, Bud.
1—7-prong wafer socket.
1—6-prong wafer socket.
1—5-prong wafer socket.
1—4-prong isolantite socket.
1—5-prong isolantite socket.
1—power transformer, 6-8 tubes. Stancor.
1—set of 8 super-het plug-in coils, Bud.
2—465 kc. iron core I.F. transformers, Miller.
1—beat oscillator coil and condenser, Miller.
1—6 inch dynamic speaker with 2,000 ohm field, Wright de Coste.
1—dual ratio tuning dial.
1—5-tube Doerle cabinet R. T. Co.
2—6C6 tubes.
1—6F7 tube.
1—37 tube.
1—41 or 42 tube.
1—80 tube.

Coil Data

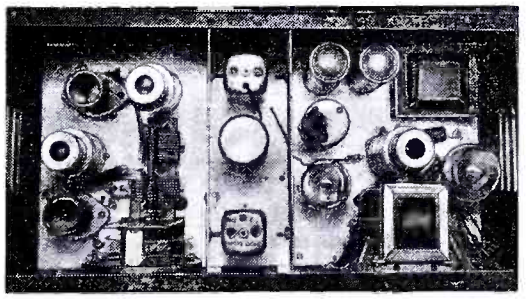
DETECTOR COIL

13 to 200 Meters	*Turns*	*Length Winding*	*Wire*	*Tickler Turns*
No. 1	6	1"	No. 20	4
No. 2	14	1⅜"	No. 22	6
No. 3	25	1⅞"	No. 26	5
No. 4	53	1⅜"	No. 28	12

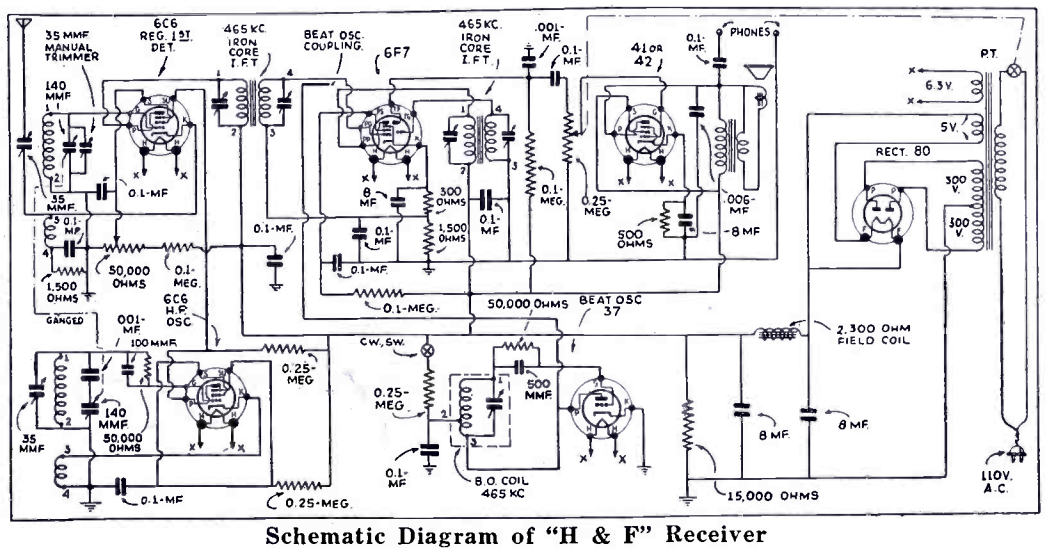
OSCILLATOR COIL

No. 1	6	1"	No. 20	4
No. 2	13	1¼"	No. 22	8
No. 3	22	1"	No. 26	9
No. 4	42	1⅛"	No. 28	12

All wound on 1¼ inch ribbed form—spacing between tickler and grid coil ⅛ inch.



Top inside view of "H & F" Receiver



Schematic Diagram of "H & F" Receiver

Gathering Data from the Stratosphere on 5 meters

(*Continued from page* 648)

weather conditions restrict the airplane or not. Past practice has been to send what is usually termed a *sounding balloon* into the upper strata for making recordings of the various conditions. The main disadvantage here, however, was that the balloons were seldom recovered, and if they were, it was many days after the ascension, and consequently the reports were of little value to daily weather forecasters. The new system, however, as we learned before, is practically instantaneous and there is no chance of losing the valuable data, even if the balloon were not returned.

Radio receiving and recording—Reception on the ultra-short waves is accomplished with superregenerative circuits. When effectively constructed these receivers are nearly, if not actually, as sensitive as the much more elaborate superheterodyne and have the great advantage of a rather broad tuning-characteristic. This is important since the simple oscillators used in this work are not sufficiently stable to permit reception on a superheterodyne. The receiver must be designed for a dual function, namely, to provide a signal to operate the recording equipment and to provide a signal for direction-finding purposes.

In designing the receiver for recording a difficulty is met with in the high noise-level characteristic of superregenerative receivers. This noise is made up of components over a rather wide audio-frequency range. When reception of speech is desired the noise can only be slightly reduced without impairing the quality of the voice, but when interested in only such a tone as emitted by one of the radio sounding transmitters a great deal can be accomplished by way of filtering out this disturbance. The recording receiver now in use is equipped with a low-pass filter which removes all frequencies above 1000 cycles per second, leaving the receiver relatively quiet but not interfering with receptions of the tone-signal. A sensitive relay-device is operated by the change in plate-current of a heavily biased amplifier-tube. This receiver has been used to record a tone sent to Blue Hill from Mt. Washington, and controlled by the anemometer-contact at the latter point. Indication is that a moderate signal will be adequate to operate the recording apparatus.

Two superregenerative receivers close together interfere badly with each other so that direction-finding must be done on the same instrument. This is accomplished by inserting a connection for listening in the circuit and picking up the signal originally on a directive antenna. There must thus be a continuous signal from the balloon, to be broken up by intervals to transmit the meteorological record. Unless equipment can be designed to give a vertical angle bearing, the location of the balloon must be secured by observations with two direction-finding stations. Our preliminary experiments with horizontal doublet antennas indicate that an adequate bearing can be secured, but it may prove desirable to construct more elaborate directive arrays.

The records are taken at Blue Hill on a chronograph which is intended to be synchronized with the rotation of the contact on the meteorograph. The drum of the chronograph is arranged for rotation in a period of one minute. As the drum makes one rotation the recording pen-mechanism is lowered so that successive lines are separated by about two mm, giving room on this instrument for a record of about two hours. As the relay on the recording receiver closes, a circuit is made to the pen-magnet causing it to make a mark on the paper. The timing pulse from the balloon should come at the same point on the chronograph-drum, but two mm lower at each revolution, giving a straight vertical line if the meteorograph and chronograph were properly synchronized. The record

of pressure, temperature, and humidity should give a curve of satisfactorily open scale, since the chronograph-drum has a cirumference of 120 cm.

The rotor consists of a brass disc about one inch in diameter, which is insulated on one surface save for a thin radial beam. Extremely fine points on the end of small extension-arms, fastened to a thin bimetal thermometer, to a small aneroid, and to a hair-hygrometer, slide on this disc. As the surface of the disc is absolutely smooth, no mechanical stresses other than a constant slight friction are exerted on the meteorological elements when the electrical contacts are made. No enlarging linkage whatsoever is used as the original deflections of the elements are sufficiently large to cover more than 100° each near the center of the disc. This elimination of enlarging mechanisms, with all their bearings and pivots, does away with important sources of trouble during operation. It contributes considerably to the simplicity of the instrument and it saves unnecessary weight. The contacting disc is driven by the one-minute shaft of a special clockwork, which functions satisfactorily at all temperatures down to 75° C below zero (—103° F). This clock is synchronized to a chronograph, the essential part of the recording equipment built by S. P. Fergusson of the staff of the Blue Hill Observatory.

The chronograph consists of a large drum rotating once a minute. A recording pen is slowly carried parallel to the axis of the drum. It writes a line on the drum which represents a perfect spiral as long as no contacts are transmitted to a relay on this pen. Each such contact causes a deflection of the pen, thus filling out the space between two spirals on the record. These markings represent the positions of the reference-pen and of the temperature-, pressure-, and humidity-pens of the meteorograph. With perfect synchronization, the markings of the reference-pen should form a straight line. As the meteorograph undergoes temperature changes of about 30° C (54° F) or more during an ascent to 20,000 feet, the clockwork speed will be slightly distorted during the ascent. This causes a certain inconvenience, but not inaccuracy, in recording the traces at the ground. However, it is felt that the present is not the time to devote too much attention to the construction of a clock of absolutely constant speed. The complex influences of the temperatures on the elasticity of the springs and the dimensions of the clockwork and of the air-densities on the movements of the escapement will be very hard to balance against each other.

The clock of the radio-meteorograph is equipped with an escapement of 312 beats per minute. Consequently, the rotating disc does not turn smoothly but jumps in frequent small jerks, each one being slightly over 1°. The present thermometer is adjusted to a range of from about 25° C (77° F) to about —35° C (—31° F). These 60° C (108° F) are distributed over a range of about 100 angular degrees on the contacting disc, that is, over about 90 jerks. In other words, the accuracy of measurement can not exceed two-thirds of a degree Centigrade. As we are accustomed to report upper-air temperatures to 0.°1, the final radio-meteorograph will have to have an accuracy of 0.°1. The same consideration holds true for the pressure and, to a lesser extent, for the humidity.

Girl Operators, Attention!

Listen "YL's" and "XYL's"!! Why not send the Editor a good photo of your "Rig"—and don't forget yourself. A separate photo of yourself will do, with a "clear" photo of that station! $5.00 for best "YL" photo.—Editor. **See page 649.**

How Short Waves Served Strato Flight

(*Continued from page* 648)

On account of the shifting position of the men in the gondola, who were obliged to operate the scientific instruments while broadcasting at the same time, an audio automatic gain control was installed, which kept the modulation level close to 100 percent regardless of the position of the broadcaster.

The transmitter as well as the receiver was constructed largely of dow metal. Their combined weight was approximately 60 pounds.

The receiver was a six-tube superheterodyne, designed to cover a frequency band of 6000 to 6500 kc., all ground transmitters having been adjusted to operate within these limits. The dimensions of the receiver were 7"x9"x9½". It was a single-control device, and earphones instead of loudspeaker were used; however, the signals were so loud that, with the exception of one period during the flight, it was possible for the observers to copy all signals with the headphones hanging loose from the receiver.

The transmitting antenna was a *quarter-wave radiator* suspended from the lower catenary band of the balloon, with a pulley arrangement to draw it taut. It was fed by a two-wire transmission line from the transmitter. The receiving antenna was of the ordinary airplane type, dropped out from the bottom of the gondola about 70 feet. The entering insulator was of soft rubber so that air pressure within the gondola would tend to seal the entrance.

In order to insure that the dry batteries used both in sending and receiving would be absolutely fresh at the start of the flight, these were kept in "cold storage" until just a short time before the take-off. The transmitter and receiver vacuum tubes were energized three-quarters of an hour before the balloon left the ground, so that a constant temperature and hence maximum stable operation would be reached.

The entire staff of NBC engineers, with several announcers, was on duty at Radio City, Chicago and Rapid City during the flight. Efficient work also was done by the R.C.A. Communications engineers at Riverhead, Point Reyes and Bolinas, Calif. Constant communication was maintained with the big balloon and with the many points on the ground circuit during the more than eight hours that the Explorer II was aloft, and the frequent switches from the balloon to ground points, and to the *China Clipper* and London were made without delay and with perfect coordination.

Ground communication was established by a combination of telephone trunk lines feeding various radio transmitters and receivers. Any point could talk to any other point, and everything that was said went out over three transmitters so that it would be sure to be picked up by the balloon. This circuit, known as a full-talk circuit, ran from New York to the Bound Brook 20 kw. radio transmitter, W3XL, operating on 6425 kc.; thence to Washington to the headquarters of the National Geographic Society and the U. S. Army Air Corps; thence to Chicago to the 5 kw. radio transmitter W9XF, on 6100 kc.; then to Rapid City, S. D., to the strato camp and the 200 watt radio transmitter W10XF, operating on 6350 kc. at the Indian School seven miles from the camp.

Signals from the balloon transmitter were picked up by the R.C.A. Communications receiving stations at Riverhead, L.I., and Point Reyes, Calif., by the NBC receiving station at the "strato" camp, and by the broadcasting receiving headquarters of the National Broadcasting company at Chicago.

When on the air, all speakers were fed to the full-talk circuit, but they could also be placed on a special program circuit with one-way repeaters which brought in the incoming messages from the balloon.

FREE S-W DATA SERVICE

Joseph Calcaterra, Director

Short Wave Craft Data Service,
99 Hudson Street,
New York City, N. Y. SWC-336

Please send to me, without charge or obligation, the catalogs, booklets, etc., the numbers of which I have circled below.

2 3 4 5
57 73 74 75 76

My radio connection is checked below:

( ) Short-Wave Set Builder
( ) Short-Wave Experimenter
( ) Short-Wave Listener
( ) Service Man operating own business
( ) Service Man for manufacturer
( ) Service Man for jobber
( ) Service Man for dealer
( ) Service Man for servicing company
( ) Dealer
( ) Jobber
( ) Experimenter
( ) Professional Set Builder
( ) Amateur Set Builder
( ) Licensed Amateur
( ) Station Operator
( ) Radio Engineer
( ) Laboratory Technician
( ) Public Address Worker
( ) Manufacturer's Executive
( ) Student

My age is years.

I have been interested in radio for years.

I buy approximately $ .00 of radio material a month. (Please answer this question without exaggeration or not at all.

(Please Print Name and Address)

Name.....

Address.....

City.....State.....

AVOID DELAY. The catalogs and booklets listed are now in stock and will be sent promptly as long as the supply lasts. Only the items listed are available. Please make your selection from the current issue of *Short Wave Craft*, and use the coupon in ordering the items.

● THE catalogs, booklets, and folders listed in this department contain a wealth of information and data which will help you in your *short-wave* work.

These catalogs, booklets, and folders may be obtained by *Short Wave Craft* readers (without the trouble and expense usually involved in writing individual letters to the various organizations which publish them) through arrangements which have been made by *Short Wave Craft* magazine with the publishers of the literature listed.

To obtain any of the material listed in this department, simply draw a circle around each Booklet Number on the coupon, corresponding to the numbers of the items you would like to have, fill in the rest of the coupon and mail it to the *Short Wave Craft Data Service.*

A complete stock of these catalogs and other literature is kept on hand and will be sent to you promptly, as long as the supply lasts. There is no limitation on the number of items you may ask for, but to avaid waste, please do not ask for material in which you are not interested or of which you already have a copy.

Only the literature listed in this issue is available. Please do not ask for catalogs which are not listed. Do not include letters asking for information from other departments with your request for catalogs as that will cause delay in answering your inquiries.

2. HAMMARLUND 1936 CATALOG. Short wave fans and set builders will find a flock of

new low-loss parts such as variable condensers, coil forms, sockets, transformers, chokes, shields, and other precision products especially designed for short-wave and ultra-short-wave work described in this catalog. Information on short-wave sets is included.

3. THE HAMMARLUND SHORT-WAVE MANUAL. No short-wave fan who is interested in short-wave set design should be without this 16-page manual, which contains constructional details, wiring diagrams and lists of parts of the day. A circular giving a description and 12 of the most popular short-wave receivers of list of contents of this manual is available free of charge to *Short Wave Craft* readers.

4. THE HAMMARLUND "COMET PRO" SHORT-WAVE SUPERHETERODYNE. This receiver is still holding its own as one of the leading short-wave receivers available for professional operators and advanced amateurs, for work on 15- to 250-meter code and phone reception. It is especially adapted for laboratory, press, police, airport and steamship use.

5. ELECTRAD 1936 VOLUME CONTROL AND RESISTOR CATALOG. No short-wave set can function properly unless the volume controls and resistors are of the best. This catalog of resistors features the latest developments in the resistor art. Fundamental volume and tone control circuit diagrams are given.

57. RIBBON MICROPHONES AND HOW TO USE THEM. How do your phone signals sound to the fellow at the receiving end? If they sound as though you're talking with a bunch of marbles in your mouth, the chances are a good microphone, properly hooked up, would help "to beat the band." This folder describes the Amperite Velocity Ribbon Microphone and gives information and circuit diagrams on how to connect up the microphone.

73. HOW TO ELIMINATE RADIO INTERFERENCE. You'll get much more enjoyment out of short-wave programs if you cut out the noise interference. This handy folder gives complete information on the Sprague Interference Analyzer and how to use it to locate and eliminate radio interference.

74. SPRAGUE ELECTROLYTIC AND PAPER CONDENSER CATALOG. You can't very well build a short-wave set without fixed condensers for filtering and by-passing. You'll find complete specifications of all the condensers you'll need for building or improving your short-wave set in this catalog. A description of the Sprague Capacity Indicator, for making tests on condensers, is included.

75. SPRAGUE TEL-U-HOW CONDENSER GUIDE. If you are ever puzzled regarding the proper kind, capacity and voltage of condenser to use in any given place, you should have a copy of this free chart which gives data on just that very subject. This folder also gives valuable hints on how to locate radio troubles due to defective condensers and includes helpful data on condenser calculations.

76. FACTS YOU SHOULD KNOW ABOUT CONDENSERS. If you have any wrong ideas or notions as to the effect of certain condenser characteristics on the filtering efficiency or suitability of a condenser for a given application, this little folder will straighten you out.

S.W.C. Started Him in Short Waves

(*Continued from page* 657)

switch-board fitted on the wall. Everything is controlled with switches at my fingertips on the table. The complete station is in my store at the above address, and I welcome any visitors. I had many from southern U.S.A. this year. Well, to conclude this letter, I would like to say that I had no help, other than reading magazines on which to start in the radio field, and so many thanks to *Short Wave Craft* again. I am now making a marked success, and hope to do so by fair dealing. Well 73 boys. Come up and see me sometime, hi-hi-hi!

Harold Knox, VE3AEL,
16 Vaughan Rd.,
Toronto, Can.

(*Hot cha, Harold, what a layout. Well, we're glad "S.W.C." helped to start you off in short waves.—Editor.*)

Police Radio Alarm Stations

(*Continued from page 672*)

WPDS	St. Paul, Minn.	2430 kc.
WPDT	Kokomo, Ind.	2490 kc.
WPDU	Pittsburgh, Pa.	1712 kc.
WPDV	Charlotte, N.C.	2458 kc.
WPDW	Washington, D.C.	2422 kc.
WPDX	Detroit, Mich.	2414 kc.
WPDY	Atlanta, Ga.	2414 kc.
WPDZ	Fort Wayne, Ind.	2490 kc.
WPEA	Syracuse, N.Y.	2382 kc.
WPEB	Grand Rapids, Mich.	2442 kc.
WPEC	Memphis, Tenn.	2466 kc.
WPED	Arlington, Mass.	1712 kc.
WPEE	New York, N.Y.	2450 kc.
WPEF	New York, N.Y.	2450 kc
WPEG	New York, N.Y.	2450 kc.
WPEH	Somerville, Mass.	1712 kc.
WPEI	E. Providence, R.I.	1712 kc.
WPEK	New Orleans, La.	2430 kc.
WPEL	W. Bridgewater, Mass.	1666 kc.
WPEM	Woonsocket, R.I.	2466 kc.
WPEP	Kenosha, Wis.	2450 kc.
WPES	Saginaw, Mich.	2442 kc.
WPET	Lexington, Ky.	1706 kc.
WPEV	Portable (in Mass.)	1666 kc.
WPEW	Northampton, Mass.	1666 kc.
WPFA	Newton, Mass.	1712 kc.
WPFC	Muskegon, Mich.	2442 kc.
WPFE	Reading, Pa.	2442 kc.
WPFG	Jacksonville, Fla.	2442 kc.
WPFH	Baltimore, Md.	2414 kc.
WPFI	Columbus, Ga.	2414 kc.
WPFJ	Hammond, Ind.	1712 kc.
WPFK	Hackensack, N.J.	2430 kc.
WPFL	Gary, Ind.	2470 kc.
WPFM	Birmingham, Ala.	2382 kc.
WPFN	New Bedford Mass.	1712 kc.
WPFO	Knoxville, Tenn.	2474 kc.
WPFP	Clarksburg, W.Va.	2490 kc.
WPFQ	Swarthmore, Pa.	2474 kc.
WPFR	Johnson City, Tenn.	2470 kc.
WPFS	Asheville, N.C.	2474 kc.
WPFT	Lakeland, Fla.	2442 kc.
WPFU	Portland, Me.	2422 kc.
WPFV	Pawtucket, R.I.	2466 kc.
WPFW	Bridgeport, Conn.	2466 kc.
WPFX	Palm Beach, Fla.	2442 kc.
WPFY	Yonkers, N.Y.	2442 kc.
WPFZ	Miami, Fla.	2442 kc.
WPGA	Bay City, Mich.	2466 kc.
WPGB	Port Huron, Mich.	2466 kc.
WPGC	S. Schenectady, N.Y.	1658 kc.
WPGD	Rockford, Ill.	2458 kc.
WPGF	Providence, R.I.	1712 kc.
WPGG	Findlay, Ohio	1596 kc.
WPGH	Albany, N.Y.	2414 kc.
WPGI	Portsmouth, Ohio	2430 kc.
WPGJ	Utica, N.Y.	2414 kc.
WPGK	Cranston, R.I.	2466 kc.
WPGL	Binghamton, N.Y.	2442 kc.
WPGN	South Bend, Ind.	2490 kc.
WPGO	Huntington, N.Y.	2490 kc.
WPGP	Muncie, Ind.	2442 kc.
WPGQ	Columbus, Ohio	1596 kc.
WPGS	Mineola, N.Y.	2490 kc.
WPGT	New Castle, Pa.	2482 kc.
WPGU	Cohasset, Mass.	1712 kc.
WPGV	Boston, Mass.	1712 kc.
WPGW	Mobile, Ala.	2382 kc.
WPGX	Worcester, Mass.	2466 kc.
WPGZ	Johnson City, Tenn.	2474 kc.
WPHA	Fitchburg, Mass.	2466 kc.
WPHB	Nashua, N.H.	2422 kc.
WPHC	Massillon, Ohio	1596 kc.
WPHD	Steubenville, Ohio	2458 kc.
WPHE	Culver, Ind.	1634 kc.
WPHF	Richmond, Va.	2450 kc.
WPHG	Medford, Mass.	1712 kc.
WPHI	Charleston, W.Va.	2490 kc.
WPHJ	Fairmont, W.Va.	2490 kc.
WPHK	Wilmington, Ohio	1596 kc.
WPHL	Portable in Obio	1682 kc.
WPHM	Orlando, Fla.	2442 kc.
WPHN	Tampa, Fla.	2466 kc.
WPHO	Zanesville, Ohio	2430 kc.
WPHP	Jackson, Mich.	2466 kc.
WPHQ	Parkersburg, W.Va.	2490 kc.
WPHS	Culver, Ind.	1634 kc.
WPHT	Cambridge, Ohio	1596 kc.
WPHU	Jasper, Ind.	1634 kc.
WPHV	Bristol, Va.	2450 kc.
WPHY	Elizabethton, Tenn.	2474 kc.
WPHZ	Oil City, Pa.	2482 kc.
WPSP	Harrisburg, Pa.	1674 kc.
WQFA	New Haven, Conn.	2466 kc.
WQFB	Macon, Ga.	2414 kc.
WQFC	Gainesville, Fla.	2466 kc.
WQFD	Columbia City, Ind.	1534 kc.
WQFE	Seymour, Ind.	1634 kc.
WQFF	Monessen, Pa.	2482 kc.

WQFG	Roanoke, Va.	2450 kc.
WQFH	Lynchburg, Va.	2450 kc.
WQFI	Petersburg, Va.	2450 kc.
WQFJ	Oneonta, N. Y.	2414 kc.
WQFK	Clearwater, Fla.	2466 kc.
WQFM	Wilkes-Barre, Pa.	2442 kc.
WQFN	Winter Haven, Fla.	2442 kc.
WQFO	Lancaster, Ohio	2430 kc.
WQFP	Springfield, Ill.	1610 kc.
WQFQ	Lafayette, Ind.	2442 kc.
WQFR	Portable, N. Y.	1658 kc.
WQFS	Hibbing, Minn.	2382 kc.
WQFT	Portable, Ohio	1596 kc.
WQFU	Sharon, Pa.	2482 kc.
WQFV	Augusta, Ga.	2414 kc.
WRBH	Cleveland, Ohio	2458 kc.
WRDQ	Toledo, Ohio	2474 kc.
WRDR	Grosse Pt. Village, Mich.	2414 kc.
WRDS	E. Lansing, Mich.	1642 kc.
W1XAO	Boston, Mass.	1712 kc.

Television Stations

2000-2100 kc.

VE9AU	London, Ont., Can.
VE9DS	Montreal, Que.
W2XDR	Long Island City, N.Y.
W8XAN	Jackson, Mich.
W9XK	Iowa City, Iowa
W9XAK	Manhattan, Kans.
W9XAO	Chicago, Ill.
W6XAH	Bakersfield, Calif.

2750-2850 kc.

W3XAK	Portable
W9XAP	Chicago, Ill.
W2XBS	Bellmore, N.Y.
W9XAL	Kansas City, Mo.
W9XG	W. Lafayette, Ind.
W2XAB	New York, N.Y.
VE9AR	Saskatoon, Sask., Can.
VE9ED	Mt. Joli, Que., Can.

42000-56000, 60000-86000 kc.

W2XAX	New York, N.Y.
W6XAO	Los Angeles, Calif.
W9XD	Milwaukee, Wis.
W2XBT	Portable
W2XF	New York, N.Y.
W3XE	Philadelphia, Pa.
W3XAD	Camden, N.J.
W10XX	Portable & Mobile (Vicinity of Camden)
W2XDR	Long Island City, N.Y.
W8XAN	Jackson, Mich.
W9XAT	Portable
W2XD	New York, N.Y.
W2XAG	Portable
W1XG	Boston, Mass.
W9XK	Iowa City, Iowa
VE9BZ	Vancouver, B.C., Can.
VE9DS	Montreal, Que., Can.
VE9AU	London, Ont., Can.
VE9RC	Quebec, Que., Can.
VE9AG	Walkerville, Ont., Can.

An Amplifier for the "SG3" Transmitter

(*Continued from page* 655)

conventional *tuned antennas* the condenser or condensers of the antenna unit should be set so that antenna or feeders are in *exact resonance* with the amplifier. The plate condenser should be the last adjustment and be set for minimum plate current. If the plate current is over 125 mills (M.A.) with the circuits in resonance then the coupling should be reduced by loosening the coupling between the one-turn link on the antenna coil and the coil itself. It is *not* good practice to *detune* the antenna in order to reduce the plate input of the amplifier. The coupling should be loose if necessary and the circuits in resonance. A last word—the heaters of the amplifier are *floating* so that it may be "keyed" in the cathodes without high voltage between the heater and cathode when the key is open, as would be the case if one side or the center of the heater circuit were connected to the B-minus.

When To Listen In

(All Schedules Eastern Standard Time)

JAPAN

● THE overseas programs from Japan are as follows at present. For the west coast of N. America daily 12 m.-1 a.m. on JVN and sometimes JVH or JVT in addition. For the eastern part of N. America Mon. and Thur. 4-5 p.m. on JVN and JVM. This will probably become a daily program shortly. For Europe Tues. and Fri. from 2-3 p.m. on JVM and JVP. For Manchuria daily from 4-8 a.m. and at intervals from 5:20 p.m. till 2:20 a.m. on any of the following: JVM, JVN, JVP, JVT, JVU. These same stations are used at other hours for telephone service.

JAVA

A NIROM station at Soerabaya, Java, is now heard almost daily from 5:30 a.m.-11 a.m. on about 9620 kc. (31.19 meters). It is believed to be YDB. This station also operates on 4,470 kc. at other hours.

HAWAII

Broadcast station KGU at Honolulu is planning the erection of a s-w relay station. It will work in the 19 and 25 meters broadcast band. It is hoped to have the station operating this spring.

CANADA

VE9HX at Halifax, N.S., is back on the air on 6,110 kc. using the call letters CHNX. The schedule is daily 9 a.m.-12:30 p.m., and 4-10 p.m. Address is P.O. Box 998. The station causes considerable heterodyning on GSL at Daventry when both are on the air. CJRX and CJRO, Winnipeg, are frequently on as early as 6 p.m.

FRANCE

"RADIO COLONIALE" at Paris now operates as follows daily: 4-5 a.m., 11:15 a.m.-6:05 p.m. on 11,880 kc.; 6:55-11 a.m. on 15,245 kc.; 6:15-9 p.m., 11 p.m.-1 a.m. on 11,720 kc.

GERMANY

In addition to the regular schedule of the Berlin broadcasters the following waves are being tested from 2-5 a.m. DJP, 11,835 kc., DJO, 11,795 kc., and DJR, 15,340 kc. The new phones at Zeesen mentioned last month (DJJ 10,042 kc. and DJI 9,675 kc.) continue their tests. In addition these phones will probably be heard testing in the daytime on the following waves in a short time. DJS, 12,130 kc.; DZH, 14,460 kc.; DJT, 15,360 kc. The special N. America from DJB which was broadcast from 8-11:30 a.m. daily during Nov., Dec. and January will be probably discontinued after Feb. 1.

LONDON

For February the following arrangements (subject to sudden change) will be in effect. Trans. 1, 3-5 a.m. on GSB and either GSD or GSF (after Feb. 15 this will be from 2:15-4:15 a.m.). Trans. 2, 6-8:45 a.m. on GSG and GSF. Trans. 3, 9-10:30 a.m. on GSF and GSE, 10:30 a.m.-12 n. on GSE and either GSF or GSB. Trans. 4, 12:15-2:15 p.m. on GSD, GSB and GSI, 2:15-4 p.m. on GSD, GSB and GSL; 4:15-5:45 p.m. on GSB and GSC. GSL was used as a third transmitter during this program in January and will probably be continued till the end of February. Trans. 5, 6-8 p.m. on GSC, GSA and either GSB or GSD. Trans. 6, 10-11 p.m. on GSC and GSL.

WEST INDIES

In the Dominican Republic there are 2 new stations. HI4B "La Voz de la Marina" at Santo Domingo operates on 6,480 kc. HI1F at Santiago de los Caballeros operates on 6,140 kc. from 6:30-7 a.m.

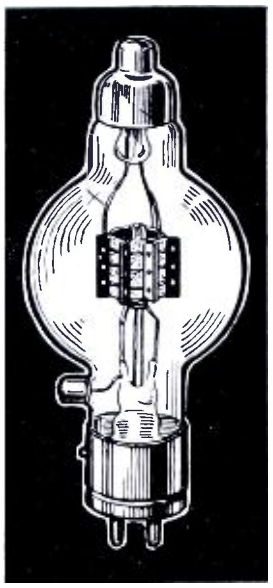
S. AMERICA

HJ4ABP at Medellin, Colombia, "Emisora Philco" on 6,135 kc. is a newcomer. In Venezuela there is YV12RM "Emisora 24 de Julio" located at Maracay and operating on 6,300 kc.

BUENOS AIRES

"El Mundo," Station LR1 at Buenos Aires, is constructing a 5 kw. short-wave relay station. This station will operate on 9580 kc. with call letters LRX, and on 15290 kc. with call letters LRU. It will be in operation shortly.

Latest TUBE DEVELOPMENTS



Model 50T

● THE vacuum tubes manufactured by a California concern have created a very favorable impression on the designers and users of high frequency transmitting equipment.

This popular line of tubes has three members at the present time, with the possibility of some additions within a short time. The type numbers, with their plate dissipation ratings, follow:

Model 50T: (left) A *triode* capable of 75 watts of plate dissipation. Unusual design permits high insulation of the electrodes, and the extremely high vacuum, made possible by the use of a new, expensive metal, called *tantalum*, permits the 50T to have power outputs of more than *three times its plate dissipation ratings!* The 50T has the lowest inter-electrode capacities of any power triode available to the experimenter; this tube is therefore particularly useful for *ultra high frequency work.* The excellent electrical characteristics of the 50T make it ideally suited for class B audio work. At the higher permissible plate voltages, two tubes will give an audio power output in excess of 350 watts. 50T F.C.C. rating, 50 watts.

50T Characteristics and Ratings:

Filament Voltage (A.C.)	5 to 5.25 volts
Filament Current (approximate)	6 amperes
Amplification Factor (average)	12
Grid-Plate Capacitance	2 mmfds
Grid-Filament Capacitance	2 mmfds
Plate-Filament Capacitance	.4 mmfds
Bulb	GT 25 Nonex
Base	UX 4 Pin
Overall Height	7½ inches
Maximum Diameter	3⅛ inches

Maximum Ratings for All Types of Service on Frequencies Less than 56 Megacycles

Maximum Plate Voltage	3000 volts
Maximum Plate Current	.125 amperes
Maximum Grid Current	.030 amperes
Maximum Plate Dissipation	75 watts

The following results can be realized under optimum circuit conditions and are suitable for 100% plate modulation.

Plate Voltage	1000	2000	3000
Plate Current (amperes)	.100	.100	.100
Grid Current (DC amperes)	.025	.025	.025
Grid Bias Voltage	—200	—400	—600
Power Output (75% eff.) (watts)	75	150	250

At plate voltages above 1000 volts we find that the carrier power outputs for all types of efficiency modulation when using the 50T is dependent upon the available plate dissipation. Efficiencies of 33% for the class "B" lineary amplifier and efficiencies of from 22% to 35% for the bias modulation systems are considered as maximum if linear 100% modulation is to be expected.

Model 150T: A *triode* having a plate dissipation of 150 watts. The unusual design, plus the use of *tantalum* for electrode material, permanently prevents such causes of tube failures as stem punctures, internal insulator breakdown, and gas released through accidental overload. The above mentioned failures account for the majority of difficulties encountered by experimenters and amateurs. The 150T is capable of giving class C outputs up to 450 watts. A pair of these tubes used in class B audio are capable of giving approximately 750 watts output. The F.C.C. rating on the 150 T is 150 watts for high-level modulation, and 50 watts for low-level modulation. The 150T has the low-

est inter-electrode capacities of any tube with anywhere near its power ratings or capabilities, so it is particularly adaptable for use at the high radio frequencies.

500T—This is the largest member of the new line of high-frequency transmitter tubes and has a plate dissipation rating of 500 watts. The 500T, in appearance, resembles an overgrown version of the 150T, though it has many times the capabilities of that tube. The class C power output of the 500T is 1350 watts. Two of these tubes used in class B audio, are capable of 2000 watts of audio power! The low inter-electrode capacities of such a high power tube makes the 500T ideally suited for high-frequency *broadcasting stations* and *police transmitters.* The FCC rating on the 500T is 500 watts when used as a high-level modulated amplifier. The 500T is capable of 250 watts of carrier when modulation is effected at a lower level.

The material from which the electrodes of all these tubes are fabricated is *tantalum,* a rare metal with many peculiarities that make this material far superior to any other material heretofore used in transmitting tube manufacture. The fact that *tantalum* can be quickly and permanently degassed permits the manufacture of a vacuum tube that does not rely on any chemical agency or "getter" to maintain the necessary vacuum for proper operation. The fact that all the gas has been eliminated from the metal parts and that no gas is held in chemical suspension on the glass envelope, permits the manufacturers of these tubes to permanently guarantee against failures caused by the liberation of gas through accidental overload. Such a guarantee has never been made by any other tube manufacturer. *Tantalum* tube life insurance is worth the much higher cost of this material over materials used in more conventional tubes.

Our Information Bureau will gladly supply manufacturers' names and addresses of any items mentioned in SHORT WAVE CRAFT. *Please enclose stamped return envelope.* (*Mention No.* 521.)

Practical Hints for the HAM

(*Continued from page* 653)

coat, and then rubbing the final coat with fine pumice stone and oil. Ordinary car or furniture wax is then applied and the result is a beautiful satin finish. This material can be obtained quite cheaply and in several thicknesses at most lumber yards.

Short Wave Scouts . . .

(*Continued from page* 665)

CJRO—6,150 kc.—Same as CJRX.
VE9GW—6,090 kc.—now CRCX. Canadian Radio Broadcasting Commission.

SOUTH AMERICA

YV2RC—6,112 kc., now on 5,800 kc.—Broadcasting Caracas, "Le Habla a la Nacion." Caracas, Venezuela.
YV3RC—6,150 kc.—Radiodifusora, Venezuela, Caracas, Venezuela.
YV6RV—6,520 kc.—Radiodifusora La Voz de Carabobo, Valencia, Venezuela.
YV5RMO—5,650 kc.—Ecos del Caribe, Maracaibo, Venezuela.
YVQ—6,672 kc.—Estacion Nacional de Radio, Maracay, Venezuela.
YV1ORSC—5,720 kc.—Irregular. Estacion Emisora "La Voz de Tachira," San Cristobal, Venezuela.
HJ1ABE—6,115 kc.—"La Voz de 'Los Laboratorios Fuentes,'" Cartagena, Colombia.
HJ1ABD—7,281 kc.—"Ondas de la Heroica," Cartagena, Colombia.
HJ3ABD—7,400 kc.—"Colombia Broadcasting," Bogota, Colombia.
HJ3ABH—5,970 kc.—"La Voz de la Victor," Bogota, Colombia.
HJ4ABC—6,080 kc.—Radiodifusora "La Voz de Pereira," Pereira, Caldas, Colombia.
HJ4ABL—6,065 kc.—"Ecos de Occidente," Manizales, Colombia.
HJ5ABC—6,150 kc.—"La Voz de Colombia," Cali, Valle, Republic of Colombia.
HJ5ABE—14,117 kc.—"Radio Cali," Cali, Colombia.

(*Continued on page* 694)

RADIO INSTRUCTION

Impedance Matching Antenna Coupler

(*Continued from page* 652)

up with two clips from the matching network not connected to the final amplifier plate coil. The plate tuning condenser of the final amplifier should be adjusted to apply minimum plate reading or exact resonance; then turning off the plate voltage, of course, the two clips "CL" should be connected to the final amplifier, midway between the center and the two outer ends, and condenser C1 set at zero capacity. C2 should also be set to zero capacity; then, as the plate voltage is applied to the final amplifier, C1 should be rotated until the plate current is at minimum reading. If this reading is too high, turn off the transmitter and set "C" at maximum capacity. Then turn on the transmitter and readjust C1 for minimum plate current reading. By all means, *do not touch* the final amplifier tuning condenser if the original adjustment has been made. At this point, the capacity of C2 should be increased or decreased, depending upon where the condenser was set and C1 adjusted at the same time to maintain the current to a minimum value. The capacity of C2 should be adjusted and followed by an adjustment of C1 until the plate current reads normal for the final amplifier stage. The final adjustment is C1; swinging this slightly back and forth, we will have the same effect on the plate current as the amplifier plate tuning condenser had. C1 should always be set at the point of dip or minimum plate current reading. Figure A in the description given, covers push-pull stage or two-wire system. For a single wire antenna or feeder and a single-ended amplifier stage (see Fig. B), the adjustments will be exactly the same, except that one coil will be used, and the clip "CL" should be about one-third the total number of turns from the plate end of the amplifier tank coil. This article has been prepared from data suplied by courtesy of Wholesale Radio Service Co.

Push-Button Controlled Transmitter

(*Continued from page* 661)

ports from other amateur stations should be considered in order to find out if enough modulation is present.

Once the sensitivity control is set, it need not be readjusted. While "talking," the meter should be watched to see that it kicks up to the same reference point.

List of Parts

Resistors

R1—100 ohms, 20W.

Lights

L1—Candelabra bracket and 110 volt Candelabra bulb.
L2—Miniature bracket 6.3 volt bulb.

Switches

S1—Double pole, single-throw-lock switch.
S2—Single-make contact, non-locking.

Relays

RE1—R.C.A. remote control relay.
RE2—2-3 volt double-pole relay.
RE3—2.3 volt single-pole relay wire.

Cabinet

1—Case; No. 305c tube checker case.

Watch Out for Description of W2AMN's New Transmitter In the Next Issue!

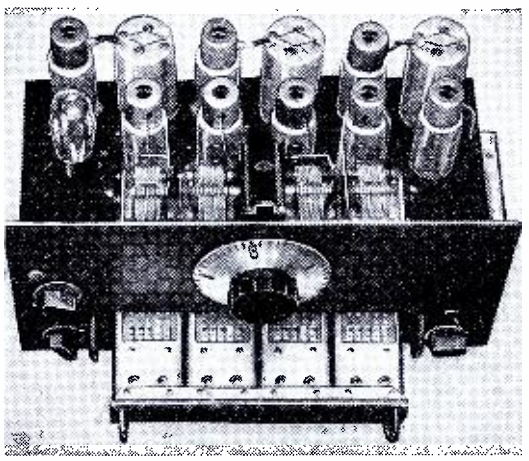
The HRO Junior

(*Continued from page* 666)

20 meter phone bands. The 75 meter and the 160 meter phone bands will be covered by one additional coil assembly, as will those frequencies between these two points. The CW operator will have those portions of the 10 and 20 meter bands, in which CW operation is permitted, suitably covered by the original coil assembly and the 40 meter coil assembly will take care of his requirements for CW on that band, as well as the CW portion of the 80 meter band.

Same Circuit As HRO

The new receiver incorporates the same circuit and tubes as the present HRO receiver and the advantage of two stages of preselection, which greatly cuts down image frequency interference and improves the over-all performance of any superheterodyne very materially, is retained in its entirety. Therefore, the receiver incorporates two stages of radio frequency amplification, a first detector, a high frequency oscillator, two stages of intermediate frequency amplification, a second detector, AVC and first audio tube in combination, a second audio stage and a beat frequency oscillator. The output impedance of the second audio stage is approximately 7,000 ohms which is suitable for use with any loud-speaker having an impedance-matching transformer, with an input of 7000 ohms. This receiver is ideal for use with the new HRO type permanent magnet dynamic speaker.



Another View of the New HRO Junior Receiver

It will be observed that the beat frequency oscillator remains in the circuit, providing a means for producing a beat note between the incoming carrier of the desired station and the oscillator itself. This beat note appears in the form of a whistle and simplifies the locating of either CW or voice modulated stations. When it is desired to receive either voice or music, the beat-note oscillator is cut off after the station has been tuned in.

Where the Changes Occur in the New Receiver

In order to produce a receiver of this nature, incorporating the single-dial multi-circuit tuning arrangement now used in the HRO, at such a very great variation in price, some of those amateurs who are acquainted with the performance of the HRO would like to know where the revision has been made. The new receiver does not include the "S" meter—an expensive device—very desirable in an amateur communications receiver, where accurate reporting between stations is desired.

The super-band spreading, provided by the regular HRO, requires exhaustive laboratory alignment and is one of the principal items of cost in the building of the receiver. It is highly desirable for some forms of communication, but is not necessary in a receiver which is to be used under average conditions and even with the elimination of this feature, the "HRO

Junior" will provide considerably more band-spread than is found with the FB7A and FBXA receivers, even when they are used with band-spread coils.

The new receiver will not incorporate the expensive and highly precise crystal filter circuit provided with the *standard* HRO because there is a rapidly growing demand for receivers which do not incorporate this circuit on the part of those who feel that the number of occasions on which such a circuit would prove of value to them is rather limited and the cost of the receiver, itself, can be so materially reduced when this feature is not incorporated.

The additional coils for the new receiver incorporate the bands from 500 to 1000 kc.; from 900 to 2000 kc.; from 1700 to 4000 kc.; from 3500 to 7300 kc. and from 7000 to 14000 kc. The 14000 to 30000 kc. coils are supplied as original equipment with the receiver.

The HRO Junior is designed for operation for the same power supply that is used with the present HRO and National FB7A. This article has been prepared from data supplied by courtesy of the National Company.

Short Wave Scouts

(*Continued from page* 691)

HCJB—8,214 kc.—"La Voz de Los Andes," Quito, Ecuador.
HC2AT—8,400 kc.—Guayaquil, Ecuador.
HC2RL—6,650 kc. "Quinta Piedad, Hello America," Guayaquil, Ecuador.
El Prado—6,620 kc.—El Prado, Riobamba, Ecuador.
OAX4R, now OAX4G—6,230 kc., now on 6,221 kc.—Auto Talleres, Reunidos, Lima, Peru.
PRF5—9,501 kc.—Daily 4:45-5:45 p.m., also irreg., Rio de Janeiro, Brazil.
PZH—6,996 kc.—Mon., Wed., Fri., 5-9 p.m.; Tues., Thurs., Sat., 2-4 p.m.; Tues., Thurs., 8-10 a.m.; Sun. 9-11 a.m.; Wed., 3-4 p.m. Algemeene Vereeniging Radio Omroep Suriname, Paramaribo.

WEST INDIES

COC, now COCO—6,010 kc.—Havana, Cuba.
COCD—6,130 kc.—"La Voz del Aire," Havana, Cuba.
HI4D—6,482 kc.—"La Voz de Quisqueya," Santo Domingo, Dominican Republic.
HIZ—6,316 kc.—"La Voz de los Muchachos," Santo Domingo, Dominican Republic.
HIH—6,814 kc.—"La Voz del Higuamo," San Pedro de Macoris, Republica Dominicana.
HIX—5,980 kc.—Santo Domingo, Dominican Republic.

CENTRAL AMERICA

HP5B—6,030 kc.—"Estacion Radiodifusora Miramar," Panama, Republic of Panama.
HP5J—9,590 kc.—Radiodifusora "La Voz de Panama," Panama Republic of Panama.
TIEP—6,710 kc.—"La Voz del Tropico," San Jose, Costa Rica.
TIRCC—6,550 kc.—"Radioemisora Catolica Costarricense," San Jose, Costa Rica.
HC2JSB—7 854 kc.—"Ecuador Radio," Guayaquil, Ecuador, South America.

EUROPE

PCJ—15,220 kc.—Philip's Radio Hilversum, Eindhoven, Holland.
PHI—17,770 kc.—Philip's Radio, Eindhoven, Holland.
HVJ—15,121 kc.—Radio Vaticano, Vatican City. Rome.
EAQ—9,860 kc.—"The Voice of Spain," Transradio Espanola, Madrid, Spain.
2RO—9,635 kc.—Radio EIAR, Rome, Italy.
OXY—6,060 kc.—Skamlebaek, Denmark.
ORK—10,330 kc.—Radio Ruysselede, West Flanders, Belgium.
HBL—9,595 kc.—"Radio Nations," Geneva, Switzerland.
HBP—7,800 kc.—Same as HBL.
RNE—12,000 kc.—"Radio Centre," Moscow, U.S.S.R.
HAT-4—9,125 kc.—"Radiolabor," Budapest, Hungary.
DJA—9,560 kc.—Zeesen, Germany.
DJB—15,200 kc.—Zeesen, Germany.
DJC—6,020 kc.—Zeesen, Germany.
DJD—11,770 kc.—Zeesen, Germany.
DJN—9,540 kc.—Zeesen, Germany.
Radio Coloniale—11,890 kc.—Paris, France.
Radio Coloniale—11,715 kc.—Paris, France.

ASIA

PLP—11,000 kc.—Bandoeng, Java.
PMY—5,172 kc.—Bandoeng, Java.

Australia

VPD—13,075 kc.—Suva, Fiji Islands.
VK2ME—9,590 kc.—"The Voice of Australia," Sydney, Australia.
VK3ME—9,518 kc.—Melbourne, Australia.
VK3LR—9,580 kc.—National Broadcasting Service, Lyndhurst, Australia.

A New 5-Meter Transmitter

(*Continued from page* 667)

Uses a 6E6 As P.P. Oscillator

The circuit has been designed using the type 6E6 twin-triode as a unity-coupled push-pull oscillator, modulated by a 42-type tube operating Class "A"; a type 76 is used as a *speech amplifier*.

Due to the use of the 6E6, "drifting" has been reduced to a minimum and the plate efficiency greatly increased. Thus, a high percentage of modulation has been made possible, using only one 42 in plate modulation.

The power output that can be obtained with this transmitter depends upon the power supply with which it is used. In the laboratory using the dynamotor described, a full seven watts was realized into a 500-ohm load. This power is more than ample for the average mobile or portable high-frequency station.

Due to the use of Class "A" amplification, the current drain is practically constant at all times, so that any converter will operate at maximum efficiency. This feature also eliminates the need for any special and expensive equipment that would be necessary with the use of Class "B" amplification.

Uses Micalex Insulation

Other features include the use of a Micalex socket for the 6E6 tube and for both the coil and its mounting base. A terminal strip on the rear of chassis feeds into a split-primary microphone input transformer, thus, permitting the use of either single or double-button carbon microphone having a resistance of 200 ohms per button.

The tank coil is of 3/16" copper tubing and is of the plug-in type, so that changes for any future developments in the 2.5 or 10-meter bands can be easily made.

Dashboard mounting has been simplified by the use of a specially designed steel cabinet; by means of a square-shank bolt secured to the dashboard the entire transmitter can be slipped in and out of the car merely by lifting it on or off the bolt. When so mounted it is within convenient operation range of the driver and held rigidly in place.

Simple to Operate

Operation consists of tuning by means of the large indicator knob and calibrated scale on the front panel. Once the frequency has been determined the condenser may be "locked" to guard against vibrational disturbance. Volume is adjusted with the noiseless gain control controlled by the lower knob on the panel. A jeweled pilot light serves as an "on-off" indicator. Two ceramic stand-offs are supplied for antenna terminals.

Steel Chassis and Cabinet

The entire unit is mounted on a steel, black crystalline lacquer finished chassis, and an aluminum panel having a dull "telephone" finish. Enclosed in its steel, black crystalline finished cabinet, the entire assembly measures 8½x8½x7", and is really a "professional" looking piece of apparatus. This article has been prepared from data supplied by courtesy of Wholesale Radio Service Co.

Latest Design In Superheterodynes

(*Continued from page* 667)

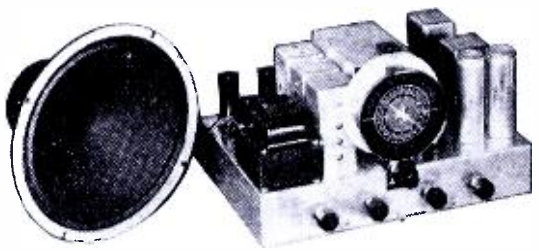
for all R.F. circuits and stages, are completely and individually contained in metal cans. For example, the coils for the three bands in the antenna circuit are on a common bakelite form and housed in a metal container with the three trimmers. The adjustments (trimmers) are easily reached in the event that realignment should ever be necessary. Similarly, the coils for the

R.F. stage and oscillator circuit are in individual metal shields, with trimmer adjustments exposed for realignment purposes, the need for which may be unlikely. A three-gang variable condenser tunes the R.F., detector and oscillator circuits, and reduces the possibility of image frequency interference, birdies and whistles, and endows the set with more than ample selectivity. Reference to Fig. 1 will illustrate the complete wiring circuit besides revealing the tube complement. The use of an R.F. stage (tuned) ahead of the 1st. Det.-Osc. increases the "gain" of the receiver, so that only one stage of Intermediate Frequency amplification is necessary. Consequently, the signal-to-noise ratio is so low that programs are received remarkably free from hiss and other noise interference.

Diode detection insures against distortion of the signal when it is being converted from radio frequency impulses to audio frequency. The automatic volume control biasing voltage is also generated at this point and distributed to the grid-returns of the R.F., Mixer tube, and I.F. tubes. To further insure against the possibility of poor quality and distortion, push-pull power amplification is used without the conventional push-pull input transformer. The advantages of resistance coupling over transformer coupling in audio amplification, for fidelity reproduction, is well known to the radio fraternity. Consequently a *phase-inversion* stage precedes the push-pull power stage, so that the A.F. signal to one of the power tubes will be 180 degrees out of phase and in equal proportion to the signal to the other tube. This action permits the attainment of true *push-pull* action and the resulting cancellation of all serious forms of harmonic distortion. The power tubes operate in class "A," and deliver over 6 watts of high-quality audio power to a 10 inch dynamic speaker. A total of 9 tubes, all metal-types, are, consequently employed to permit realization of an efficiency that is the equivalent of at least 12 ordinary tubes.

The net result of a receiver with design features such as has been enumerated results in efficiency, power and reproducing qualities fine enough to satisfy any radio listener.

This article has been prepared from data supplied by courtesy of Roland Radio Co.



Complete Finished Receiver. (No. 519)

$50.00 CASH PRIZE CONTEST

First Prize	$20.00
Second Prize	10.00
Third Prize	5.00
Fourth Prize	3.00
Fifth Prize	2.00
Sixth to Fifteenth Prizes each	1.00

Read full details of $50.00 prize contest for "best letter" explaining what Ten Things in Short Waves interest you most Today, page 588, February issue.

Short Wave Scout News

(*Continued from page* 673)

HIL on about 6.50 meg. is on irregularly till 7:15 p.m.

HI1A on 6.19 meg., 7:40 to 8:40 p.m. and also at other times.

CT1AA on 9.65 meg. has a new transmitter and are being heard much better, although they always did come in good.

DJI, 9.67 meg., operating daily till 7:30 p.m.

2RO, Rome, is operating on the following schedule:

11.81 meg., 8:15 a.m. to 9 a.m., 9:15-11 a.m., 11:30 a.m.-12:15 p.m.

9.64 meg. 1:30 p.m. to 5 p.m.

9.64 meg. 6 p.m., daily except Sundays. News in English.

9.64 meg. 6:15 p.m. Tuesdays, Thursdays and Saturdays, the South American Hour.

9.64 meg. 6:15 p.m. Mondays, Wednesdays and Fridays "The American Hour". A news bulletin in Italian precedes the "American Hour".

YV4RC 6.37 meg. sends out some swell music nightly, 4:30 to 10:30 p.m. is their schedule.

HJ4ABL, 6.06 meg. also sends out some fine musical programs. They operate 5:30 to 7:30 p.m., Saturdays till 10:30 p.m.

VP3MR, Georgetown, British Guiana, 7.08 meg. 4:45 to 8:40 p.m. They have 300 watts power.

YV5AM, an amateur on 7.05 meg. 6:00 to 10:00 p.m. with 15 watts power.

TI8WS, 7.56 meg. has moved to 6.48 meg. They have 120 watts power.

HIZ, 5 to 9:30 p.m. Puts out a good signal.

ANGELO CENTANINO,
Box 516,
Freeport, Pa.

Report of Fletcher W. Hartman, South Amboy, N.J.

● I want to take this opportunity to thank you again for the Beautiful Trophy I have won, it is an excellent specimen of the silversmith's art, and it is admired by all that have seen it.

Among the stations heard the past month are: *(9125, etc., is freq. in kc.)*

HAT4—11/24—9125—Budapest, Hungary—6:35 p.m.—Very Good, Clear.

PCJ—11/25—15220—Eindhoven, Holland—9:09 a.m.—Fair, Heavy Fading.

Radio Colonial—11/25—15245—Paris, France—9:21 a.m. Fair, Heavy Fading.

YV6RV—11/25—6520—Valencia, Venezuela—7:10 p.m.—Good.

DJB—11/26—15220—Berlin, Germany—10:42 a.m.—Very Good, Steady.

GSI—11/26—15260—Daventry, England—1:15 p.m.—Good, Slight Fading.

GSD—11/26—11750—Daventry, England—1:40 p.m.—Good, Steady.

ORK—11/26—10330—Bruxells, Belgium—2:42 p.m. Good, Steady.

CJRO—11/26—6150—Winnipeg, Canada—9:20 p.m.—Very Good, Steady.

GSF—11/27—15140—Daventry, England—9:03 a.m.—Very Good, Steady.

●ETB—11/27—11995—Addis Ababa, Ethiopia—4:49 p.m.—Very Good, Steady.

GSC—11/27—9580—Daventry, England—5:32 p.m.—Fair.

TIEP—11/27—6710—San Jose, Costa Rica—7:40 p.m.—Very Good.

TIPG—11/27—6410—San Jose, Costa Rica—10:15 p.m.—Very Good.

HJ5ABC—11/28—6150—Cali, Colombia—8:32 p.m.—Fair, Slight Fading.

Radio Colonial—11/29—Paris, France—1:30 p.m.—Fair.

DJD—11/29—11770—Berlin, Germany—2:30 p.m.—Poor.

●DJJ—11/29—10042—Berlin, Germany—2:40 to 3:05 p.m.—Very Good, Steady.

HAS3—12/1—15370—Budapest, Hungary—9:27 a.m.—Good.

COCD—12/1—6130—Havana, Cuba—10 p.m.—Very Good.

I2RO—12/18—9635—Rome, Italy—4:30 p.m.—Poor.

COCH—12/18—9428—Havana, Cuba—4:40 p.m.—Good.

CRCX—12/18—6090—Toronto, Canada—6:45 p.m.—Good.

DJC—12/22—6020—Berlin, Germany—9:30 p.m.—Good, Steady.

HJ1ABB—12/23—6447—Barranquilla, Col.—Fair.

HIZ—12/23—6316—Santo Domingo, D. R.—8:35 p.m.—Good.

TIPG—12/23—6410—San Jose, Costa Rica—10:02 p.m.—Good, Steady.

GSB—12/24—9510—Daventry, England—4 p.m.—Good.

HC2RL—12/24—6660—Guayaquil, Ecuador—10:02 p.m.—Very Good.

●HI1S—12/24—6420—Dominican Republic—10:39 to 11:36 p.m.—Good, Slight Fading.

TI5HH—12/24—5500—San Ramon, Costa Rica—11:40 p.m.—Fair, Static.

CJA4 — 12/25 — 11413 — Drummondville, Canada—5:10 p.m.—Fair.

● indicates new station.

FLETCHER W. HARTMAN,
365 John Street,
South Amboy, N. J.

News from Detroit, Mich.

● HERE are some of the stations heard here this month.

COCD, Havana Cuba, 6.13 mc. A 250 watt station. Address Hotel Palace or 25y G Street, Vedado. Daily 11:00 a.m. to noon, 7:00 p.m. to 10 p.m.

COCH, Havana, Cuba, 9.42 mc. A 150 watt station. Address, B street, No. 2-B, Vedado. Daily 8:00 a.m. to 7:00 p.m. Sundays 11 a.m. to noon.

HJ1ABB, Barranquilla, Colombia, 6.45 mc. Daily 4:30 p.m. to 10:30 p.m.

YV2RC, Caracas, Venezuela, 5.80 mc. Daily 5:15 p.m. to 10:00 p.m. Announces as "Broadcasting Caracas."

HRN, Telgucigalpa, Honduras, 5.87 mc. Daily 6:30 p.m. to 8:00 p.m. & 8:30 p.m. to 10 p.m. Announces as —H—Honduras, —R—Radio, —N—Navy.

TIPG, San Jose, Costa Rica, 6.41 mc. 1000 watts station. Address Box 225. Wednesday and Saturdays, 9:00 p.m. to 10 p.m. Other days 6:00 p.m. to 11:00 p.m.

XECR, Mexico City, Mexico, 7:38 mc. Sundays 6 p.m. to 7 p.m.

I2RO, Rome, Italy, 9.64 mc. Daily 2:30 p.m. to 5:30 p.m. & 6:00 p.m. to 7:30 p.m.

HVJ, Vatican City, Italy, 15.1 mc. Daily 10:30 a.m. to 10:45 a.m.

On 20 meters heard VQ4CRO, VE1's, VE2's, VE3's, VE4's, G's, CO2's, CO8, CO6, T13, VP9, W6's, X1's, X2's.

CHARLES GUADAGNINO,
15226 Mack Ave.,
Detroit, Mich.

Report from Puerto Rico

● GREETINGS, friends from everywhere.

Thanks for all your most interesting letters, good readers of *Short Wave Craft*. I hope that everyone is enjoying the very fine listening conditions prevailing.

My best DX this month have been the Japanese JVM and JVN which have been heard with R7 and 8 volume every Thursday afternoon.

All of the bands are good now. On 16 meters W3XAL and GSG are the best. DJE is heard but not so good.

On the 25 meter band there is a new change. HJ4ABA on its night program changes frequency to avoid interference with "Radio Colonial" and locates at about 11850 kc; in this way it is heard much better. RNE has moved to 6000 kc. but it is not heard as good as before, due to too much QRN.

CEC—DIQ—LSX are heard quite good. Two new German stations are on the air as follows; DJJ on 10.04 mc and DJI on 9.675 mc.

On the 31 meter band all stations good.

On the very crowded 49 meter band there are some newcomers which are as follows:

HIL, which was "off the air" for some time.

H15N, Santo Domingo—HI11, Santo Domingo (every Friday afternoon).

HH2S—Port au Prince, Haiti.

YV12RM—Maracay, Venezuela.

Have just received verification from TI8WS—7550 kc.—Punta Arenas, Costa Rica. Nice card; schedule every evening till 12 p.m. Have been unable to hear SPW, the new Polish station. One of the broadcasts of ETB, was heard quite good.

JUAN CLOQUELL STORER,
P. O. Box 194,
Arecibo, Puerto Rico, W.I.

Eliminating Radio Interference

(*Continued from page* 664)

will not always satisfy the radio listener, and some unsymmetrical condition in the electrical system may make it necessary to construct a *symmetrical interference trap* as shown in Fig. 3b. By applying the condenser bridge C1, C2, and C3, a good many of the unsymmetrical factors are compensated for. However, other troubles may appear due to the conductivity of condensers for an A.C. current.

Do Not Touch the Motor Casting!

The conductance of the condensers means that an alternating current will flow all of the time over the condenser C1 and C2, and will also be brought over the condenser to the motor casting or frame, which makes it dangerous, especially if it is accidently touched. Tests have shown that a current exceeding 0.8 milliampere may cause serious trouble in the event that some part of the body comes in contact with it.

The best method of avoiding this occurence is through a careful selection of the condenser values. As the condensers become smaller, the current flowing over them to the motor casting (frame) becomes correspondingly less. Due to the fact that the line generally has a capacity estimated to be between 0.01 and 0.04 mf., and sometimes considerably larger, it is advisable to eliminate the interference with small condensers (about 0.1 mf. for C1 and C2) to keep the current flow down, and it is absolutely necessary to use large ones. It might be wise in complicated cases to use R.F. chokes, as shown in Fig. 3c, rather than condensers of large capacity. The capacity of condenser C3 should be between 0.5 and 1 m. to obtain worth-while results.

Only the Ground Casting Helps

A much better method than the use of condenser C3, is the use of a grounded motor casting, as shown in Fig. 3d, not only since it keeps the high voltage charge out of the motor casting, but also since a great part of the interference may disappear, if the grounding system is really efficient. As stated before, the condenser C3 is not necessary since the grounded line leads off the charge continuously. The current flow over the condenser bridge C1 and C2 is so small that no appreciable increase in the power bill will be noticed.

Obtaining a Good Ground for the Motor Frame

The current flow over the condenser bridge C1 and C2 makes it necessary to have an effective ground line if any trouble caused by an accidentally broken line is to be avoided. In cases where the motor is connected, as shown in Fig. 1a, it is a very simple matter to obtain an excellent ground by merely connecting the casting to the one terminal of the motor which is connected with the grounded side of the line.

If the conditions, as shown in Fig. 1b are in use, a special line to the so-called "ground point," or neutral point, is necessary. This ground point is often provided by means of a fourth conductor into the cellar of the building, and will be found, in most cases, on the distribution panel near the meter.

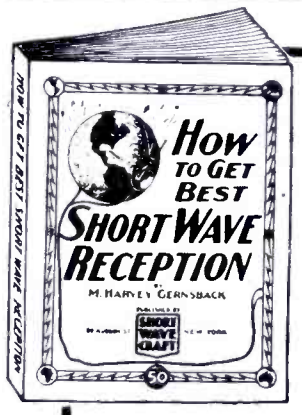
The Artificial Ground Point

In case the motor is connected as shown in Fig. 1c, and in which case the neutral point of the power transformer is not grounded, it may be difficult to obtain a good ground for the motor casting. This difficulty may be overcome by a so-called "artificial" ground point, as shown in Fig. 4a. To avoid destroying the symmetrical

(*Continued on page 701*)

Here are the Six BEST SHORT-WAVE RADIO BOOKS!

Without doubt you will have to go a long way to buy better books on short waves than you find on this page. Each book is written by a well-known authority on short waves . . . each book has been carefully illustrated with photographs and diagrams to make the study of this field of radio much simpler. The volumes on this page are **the finest books on short-waves which are published anywhere today.** Order one or more copies today . . . find out for yourself how fine they are. Prices are postpaid.



How to Get Best Short-Wave Reception

By M. HARVEY GERNSBACK

This book tells you everything you 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.

Why is one radio listener enabled to pull in stations from all over the globe, even small 100 watters, 10,000 miles away, and why is it that the next fellow, with a much better and more expensive equipment, can only pull in the powerful stations that any child can get without much ado?

The reason is intimate knowledge of short waves and how they behave. Here are the chapters of this new book:

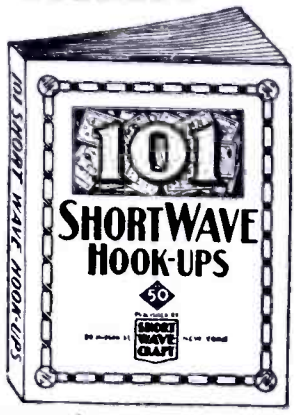
1. What are Short Waves and what can the listener hear on a short-wave receiver or converter?
2. How to tune and when to listen in on the short waves.
3. How to identify short-wave stations.
4. Seasonal changes in short-wave reception.
5. Types of receivers for short-wave reception.
6. Aerial systems for short-wave receivers.
7. Verifications from short-wave stations.

The book makes excellent reading matter. There are many tricks in short-wave reception that even some of the "old-timers" do not know. Be sure to get it.

40 Illustrations, 72 Pages. Stiff, flexible covers **50c**

101 SHORT-WAVE HOOKUPS

Compiled by the Editors of SHORT WAVE CRAFT



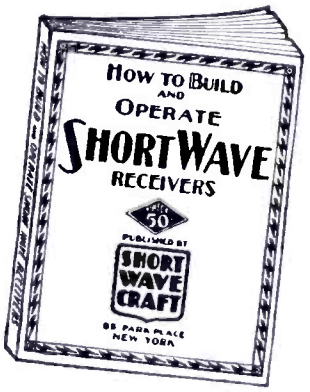
EACH and every hook-up and diagram illustrated is also accompanied by a thorough explanation of what this particular hook-up accomplishes, what parts are required, coil-winding information, values of resistors, etc., in fact, everything you want to know in order to build the set or to look up the data required.

To be sure, all of the important sets which have appeared in print during the past five years are in this valuable book. Sets such as the Doerle, Dinsmore, the "19" Twinplex, Oscillodyne, Denton "Stand-by," Megadyne Triplex 2, "Globe Trotter," 2-Tube Superhet, Minidyne, "Loop" Receiver, "Doerle" 2-tube Battery, "Doerle" 3-tube Battery, "Doerle" 2-tube A.C., "Doerle" 3-tube A.C. Doerle "Signal Gripper," Duo R.F. 4-tube Receiver, The Sargent 9-33 Tapped Coil Receiver, Globe-Girdler 7, The 2-Tube "Champ"—2 Tubes Equal 3, Ham-Band "2-Tube Pee-Wee" Wyeth All-Way 6, Denton Economy 3, 2-Tube "Regenerative-Oscillodyne" will be found here, with full descriptions. In many cases, we have also included a Picture hook-up for those who do not wish to follow the regular symbolic hook-up, but wish to have a regular wiring diagram.

This is a very handy volume, especially for those "fans" who wish to study the best sets in the short-wave art, from one tube up to ten tubes.

100 Illustrations, 72 Pages, Stiff, flexible covers **50c**

HOW TO BUILD AND OPERATE SHORT-WAVE RECEIVERS



THIS is the best and most up-to-date book on the subject. It is edited and prepared by the editors of SHORT WAVE CRAFT, and contains a wealth of material on the building and operation, not only of typical short-wave receivers, but short-wave converters as well. Dozens of short-waves sets are found in this book, which contains hundreds of illustrations; actual photographs of sets built, hookups and diagrams galore.

This book is sold only at a ridiculously low price because it is our aim to put this valuable work into the hands of every short-wave enthusiast.

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HOW TO BECOME AN AMATEUR RADIO OPERATOR

WE chose Lieut. Myron F. Eddy to write this book because his experience in the amateur field has made him pre-eminent in this line. For many years he was instructor of radio telegraphy at the R.C.A. Institute. He is a member of the I.R.E. (Institute of Radio Engineers), also the Veteran Wireless Operators' Association.

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.

Partial List of Contents

Ways of learning the code. A system of sending and receiving with necessary drill words is supplied so that you may work with approved methods. Concise, authoritative definitions of radio terms, units and laws, brief descriptions of commonly used pieces of radio equipment. This chapter gives the working terminology of the radio operator. Graphic symbols are used to indicate the various parts of radio circuits. General radio theory particularly as it applies to the beginner. The electron theory is briefly given, then waves—their creation, propagation and reception. Fundamental laws of electric circuits, particularly those used in radio are explained next and typical basic circuits are analysed. Descriptions of modern receivers that are being used with success by amateurs. You are told how to build and operate these sets. Amateur transmitters. Diagrams with specifications are furnished so construction is made easy. Power equipment that may be used with transmitters and receivers, rectifiers, filters, batteries, etc. Regulations that apply to amateur operators. Appendix which contains the International "Q" signals, conversion tables for reference purposes, etc.

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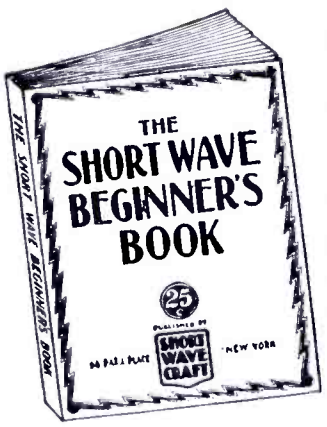

HERE is a book that solves your short wave problems—leading you in easy stages from the simplest fundamentals to the present stage of the art as it is known today. It is the only low-Priced reference book on short waves for the beginner.

The book is profusely illustrated—it is not "technical." It has no mathematics and no technical jargon.

It also gives you a tremendous amount of important information, such as time conversion tables, all about aerials, noise elimination, all about radio tubes, data on coil winding and other subjects.

Partial List of Contents

Getting Started in Short Waves—the fundamentals of electricity. Symbols, the Short Hand of Radio—how to read schematic diagrams. Short Wave Coils—various types and kinds in making them.

Short Wave Aerials—the points that determine a good aerial from an inefficient one.

The Transposed Lead-in for reducing Static.

The Beginner's Short-Wave Receiver—a simple one tube set that anyone can build.

How to Tune the Short-Wave Set—telling the important points to get good results.

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Wave length to Kilocycle Chart.

Wire Chart—to assist in the construction of coils.

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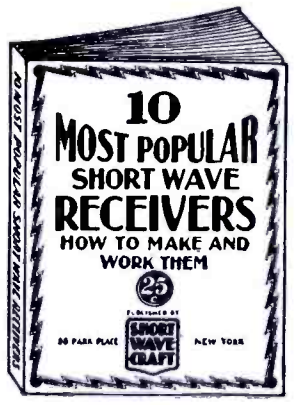
TEN MOST POPULAR SHORT-WAVE RECEIVERS

—HOW TO MAKE AND WORK THEM



THE editors of SHORT WAVE CRAFT 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, hookup and all worth-while specifications. Everything from the simplest one-tube set to a 5-tube T. R. F. receiver is presented. Complete lists of parts are given to make each set complete. You are shown how to operate the receiver to its maximum efficiency.

CONTENTS

The Doerle 2-Tube Receiver That Reaches the 12,500 Mile Mark, by Walter C. Doerle.

2-R.F. Pentode S-W Receiver having two stages of Tuned Radio Frequency, by Clifford E. Denton and H. W. Secor.

My de Luxe S-W Receiver, by Edward G. Ingram.

The Binneweg 2-Tube 12,000 Mile DX Receiver, by A. Binneweg, Jr.

Build a Short-Wave Receiver in your "Brief-Case," by Hugo Gernsback and Clifford E. Denton.

The Denton 2-Tube All-Wave Receiver, by Clifford E. Denton.

The Denton "Stand-By," by Clifford E. Denton.

The "Stand-By" Electrified.

A COAT-POCKET Short-Wave Receiver, by Hugo Gernsback and Clifford E. Denton.

The S-W PENTODE-4, by H. G. Cisin, M. E.

Louis Martin's Idea of A GOOD S-W RECEIVER, by Louis Martin.

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Eliminating Radio Interference

(Continued from page 699)

condition of the system, a choke (Ch 1) has to be put in the ground lead. The dimensions of the choke depend upon the size of the motor and are given in the first article. (See June, 1935 issue.)

The line from the frame to the artificial ground should be a heavy conductor in order to carry the full motor current should anything go wrong. Precautions should be taken to prevent this line from being destroyed through accident or corrosion. The end of this line may be connected to the cold water pipe on the street side of the meter, or to a special ground-rod driven into the earth. The connection to the ground rod, and to the cold water pipe should be covered with several layers of lacquer to keep out moisture and air. The steel frame of a building or other substitute grounds do not work satisfactorily or give the necessary protection against personal injury should the casting (frame) be touched.

Chokes are Often Necessary

Since condensers and artificial grounds are often not sufficient to eliminate all radio interference entirely, in this case the use of two chokes, as indicated in Fig. 4b, might be necessary. The dimensions of these chokes shown in Fig. 3c may be obtained from the first article on radio interference elimination. (June 1935 issue.)

World-Wide Short-Wave Review

(Continued from page 663)

used as oscillator for transmitting and detector for receiving. The pentode is used as modulator for transmitting and amplifier for receiving.

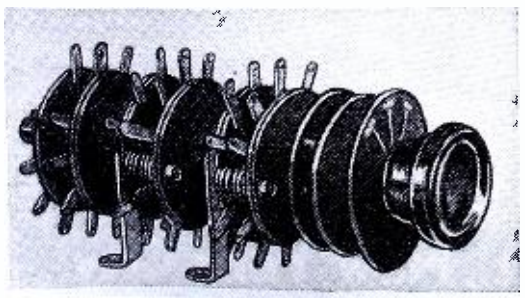
The values of the parts are indicated on the circuit diagram. The three-section switch changes the unit from transmitting to receiving circuits. The transformer T1 is a combined A.F. and modulation type, having a small winding for modulation. Coil T2 is an auto transformer with a turns ratio of 1 to 1.6, which acts as the output impedance or load for receiving and as decoupling choke for transmitting.

The transceiver is used with a half-wave vertical di-pole aerial. The coils are self-supporting and are mounted, according to regular practice, on the terminals of the tuning condenser. The latter, as you will note is a split stator unit, having a single set of rotor plates and two sets of fixed plates.

Gang-Type Wave Switch

● A WAVE switch of the true gang type was introduced in the "New Apparatus" page of a recent issue of *Wireless World* (London).

This switch is made in sections, each of which is a complete five-position switch unit for one circuit. As many of these individual units as needed are grouped together on a single shaft to solve the switching problem of any all-wave set.



A Novel "Gang" Type Wave Switch

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Advertisements are inserted at 5c per word to strictly amateurs, or 10c a word to manufacturers or dealers. Each word in a name and address is counted. Cash should accompany all orders. Copy for the April issue should reach us not later than February 5.

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• 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.)

The Cosman Four Has Band-Switch

(*Continued from page* 666)

remembered that reception on the 200 to 550 meter band will not be as selective as that found on standard commercial receivers, but will be ample for all ordinary requirements.

It is imperative that wiring leads be kept as short as possible. This will eliminate any stray capacities and feedback between leads, which may, at times render the receiver inoperative at certain parts of the short-wave bands. The resistor values specified should be followed closely because they have been carefully worked out to give the best results, and quiet operation. In wiring we suggest that all connections be cleansed thoroughly before an attempt is made at soldering. The unit is provided with five controls; a combination volume control and switch assembly; wave-band switch; regeneration control; "Tank" tuning control; and airplane dial for band-spread operation. The dynamic speaker is built in and requires a field resistance of 3000 ohms.

This article has been prepared from data supplied by courtesy of Try-Mo Radio Co.

New Apparatus For the Ham

(*Continued from page* 668)

so that the amateur bands fall in the proper position on the dial with a 140 mmf. tuning condenser used to tune the coils.

Amplifier Foundation Unit, H41

Anyone having experience with a high-gain amplifier will appreciate this foundation unit. It is especially designed to accommodate the average modulator or power amplifier. It consists of a chassis and a perforated metal housing which encloses the entire unit. They are made in 3 sizes—one in particular is as follows: The chassis measures 10"x17"x2½" and the over-all height including the cage covering, is 8¼". The finish is black enamel, and will make any audio amplifier have a professional appearance.

Lloyd S. Hale, W7EAA, Has Neat Station

(*Continued from page* 657)

All U.S. districts have been worked on 160 meter phone. The receiver is a Browning "35."

Lloyd S. Hale, W7EAA,
Tekoa, Wash.

(Fine work, Lloyd. The crystal "mike" should put out a peach of a clear voice signal. All in all, you seem to have an excellent line-up. Good luck and plenty of DX.—Editor.)

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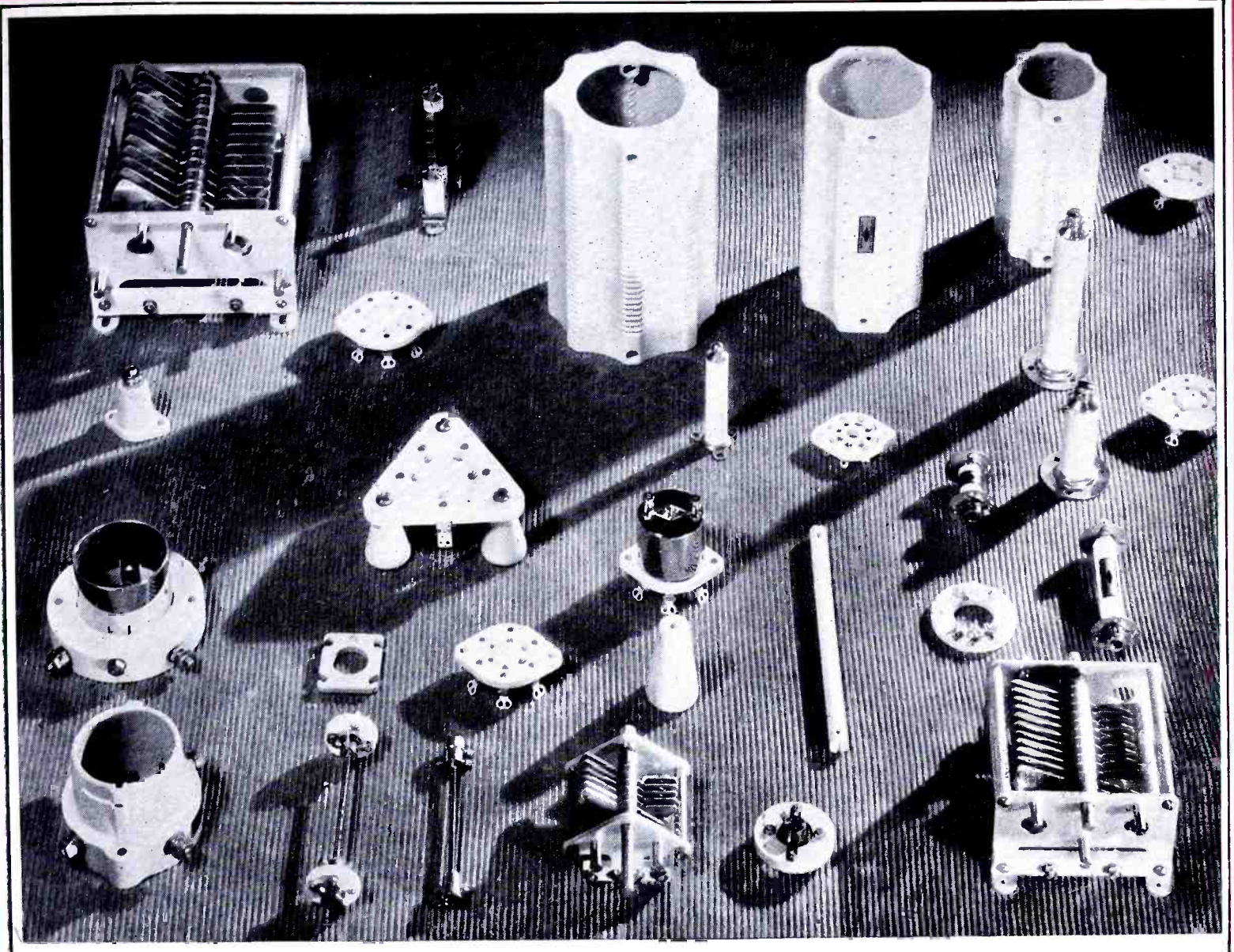

National offers a thoroughly engineered part for nearly every radio purpose. The entire line cannot be compressed into our twenty-page catalogue, much less a single page. But look over the group above. Transmitting condensers from the little 1000 volt TMS in the foreground to the 12,000 volt TMA at the rear. Low loss ceramic coil forms for every amateur band. Low loss sockets for nearly every tube type, from acorns to power pentodes. Flexible couplings from the little TX-12, which will work around a corner, to the big fellows for heavy condensers, high voltages, and low-losses. Strain insulators, spreaders, lead-ins for the antenna: stand-offs, chokes, dials for the rig. National has what it takes.

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