THE RADIO EXPERIMENTER'S MAGAZINE

SHORT WAVE CRAFT

August

HUGO GERNSBACK
Editor

FREE BLUEPRINT OF THE NEW "CLIPSET" WITH THIS ISSUE

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See Page 204

WORLD'S LARGEST SHORT WAVE CIRCULATION

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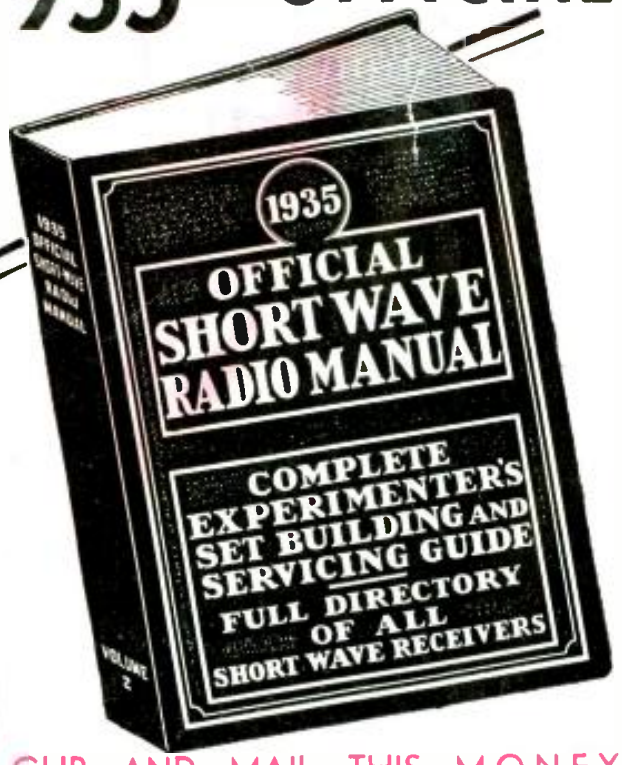

When we brought out our 1934 OFFICIAL SHORT WAVE RADIO MANUAL, of which many thousands of copies were bought by short wave enthusiasts, we promised you that a new volume would be published every year.

In keeping with this promise, we now take great pleasure in announcing the 1935 OFFICIAL SHORT WAVE RADIO MANUAL.

There has been tremendous progress and a great boom in short waves in the past year, and the art has made such rapid progress that no single book, up to now, has been able to keep up with this progress. The 1935 OFFICIAL SHORT WAVE RADIO MANUAL fills this need, and it fills it completely. All the progress made in short waves, whether it is in set building, whether it is in radio servicing, whether it is in new models, whether it is in new short wave discoveries, all are faithfully reported and chronicled in this great 1935 volume.

Like its predecessor, it is a BIG book, in which you will find literally EVERYTHING in short waves—nothing has been left out.

Not only is it a complete manual, but it is a great encyclopedia of short wave facts, information, hookups, photographs, tables, maps, etc., etc. The wealth of material is so great that it would take several pages to list all the valuable data that has been included in this volume.

Similar to last year's volume, the new book has been edited by Hugo Gernsback, Editor of SHORT WAVE CRAFT and H. W. Secor, Managing Editor, and if you are and have been a reader of SHORT WAVE CRAFT, and particularly if you have seen the 1934 Manual, you will know just what you can expect from this, the greatest short wave manual ever put out by Mr. Gernsback.

Here are the star features of the book:

29 ★ Features:

★ 1—**Short-Wave Beginners' Section**—Dozens of new simplified circuits for 1-2 and 3 tube receivers, including famous "Doerle" and "Oscillodyne," etc.

★ 2—**Short-Wave Receivers**—All types discussed with diagrams and pictures—The best types only, which have "stood the test" of actual operating service. Full details for constructing them, etc., "Band-Spreading" the Doerle, 5-tube T.R.F. Receivers, etc.

★ 3—**Battery Short-Wave Receivers**—1-2, & 3 tube sets—all the way up to special 5-tube superheterodyne, designed especially for battery operation.

★ 4—**"5-Meter" Department**—All the latest "dope"—including newest transmitters, "Long Line" oscillators, improved "high sensitivity" receivers. How to arrange best aerial to get greatest distance, 5-meter transceivers, hook-ups, etc.

★ 5—**Short-Wave "Artificial Fever" Apparatus**—also newest therapeutic and other allied applications of ultra short waves.

★ 6—**Short-Wave Experimenter's Section**—filled with Short-Wave Kinks, Short-cuts, etc., of interest to every experimenter.

★ 7—**Ultra Short Waves**—Newest circuits, apparatus, and results obtained in this field.

★ 8—**Commercial "Short-Wave" and "All-Wave" Receivers**—Full Servicing Data for "Set-Owners" and "Service-men."

★ 9—**How to build "Power Supply" Units for Short-Wave Receivers.**

★ 10—**Latest Short-Wave Converters**—With servicing data on Commercial Models.

★ 11—**The Short-Wave Antenna**—Including latest "Noise-Reduction" types, Transposed Lead-In systems, shielded cable, Double-Doublet, etc.

★ 12—**Short-Wave Superheterodynes**—From 3 to 11 tubes—Latest descriptions and diagrams including commercial all-wave superhets.

★ 13—**Phone Transmitters for Amateur Stations**—How to build them.

★ 14—**"Skip" Distance**—Heaviside layer, etc.—explained; physics of Short Waves.

★ 15—**Super-Regenerative Short-Wave Receivers**—latest circuits, etc.

★ 16—**Recording "Foreign" and "Domestic"** Short-Wave programs. All systems in use.

★ 17—**"High Fidelity"**—How to obtain it in Short-Wave Receivers.

★ 18—**The best Short-Wave Questions** and answers of the year.

★ 19—**The best Short-Wave "Kinks" of the year.**

★ 20—**Foreign Short-Wave Review**—Novel circuits, apparatus, etc.

★ 21—**Tubes for Short-Wave purposes**—Including tables of latest tubes for Short-Wave transmitters and Receivers.

★ 22—**Short-Wave Transmitters**—All about the new "Long Lines" Oscillators as well as other "simplified" high-efficiency transmitters, Rack and Panel jobs, Crystal Control, etc.

★ 23—**Multi-Purpose Tubes**—How to use them on Short Waves—Sets in which 2 tubes=4; 3 tubes=6; etc.

★ 24—**"Audio Amplifiers" for Short-Wave Receivers**, Circuits, etc.

★ 25—**"Band-Spread"**—How to spread the stations over the dial for easier tuning.

★ 26—**Plug-less "Mono-Coil" Receivers**—How to build efficient switch-type coils to eliminate plug-in coils; "Clip-Coil" Receivers, etc.

★ 27—**Boosters, Pre-amplifiers and Beat Oscillators**—How they work, with constructional data, diagrams, etc.

★ 28—**Portable Short-Wave Receivers and Transmitters**—Transmitter Power supply from Ford Coils, etc.

AND FOR SERVICE MEN

★ 29—Every short-wave diagram, every short-wave set, whether it is a battery set, whether it is an all-wave set, EVERYTHING, in other words, that has been manufactured in the commercial set line, will be found in this special enlarged section. Hundreds of valuable diagrams, with tube layouts, resistor values, color codes of wiring cables, etc., and the purpose of each tube in each set clearly indicated on the diagram, wherever this information can possibly be obtained.

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As has been customary with us in the past, we give our readers the opportunity to order the book before it comes off press and save money. The price of the new 1935 OFFICIAL SHORT WAVE RADIO MANUAL will be $2.50 as soon as it comes off the press. No reduction in price will be made later. To you, who order this book before publication, the price is $2.00.

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HUGO GERNSBACK, EDITOR H. WINFIELD SECOR, MANAGING EDITOR

SHORT WAVE CRAFT

Short Waves and Television

An Editorial By HUGO GERNSBACK

● In a recent report published by Radio Corporation of America, the company stated that it was expending one million dollars in actual field experimentation in television during the next twelve to fifteen months.

Sums equal to this, and larger ones, have already been expended on television by the American Telephone & Telegraph Corporation, and other interests, all of which points to one direction, and that is that we are getting nearer to the solution of television all the time.

Television, however, is NOT just around the corner, and there are still tremendous obstacles to be overcome. The final word in television has by no means been said. The rotating scanning disc, that is, the mechanical type of televisor, may be safely left out of future plans. It is *not* the solution of television. The next and apparently best solution which television has to offer so far lies in the *cathode ray tube*. Yet, even this, in my opinion is not the final word, and I do not believe that the television receiver of say twenty-five years hence, will have the present type of cathode ray tube.

My own opinion is that we need an *entirely* new discovery in television before it will become as popular as aural radio is today. The animal eye is still the best type of television transmitter and receiver; it does not work on a mechanical principle nor does it require a cathode ray for its functioning. And, besides, the human eye does not have to "scan" as all present television apparatus do. Something radically different than our present apparatus —something far simpler—is, in my opinion, the solution to the television problem.

In the meanwhile, one thing is quite certain, and that is that when television finally arrives, it will come via *short waves*. At the present time, research scientists and radio-television engineers, believe that we require a wide wave-band for television, much wider than that for our present short-wave broadcast signals. In broadcast short waves we can get along with a band which, expressed in technical terms, is 10 kilocycles wide. Television, present-day engineers tell us, must have at least a band 400 kilocycles wide if we are to get a good image of some 200 lines. This, it is claimed, is required in order to give the image proper definition and to make the image appear with a clarity equivalent to a photograph printed in this or any other magazine.

For that reason, the experiments that are now being made by our large research organizations take it for granted that television broadcasting will be done on a wave-length somewhat less than six meters. Television engineers now have in mind networks whereby a New York studio, for instance, will send out original television impulses, which are then radiated simultaneously by hundreds of stations all over the country, situated at some elevated point such as a high building, hill, etc. The reason for this is that the short wavelengths of six meters do not reach much beyond the horizon, and consequently they cover only from 25 to 50 miles radius from the television transmitter, depending on the elevation of the latter.

If this plan ever goes into operation, it will mean that hundreds of millions of dollars will have to be expended in new equipment, not only to put up new stations but in addition, we cannot use ordinary telephone or telegraph lines to interconnect the various stations, such as broadcast stations do today with their nation-wide hook-ups. Instead, entirely new cables, which have recently been invented, and which are termed *concentric transmission lines*, will have to be used from coast to coast, and this alone is a tremendous undertaking. Then, add to this, the installation of the transmitters themselves, in thousands of cities, all over the land, and you will get a slight idea of the huge capital outlay required to make television practical in this country.

All this is based upon the assumption that for television we have to use the extremely short wavelengths, below six meters. If, however, another revolutionary television invention should be made, in the meanwhile, it is possible that an entirely different plan may be devised, and in this case, instead of having thousands of cities broadcast television locally, perhaps a few dozen or fifty transmitters working on short waves, anywhere between 15 and 25 meters, might solve the problem. All of this, however, is purely problematical and one opinion today seems as good as another. As I said before, the final word in television has not as yet been spoken.

There is also another important point to consider, and that is when television finally comes, it will, of course, supplement our present broadcast stations because we cannot very well imagine a television receiver, which receives only images, without sound. In any event, the television receiver of the future will work in either of the following manners:

Either the television impulses are sent out on the same wavelengths which the broadcast stations use now (200 to 550 meters). This is, however, rather doubtful.

Or the alternative would be to have the receiver work on two wavelengths, both present broadcast (200 to 550 meters) for sound—and ultra short wave, (for television) below six meters, simultaneously; that is, the sound would be received just as it is today, whereas the television impulses will be received on ultra short wavelengths, below six meters, on a separate receiver or a dual-purpose receiver, all built in the same cabinet or console.

The third and best alternative would be to have the audible broadcasts also sent by ultra short waves, in which case, the present broadcast stations would no longer be neccssary, *because both audible programs and television programs could go over a single wave-length*. This latter has already been achieved successfully. This would simplify matters a great deal for the ultimate user, because it would do away with a multiplicity of controls which you would have in the aforementioned cases. In other words, instead of tuning in two wavelengths, (that is tuning for sound and then tuning in for television,) you would only tune in for a single wavelength, which would bring you *simultaneously* television and sound as well.

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

This is the August 1935 Issue—Vol. VI, No. 4. The next Issue Comes Out August 1.

Editorial and Advertising Offices, 99-101 Hudson Street, New York City

Calls Home from Auto by Short Wave

Left—The home station has a 1 kw. C. W. and phone transmitter operating on 10, 20, 40, and 80 meters. Right—Don Wallace talking from car.

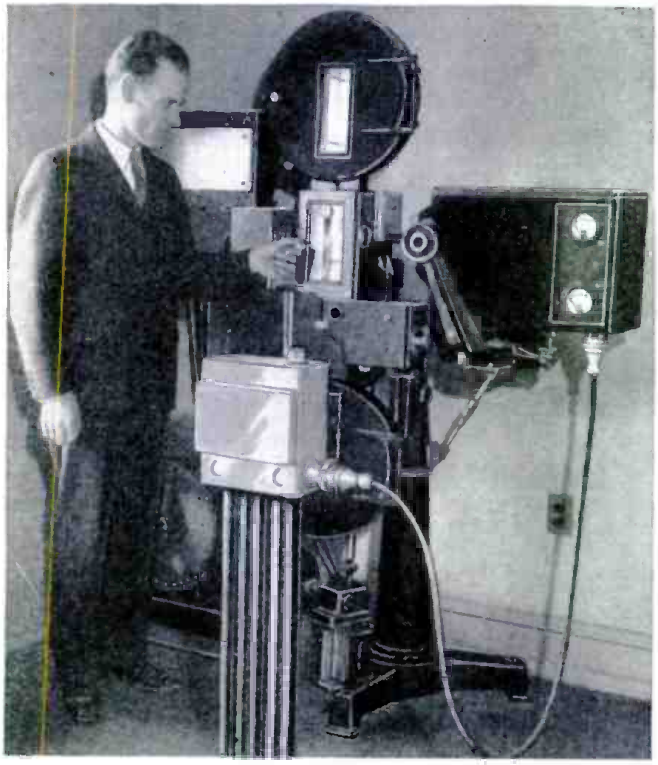
● DON C. WALLACE of Long Beach, Calif. calls up his home daily on 5 meters, using the apparatus shown in the occompanying photos. His car is fitted with a 5-meter 2-way radio set, so that he can talk to his home and hear the folks when they talk to him. In the event that he is away on a trip 20 miles or so from home and finds that he will be home late, he can close a switch with his foot which will start his 5-meter transmitter going and he then calls his home. His 12-year-old son, Bill, stands watch everyday at 5:30 p.m.

By kicking the floor switch in the opposite direction, the 5-meter receiver is set into operation aboard the speeding auto and Don Wallace can then hear his son's voice and the "family news" of the day. Mr. Wallace tells us that the set on the car works as well at high speed as it does when standing still. The main parts of the transmitter are located under the hood of the car.

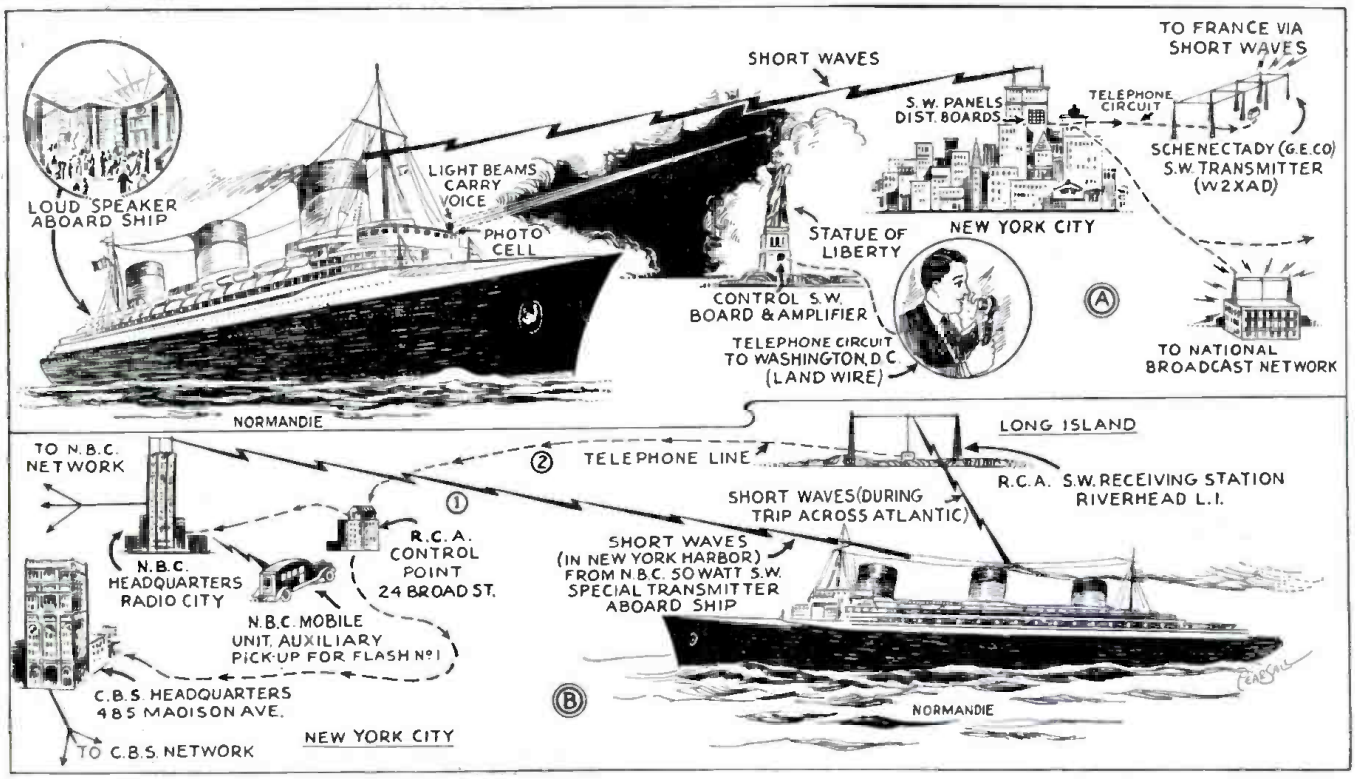
Twelve-volt storage batteries supply the primary current for the motor-generator, which delivers 525 volts with 300 M.A. The antenna on top of the car is a 5-foot vertical steel fishing rod; This is hinged so that if any object such as a tree should hit it while the car is speeding along, the pole will merely bend.

This antenna works against a 3-foot counterpoise which extends forward and down toward the hood. The entire 5-meter transmitter and receiver is relay-controlled, a foot-operated switch on the floor serving to operate all of the relays.

Newest Cathode-Ray Televisor



● THE two photos above and at the right show the very latest cathode ray television apparatus developed by the Farnsworth Television Co. of Philadelphia. The photos above show Mr. Farnsworth's newest television pick-up device for transmitting from a "movie" film and undoubtedly this system will be one of the most extensively used tomorrow, when television becomes an everyday commonplace. The right-hand photo shows Mr. Farnsworth with his new television cathode tube and also the appearance of his televisor with an image on the screen.



The elaborate rôle played by short waves in the maiden voyage of the magnificent new French liner, "Normandie," is illustrated in the picture above. A light beam carried the voice as the ship passed the Statue of Liberty.

Short Waves Carried Normandie's Greetings

● A TALKING beam of light from the torch held in the upraised hand of the Statue of Liberty officially welcomed the new French liner, *Normandie*, when she steamed up New York harbor on her maiden voyage. General Electric engineers, who were consultants in designing the turbine-electric drive for the ship, developed special equipment for this unique stunt.

This method of communication differed from radio broadcasting in that the words were confined strictly to the light beam, and were received only by special apparatus installed on the ship. The words of greeting, from Washington, were brought to the statue by land wire, there transposed into light pulsations and directed to the ship by means of a powerful reflector, capable of casting the light a distance of five or six miles. On the bridge of the ship was the receiver, consisting of a large concave mirror which will pick up the light rays and converge them upon a phototube or "electric eye." This transposed the light waves back into electric pulsations, which were fed through the public address system of the ship, so that the passengers could hear the welcome, and were also sent by *short-wave* radio to New York and fed into the WEAF or red network of the National Broadcasting Company. From the network, General Electric's short-wave station, W2XAF, in Schenectady, sent the voice to France, where arrangements were made to receive it and rebroadcast it throughout that country.

Stratosphere Short-Wave Set

● THE photo herewith shows the specially built R.C.A. Victor short-wave transmitter and receiver which will be carried on the new stratosphere flight by Captains Albert W. Stevens and Orville O. Anderson. At the left of the photo appears Gen. James G. Harbord, Chairman of the Board of R.C.A., and at the right, Richard C. Patterson, Jr., Executive Vice President of NBC, who are shown examining the stratosphere short-wave equipment. It is planned to broadcast programs over the NBC network from the stratosphere balloon in flight.

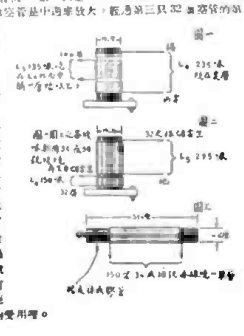
How We Look In Chinese!

● BELOW we reproduce a page from the Chinese radio magazine—"The China Radio" and the article shown is one that was republished from a previous issue of *Short Wave Craft*. We have seen our articles reprinted in practically every language, but this is the first in Chinese.

中國無線電 | China Radio

短波五管外差收音機 (上卷)

(原自 Short Wave Craft 1934 年十一月份)



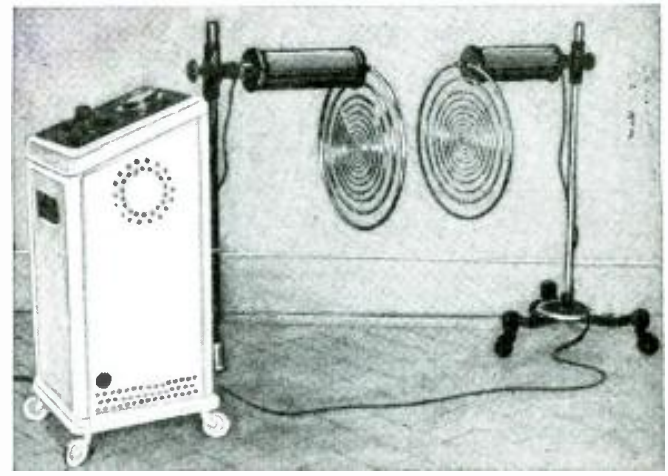
Realizes Radio Ambition

● ROSS A. HULL, of the American Radio Relay League, recently realized his long-cherished ambition of talking from and to both sides of the world when, while in Schenectady, N. Y., he conversed with his brother in Sydney, Australia. He had previously talked to Schenectady from Sydney, In the picture, Hull (right) and K. B. Warner, secretary of the ARRL, are pointing out the locations of W2XAF, one of General Electric's short-wave stations at Schenectady, and VK2ME, "down under" at Sydney—the stations participating in the two-way conversation.

New Multiple Wave Oscillator For Medical Use

By Dr. Pierre Rigaux
(Paris)

A radically new system of applying multiple short-waves for medical treatments is here described, also some remarkable results obtained by this new method, including the treatment of cancer.



New "multiple-wave" medical treatment apparatus devised by Georges Lakhovsky.

● DURING the last century the theory of waves was developed as a result of the numerous researches of Max Wael, Hertz, Branly and d'Arsonval. In 1924 Georges Lakhovsky performed, at the surgical clinic of the Salpetriere, experiments in the cure of artificial cancer among plants.

First Experiments

These experiments, the reports on which were communicated to the Biological Society, became very celebrated and were reproduced throughout the world with equal success.

The bacterium *Tumefaciens*, when inoculated into plants, produces a series of white tumors of the size of a cherry stone, which multiply indefinitely and only perish with the plant or limb that bears them. Even when surgically removed, these tumors continue to proliferate (grow). Georges Lakhovsky treated these plants with an apparatus which he himself built. It was no doubt primitive, being called the radio-cellulo-oscillator, and producing oscillations of the order of 2 meters in length, which corresponds to an oscillation of 150,000,000 vibrations a second. The Pelargoniums were given two treatments of three hours duration each, with this apparatus, at twenty-four hours' interval. During the days immediately following the tumors continued to proliferate, but 16 days after the first treatment, the tumors suddenly began a process of necrosis (death), and 13 days later still, the cure was complete.

The necrosing activity of the waves was demonstrated at the same time as their great value in selecting cancerous tissues for the object of such action. It thus became possible to establish that tumors—at least among plants—were affected by radiative influences.

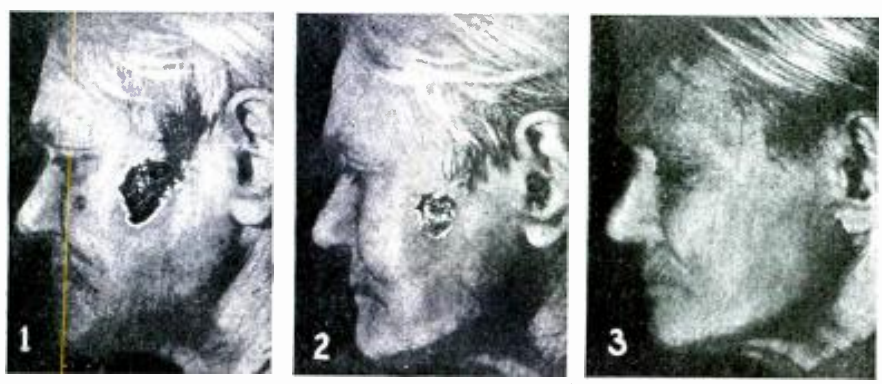
It therefore appeared to Georges Lakhovsky that one could arrive at a system of wave emission which could cause all the little circuits which constitute the living cell to vibrate aperiodically; and if all the circuits which constitute a single cell, why not all those which make up an entire organism? This theory of *Cellular Oscillation*, which he has brought before the public so sensibly and with so much regard to the laws of physics and biology in such works as "*Le Secret de la Vie*," "*L'Universion*," "*L'Oscillation Cellulaire*," "*La Terre et Nous*," and "*La Metière*," has completely revolutionized old concepts. Not at all content to remain within the domain of theory, Lakhovsky was moved to produce a machine inspired by his little radio-cellulo-oscillator—the one with which he had cured cancerous geraniums in a single month—a machine which should emit radiation of multiple wavelengths which would create an electromagnetic field containing all lengths of radiation from 3 meters to the infra-red, so that every cell placed within this magnetic field, and every filament in every cell would find the frequency necessary for it to vibrate in resonance.

Lakhovsky's theory, taken up by numerous other scientists, has given rise to many interesting experiments in various parts of the world. His experiments, repeated by M. Labergerie at the Ecole d'Agriculture at Montpelier, by Professor the Duke of Vincenzo-Rivera in Italy and by Dr. Brunori at New York, permitted Professor Attilj, the chief radio technician of the Hospital San Spirito in Sassia of Rome, to carry on experiments with 300 cancerous persons, of whom 24 had been given up as past help by ordinary operative methods. The results were remarkable. Two of the hopeless cases were entirely cured and the condition of the rest improved noticeably. Professors Mezzadroli of the University of Bologna, Castaldi of the University of Cagliari, Reffo of the Institute of Experimental Medicine for Cancer at Buenos Aires, S.A., have also taken up Lakhovsky's work and carried it on with great success. One cannot avoid citing also the work done by Araujo in Montevideo. Karsis in Athens, and Kotzareff in Paris.

Lakhovsky's Short-Wave Oscillations

There was thus, no longer any opposition from scientific sources to the production of an electromagnetic field apparatus, and after four years of incessant labor and the conquest of numerous and serious difficulties, George Lakhovsky undertook his first experiments on human subjects. This was six years ago. The machine was extremely simple to operate, plugged in on an ordinary electric lighting circuit, and was composed of a transmitter which included a generator for damped waves of very high frequency, serving a diffuser (spreader). This spreader was composed of a series of concentric open circuits, their general appearance recalling that of the earliest oscillating circuits to be conceived, and all were so suspended as to be insulated from each other. The receiving apparatus (which, it has now been discovered, may be done away with) is of the same type of construction. The radiant energy obtained through this apparatus may reach a potential of 150,000 volts. The machine produces all wavelengths from 400 meters down to 10 centimeters, and therefore all frequencies from 750,000 to 3,000,000,000 a second. It seems almost

(*Continued on page* 233)



1—Madame S. photographed a day before the first treatment, the 25th of April, 1932. Note the wrinkles in the neck and the generally aged appearance of this 82-years-old woman. 2—Madam S, photographed 16 days after the first photograph and not having had more than 2 sittings (treatments). One notes the rejuvenation of the tissue. The cancer under the eye has disappeared and the other has considerably decreased. The wrinkles on the jaw and under it have also almost disappeared. (Photograph taken May 10, 1932.) 3—The same subject photographed a month later. The cure is now complete. The woman of 82 has recovered the transparent and rosy skin of a woman of 30 or 40.

1935 "PROF" DOERLE RECEIVER

By GEORGE W. SHUART W2AMN

● UNQUESTIONABLY the most popular short-wave receiver ever described in *Short Wave Craft* magazine was the original 2-tube Doerle. This receiver was described in the Dec., 1931-Jan., 1932 issue and used a pair of type 30 tubes. There was nothing unusual about the 2-tube Doerle. One tube was a regenerative detector in a very conventional circuit, and the other type 30 used was an audio amplifier. Undoubtedly the simplicity of the receiver was the feature that made it so popular. So simple was it that everyone that built it had no trouble in getting it to work and they received all the principal short-wave stations "right off the bat!" That original 2-tube set was made in the crudest manner, with parts of old broadcast receivers "cut down" to work on the shorter waves. The condensers and sockets were nothing like the present-day low-loss parts, which are made either of isolantite, R39, Victron, etc. And the whole set was built on a wood baseboard fastened to a bakelite panel.

Nearly every day some one of our readers requests information regarding the original Doerle receiver and it is for that reason we have written this article. We believe that, despite the fact that the circuit is one of the oldest known *regenerators*, interest among the beginners and less experienced S-W fans warrants the description of the Doerle using up-to-date parts. We have named it the "1935 'Prof.' (Professional) Doerle" because most of the modern set design features have been incorporated in it. The circuit fundamentals of the first Doerle set have been retained however, and the success of the receiver is assured by this fact.

All Ready for World-Wide Reception on the "Prof" Doerle

¶Probably more fans have cut their teeth on the original 2-tube DOERLE receiver described in SHORT WAVE CRAFT during the latter part of 1931, than any other short-wave receiver ever described. For this reason we are happy to present the 1935 version of the 2-tube battery-operated DOERLE.

¶This set uses only two tubes and the circuit is identical to the original one, except for the additional stage of audio made possible by the dual-purpose 19 tube.

¶By the use of low-loss up-to-date parts, and with the additional stage of audio amplification, the designer has made this an ideal battery-operated receiver for the short-wave fan who demands both efficiency and simplicity. Another distinctive feature is the unique one-piece metal panel and base.

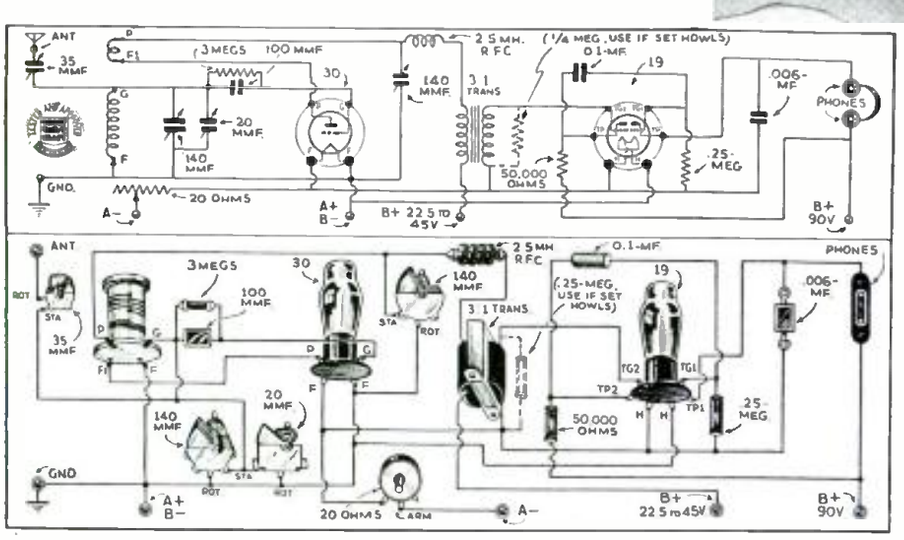
One-piece Panel and Subpanel

We have dispensed with the wooden baseboard and the old bakelite panel and replaced them with a neat one-piece metal panel and base. The old-fashioned condensers and sockets have been replaced with up-to-date parts, using the highest grade of insulation. The critical tuning of the old set is replaced by a good vernier dial and band-spread has been added. The band-spread is *continuous* over the entire range of the receiver from 15 to 200 meters!

Note the Very Handy Arrangement by Which the Coils Are Plugged in Through the Front Panel

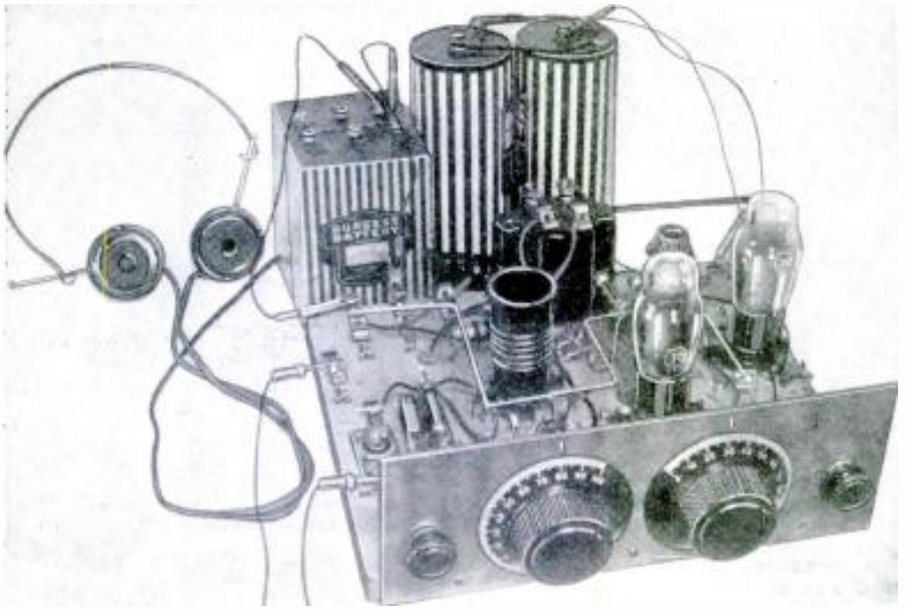
Plug-in coils are still highly favored and the data for "winding your own" on old tube-bases are given in the appended coil data table, although standard manufactured coils will give just as good if not better results. You no longer have to reach behind the panel in this set to change the plug-in coils, because it is arranged so that the coils plug in *right from the front of the panel!* The original set had a homemade antenna coupling condenser and it wasn't even adjustable without either bending the

(*Continued on page 235*)



Schematic and Physical Diagrams of the Modernized 2-Tube Doerle

CLIPSET—A Universal All-Wave Hook-Up Board



General appearance of the very latest idea for the "New Circuit Hound"—all connections are quickly changed with short cables or wires, by simply following the numbered terminals as shown in the blueprint supplement.

● LET us turn back the pages of radio history for a few minutes—back to the days of 1924-25, the "Era of Reflex Circuits." The problem at that time was to have one tube amplify both R.F. and A.F. Currents at the same time—*and there were hundreds of methods of doing it.* Everyone who knew anything at all about radio was working feverishly to try out the various circuits and be the first one to present to the world the one which, in his opinion, was the most stable and most reliable—and opinions vary. Now, the question arose, how many circuits could a fellow try out in an evening? What with the laying out of the parts, fastening them to the baseboard, careful soldering, etc., and then completely undoing what he'd done, to make ready for the next circuit—if he completed *one* per evening (a radio experimenter's "evening" is generally defined as starting at about 6:00 p.m. and ending when the "midnight oil" gives out) he was doing very well—*and there were hundreds of circuits to be tried.*

To alleviate the "sufferings" of his radio friends and readers, Hugo Gernsback came to the rescue with his famous "Hook-up Board." This practical and unique time-saving device was thoroughly described in the November 1924 issue of his former magazine *The Experimenter*, and is the seed from which grew this modern version known as the *Clipset Universal All-Wave Hook-Up Board.* The entire principle and purpose of this board was very beautifully explained by Hugo Gernsback in that issue of *The Experimenter* as follows:

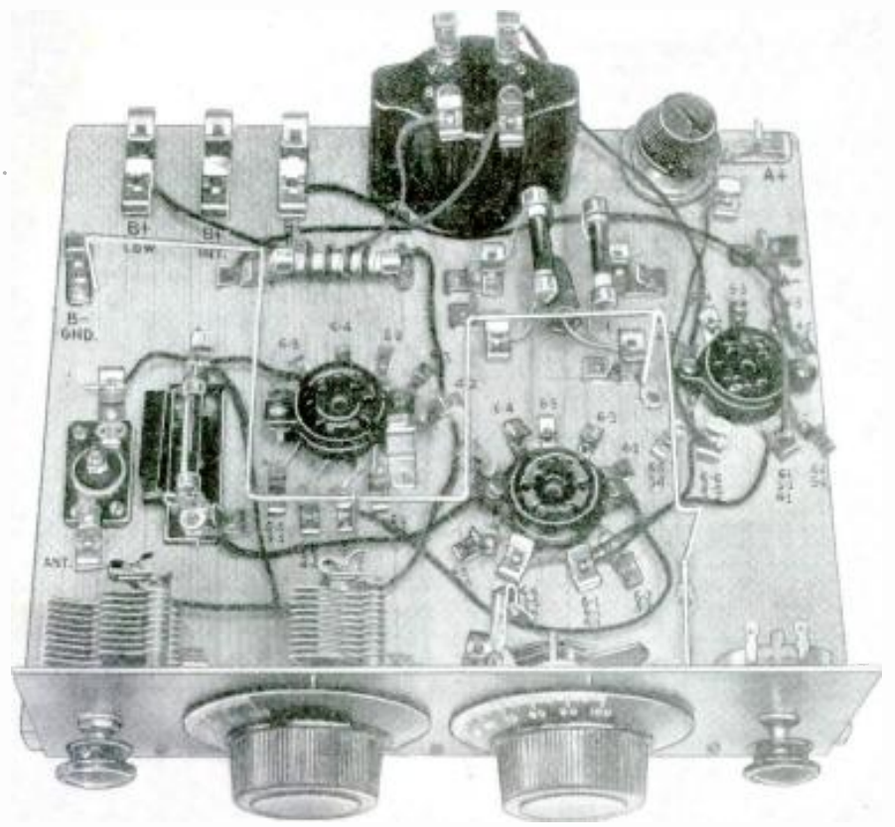
"Here is a new idea for the radio experimenter. Heretofore, when experimenting with different circuits, you placed your parts haphazard on a table and connected the instruments with wire (and solder, of course). Every time you wanted to change from one circuit to another it took long and tedious work to accomplish this.

"All this is a thing of the past. The writer has worked out an entirely new arrangement which will be known to the radio fraternity hereafter as the *Hook-up Board.* By means of this arrangement it is possible to hook up different circuits in a minimum of time. Nor do you have to screw and unscrew nuts and binding posts to accomplish this. We now use Clip-Leads and Tip-Leads, which are merely short pieces of flexible wire, to the ends of which have been soldered either spring clips or otherwise telephone cord tips. By means of this arrangement connections can be hooked up or unhooked in fractions of a second. The Hook-Up Board is arranged in such a manner that by using spring binding posts in great numbers the most intricate connections can be made in the shortest time.

"The noteworthy improvements in this system are immediately apparent to anyone. However, the most important feature of the new system is that loose connections are practically impossible now. How often have you hooked up a set according to directions and after you played with it for hours without result, you have found that there was a loose connection, or a broken wire held together by its insulation.

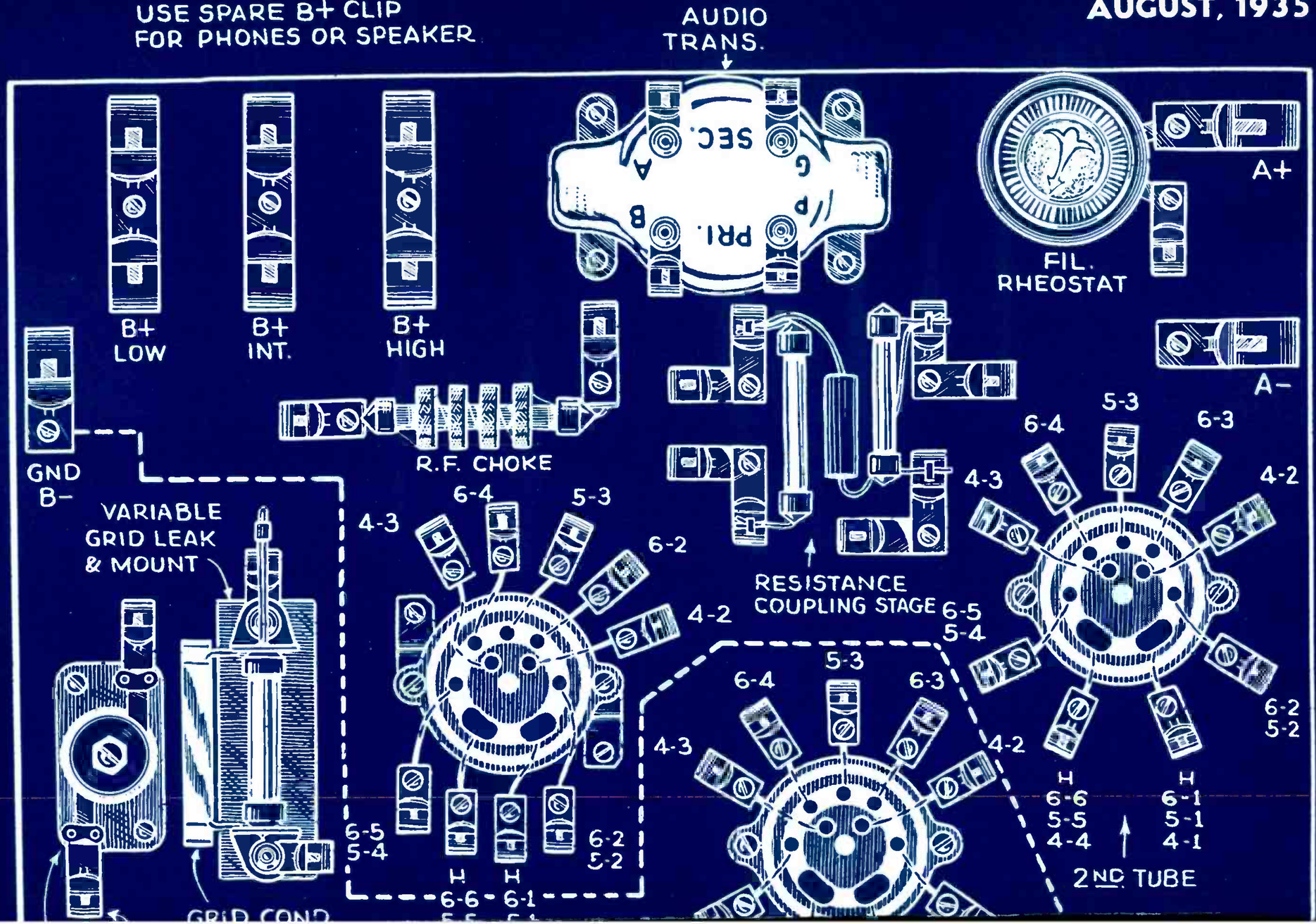
"All these irritating annoyances are now a thing of the past, thanks to the *Hook-Up Board;* experimenting now becomes a pleasure and a pastime,

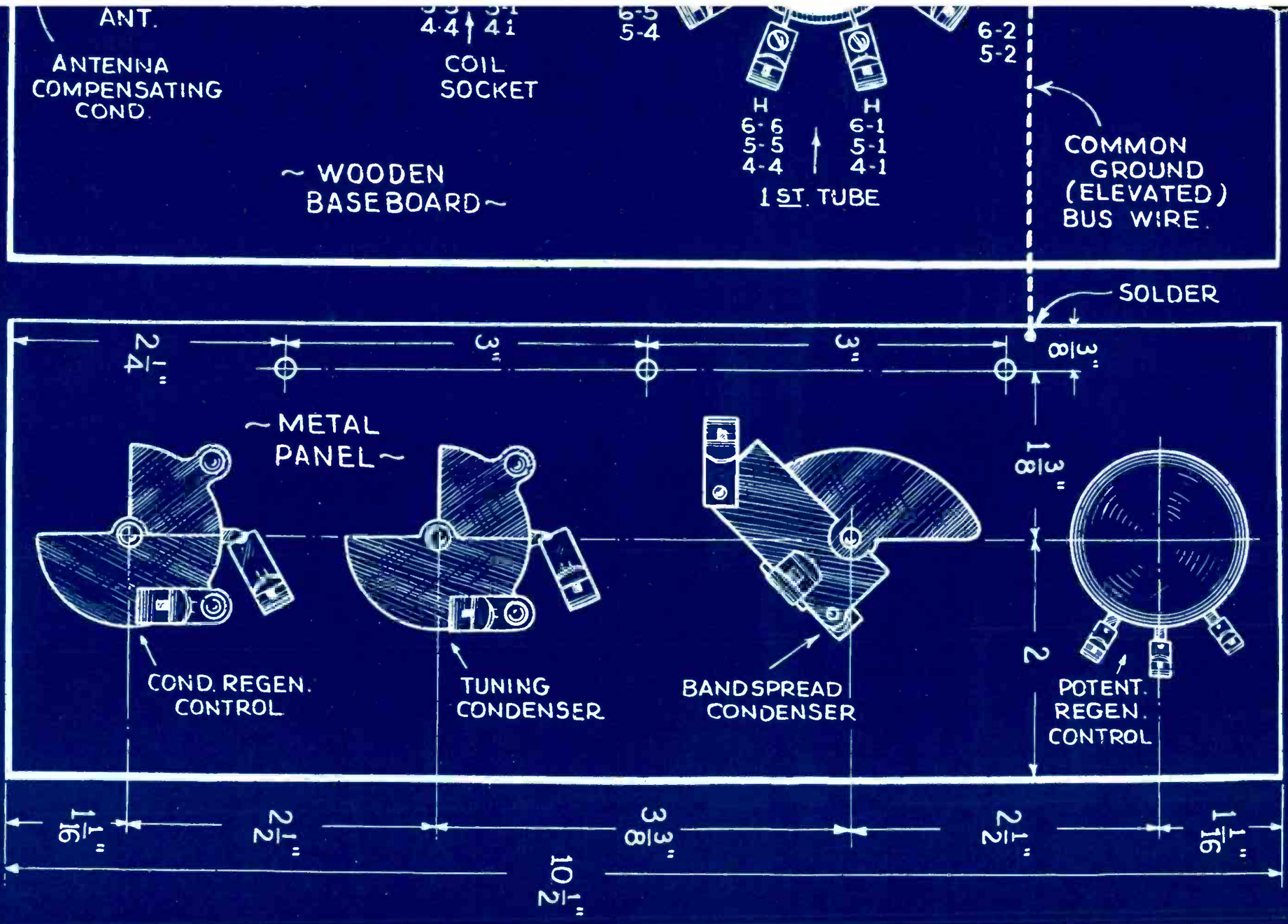
IN THE NEXT ISSUE!
Don't miss the article and diagrams showing "HOW TO ELECTRIFY THE UNIVERSAL HOOK-UP BOARD."



Top view of the new "Clipset"—it's a cinch to try out any one of a hundred different circuits in a "jiffy" by simply connecting up the numbered terminals as shown in the diagrams on the opposite page.

DRAWING BY SHORT WAVE CRAFT
AUGUST, 1935





By Hugo Gernsback

IN my former magazine *The Experimenter*, for November 1924, there will be found an account of my original *Hook-up Board* which I designed at that time. This was during the vogue of reflex sets, when we were still using crystal detectors to a considerable extent. The Hook-up Board at that time was designed by me so that different circuits could be tried experimentally, quickly and efficiently.

The new Clipset Hook-up Board shown in these pages has been originated especially for short-wave work and is dedicated by me to all serious short-wave experimenters.

The idea behind it is that hundreds of circuits can be tried out effectively with this board, and any modern one- or two-tube circuit can be tested. The Clipset Hook-up Board is designed in such a manner that temporary connections can be rapidly made by means of *clip-leads;* or, when more permanency is desired, connecting wires can be inserted into the spring binding posts provided for that purpose.

The great advantage of the Clipset is that new circuits can be tested out quickly and effectively, and once the clip board is assembled, as per our blueprint, any new circuit can be tested out *without any soldering of connections whatsoever.*

The blueprint which accompanies this issue shows the Clipset board in its full, actual size. It will serve as an excellent guide for all those who wish to build the 1935 version of the Hook-up Board.

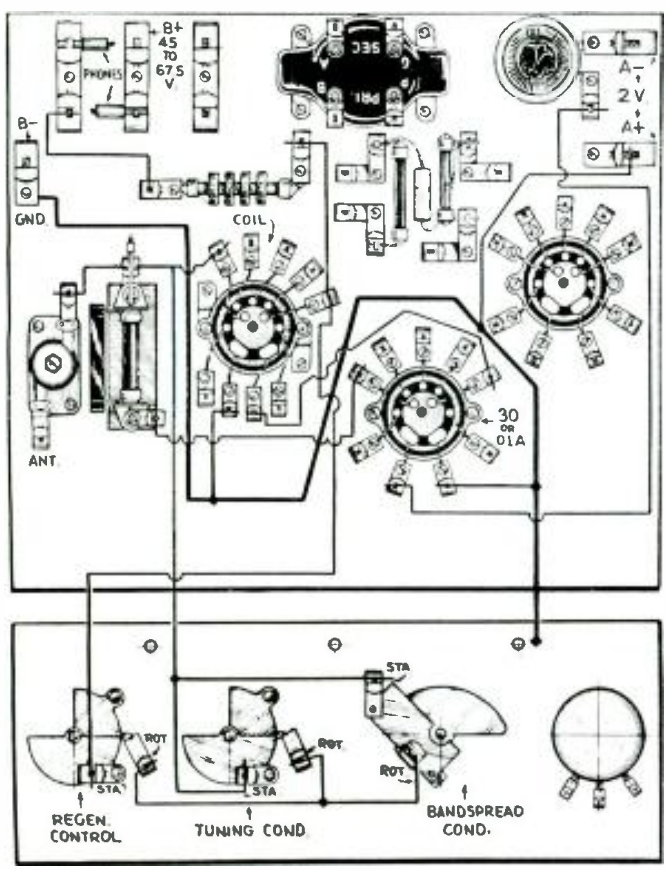
We have gone to a great expense to provide the special blueprint with this issue. If this free blueprint idea appeals to you in connection with this magazine, be sure to write to me. Further free blueprints will only be given with SHORT WAVE CRAFT if a sufficient number of requests are received from readers. And, we would especially like to hear from those who have built the new Clipset.

where heretofore, it was tedious and unpleasant work."

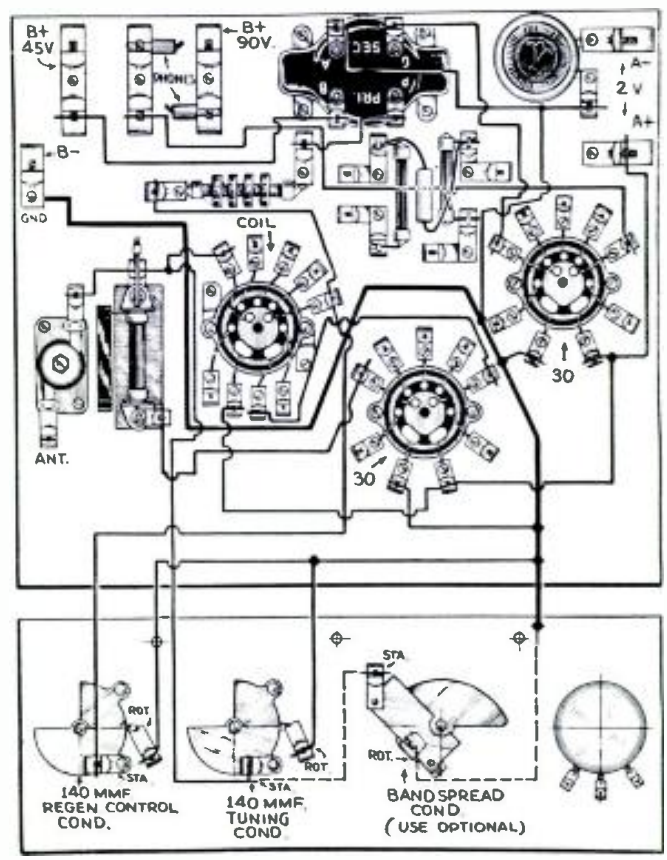
Then, it was reflex circuits, now it's short waves, later on television and beyond that perhaps tele-olfactory transmissions (the transmission of smell).

The "Universal All-Wave Hook-Up Board" is an extremely flexible, practicable, and convenient device containing all the fundamental units necessary for building a great many one- and two-tube regenerative short- and long-wave circuits. It provides to its owner the options of using either four-, five- or six-prong tubes without changing sockets (*the new composite sockets being used*); employing transformer or resistance-capacity coupling or both; using potentiometer or variable-condenser control of regeneration and of constructing battery, A.C. or A.C.-D.C. circuits. Furthermore it permits one to experiment with most of the latest type tubes including those of the dual-purpose type which make a two-tube set perform like one having four of the ordinary types. And all this can be done almost as quickly as it takes to say it—*without the necessity of soldering a single connection.* The Experimenter's dream come true!

The essential units required for the hook-up board are as follows: One 140 mmf. variable tuning condenser; one 35 mmf. band-spread variable condenser; one 140 mmf. variable regeneration-control condenser; one 30,000-ohm



Beginners 1-Tuber—a "dead simple" battery receiver anyone can build with the "Clipset."

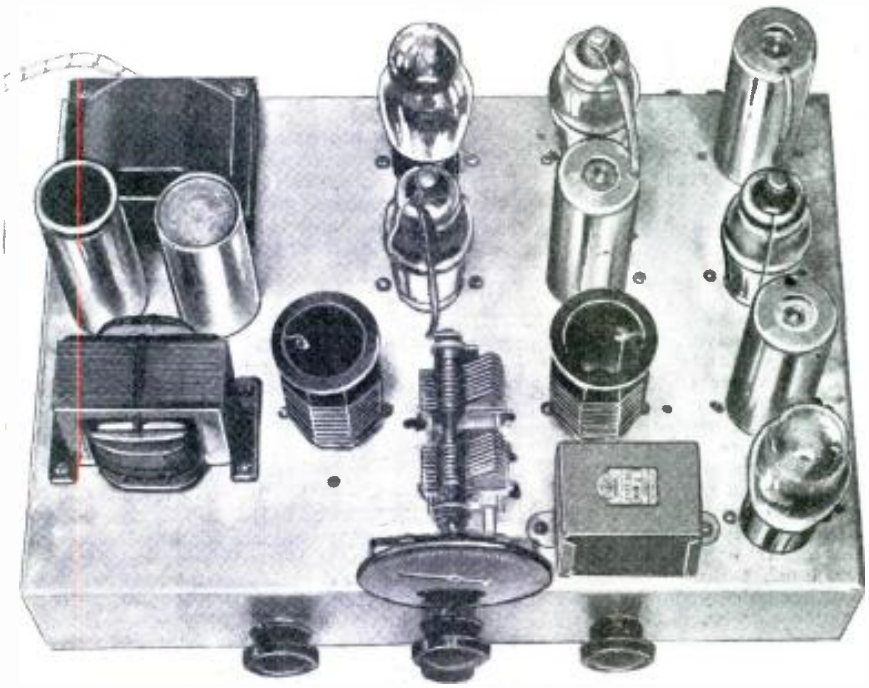


"Clipset" connections for the 2-tube, 12,500 mile DOERLE receiver.

potentiometer for smooth regeneration control when using screen-grid tubes; one 35 mmf. variable antenna compensating condenser, mica dielectric; one 100 mf. fixed mica grid-blocking condenser; one ¼ to 20 megohn variable grid-leak resistor and mount; three composite 4-5-6-prong sockets; one 2.5 m.h. R.F. choke; one 3½ to 1 ratio audio transformer; two ¼ megohm resistors and one 0.02 mf. good paper fixed condenser for resistor-condenser coupling (the values of these two resistors will probably vary for the different tubes, but that doesn't matter, for they are easily slipped in and out of their spring-clip holders); one 30-ohm filament rheostat and finally a whole fistful of Fahnestock spring binding-post clips.

The terminal lugs and posts of the components all have Fahnestock clips soldered to them for easy connections. The dimensions of the baseboard and metal panel as well as the drilling specifications for the panel are all plainly marked on the blueprint, which comes as a welcome supplement with this issue of *Short Wave Craft*. Note the bare bus-wire weaving in and around the apparatus. This is the common *ground* wire, elevated for making quick connections. *The metal panel grounds to this wire.* Be sure to follow the layout as indicated on the blueprint for shortest possible leads. For swift and careful (*Continued on page* 242)

5-Tube "Super" Does the



This view shows the layout of parts and general construction of Mr. Eastman's powerful 5-tube Superhet.

● IT seems to be a fact that every experimenter wants to get the most out of his S-W receiver with the least number of tubes and parts. At present the *superheterodyne* type of circuit is getting plenty of attention and as short-wave experimenting continues there will be much more attention given to this form of circuit for short-wave reception. While other types of receivers can be built they do not equal or exceed the efficiency of the superheterodyne. Therefore, for economy and efficiency we are inclined to acknowledge the fact that tube for tube, the superheterodyne circuit surpasses by far, any other type of radio circuit.

With the advent of the numerous multi-purpose tubes, the superheterodyne circuit has been greatly simplified and has left little to be desired in regards to efficiency, simplicity, and economy. The circuit about to be described is a remarkable example of what can be accomplished due to the progress which has been made in designing radio tubes that can perform two and even three functions at one time. It may not be exaggerating to forecast that eventually we shall have an entire ten-tube radio set built around one tube having possibilities far beyond our present-day receivers.

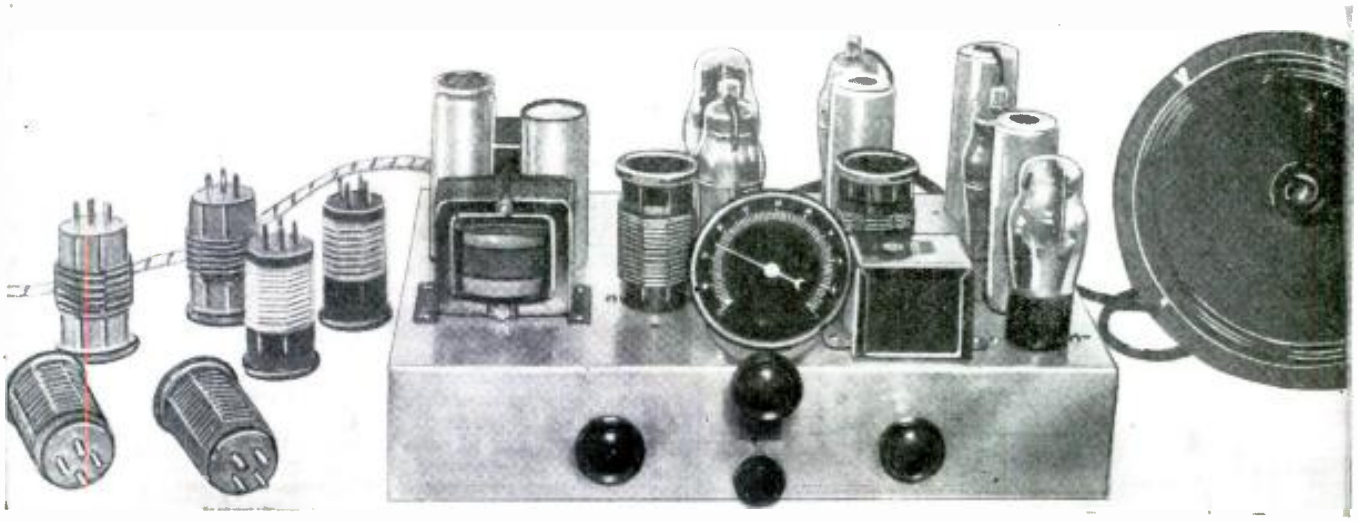
First Tube Replaces Two

The first tube, the 2A7, replaces two tubes and functions as first detector and high frequency oscillator. This tube known as the *Pentagrid converter* has other merits along with that of combining the functions of two tubes. It not only gives the stability of an electron-coupled oscillator but also correct oscillator-mixer coupling. The triode section is used as oscillator and the screen-grid section is used as first detector. The 2A7 is tranformer coupled to the first I.F. tube which is a 58. In the plate circuit of the 58 there is a 15,000-ohm resistor, by-passed with a .1 mf. condenser, this will help to prevent the tube from oscillating and causing instability. A 400-ohm resistor is placed in the cathode lead going to the arm of the 10,000-ohm volume control; this biases the 58 amplifier. The 58 tube is in turn coupled to the third tube, the "2B7."

One 2B7 Replaces 3 Tubes!

The "2B7" tube is known as a "double-diode high-gain pentode" and replaces three tubes. It is wired for *reflex* operation and functions as second I.F., second detector, and the signal is reflexed back to the pentode section to act as an impedance-coupled driver for the 2A5 output pentode. The signal is fed to the grid of the pentode unit and amplified. A circuit tuned to the intermediate frequency is used in the plate circuit with the 100,000-ohm isolating resistor to increase stability. The secondary of the third I.F. transformer is connected to both diodes and the rectified signal is developed across the 1-megohm resistor, which is also by-passed with a .0001 mf. condenser. The audio frequency signal after passing through the 300,000-ohm resistor and .01 mf. condenser is applied to the grid of the pentode section again for amplification at audio frequencies to drive the "2A5" tube.

The I.F. transformer primary in the plate circuit offers a low impedance to the audio signal while the 100,000-ohm resistor and audio plate choke function as the load. The plate resistors and by-pass condensers must be of good quality and fairly accurate for the proper separation of the I.F. and audio signals. For best results it is very im-



The 5-tubes = 8 Super set-up ready for operation

Work of 8-Tubes

By David Eastman

Here is a receiver that really does pull them in; it is 5-tube superheterodyne using multi-purpose tubes. These 5 tubes perform the functions of 8. A 2A7 is used as the high frequency oscillator and first detector with a 58 intermediate frequency amplifier. The 2B7 is an I.F. amplifier, second detector and also first audio amplifier which drives a 2A5 pentode. The principal foreign stations were received with excellent volume, during the tests made by the editors.

portant to have the 100,000-ohm resistor in the plate circuit of the "2B7" tube. Do not use any other value.

2A5 Power Output Tube to be Used

The fourth tube in the circuit is the "2A5" power amplifier pentode. It is capable of giving large power output with a relatively small input signal voltage. The amplification factor is 220 and it is the ideal power output tube.

The combination of the 2A7, 58, 2B7, and 2A5 tubes in this circuit gives results in selectivity, sensitivity, and volume that cannot be surpassed by any other set using the same number of tubes. For rectification the type 80 tube is used and proves to be ideal for use in short-wave receivers.

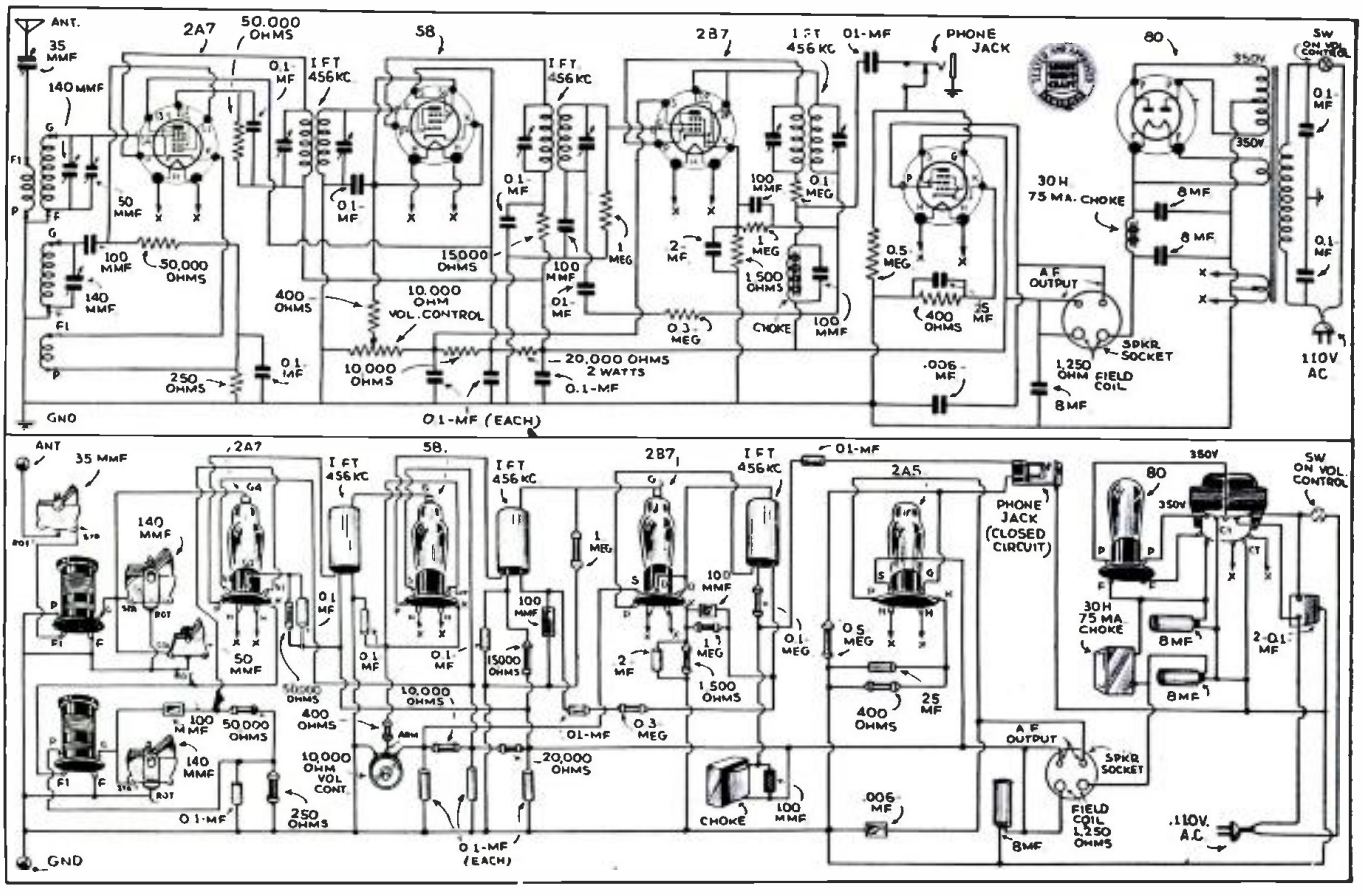
It is absolutely necessary to have short leads if you want to obtain the very best results with this receiver. The wiring may not look very pretty, but after all we are after results and not looks. The size of the chassis is 9¾" x 14½". A smaller one could have been used, but due to the possibility of critical feed-back conditions that may exist between the power supply and other circuits it was decided that this size would be about right, in order to keep the power supply equipment as far removed as possible from the rest of the circuits. The filament supply leads should be twisted and placed around the edges of the chassis, together with the plate and screen voltage supply wiring. This would leave the central part of the chassis free for the more important circuits where short leads are necessary to obtain the best results.

Looking at the receiver from the top we see the power transformer in the upper left-hand corner separated from the filter choke which is located in the lower left-hand corner near the two electrolytic condensers. At the lower central part of the chassis the two-gang .00014 mf. tuning condenser is flanked on either side by the plug-in coils. This permits very short leads.

Directly to the left of the 2A5 tube is the audio plate choke. Immediately behind the tuning condenser is the 2A7 tube. In line with it at the upper central part of the chassis is the 80 rectifier tube. In the upper right-hand corner is the second I.F. transformer. Below that is the 2B7 tube and in the lower right-hand corner is the 2A5 power tube. The first I.F. transformer is between the 2A7 and 2B7 tubes and is coupled to the 58 tube situated between the 80 and the second I.F. transformer. The third I.F. transformer is located between the 2B7 and 2A5 tube. The 2A7, 58 and 2B7 tubes must be shielded to prevent feedback. The set is not critical in regards to make of tube. Any good make may be used.

After the set has been wired, it should be thoroughly checked for any mistakes in wiring, otherwise damage to tubes or parts may be the result. After checking the wiring, the set is now ready for alignment. The speaker plug must be inserted in the speaker socket before the current is turned on. This

(*Continued on page* 244)



Physical and schematic circuit diagrams for the 5-tubes = 8 receiver.

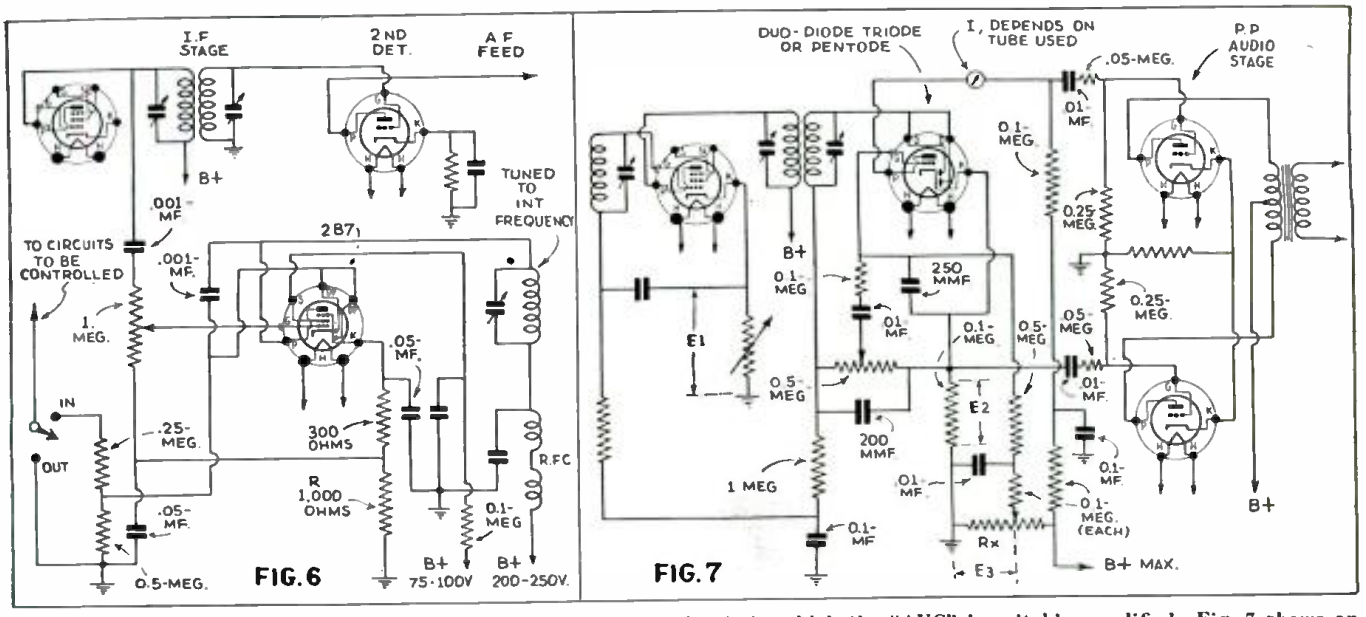


Fig. 6 above shows an improved automatic volume control circuit in which the "AVC" is suitably amplified. Fig. 7 shows an interesting circuit for obtaining push-pull coupling without the use of a transformer.

The ABC OF AUTOMATIC VOLUME CONTROL

By Clifford E. Denton

In this second and concluding part of the article on automatic volume control, Mr. Denton, well-known expert on short-wave problems, discusses two very interesting receiver circuits which every experimenter will want to try out.

● ONE of the most common complaints from users of A.V.C. circuits is that the voltage available for A.V.C. action is not sufficient to insure adequate control. Therefore, the circuit of Fig. 6 incorporates many features which would be highly desirable where more voltage for A.V.C. action is necessary, especially for use with remote cut-off tubes, such as the 6D6, the 78, or the 51.

In this circuit, the radio frequency voltage developed in the final I.F. amplifier stage is impressed on the grid of the 2B7 or a 6B7 tube. This voltage can be adjusted by means of the 1 megohm potentiometer used as a voltage divider. The direct current is prevented from flowing in this circuit by means of the .001 mf. mica condenser. The 2B7 pentode portion is used in the conventional manner. The amplification obtained from the tube is considerable, as the tuned impedance plate load, which, by the way, is tuned to the intermediate frequency of the receiver serves as an excellent plate load. The .001 mf. condenser connected between the plate of the pentode portion of the 2B7 or 6B7 and the diode plates is the coupling means by which the amplified voltage made available for A.V.C. is conducted over to the diode rectifier circuit. This circuit is completed through the ½-megohm resistor to the ground or B minus. The cathode circuit of the 2B7 tube has two resistors; one 300 ohms in value, which is by-passed to ground through a .05 mf. condenser. The drop across this resistor places the proper operating bias on the pentode portion of the 2B7. The addition of resistor R, the 1000-ohm resistor in the cathode circuit, is such that it permits the development of a delayed voltage so that in this circuit it is possible to have *amplified* and *delayed* A.V.C. voltage. Variations in the constants of resistor R will determine the amount of delay. This can be easily figured out if the plate current is known, by dividing the total current flowing in both the plate and screen circuits of the tube into the voltage required for the delay. For example, if the plate current is 5 mils. (M.A.) and R is 1000 ohms, then the voltage for delay would be 5 volts. Changes in the value of R will change the voltage available for the delayed voltage, but will not affect the effective bias on the pentode portion of the 2B7 unless R is increased to such a large value as to materially decrease the effective plate voltage on the tube. The constants are satisfactory for practically all applications, and can be installed very readily. The main additional equipment necessary is 2B7 and its associated socket, and an additional double tuned I.F. transformer, one winding of which would be used; the other one can be removed from the form if desired, or can be left, but should not be tuned to any frequency near the intermediate frequency used in the receiver.

The A.V.C. *in* and *out* switch is also included and the circuits of the control tubes are conventional and connected in the same manner as illustrated in Figures 4 and 5 (Part I in the July issue). Needless to say, the additional voltage gain for A.V.C. action in this amplified circuit is well worth while and the extra parts needed are easily justified. A circuit of this type appears to be the most interesting of the lot and should be used wherever the space and the parts are available. Close adjustments of the voltage available for A.V.C. action are obtained with the 1 megohm potentiometer, limiting the input voltage to the pentode portion of the 2B7.

Push-Pull Coupling Without a Transformer.

Fig. 7 discloses a very interesting circuit for the experimenter, as this permits the obtaining of push-pull coupling without a transformer, from a single triode or pentode tube into a pair of push-pull tubes. All constants are indicated except the value of Rx. This can be a wire-wound potentiometer having total resistance of 50,000 ohms, and is connected between the plus maximum and the ground. The purpose of this resistor is very interesting. It will be noted that the plate loading resistor is .1 megohm and is placed in the plate circuit of the triode or pentode portion of the detector tube.

A resistor equal in value, namely .1 megohm, is connected between the cathode and the ground. Thus, there is a voltage drop across the .1-megohm resistor in the plate circuit and .1-megohm resistor in the cathode circuit, which will be equal in value, as the current is the same through both of these resistors. However, the voltage E2 will be too great, in actual practice (around 90 volts) to be used as the bias for the triode or pentode portion of the audio section of the tube. Therefore, a new voltage, E3, must be developed across resistor RX, having some value *(Continued on page 232)*

Miss Charline J. Armond, aged 16, of Santa Clara, Calif. She built her own set and operates it under the call W6LMA. Hats off to Miss Armond!

Second Award In Our $5.00 "YL" Photo Contest

The editors are offering a $5.00 prize for the best "YL" or "XYL" station photo submitted. All photos entered for the next number should be in the editor's hands by July 20. In the event of a tie, equal prizes will be given to both.

PRIZE WINNER—Charline J. Armond W6LMA, of Santa Clara, Calif.

● Miss Charline J. Armond of Santa Clara, Calif., is a regular ham—she built her own radio set and knows how to operate it—as her licensed Government call. W6LMA, attests. Miss Armond, a dainty little miss from beautiful Santa Clara, may give some of you boys a buzz. Miss Armond is shown ready to put through a short-wave phone call to a fellow ham, her hand resting on the mike stand. The phone transmitter is shown at the right of the picture, while the receiver used at her station is shown just behind the young lady. If you have keen eyesight, you may be able to find a large snake skin in this picture.

73-Year-Old Lady Operator

● The photo below shows 73-year-old Mrs. Madeline Boeder, a radio operator of many years standing. She communicates weekly with her son who maintains an amateur radio station at Feeding Hills, Mass. She studied radio quite a few years ago in order to keep in touch with her son, who was a steamship radio operator at the time. Mrs. Boeder has lived in the Bronx, N.Y., for 53 years; she is here shown at the key, with one hand on the tuning dial of the receiver. The short-wave transmitter appears just behind Mrs. Boeder.

Mrs. Madeline Boeder, 73-year-old radio operator, who communicates regularly with her son via short waves.

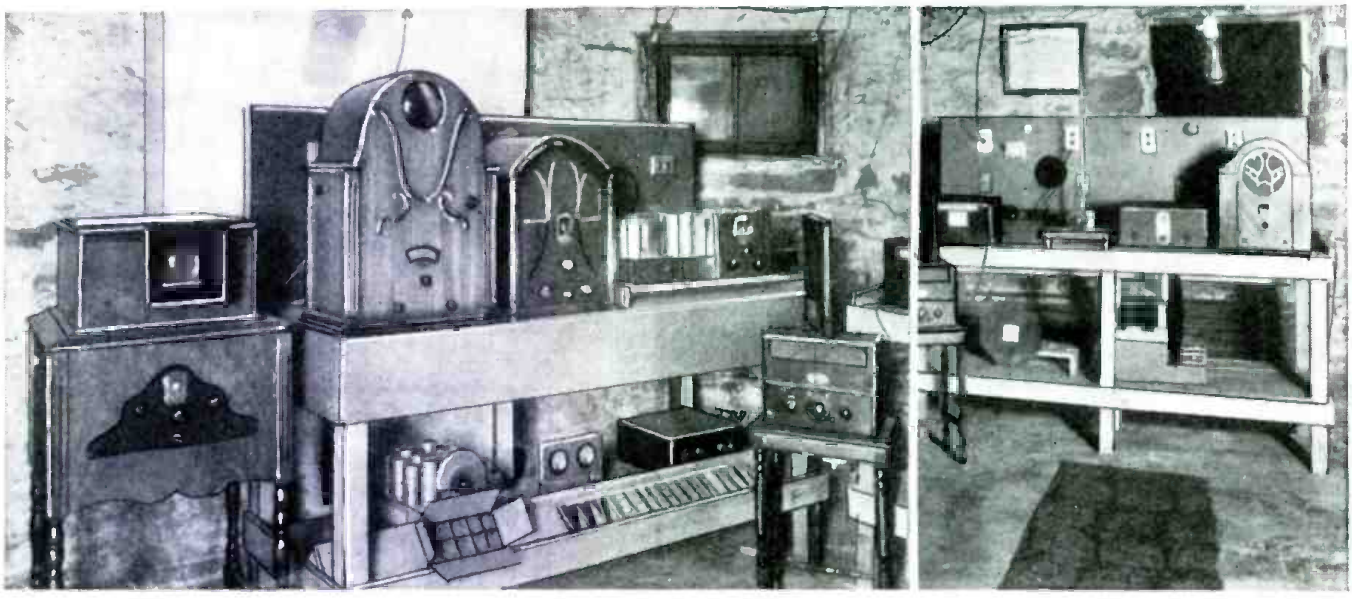
Jean Hudson, who successfully took her "YL" operating license test when she was only 8 years old.

● The photo above of little Jean Hudson should serve as a strong incentive to every YL and XYL to send their pictures in to the editor. If Baby Jean walked off with her amateur radio operator's "ticket," there must be many charming ladies in all parts of the country who have obtained their licenses from Uncle Sam and who are daily operating a short-wave transmitter. The editors hope to be deluged with a perfect flock of pictures and descriptions of YL stations for the next issue.

● This is the third "YL" Station Photo Contest that we have published. But for the next article and prize award, if there is to be one, we will need some more good photos of our lady operators and their sets. So, come on girls, here is your chance to win a prize and fame!

SHORT WAVES and

All Hail! A "Television" Lab!



Man alive! This surely must be the television experimenter's utopia! How would you like to be turned loose in this wonderful television "lab" owned by James R. Morse of Rochester, N. Y.?

Editor, Short Wave Craft:

As a regular reader of *Short Wave Craft*, I noticed that you made special note of amateur *television* laboratories. Therefore, I submit to you the enclosed pictures of my laboratory, in which you will recognize two commercial television receivers as well as two homemade scanners. All of these are working or have worked in the past. I am now receiving regular programs from Purdue University on the one on the left of the picture.

You will note on the table in the rear the type of aerial described in *Short Wave Craft* about a year ago, which is now being used with a National *converter* with excellent results.

JAMES R. MORSE,
13 South Goodman St.,
Rochester, N. Y.

(Thanks a lot, James, for sending us the very interesting picture of your "television" experimental laboratory. We had begun to think that there was not one experimental "television" laboratory anywhere in the country, judging by the scarcity of such photos. We hope that some of our other readers who may happen to be "looking in" as well as "listening in," will borrow a camera and take a picture of their television "set-up." The Editors are also interested in hearing from you as well as other readers regarding any articles they might like to write for Short Wave Craft on television results which they have obtained, with hints on how they synchronize their scanning disc and motor, and also how they maintain synchronism. Let us hear from you again with photos of any new television apparatus you have set up and working.—Editor.)

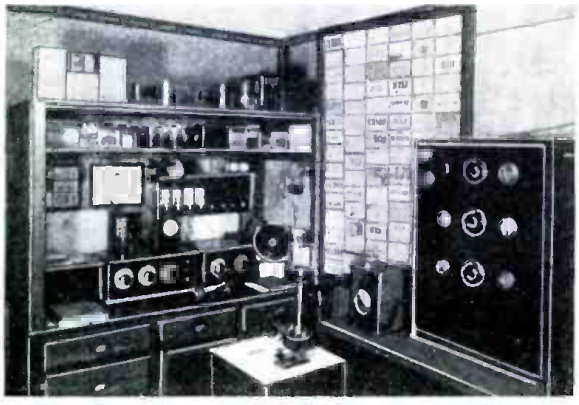
A DANDY ENGLISH STATION

Editor, Short Wave Craft:

I have been a keen reader of *Short Wave Craft* for some months now and I should like to take this opportunity of thanking you for the very fine articles you have in every issue. Believe me, I always look forward to the date of the next issue. I am enclosing herewith a photo of my "shack" for entry in your magazine photo competition. The transmitter is a CO-FD-PA. All continents and the British Empire have been worked using only 10 watts (CW). The two frequencies used are 7040 kcs. and 14080 kcs. The receiving aerial is 66' indoor and occasionally 66' 30' high outdoor. I shall shortly be rebuilding the transmitter and also erecting a new aerial. The "States" have been worked many times and a note in your magazine to the effect that "anyone reporting reception of my signals or willing to exchange photos of 'shacks,' etc., will receive a photo and QSL in return."

Yours "hamfully,"
Tom Martin, G2LB, 3 Gladys Rd., South Yardley, Birmingham, England.

(We are always very glad to hear from short-wave FANS and HAMS in foreign countries, Tom, and we are pleased to reproduce the photograph of your station herewith. You have a very efficient station, indeed, in order to have worked all continents with only ten watts. In answer to your request you will undoubtedly hear from many American HAMS.—Editor.)



A snappy-looking ham station, operated by Tom Martin in South Yardley, England, his call being G2LB.

GREAT RESULTS WITH 1-TUBE POCKET SET

Editor, Short Wave Craft:

Just a line to tell you of our success with the "1-Tube Short-Wave Pocket Set" described in December 1934 issue. We built the set on a chassis similar to that of the "19 Twinplex Receivers," not as described in a pocket form. We followed the specified parts values exactly as you stated. The results were exceedingly good!

Stations:—EAQ, GSB, GSA, GSE, GSD, PHI, PRADO, COH, PRF5, HJ1ABB, XEBT, along with many Canadian and American commercial stations, to say nothing of the Hams and Airplane Stations which were received with good volume on a 100-ft. antenna and *no ground!*

The aerial was completely bordered or shielded on the south side by a row of tall evergreen trees. Not so bad, eh, considering it was our first short-wave set? We read your swell magazine frequently.

Well, we'll say "73." Keep up the good work.

GORDON JONES and SCOTT REID,
Box 238,
Wingham, Ont., Canada.

(More good results with the 1-Tube Pocket Set! Well, Gordon and Scott, we thank you for your letter and feel as pleased as you do with the excellent foreign reception you accomplished with this little set.—Editor)

LONG RAVES . . . OUR READERS' FORUM

LIKES OUR REVIEW OF FOREIGN ARTICLES

Editor, Short Wave Craft

Herewith a picture of my short-wave "listening post." It is not yet a ham station, but I am planning to learn the code this summer and get a license.

I am 14 years old and my radio activities date back to November, 1933. I bought a *Doerle* 2-tube battery set using 30's. In January, 1934, I changed it to use a 57 and 56 according to instructions in *Short Wave Craft*. In September, 1935, I changed to my present set. It is almost like the 3-tube Doerle described in *Short Wave Craft*. It uses a 58 T. R.F., a 57 detector resistance-coupled to a 56. This stage is transformer-coupled to a 45 output stage which is built separately. The speaker is an Atwater-Kent magnetic.

The first two sets didn't work so well for me, but the present one is "hot stuff." I have received verifications from VE9GW, W9XAA, W1XAZ, W3XAU, and also HP5B in Panama City. Other stations I have received are: W3XAL, W1XAL, W8XK, W2XAF, W2XE, W9XF, W8XAL, KEE, the RCA station in California, (I received this on about 10 feet of lead-in about R7), GSA. GSB. GSD, DJC, XEBT, YV2RC, YV3RC. HJ1ABB, HJ3ABF, I2RO, EAQ, COC, COH, CJRO, CJRX and HVJ. I have also received hams in 34 states and in all but the seventh district.

I am using the same antenna as the B.C. set downstairs and I am lucky to get anything at all on it.

Listening post of Mervin Frank of Upper Sandusky, Ohio.

The other set in the picture is a Philco 5-tube super-het B.C. set, using two 24's, a 35, a 47, and an 80.

I like your magazine very much. I especially like the *World-Wide Short-Wave Review*.

Mervin Frank, 315 N. Sandusky Ave., Upper Sandusky, Ohio.

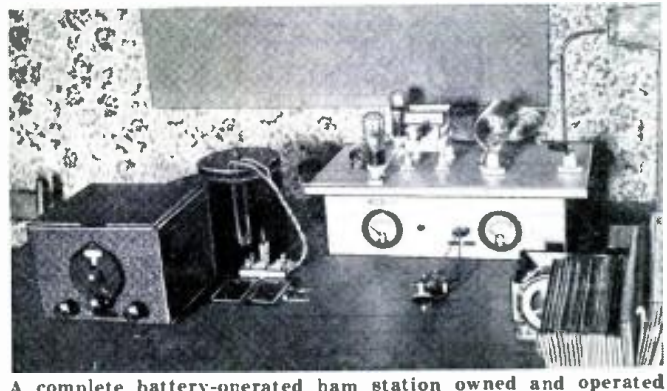
(Glad to hear from you, Mervin, and a right snappy photo, too. The editors only hope that our readers will take note of your photo and endeavor to have their next snapshot include themselves as well as their apparatus. After all, the readers of Short Wave Craft are human, and they like to see what the station operator looks like, besides the more or less lavish display of dials, tubes, and "what have you."—Editor.)

AN "ALL-BATTERY" HAM STATION

Editor, Short Wave Craft:

Here is a description of a station in which all power is taken from batteries. This station is licensed under the call W5EZA. The transmitter is of the T. P. T.G. type and uses a pair of 112's in push-pull. Meters for keeping check on the filament voltage and the plate current are mounted in the pine frame. No antenna-coupling coil is used as clipping to the tank coil works just as well. Of course, a blocking condenser is used in the antenna circuit. The input on 40 meters is 5 watts. With this low power it was necessary to use only the best equipment and insulators. The coils are of the plug-type. This makes it possible to change from one band to another with speed. The antenna feed-through insulator is of my own construction and is made of two drinking glasses. The construction of this insulator is such that the brass rod through the the center is surrounded by air. thus making it very efficient. One hundred eighty volts of heavy-duty "B"

(Continued on page 255)



A complete battery-operated ham station owned and operated by D. C. Blake of Redwood, Miss.

Our Circuits Work Fine!

Prize-Winning Station Photo awarded one year's subscription to Short Wave Craft

Editor, Short Wave Craft:

I have been a reader of *Short Wave Craft* since 1932 and have built many receivers from the circuits published in the past issues and all of them have worked out fine. I have been quite interested in the *Short Waves and Long Raves section* which you have been printing in *Short Wave Craft* during the last few months. but so far I have not seen any photographs of our Canadian stations. I am enclosing a photo of my little station as a contribution to your column, and I hope that some other Canadian short-wave enthusiasts may do the same.

I am a member of the *Short-Wave League* as can be seen by the photo.

Below the certificate is a boomerang which I received from a ham in Australia. On the top shelf is the power-pack which I use to operate my 3-tube A.C. receiver which is shown in the lower left-hand corner. This receiver was built according to Mr. McEntee's circuit in the July 1933 issue of *Short Wave Craft* and it works fine on all the bands.

The receiver in the center is a 3-tube battery job, using 230 type tubes and was also built from one of the circuits given in your magazine. The main panel in the center consists of switches for the plate supplies on receivers and code oscillator shown at right, center row.

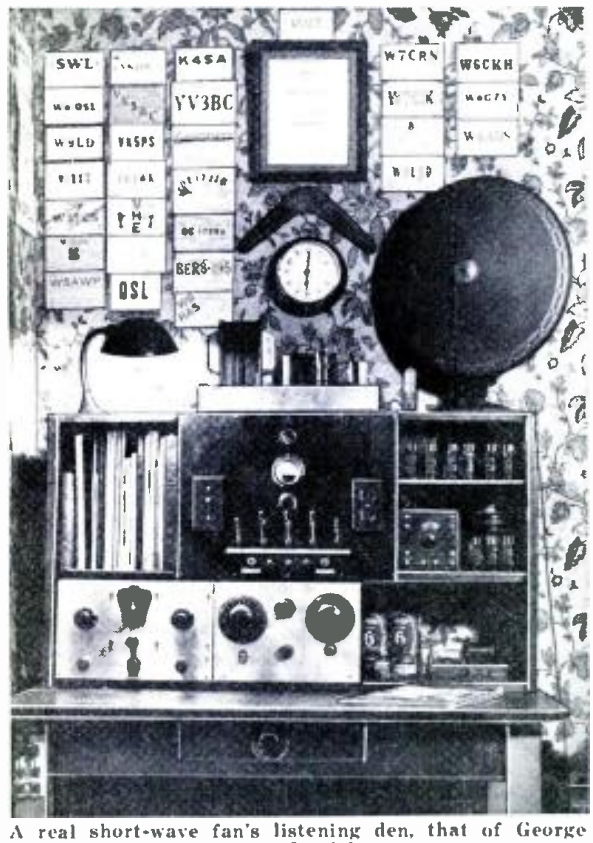
The meter is used as a resistance meter and the jacks are for receiver and code oscillator.

The antenna now in use is a half-wave doublet with twisted pair feeders. The antenna switch may be seen in the lower left of the photo.

I have verifications from Belgian Congo, Spain, England, Dutch West Indies, South America, Germany and all sections of the U. S. A.

Hoping to hear from you soon and that the next issue of *Short Wave Craft* will be off the press soon.

George R. L. Daniels, 541 St. Clement St., Viauville, Montreal, Canada.



A real short-wave fan's listening den, that of George R. L. Daniels.

(We have selected your short-wave listening station this month for the prize, George, as we believe that your layout represents a typical average S-W listening post. Thousands of our readers have undoubtedly built at least one, and possibly more, short-wave receivers after plans described in this magazine as you have. We note that you have heard stations from practically all over the world. Good luck to you and we hope you enjoy the twelve forthcoming numbers of Short Wave Craft. —Editor.)

WORLD-WIDE SHORT-

Something New in Tuning Condensers

● THE French magazine, *L'Accessoire et la Pièce Detachée*, a new magazine for the professional radio man contained a short description and a picture of a new type of tuning condenser in a recent issue.

This condenser which has advantages for short-wave work consists of two spirals of metal, which are intermeshed by the action of a worm gear and a pinion.

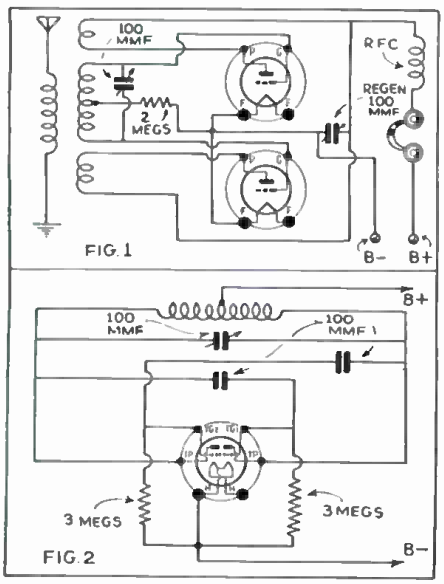
A radically new idea in tuning condensers—each unit comprising two spirals of metal which are caused to intermesh by means of a worm gear and pinion.

The advantages of this method of construction over the usual parallel plates lies in the fact that the spiral section can be made any shape, thus producing any desired capacity curve, and since the worm and pinion can be easily made to provide any desired tuning ratio, the tuning adjustment can be as slow or as fast as required for the waveband covered by the set. It is also easy to shield the entire condenser to prevent electrostatic coupling between circuits or *pick-up of signal* at the wrong point.

A Push-Pull Detector Circuit

● IN a series of hints for the short-wave experimenter published recently in *Popular Wireless*, two very interesting push-pull circuits were included.

The first is a push-pull detector for short-wave sets which the author claims is much more stable than single tube circuits and in addition will oscillate on much higher frequencies. The circuit is shown



Two interesting push-pull detector circuits, Fig. 1, designed for two tubes and Fig. 2, a push-pull oscillator using a twin-triode.

● 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.

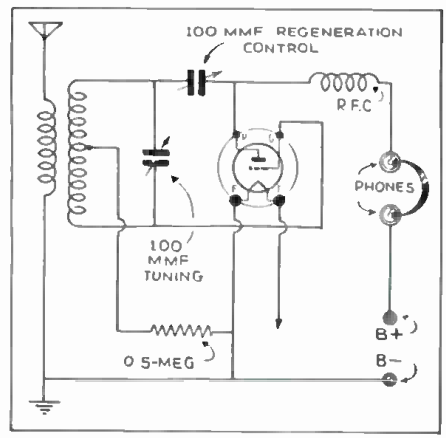
here and it will be seen that it is a "split Colpitts" arrangement with the grid-leak in the center tap of the grid coil.

The coils required for this detector are an ordinary tuning coil, having a center tap for the grid return. The two plate coils are wound at the extremities of the grid coil. The winding details will have to be worked out to suit the individual conditions, as the author fails to include winding data.

The second circuit is a push-pull oscillator, using one of the double-triode arrangements, such as the 19, 53, or 79 types available in the U.S. As this oscillator uses only a single center-tapped coil, it is a simple matter to change from one frequency band to another and the circuit will oscillate on any frequency from 12 cycles to 60 megacycles. This oscillator should have many uses in the short-wave transmitter, as the oscillator in super-hets., as a detector, etc.

Composite Circuit

● THE circuit shown here, which is reproduced from *Popular Wireless* magazine



This circuit is claimed to be very sensitive for use in short-wave reception.

is a combination of the old ultra-audion circuit and the Colpitt's circuit. It is claimed that it is very sensitive and a "sure-fire" circuit for short waves.

While both condensers are "live" and must be set back from the panel, this slight disadvantage is overcome by the high sensitivity of the circuit.

The coils consist of a primary for the aerial and ground connections and a secondary which is center-tapped. Regular manufactured coils can be used, by removing the regeneration coil and tapping the secondary coil at the center.

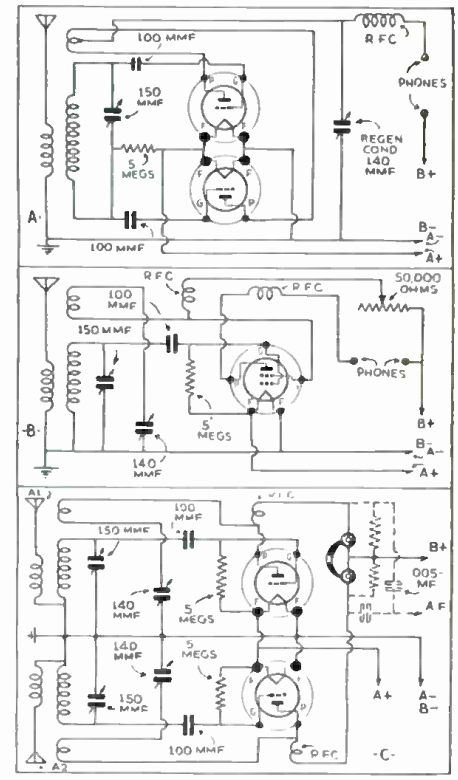
The values of other parts used in the circuit are indicated on the diagram.

Double Detection Circuits

● THE experimenter in short-wave reception who is always on the lookout for new and interesting circuits to try will find the three circuits here of interest.

The first (A) while not new, offers some interesting possibilities. It is a push-pull detector, which has some advantages over conventional regenerative circuits, in ease of regeneration control, stable operation up to the "oscillation point" and in some cases, a considerable increase in signal strength.

The second circuit (B) uses a screen-grid type of tube in a novel way. The control-grid and plate are operated as a simple triode detector, while the screen-grid is connected to the feed-back coil and supplies the control over regeneration. This approximates the action of two tubes, one for detection and the other for regeneration control. The use of two tubes connected in this way has found much favor in Europe, because of the flexibility of control achieved.



Every short-wave experimenter will want to try out the three "double detection" circuits shown above, which are claimed to give smoother regeneration control, establish extra stable operation, and stronger signals.

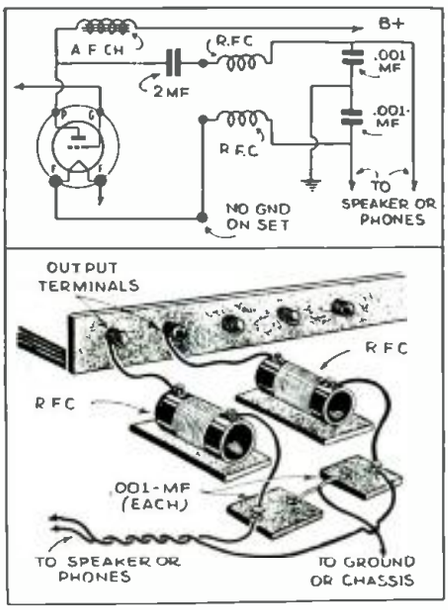
The third circuit (C) is in reality two separate sets, though the outputs are fed to the same pair of phones or amplifier. By using two detectors with aerials spaced as far apart as possible, many interesting actions can be noted. The fading time for short-wave stations often varies even for small changes in the location of the receiver. Thus if two aerials are separated by some hundred feet, the fading of the signals on one set will not correspond with that on the other, and if the two are tuned to the same station, the fading is apparently reduced. Many other interesting effects will be found by the experimenter with such a combination.

These three interesting circuits appeared in *Practical and Amateur Wireless* magazine. The details of coil construction, etc., must be determined by the individual, as they were not included in the original article.

WAVE REVIEW.. Edited by C. W. PALMER

Eliminating Hand-Capacity

● ONE of the most annoying things encountered in operating a short-wave set is to tune in a weak station very carefully, and then find that you cannot "move a hair" without losing it.



A cheap yet efficient filter to eliminate the troublesome "hand capacity."

As we all know, this is due to "hand-capacity" and a good deal of information has been published in past issues of *Short Wave Craft* for overcoming this bugaboo. Shielded panels, condensers set back from the panel, and a careful layout of parts overcomes the usual cases, but there is one point that most "set-builders" overlook.

A recent issue of *Popular Wireless* contained the details for making a filter to eliminate the "hand" capacity. Every fan has at one time or other found that taking the phones off, touching them, or even moving them, is sufficient to "detune" a weak station. This is due to high frequency currents getting into the phone circuits, so that changes in the capacity of this circuit affect the R.F. portions of the receiver.

As shown in the sketches here, the filter consists of two R.F. chokes and two .001 mf. condensers connected between the phones and the detector tube. The R.F. chokes are connected in the two leads to the phones, at a point where they connect to the set. The condensers are connected in series, across the phone leads, with the center-tap grounded to the set chassis.

A novel short-wave set on a "pie-tin."

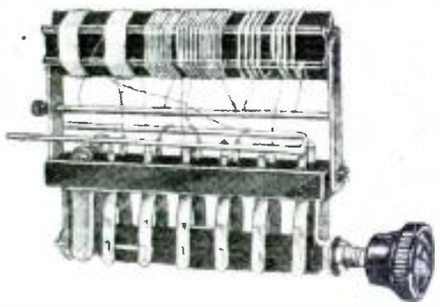
English Coil Assembly

● A SIMPLE short-wave coil and switch assembly which keeps losses at a minimum is shown in the accompanying photo, reproduced from *Practical and Amateur Wireless*.

As shown it consists of a ribbed coil form on which the three sets of coils, covering the three wavebands, are wound. Directly below each set of coils is the switch for that particular coil, thus keeping connections extremely short, yet allowing sufficient spacing between the coil and switch so that absorption losses are not noticeable.

A glance at the photo shows that the common leads—i.e., the grid return and plate return ends of the coils are connected to heavy bus-bars. The switch is a cam-type unit, made with an insulated cylinder having protrusions at the correct points for coil contact.

A typical circuit for using this coil assembly is also shown. This consists of an aperiodic R.F. amplifier coupled to the detector, in which the coil assembly is connected.



An improved English short-wave coil and switch assembly.

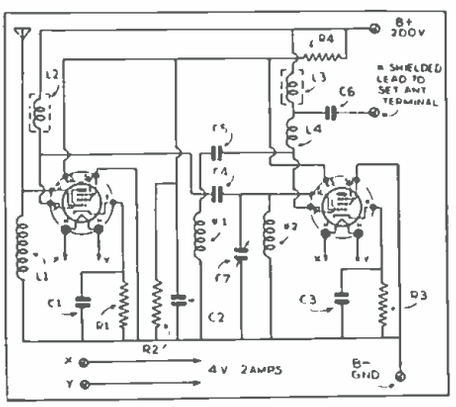


Diagram of English coil assembly.

A Novelty in Set Construction

● AN ingenious application of an inverted cake pan as a combined chassis and shield for a short-wave set or converter was pictured recently in the Austrian magazine *Radio Amateur*.

As shown here, the pan is inverted over a wooden or fibre disc. The various condensers, tube and coil sockets, resistors and switches that make up the set are mounted on the bottom of the cake pan, just as they would be mounted on a metal panel.

This type of construction offers the experimenter a way to make neat units that are attractive in appearance, low in cost and unusually flexible in circuit and design possibilities. Thus, it is possible to make a unit set in several of these "chassis" using one for detector, one for A.F. amplifier and another for power supply.

Increasing Selectivity of S-W Sets

● CONTRARY to general belief, there is a very definite need for selectivity in the short-wave receiver. If you have tried to separate some of the stations which are crowded up in the 49-meter band and some of the amateur bands, this need will be apparent.

And band-spreading is not a solution to the problem, as this simply separates the stations further apart on the dial, while at the same time it *decreases* the apparent selectivity, so that interference is still encountered between the stations. Of course, in complicated super-hets, this trouble is not encountered, for here we have plenty of selectivity and spreading the bands accomplishes the required object.

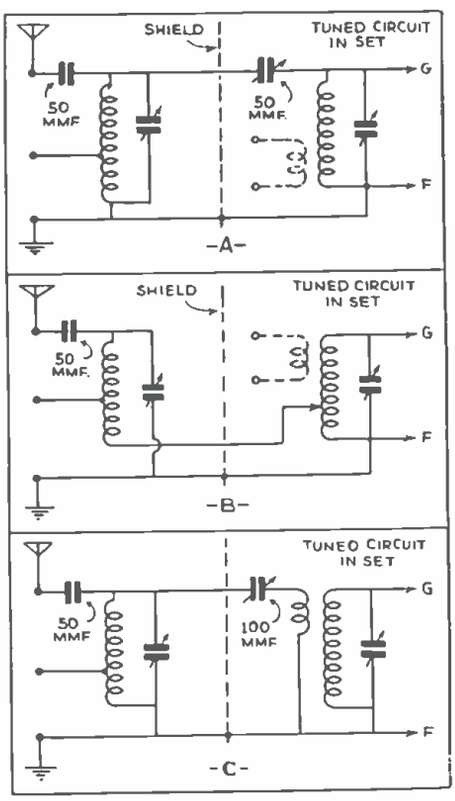
As a means of increasing the selectivity of regenerative sets *Radio Welt*, a German magazine, recently published several circuits for adding a tuned circuit to existing receivers.

Three circuits are shown here. The first (A) consists of the addition of a coil and condenser identical with the tuning coil and condenser in the set. The new coil and condenser are shielded from the set, and coupling is accomplished through a small condenser of the type used for aerial coupling in some sets.

The second circuit (B) also uses a coil and condenser similar to the regular tuning units, but here, the secondary (grid coil) of the set is tapped to provide the required degree of selectivity.

The third method (C) uses the entire tuning coil of the receiver (including the aerial coil) and coupling is accomplished through a 100 mmf. variable condenser. The step-up ratio of the aerial coil to the grid coil and the use of a variable coupling condenser provides the required adjustment of selectivity (coupling).

These three circuits should provide the experimenter with some ideas on how to improve the "old faithful."



Here's how to actually improve the selectivity of your regenerative receiver, by simply adding a tuning circuit to the one now in use in your set.

A GOOD TELEVISION HOOK-UP

By W. H. SINGLETON

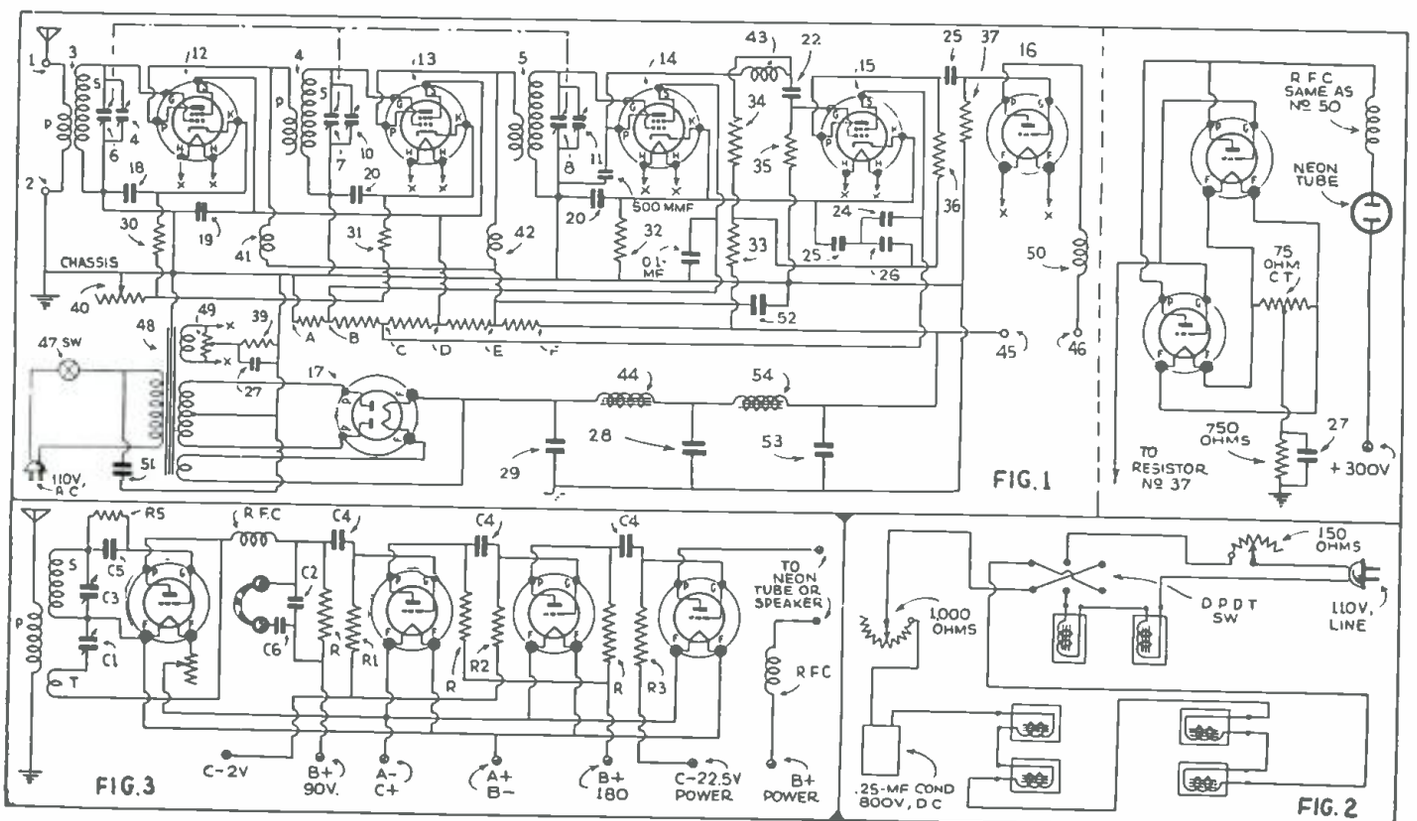
● HERE are the diagrams of my television receiver, amplifier and tuner; also the hookup of the neon tube and scanner arrangement. I hope I have explained everything clearly and that before long we'll soon have a bunch of fellows interested in television.

This is the receiver I am using now and it gives very good results. It is built on a metal chassis and is completely shielded. It covers the bands from 200 to 70 meters and tunes broad in order to get all the signals, which is very important in receiving good images. I have also used two 45's in parallel as output, in place of the single 45, by changing resistor No. 39 to 750 ohms; this gives a brighter image. The primary windings of the coils are placed at the top of the coil form and are wound on top of the secondary windings. (I use a 175-foot antenna with this set as it gives greater signal pickup.)

The output terminals Nos. 45 and 46 connect directly to the neon tube or speaker and I use a double-pole double-throw switch so I can switch from neon tube to speaker to tune in the signals. All wires to neon tube should be of No. 14 stranded copper wire. The neon tube fits a standard 4-pin socket and is mounted, pins down, inside a cylinder 2½ inches in diameter and 7 inches high, with the top closed. This cylinder acts as a shield for the tube and is adjustable up and down to keep the picture in frame. The cylinder has a three-fourths of an inch square hole in the side and the cathode of the tube, which is about 1 inch square, is so placed so as to cover this hole. The cylinder is placed one-fourth inch back of the scanning disc, with the square hole towards the disc. The cathode of the tube should glow bright, and if it doesn't, reverse the leads Nos. 45 and 46 on posts of receiver. This arrangement works either on a 60- or 45-hole disc, which are made of aluminum. The 60-hole double-spiral disc is 12 inches in diameter and turns clockwise, at a speed of 1200 R.P.M. The 45-hole 3-spiral disc is 12 inches in diameter and turns counterclockwise, at a speed of 900 R.P.M. Occasionally 2 images will be seen in one frame. This condition is called ghost images, which is reflection from the Heaviside layer and therefore arrives later than the direct signals. This may be helped by placing a wire parallel a few feet above the antenna and grounding it. I use an Eddy current, 110-V., A.C., 60-cycle motor running 1200 R.P.M. It has 6 coils with iron cores and 4 of these are used for synchronizing. The neon tube, cylinder and motor are all fastened to a cast aluminum frame. I have a 1000-ohm rheostat from one side of the 110-V. line to a .25-mf. bypass condenser; the other side of the condenser hooks to the other small magnet. This rheostat is used to synchronize the disc. I have put a 150-ohm, 50-watt wire-wound rheostat in one side of the 110-V. line to cut the speed down to 900 R.P.M. and I use a double-pole double-throw switch to put motor in reverse, so I can use the 45-hole disc, on the same motor. (I have also used a small one-sixteenth-H.P. induction-type motor to turn the 45-hole disc, and I have found that any motor of this type, which runs the right speed, can be used to drive a scanning disc.) The motor must run

(*Continued on page 238*)

We have had many requests for the diagrams and values of parts for a good Television Receiver hookup. Herewith Mr. Singleton presents the diagram of the successful television receiver he is using in his station, together with the values of the various parts used in building up the circuit.



Above—television receiver hookup successfully employed at the Television and Short-Wave station of Mr. Singleton, including hookup of his scanning motor as well as a diagram for a battery-type television receiver.

SHORT WAVE SCOUTS

SEVENTEENTH "TROPHY CUP" WINNER

Presented to

SHORT WAVE SCOUT

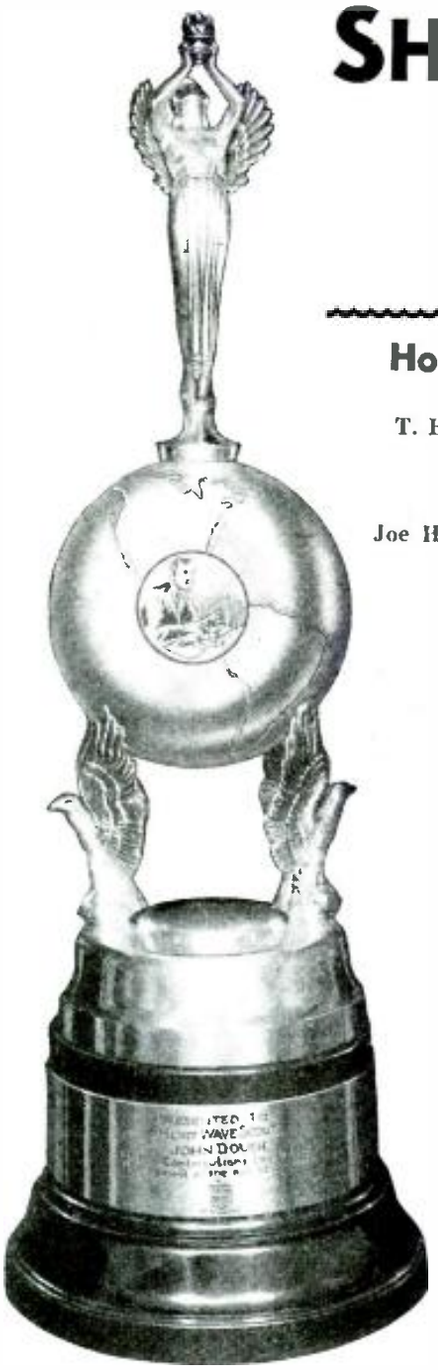
ALAN E. SMITH, M. D.
CHESTER, VT.

For his contribution toward the advancement of the art of Radio

by

SHORT WAVE CRAFT

Magazine



● 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.

17th TROPHY WINNER

Alan E. Smith, M.D., Box 288, Chester, Vt.

54 Stations, 40 Foreigns

● THE seventeenth Short-Wave Scout Trophy is awarded to Dr. Alan E. Smith, M.D., of Chester, Vt. Dr. Smith's list had the very excellent total of 54 stations; 40 of these were foreign stations, that is, stations not located in the United States. In rolling up this fine number of stations Dr. Smith used a Midwest 16-tube receiver. The antenna used with the Midwest receiver consisted of a 90 foot flat-top pointing in the direction northwest and southeast, 25 feet above the ground.

We are not surprised that Dr. Smith won the Trophy Cup this month for he certainly should be able to hear practically every short-wave station in the world. After all, a set using 16 tubes should show some superior performance over a set using from 3 to 5 tubes, in the same way that a thoroughbred racehorse wins a race against a field of second raters. Of course, the listener who uses a set with a less number of tubes can hear these stations also, but it usually requires much more skill and care in tuning in for these stations, as the signals are not so highly amplified and the tuning therefore not so simple.

Dr. Smith's List of Stations

NORTH AMERICA U. S.

W1XAZ—9,570 kc., now W1XK. Daily. 7-1 a.m. Boston.
W2XAD—15,330 kc.; daily 2:30-3:30 p.m. Schenectady.
W2XAF—9,530 kc., daily 6:30-11 p.m. Schenectady.
W2XE—6,120 kc.; daily, 5-10 p.m. New York.
W2XE—11,830 kc.; daily, 2-4 p.m. New York.
W3XAL—17,780 kc.; daily ex. Sun., 8-9 a.m., Tues., Thurs., Sat., 2-3 p.m. New York.
W3XAL—6,100 kc., Mon., Wed., Sat., 4-6 p.m. New York.
W3XAU—9,590 kc.; daily, 12 noon-8 p.m. Philadelphia.
W3XAU—6,060 kc.; daily, 8-11 p.m. Philadelphia.
W8XAL—6,060 kc.; daily, 6:30 a.m.-8 p.m.; 11 p.m.-2 a.m. Cincinnati.
W8XK—11,870 kc.; daily, 4:30-10 p.m. Pittsburgh.
W9XF—6,100 kc.; daily, 1-2 a.m., 9-10 p.m. Chicago.
W9XAA—6,080 kc.; Tues., Thurs., Sat., 4-12 p.m.; Sun., 11:30 a.m.-9 p.m., Chicago.
W9XBS—6,425 kc.; experimental. Chicago.

Honorable Mention Awards

First Honorable Mention

T. E. Port, 17 Wyatt Rd., Highbury, London N5, England
40 veris

Second Honorable Mention

Joe Haddish, 803 Twenty-fourth St., Ambridge, Pa.
34 veris

FOREIGN STATIONS

Canada

CJRO—6,150 kc.; daily, 8-12 p.m., Sun. 3-10:30 p.m. Winnipeg.
CJRX—11,720 kc.; same as CJRO.
VE9GW—6,090 kc.; Mon., Tues., Wed., 3-12 p.m.; Thurs., Fri., Sat., 7 a.m.-12 m.; Sun. 1-9 p.m. Bowmanville.
VE9AS—6,425 kc.; no longer broadcasting. Fredericton, N.B.

West Indies

COH—9,428 kc.; daily, 10-12 a.m., 5-6 p.m., 8-10 p.m. Havana.
COC—6,010 kc.; daily, 9:30 a.m.-12:30 p.m., 4-7 p.m., Sat. 11:30 p.m.-12:30 a.m. Havana.
HIH—6,810 kc.; daily, 7-8 p.m., Sun. 4:30-5:30 p.m. "La Voz del Higuamo," San Pedro de Macoris, Dominican Republic.
HIX—5,980 kc.; Tues., Fri., 8-10 p.m., Sun. 7:40 a.m. Daily at noon. Santo Domingo, D.R.
HI4D—6,480 kc.; daily ex. Sun., 12-1:45 p.m., 4:40-7:40 p.m. "La Voz de Quisqueya." Santo Domingo, D.R.

South America

CP5—6,080 kc.; daily 8-9:30 p.m. Radio "Illimani." La Paz, Bolivia.
HJ1ABD—6,098 kc., now on 7,281 kc. Irreg. evenings. Cartagena, Col.
HJ4ABE—5,930 kc.; Mon. 7-11 p.m., Tues., Thurs., Sat., 6:30-8 p.m., Wed., Fri., 7:30-11 p.m. "La Voz de Antioquia." Medellin, Colombia.
HJ4ABL—6,065 kc.; daily 11-12 a.m., 5:30-7:30 p.m. Sat. 10:30-11:30 p.m. (English). "Ecos de Occidente." Manizales, Colombia.
HP5B—6,030 kc.; daily 12-1 p.m., 8-10:30 p.m. "Estacion Miramar." Panama.
PRADO—6,616 kc.; Thurs. 9-11 p.m. "Radiodifusora de 'El Prado.'" Riobamba, Ecuador.
HC2RL—6,668 kc.; Sun. 5:45-7:45 p.m., Tues. 9:15-11:15 p.m. "Hello, America," Guayaquil, Ecuador.
TIGPH—5,820 kc.; now on 6,140 kc. Irreg. evenings on either freq. Radio "Alma Tica," San Jose, Costa Rica.
YV3RC—6,150 kc.; daily 4-10 p.m. Radiodifusora Venezuela, Caracas, Venezuela.
YV6RV—6,030 kc.; now on 6,520 kc. Valencia, Venezuela.

(Continued on page 239)

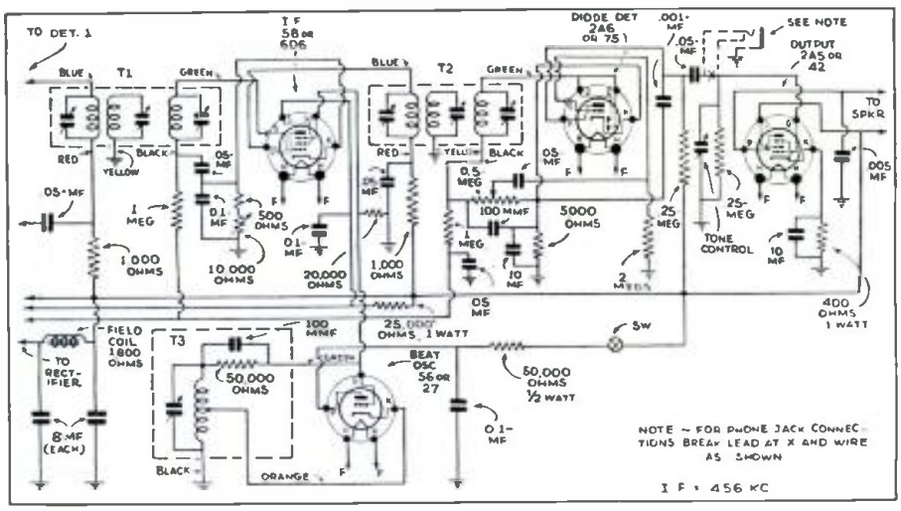
BROWNING-35 All-Wave Receiver

By Glenn H. Browning

PART II.

In the last issue a general description of the Browning 35 was given and in the present article some of the extremely valuable special features found in this receiver are discussed, especially the tuning characteristics.

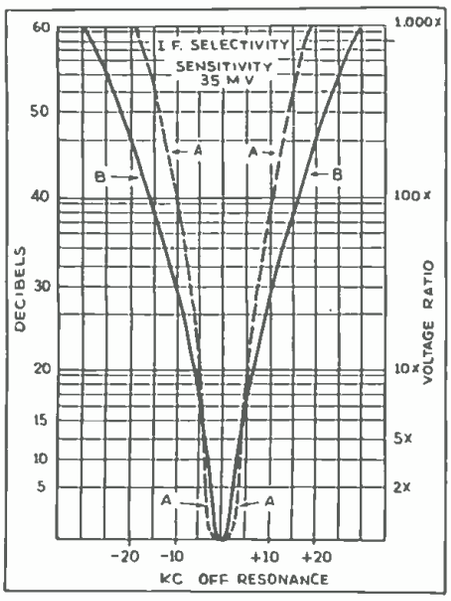
● IT is an unfortunate fact that the general public is accustomed to rate a radio receiver in terms of the number of tubes it contains. Radio experimenters, possessing even a slight technical knowledge, realize the fallacy of this tendency. They know that with modern tubes, amplification is no problem. Consider, for instance, the 58 triple-grid super-control tube, which has an amplification factor of 1280! Two such tubes, in an efficient circuit, will provide more R.F. amplification than can be used. This principle is well illustrated in the BROWNING 35 receiver which makes use of two of these super-control tubes as R.F. amplifiers—one ahead of the first detector, as a *pre-amplifier*, and the other as *intermediate amplifier* in the band-pass filter circuit. In spite of the fact that a *diode* is used as the second detector, there is more R.F. gain in this receiver than can be used, except under unusual circumstances.



Schematic diagram showing band-pass I.F., detector, beat frequency oscillator, and audio amplifier stage.

Last month we gave a general description of the BROWNING 35 circuit together with an explanation of the *Tobe Super-Tuner* unit, around which this set is designed. It was shown how the super-tuner has made it possible for the experimenter to easily construct such an advanced type of receiver and obtain consistent distant reception comparable with the most expensive commercial outfits. In the previous article, features of the circuit in connection with the stage of pre-selecting R.F. amplification and the combination mixer and oscillator tube were discussed, together with a description of the band-pass filter used in the intermediate frequency amplifier to obtain selectivity without sacrificing reproduction quality.

An I.F. amplifier serves two purposes. It provides selectivity and it amplifies the received signal, as well as tube noises, electrical disturbances and static. If a low noise-level is desired—and this is of the utmost importance in distance reception—it is an advantage to have good amplification *ahead* of the mixer or first detector tube and as little as necessary in the intermediate amplifier. As pointed out above, for the purpose of amplification, one tube in the I.F. amplifier is all that is necessary *if an efficient stage of pre-amplification is used.* Therefore the only excuse for using more than one stage of I.F. amplification would be to obtain adequate selectivity, or to try to compensate for inefficient pre-selection.

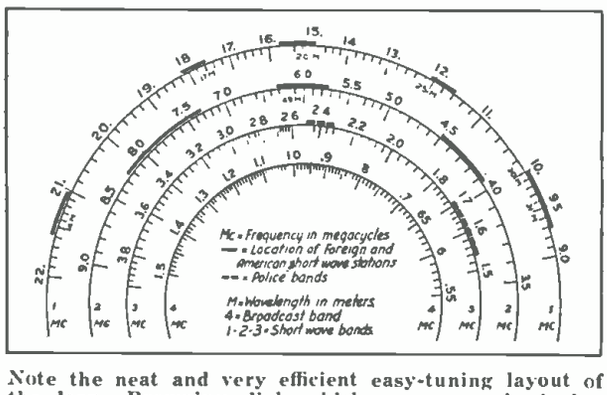


I.F. "Selectivity Curve." A.—Browning band-pass intermediate; B.—Ordinary "high-Q" intermediate. Note that the latter is sharper at the "nose," resulting in poorer quality, but at a voltage ratio of 100 times or 40 D.B. down, the selectivity of the band-pass filter is much better.

10 Kc. Selectivity!

The problem of selectivity was solved in this receiver by utilizing a double band-pass filter. This filter not only provides 10 kc. selectivity, but it does this without developing a sharp amplification peak. The result is an unusually fine combination of selectivity, plus faithful reproduction. The accompanying I.F. Selectivity Curve illustrates this feature and shows how the band-pass filter characteristics compare to the usual "high-Q" I.F. circuit. It will be noted that the latter circuit has a sharper peak or "nose," resulting in poorer quality; but at a voltage ratio of 100 times, or 40 D.B. down, the band-pass circuit is much more selective in spite of its round "nose," which gives better high audio frequency response.

This "broad nose" tuning characteristic is actually noticeable in operating the receiver for, while the *micro-vernier* tuning control may be rotated several degrees on the low frequency broadcast band without a noticeable change in signal level, rotating it a fraction of a degree further snaps out the signal entirely and the local or distant station operating on the adjacent frequency channel "pops in."



Note the neat and very efficient easy-tuning layout of the large Browning dial, which measures six inches across. The large scale spreads out the stations and makes tuning very simple.

The practical result of this "round-nosed" amplification curve is noticeable not only in the selective tuning but also in the final high-quality reproduction. The low deep resonant tones are there—you can both hear and *feel* them—and it is not a false, booming, hollow-toned bass obtained at the expense of the upper registers. The high delicate notes and overtones are also present, while

(Continued on page 241)

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 a few simple rules will save the short-wave fan a lot of otherwise wasted time.

From daybreak till 8 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 4 p.m.-4 a.m., the 25-35 meter will be found very productive. To the west of the listener this same band is best from about 10 p.m. until shortly after daybreak. (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.
6 a.m.-2 p.m.; relays KDKA

21530 kc. GSJ
-B- 13.93 meters
DAVENTRY, ENGLAND
B.B.C., BROADCASTING
HOUSE, LONDON, ENGLAND
See "When to Listen In" column

21470 kc. GSH
-B- 13.97 meters
DAVENTRY, ENGLAND
B.B.C., BROADCASTING
HOUSE, LONDON, ENGLAND
See "When to Listen In" column

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

19380 kc. WOP
-C- 15.48 meters
OCEAN GATE, N. J.
Calls Peru, daytime

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

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

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
BRITISH BROAD. CORP.
DAVENTRY, ENGLAND
See
"When to Listen In" Column

17780 kc ★W3XAL
-B- 16.87 meters
NATIONAL BROAD. CO.
BOUND BROOK, N. J.
Relays WJZ. Daily exc. Sun.
8-9 a.m.; Tues., Thurs., Fri.,
2-3 p.m.

17775 kc. ★PHI
-B- 16.88 meters
HUIZEN, HOLLAND
Daily exc. Tues. and Wed. 7:30-
9:30 or 9:45 a.m., Sat. till
10:30. Sun. till 10:15 a.m.

17760 kc. ★DJE
-B- 16.89 meters
BROADCASTING HOUSE
BERLIN, GERMANY
Irregular 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

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.

15280 kc. DJQ
-B- 19.63 meters
BROADCASTING HOUSE
BERLIN, GERMANY
12:30-2 a.m., 8-11:30 a.m.

15270 kc. ★W2XE
-B- 19.65 meters
ATLANTIC BROADCASTING
CORP.
485 Madison Av., N.Y.C.
Relays
WABC daily, 10 a.m.-1:45 p.m.

15260 kc. GSI
-B- 19.66 meters
DAVENTRY, ENGLAND
B.B.C., BROADCASTING
HOUSE, LONDON, ENGLAND
See "When to Listen In" column

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

15243 kc. ★FYA
-B- 19.68 meters
"RADIO COLONIAL"
PARIS, FRANCE
Service de la Radiodiffusion
103 Rue de Grenelle, Paris
6-10 a.m.

15220 kc. ★PCJ
-B- 19.71 meters
N.V. PHILIPS' RADIO
EINDHOVEN, HOLLAND
Broadcasts relaying PHI
Sat. and Sun.
Also tests Tues. 3-6 a.m.,
Wed. 7-11 a.m.

15210 kc. ★W8XK
-B- 19.72 meters
WESTINGHOUSE ELECTRIC
& MFG. CO.
PITTSBURGH, PA.
6 a.m.-4:15 p.m.
Relays KDKA

15200 kc. ★DJB
-B- 19.73 meters
BROADCASTING HOUSE
BERLIN, GERMANY
12:30-2, 3:45-7:15 a.m.,
8-11:30 a.m. and 12 N-4:30 p.m.

15140 kc. ★GSF
-B- 19.82 meters
BRITISH BROAD. CORP.
DAVENTRY, ENGLAND
See
"When to Listen In" Column

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

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

(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
Broadcasts "American Hour" daily at 8:30 p.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

14500 kc. LSM2
-C- 20.69 meters
HURLINGHAM, ARGENTINA
Calls U. S., evening

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

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

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., 1-6 p.m.
Mon., Wed., Fri. 4-6 p.m., Wed. also 5-6 a.m.

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

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

11875 kc. ★FYA
-B- 25.25 meters
"RADIO COLONIAL"
PARIS, FRANCE
10:15 a.m.-1:15 p.m., 2-5 p.m.

11870 kc. ★W8XK
-B- 25.26 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
PITTSBURGH, PA.
4:20-10 p.m.
Fri. till 12 m
Relays KDKA

11860 kc. GSE
-B- 25.29 meters
BRITISH BROAD. CORP.
DAVENTRY, ENGLAND
See
"When to Listen In" Column

11830 kc. ★W2XE
-B- 25.36 meters
ATLANTIC BROADCASTING CORP.
485 MADISON AVE., N. Y. C.
2-4 p.m. Relays WABC

11811 kc. ★2RO
-B- 25.4 meters
E.I.A.R.
Via Montello 5
ROME, ITALY
8:15-9 a.m., 9:15-10:15 a.m., 2:30-5 p.m.

11790 kc. W1XAL
-B- 25.45 meters
BOSTON, MASS.
Irregularly in the afternoon

11770 kc. ★DJD
-B- 25.49 meters
BROADCASTING HOUSE,
BERLIN, GERMANY
12-4:30, 5:05-10:30 p.m.

11750 kc. ★GSD
-B- 25.53 meters
BRITISH BROAD. CORP.
DAVENTRY, ENGLAND
See
"When to Listen In" Column

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

11705 kc. ★FYA
-B- 25.63 meters
"RADIO COLONIAL"
PARIS, FRANCE
6-9 p.m.
10 p.m.-12 m.

11700 kc. ★HJ4ABA
-B- 25.66 meters
P. O. BOX 50,
MEDELLIN, COLOMBIA
Irregularly 5-11 p.m.

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

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

10740 kc. ★JVM
-C- 27.93 meters
NAZAKI, JAPAN
Phones California evenings

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

10660 kc. ★JVN
-C- 28.14 meters
NAZAKI, JAPAN
Broadcasts
irregularly 2-7:45 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.

10345 kc. CAC
-B- 29 meters
HAVANA, CUBA
Sunday, 8:30-9:30 p.m.

10330 kc. ORK
-B-C- 29.04 meters
RUYSSELEDE, BELGIUM
Broadcasts 1:30-3 p.m.

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

10290 kc. DIQ
-X- 29.16 meters
KONIGSWUSTERHAUSEN, GERMANY
Broadcasts irregularly

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

10250 kv. 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

10200 kc. CO9WR
-X- 29.41 meters
P. O. Box 85
SANCTI SPIRITUS, CUBA
Testing in early evening

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

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 5:15-7:30 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

9635 kc. ★2RO
-B- 31.13 meters
E.I.A.R.,
ROME, ITALY
M., W., F. 6-7:30, 7:45-9:15 p.m.

9600 kc. ★CT1AA
-B- 31.25 meters
LISBON, PORTUGAL
Tues., Thurs., Sat. 3:30-6 p.m.

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

9590 kc. ★VK2ME
-B- 31.28 meters
AMALGAMATED WIRELESS, LTD., 47 YORK ST.
SYDNEY, AUSTRALIA
Sunday 12M.-2 a.m., 4:30-8:30 a.m., 11:30 a.m.-1:30 p.m.

9590 kc. HP5J
-B- 31.28 meters
J Street,
PANAMA CITY, PANAMA
7:30-10 p.m.

9590 kc. W3XAU
-B- 31.28 meters
NEWTOWN SQUARE, PA.
Relays WCAU
11 a.m.-6:50 p.m.

9580 kc. ★ GSC
-B- 31.32 meters
BRITISH BROAD. CORP.
DAVENTRY, ENGLAND
See
"When to Listen In" Column

9580 kc. ★VK3LR
-B- 31.32 meters
Research Section,
Postmaster Gen'ls. Dept.,
61 Little Collins St.,
MELBOURNE, AUSTRALIA
3:15-7:30 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, 6 a.m.-12 m.

9565 kc. VUB
-B- 31.36 meters
BOMBAY, INDIA
11 a. m.-12:30 p. m., Wed., Sat. Sun. 7:30-8:30 a.m.

9560 kc. ★DJA
-B- 31.38 meters
BROADCASTING HOUSE,
BERLIN
5:05-9:15 p.m.

9540 kc. ★DJN
-B- 31.45 meters
BROADCASTING HOUSE
BERLIN, GERMANY
3:45-7:15 a.m.
5:05-10:30 p.m.

9540 kc. LKJ1
-B- 31.45 meters
JELOY, NORWAY
Relays Oslo 5-8 a. m.

9530 kc. ★W2XAF
-B- 31.48 meters
GENERAL ELECTRIC CO.
SCHENECTADY, N. Y.
Relays WGY 5:25-11 p.m.

9510 kc. ★GSB
-B- 31.55 meters
BRITISH BROAD. CORP.
DAVENTRY, ENGLAND
See
"When to Listen In" Column

9510 kc. ★VK3ME
-B- 31.55 meters
AMALGAMATED WIRELESS, Ltd.
G. P. O. Box 1272L,
MELBOURNE, AUSTRALIA
Wed., Thurs., Fri., Sat.
5:00-7:00 a. m.

9500 kc. ★PRF5
-B- 31.58 meters
RIO DE JANEIRO, BRAZIL
Daily
except Sun. 5:30-6:15 p. m.

9428 kc. ★COH
-B- 31.8 meters
2 B ST., VEDADO,
HAVANA, CUBA
10 a.m.-12 n., 4-6:30, 8-10 p.m.
also 11 a.m.-12 N. Thurs.

9415 kc. PLV
-C- 31.87 meters
BANDOENG, JAVA
Phones Holland around 9:45 a.m.

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.

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.

(All Schedules Eastern Standard Time)

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

8750 kc. ZEK
-B- 34.29 meters
HONGKONG, CHINA
Relays ZBW
Daily 11:30 p. m.-1:15 a. m. Mon. and Thurs. 3-7 a. m. Tues., Wed., Fri. 6-10 a. m. Sat. 6-11 a. m.

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

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

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

8214 kc. HCJB
-B- 36.5 meters
QUITO, ECUADOR
7:14-11:14 p.m., except Monday Sun. 4:14-10:44 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.

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.

7860 kc. HC2JSB
-B- 38.17 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

7510 kc. JVP
-C- 39.95 meters
NAZAKI, JAPAN
Heard irregularly

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.

7310 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.

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

7000 kc. HJ5ABE
-B- 42.86 meters
CALI, COLUMBIA
Irregular in evening

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.

6800 kc. HIH
-B- 44.12 meters
SAN PEDRO de MACORIS DOMINICAN REP.
12:10-1:40 p.m., 6:40-7:40 p.m., Sun. 3-4 a.m. 12:10-1:40 p.m., 2:20-4:40 p.m.

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

6750 kc. JVT
-X- 44.44 meters
NAZAKI, JAPAN
KOKUSAI-DENWA KAISHA, LTD., TOKIO
Broadcasts 2-7:45 a.m.

6660 kc. ★TIEP
-B- 45.05 meters
LA-VOZ DEL TROPICO
SAN JOSE, COSTA RICA
APARTADO 257. Daily 7-10 p.m.

6650 kc. ★HC2RL
-B- 45.06 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- 45.1 meters
PISA, ITALY
Calls ships, evenings

6620 kc. ★PRADO
-B- 45.30 meters
RIOBAMBA, ECUADOR
Thurs. 9-11:45 p.m.

6611 kc. RV72
-B- 45.38 meters
MOSCOW, U. S. S. R.
1-8 p. m.

6610 kc. HI4D
-B- 45.39 meters
SANTO DOMINGO, DOMINICAN REPUBLIC
Except Sun. 11:55 a.m.-1:40 p.m.; 4:40-7:40 p.m.

6550 kc. TI2PG
-B- 45.77 meters
APARTADO 225,
SAN JOSE, COSTA RICA
"Costa Rica Broadcasting"
9-10 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
5-7, 9-11 p.m., irregular

6500 kc. HJ5ABD
-B- 46.15 meters
MANIZALES, COL.
12-1:30 p. m., 7-10 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. W3XL
-X- 46.70 meters
NATIONAL BROADCASTING CO.
BOUND BROOK, N. J.
Tests irregularly

6425 kc. VE9AS
-X- 46.7 meters
FREDERICTON, N.B., CANADA
Operates irregularly

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.

6250 kc. HJ4ABC
-B- 48 meters
PERIERA, COL.
9:30-11:30 a.m., 7-8 or 9 p.m.

6230 kc. OAX4B
-B- 48 meters
Apartado 1242
LIMA, PERU
Wed. & Sun. 7-10 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
Generally 4:00-10:00 p. m.

6155 kc. CO9GC
-B- 48.74 meters
GRAU & CAMENEROS LABS., BOX 137, SANTIAGO, CUBA
9-10 a.m., 11:30 a.m.-1:30 p.m., 3-4:30 p.m. and irregularly 7-11 p.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.

6140 kc. ★W8XK
-B- 48.86 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
PITTSBURGH, PA.
Relays KDKA
4:30 p.m.-12 m.

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

6128 kc. LKJ1
-B- 48.94 meters
JELOY, NORWAY
Relays Oslo, 10 a.m.-6 p.m.

6122 kc. JB
-B- 49 meters
JOHANNESBURG, SOUTH AFRICA
Daily except Sat. and Sun., 11:45 p. m.-12:30 a. m., 4-7 a. m., 9 a. m.-3:30 p. m. Sat., only, 4-7 a. m., 9 a. m.-4:45 p. m.
Sun., only, 11:45 p. m.-12:30 a. m., 8-10:30 a. m., and 12:30-3 p. m.

6120 kc. ★YDA
-B- 49.02 meters
N.I.R.O.M.
BANDOENG, JAVA
10:40 p.m.-1:40 a.m., 5-9:40 a.m.

6120 kc. ★W2XE
-B- 49.02 meters
ATLANTIC BROADCASTING CORP.
485 MADISON AVE., N. Y. C.
Relays WABC, 5-10 p.m.

6115 kc. HJ1ABE
-B- 49.05 meters
CARTAGENA, COL.
P. O. Box 31
Daily 11:15 a. m.-1 p. m.; Sun. 9-11 a.m.; Mon. 10 p.m.-12 m. Wed. 8-11 p.m.

6112 kc. YV2RC
-B- 49.08 meters
CARACAS, VENEZUELA
Sun. 9:30 a.m.-10:30 p.m., Daily except Sun. 11 a.m.-1:30 p.m., 4-9:30 p.m., Tues., till 10 p.m.

6110 kc. GSL
-B- 49.10 meters
British Broadcasting Corp.
Daventry, England
See "When To Listen In"

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.

6110 kc. HJ4ABB
-B- 49.1 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.

6105 kc. HJ4ABL
-B- 49.14 meters
MANIZALES, COL.
Daily 6-10 p.m., Sat. 11 p.m.-12 m.

6100 kc. ★W3XAL
-B- 49.18 meters
NATIONAL BROADCASTING CO.
BOUND BROOK, N. J.
Relays WJZ
Monday, Wednesday, Saturday, 4-5 p.m. Sat. also 11 p.m.-12 m.

6100 kc. ★W9XF
-B- 49.18 meters
DOWNERS GROVE, ILL.
Relays WENR, Chicago
Daily except Mon, Wed. & Sat., 2:30 p.m.-1 a.m.
Mon., Wed. 2:30-4, 5 p.m.-2 a.m. Sat 2:30-4, 5 p.m.-11 p.m.

6097 kc. JB
-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. ★VE9GW
-B- 49.26 meters
BOWMANVILLE, ONTARIO, CANADA

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

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

6072 kc. ZHJ
-B- 49.41 meters
PENANG, MALAYA
Mon., Wed., Sat., 6:30-9 a.m. also Sat. 11 p.m.-1 A.M. (Sun.)

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

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.

6060 kc. OXY
-B- 49.50 meters
SKAMLEBOAEK, DENMARK
1-6:30 p. m.; also 11 a. m.-12 n. Sunday

6060 kc. ★W8XAL
-B- 49.50 meters
CROSLEY RADIO CORP.
CINCINNATI, OHIO
6:30 a.m.-7 p.m.; 10 p.m.-1 a.m.
Relays WLW

6060 kc. VQ7LO
-B- 49.50 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.

6060 kc. W3XAU
-B- 49.50 meters
NEWTOWN SQUARE, PA.
Relays WCAU, Philadelphia
7 p.m.-10 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. ★W1XAL
-B- 49.67 meters
BOSTON, MASS.
Tues., Thurs. 7:30-9 p.m.
Sun. 5-7 p.m.

6030 kc. ★HP5B
-B- 49.75 meters
P. D. BOX 910
PANAMA CITY, PAN.
12 N.-1 p.m., 8-10:30 p.m.

6030 kc. VE9CA
-B- 49.75 meters
CALGARY, ALBERTA, CAN.
9 a.m.-3 p.m., 7 p.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., 9:30-10:30 p.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. ★COC
-B- 49.92 meters
P.D. BOX 98
HAVANA, CUBA
Daily 9:30-11 a.m., 4-7 p.m. Sat. also at 11:30 p.m.

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
7 p. m.-1 a. m.

5980 kc. XECW
-B- 50.17 meters
CALLE del BAJIO 120
MEXICO CITY, MEX.
4-4:30 p.m., 10:30 p.m., 12 m.

5980 kc. HIX
-B- 50.17 meters
SANTO DOMINGO, DOMINICAN REP.
Tues. and Fri. at 8:10 p.m.
Sun. at 7:40 a.m., irreg. Tues. and Thurs.

5970 kc. HJ3ABH
-B- 50.25 meters
BOGOTA, COLO.
APARTADO 565
7-11 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. HJ1ABJ
-B- 50.42 meters
SANTA MARTA, COLO.
11 a.m.-1 p.m., 7-9 p.m.

(All Schedules Eastern Standard Time)

(Continued on page 236)

Television Stations

2000-2100 kc.

W2XDR—Long Island City, N.Y.
W8XAN—Jackson, Mich.
W9XK—Iowa City, Ia.
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.

42000-56000, 60000-86000 kc.

W2XAX—New York, N.Y.
W6XAO—Los Angeles, Calif.
W9XD—Milwauke, 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, Ia.

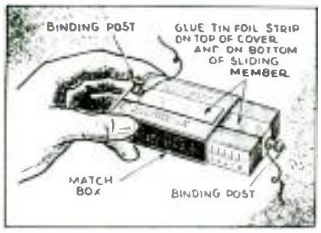
Police Radio Alarm Stations

CGZ	Vancouver, B.C.	2452 kc.
CJW	St. Johns, N.B.	2416 kc.
CJZ	Verdeen, Que.	2452 kc.
KGHA, KGHB, KGHC, KGHD, KGHE	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	Lakton, 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.	2482 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.	2474 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.
KGPY	Baton Rouge, La.	1574 kc.
KGPZ	Wichita, Kans.	2450 kc.
KGZA	Fresno, Calif.	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.	2382 kc.
KGZI	Wichita Falls, Tex.	2458 kc.
KGZJ	Phoenix, Ariz.	2430 kc.
KGZL	Shreveport, La.	1712 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.
KGZS	McAlester, Okla.	2458 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	2414 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, Ia.	1682 kc.
KNFO	Storm Lake, Ia.	1682 kc.
KNFP	Everett, Wash.	2414 kc.
KNFQ	Skykomish, Wash.	2490 kc.
KNGE	Cleburne, Tex.	1712 kc.
KNGF	Sacramento, Cal.	2422 kc.
KNGG	Phoenix, Ariz.	1698 kc.
KNGH	Dodge City, Kans.	2474 kc.
KNGJ	El Centro, Cal.	2490 kc.
KNGK	Duncan. Okla.	2450 kc.
KNGL	Galveston. Tex.	1712 kc.
KSNE	Duluth, Minn.	2382 kc.
KSW	Berkeley, Cal.	1658 kc.
KVP	Dallas, Tex.	1712 kc.
VYR	Montreal, Can.	1712 kc.
VYW	Winnipeg, Man.	2452 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.
WPDR	Rochester, N.Y.	2422 kc.
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	Fairhaven, Mass.	1712 kc.
WPFO	Knoxville, Ten.	2474 kc.
WPFP	Clarksburg, W. Va.	2490 kc.
WPFQ	Swathmore, 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, O.	1682 kc.
WPHD	Steubenville, O.	2458 kc.
WPHE	Marion Co., 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, O.	1596 kc.
WPHL	Portable in Ohio	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	1682 kc.
WPHV	Bristol, Va.	2450 kc.
WPHY	Elizabethton, Tenn.	2474 kc.
WPSP	Harrisburg, Pa.	1674 kc.
WRBH	Cleveland, Ohio	2458 kc.
WRDQ	Toledo. Ohio	2474 kc.
WRDR	GrossePt.Village, Mich.	2414 kc.
WRDS	E. Lansing, Mich.	1666 kc.

"WHEN TO LISTEN IN"
Appears on Page 246

$5.00 PRIZE MATCHBOX CONDENSER

A cheap and easily constructed variable condenser can be made with a safety matchbox and a few short pieces of tinfoil. In



the drawing we see that two pieces of tinfoil are used to form the two electrodes of a variable condenser. One piece of tinfoil is glued to the top of the box frame and the other piece is glued to the bottom of the sliding portion of the matchbox.

A binding post is used on each of these strips of tinfoil in order to facilitate connections. If desirable, a scale can be marked on one side of the sliding member. This is clearly shown in the drawing. When the box is entirely collapsed the capacity of the condenser is maximum; by sliding the inner section of the box outward the capacity is reduced. This is a handy instrument and many readers of "Short Wave Craft" will find various uses for it.—Gilbert S. Lowry.

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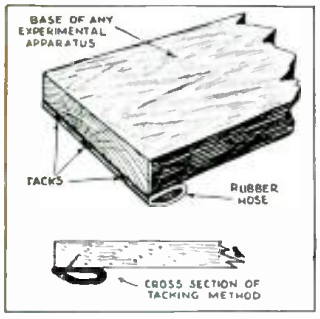

SHOCK ABSORBER

A short length of rubber hose can be used to form a very simple shock absorber to eliminate vibration in a radio receiver. The drawing clearly shows that the hose is tacked or screwed to the base with the screws or tacks in such a position that they will not rest upon the table or interfere with the cushioning action of the rubber hose. This kink is especially useful with battery receivers because these tubes are usually quite a bit more microphonic than the heater type of tubes. It can also be used in conjunction with the transmitters where vibration is liable to cause a poor signal by modulating the note.—Francis P. Srebro.

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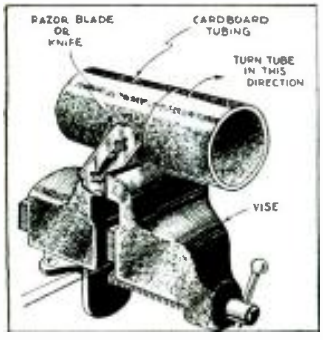
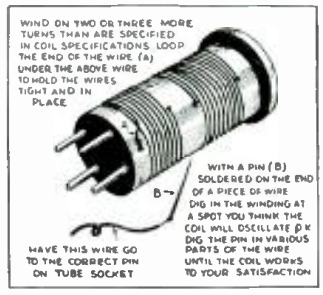


RAZOR BLADE FOR CUTTING TUBING

Probably the most difficult part of short-wave experimenting is cutting bakelite or other composition tubing the proper length for coil forms. Usually a hack-saw blade is used and in many cases a very jagged and uneven cut is made. However, by fastening a razor blade or knife blade in the vise and placing the tubing alongside of it, an accurate cut can be made. First wrap a piece of paper around the tubing in order to mark it where the cut is to be made. By squaring the edges of the paper, the mark on the tube will be perfectly square. By rotating the tube in one direction slowly and keeping the blade on the mark, accurate lengths of tubing can be cut with very little difficulty. The drawing clearly shows how this is done.—W. H. Hitchen.

$5.00 FOR BEST SHORT-WAVE KINK

The Editor will award a five dollar prize each month for the best short-wave kink submitted by our readers. All other kinks accepted and published will be awarded eight months' subscription to SHORT WAVE CRAFT. Look over these "kinks" and they will give you some idea of what the editors are looking for. Send a typewritten or ink description, with sketch, of your favorite short-wave kink to the "Kink" Editor, SHORT WAVE CRAFT.



SIMPLIFYING COIL CONSTRUCTION

Many of the readers of "Short Wave Craft" have spent considerable time in winding homemade plug-in coils. By using the scheme depicted in the drawing, the correct number of turns can easily be found. The pin is soldered to a short piece of wire and can be pushed through the insulation on any turn. When proper results are obtained, you can remove the unused turns and your coil is finished.—Howard Sigmund.

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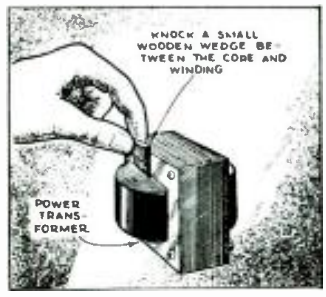

ELIMINATING TRANSFORMER HUM

Many fans who have all-electric short-wave receivers using power transformers are troubled by a loud buzzing noise in the transformer itself. This is usually due to either loose windings or a loose section of the core. In most cases where "E" type cores are used, the center leg of the two outer laminations makes all the noise. This can be stopped quite readily by removing the frame or mounting bracket of the transformer and wedging a small piece of wood between the winding and the core. If you will refer to the accompanying drawing you will see how this piece of wood is tapered in order that it may be easily inserted.—Francis P. Srebro.

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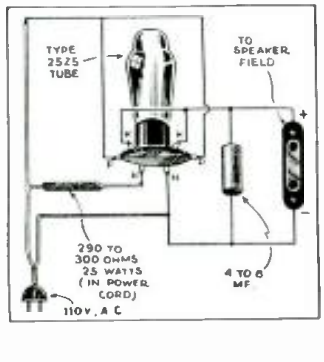

FIELD SUPPLY FOR DYNAMIC SPEAKER

Here is a very simple method of obtaining power for the field of a dynamic speaker. Although this is not original to the writer he thought it would be of interest to the average short-wave fan. A single 2525 is used in a half-wave rectifying circuit. The physical drawing shows just how the connection should be made. The smoothing condenser across the output of the rectifier can be anywhere from 4 to 8 mf. and is an electrolytic having a working voltage of somewhere around 200. Heater voltage for the 2525 is furnished directly by the line through the 290- to 300-ohm resistor which is built right into the line cord.—W3ED.

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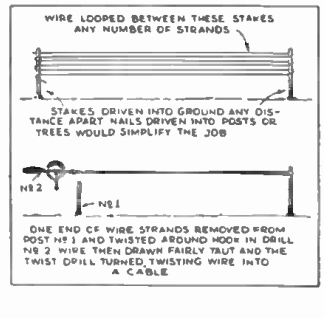

HOW TO MAKE STRANDED WIRE

At some time or other, many short-wave fans, like myself, have been in the need of stranded antenna wire. By dismantling an old power transformer and unwinding the primary, quite a long length of stranded wire can be made. The drawings clearly show how the wire is first wrapped around two posts driven in the ground. The distance between the two will determine the approximate length of the finished cable. After the wire has been wrapped around the post remove one post and fasten the wire into a hand drill. Then by simply turning the crank handle of the drill, the wire will be twisted evenly.—William J. New.

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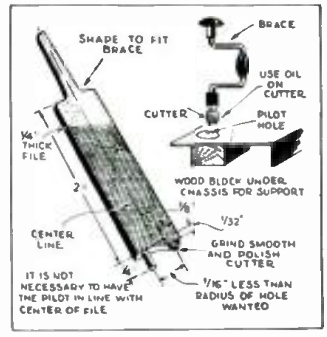

HOLE CUTTER

With the increase in popularity of metal panels and chassis, many home constructors will be in need of a simple, yet effective, circle cutter. The drawing clearly shows how one of these can be constructed from an old file. In use this cutter saves considerable time inasmuch as a hole can be cut in less than one minute in ordinary aluminum, and two to three minutes in steel panels.—Henry Larrabee.

CODE ON CARDS

Here is a kink that I think will help the short-wave fan who has just started to learn the code. Cut twenty-six one-inch squares out of cardboard. Next, mark on them the translation of the alphabet from A to Z in the continental code. Also, put a small arrow at the bottom of each card so one will know which way the card is to be held. We now shuffle the squares just as a pack of playing cards, and one by one take each card, identifying the letter it represents, and place it apart from the unpicked ones. In this way one gets to know the letters from their continental translation instead of forming the habit of letter to code. As soon as one knows the letters, cards of the numbers can be made.—Norman Esplin.

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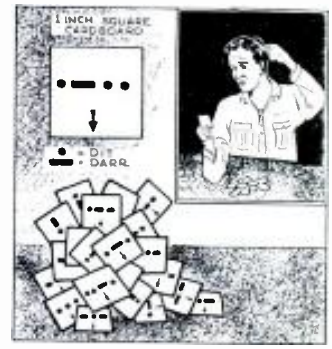

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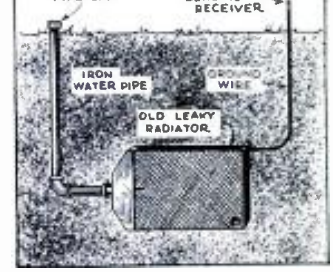
OLD CAR RADIATOR USED FOR A GROUND

Being unable to obtain a good ground, I finally hit upon the idea illustrated in the accompanying drawing. I obtained an old radiator which had a good many leaks in it. After fastening a pipe to the filling hole on the radiator and soldering a wire to the other end, I buried the entire assembly in the ground four or five feet below the surface. I then proceeded to fill the radiator with water. This, due to the holes in the radiator, seeped outward and made the earth surrounding the radiator quite moist lowering the ground resistance considerably. The lead from this ground to the receiver was kept as short as possible, and really excellent results have been obtained. I am passing this information along to the readers of "Short Wave Craft" in the hope that it will be of material benefit to them.—Edwin Boon.



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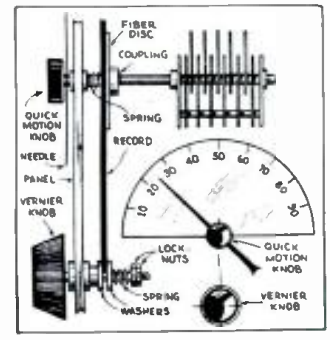
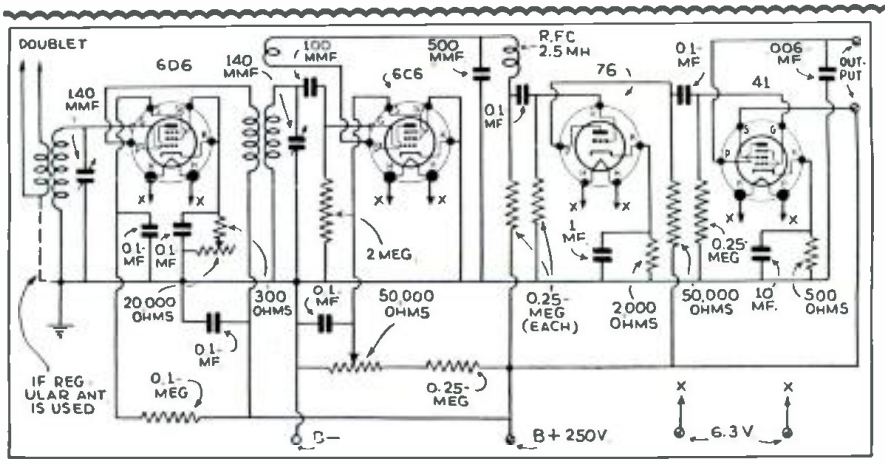
HOMEMADE VERNIER DIAL

Nearly every short-wave fan who builds his own equipment gets the greatest amount of fun out of building it rather than listening to the short-wave stations. The experimenter will find this dial easy to construct and very handy in operation. There are two knobs, one which is attached directly to the main shaft and gives a direct drive for rapid tuning, and another knob which drives the outer edge of the large disc for vernier tuning. All the parts of this simple vernier dial can be found in the shack junk box.—G. E. Tovey.



• • • Short Wave



Hook-up for 4-tube T.R.F. short-wave receiver.

EDITED BY GEORGE

● 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 remit-

4-TUBE T.R.F. RECEIVER

Jack Merewether, Detroit, Mich.

(Q) Will you please be kind enough to print a diagram of a 4-tube A.C. receiver using a 6D6, 6C6, 76, and any other suitable pentode tube which you think best. You will note that these are all 6.3 volt tubes, and I have done considerable experimenting with a set similar to this, but have had a lot of trouble. I would greatly appreciate a good hook-up using these tubes and also would like to use 140 mmf. tuning condensers.

(A) We are printing the standard T.R.F. hook-up for the type tubes mentioned in your letter. If you follow the diagram carefully, you should have no trouble in getting it to work; providing, of course, all your parts are in perfect working order. In the antenna circuit the dotted line indicates a connection which should be made if a regular antenna and ground are used.

When a doublet is used, this connection is not made and the ground is connected to the B minus. Inductive coupling is used between the R.F. and detector stages for highest amount of gain and greatest stability. Resistance coupling is used throughout the audio section and you will find that this receiver will give remarkable quality.

PENTODE AUDIO AMPLIFIER

Lawrence Kubrocki, Detroit, Mich.

(Q) Please publish a circuit diagram of a suitable output amplifier for the "Short-Wave Fan's Own 3-Tuber," published in the SHORT WAVE CRAFT of March, 1933. I would like to use type 45 tube if possible.

(A) The diagram we show can be connected to your receiver or any other short-wave receiver for that matter. We believe you will obtain much better results with a 2A5 than you would with the type 45. The 2A5 will give greater output with less signal input and for this reason is more suitable for use in conjunction with short-wave receivers where full speaker volume is required.

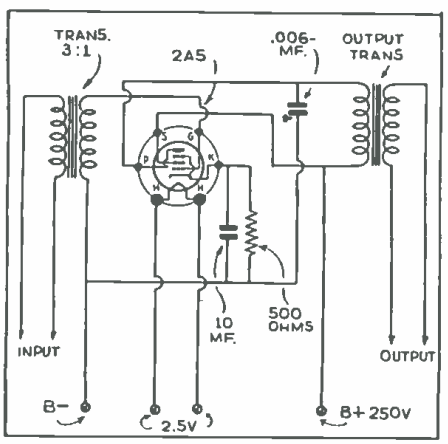


Diagram of output amplifier, for use with "S-W Fan's Own 3-Tuber."

3-TUBE ALL ELECTRIC S-W RECEIVER

Walter Joyce, Albuquerque, N. Mex.

(Q) I would like to build a receiver using a 58 regenerative detector and a 2A5 audio amplifier. I would appreciate it very much if you would print such a diagram together with the necessary power supply. I intend to make this receiver and power supply all one unit.

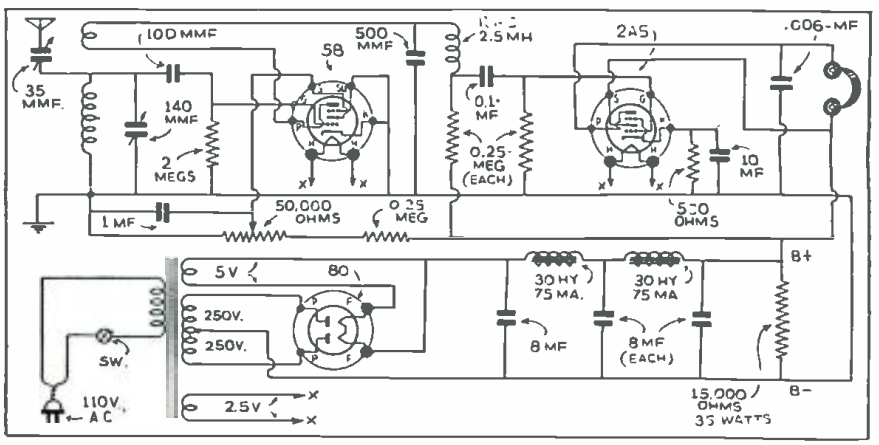
(A) We are very pleased to print your diagram, Walter, and if you use care in the construction of this receiver, you should obtain excellent results. Data for the coils can be found in almost any issue of SHORT WAVE CRAFT, particularly in the April 1935 Question Box. The output circuit of the 2A5 shows a pair of earphones connected directly in the circuit, however, due to the comparatively large amount of current drawn by the 2A5, it is advisable to use an output transformer. This will prevent the D.C. plate current from traveling through the headphones and will result in much longer headphone life. If hum is experienced in the receiver, we suggest that you try connecting one side of the 2½ volt filament circuit to the B minus.

T.R.F. AMPLIFIER FOR BATTERY SET

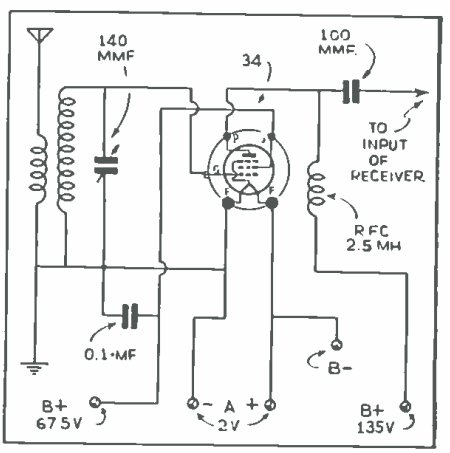
W. L. Cornelius (W9JAJ), Bellevue, Iowa.

(Q) I have recently built a 5-tube superheterodyne using 2-volt battery tubes and would like to have you print a diagram of a tuned R.F. stage which may be added to this receiver in order to improve its pick-up and also to reduce the images.

(A) This tuned R.F. amplifier will work well with any type of battery-operated short-wave receiver. The output of the amplifier should be connected directly to the antenna posts of the receiver. If separate A and B batteries are used for the amplifier and receiver, a connection should be made to join the "B" negatives of both sets of batteries.



How to hook up parts and tubes for a 3-tube all-electric S-W receiver.



Tuned R.F. stage for use with any type battery-operated receiver.

QUESTION BOX

W. SHUART, W2AMN

tance may be made in the form of stamps or coin.

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.

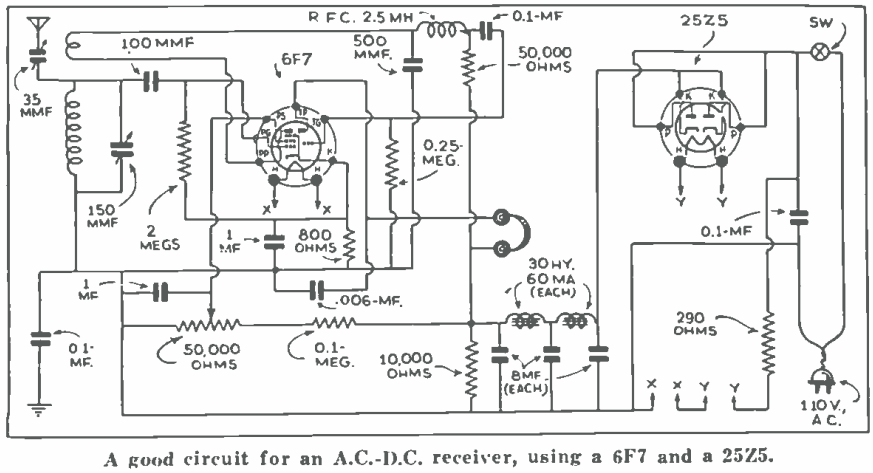
If the same batteries are used for both amplifier and receiver, this connection will not be necessary, of course.

2-TUBES EQUAL 3

George Wohlwend, Ann Arbor, Mich.

(Q) I would appreciate it if you would publish a diagram of an A.C.-D.C. receiver using a 6F7 and a 25Z5. The 6F7 is to be used as a pentode regenerative detector and one stage of resistance-coupled audio amplification using the triode section. I would like this receiver to have as little hum as possible so kindly show the diagram of a good filter circuit.

(A) We are pleased to print the diagram you requested, although, we can offer no guaranty regarding the *hum-level*. The 6F7 works remarkably well as a regenerative detector and one stage of audio amplification. We have shown the filter circuit which should work as well as any, although it is just about impossible to eliminate all traces of hum in an A.C.-D.C. circuit. In wiring up the 6F7 do not fail to connect the grid-leak of the detector between the grid and the cathode, and *not* between the grid and "B" negative, The .1 mf. condenser shown connected across the 110 volt line has been found to eliminate all traces of *tunable* hum. We recommend that this be incorporated in all A.C.-D.C. receivers.



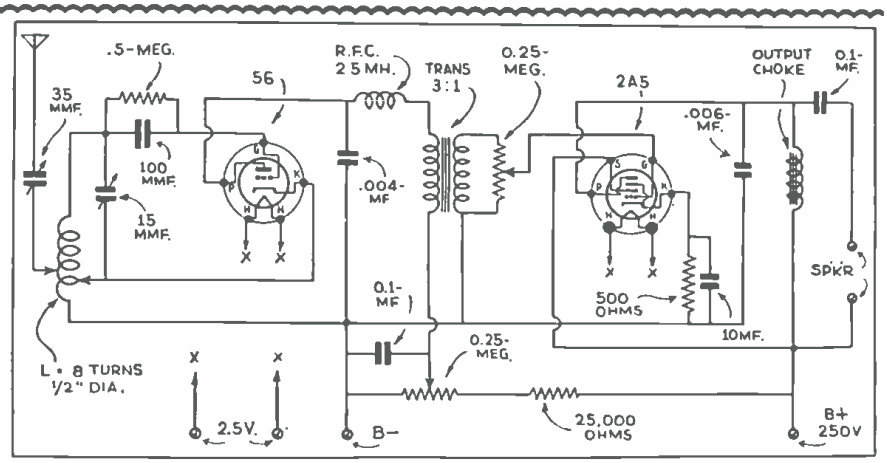
A good circuit for an A.C.-D.C. receiver, using a 6F7 and a 25Z5.

2-STAGE AUDIO AMPLIFIER

E. P. Renstrom, Jr., Chicago, Ill.

(Q) Would you please publish in your *Short-Wave Question Department* a diagram of an amplifier using a single 27 first stage transformer coupled to a pair of 47's in push-pull? I would also like to have some form of volume control on this amplifier.

(A) The diagram you requested can be found printed on this page and uses a 27 driver with a pair of 47 pentodes in push-pull. The audio volume control is incorporated in the grid circuit of the 27.



Here's a dandy 5-meter 2-tube receiver hook-up. It has proved very satisfactory in actual tests.

The design of input and output transformers is dependent upon the apparatus which this amplifier is to be associated with. For dynamic speaker operation, the *output* transformer will undoubtedly be incorporated in the speaker itself. The *input* transformer should have a primary which matches the tube, microphone, or pick-up, whichever you may happen to use.

2-TUBE 5-METER RECEIVER

Walter Swenson, New York City.

(Q) I have heard a great many 5-meter Hams talking about the 2-tube 5-meter receiver, which is apparently giving excellent results. I have been unable to obtain this diagram and wish that you would be kind enough to print one in your next *Question Box*. The receiver uses a 56 and a 2A5.

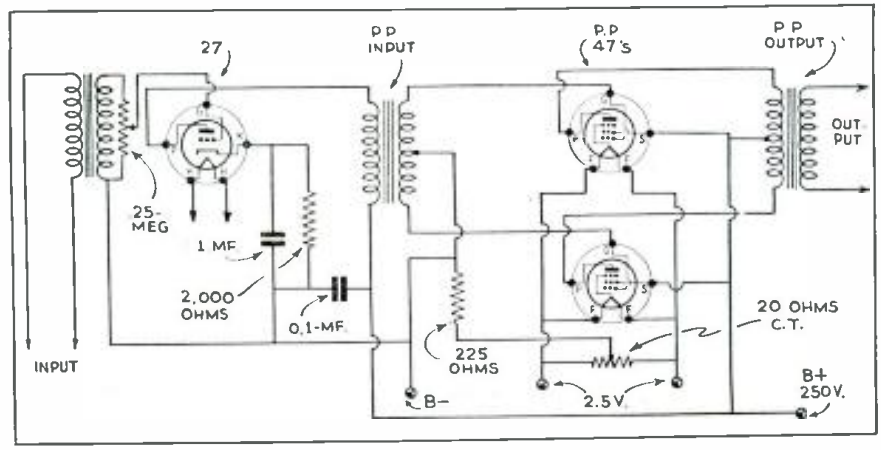
(A) Right you are, Walter, when you say that you have heard a great many Hams speaking of this receiver. It is safe to say that 90 percent of the 5-meter boys in and around New York and New Jersey, and probably a great many more in other parts of the country, are using this receiver, which was described in SHORT WAVE CRAFT, November 1934 issue. Some changes have been made since that time and we have found that connecting the antenna either directly to the cathode tap or somewhere along the low potential end of the coil gives much better results than when connected to the grid. If you follow the diagram carefully and (we also suggest that you refer to the 1934 issue) you will experience no difficulty in getting it to work.

S-W ANTENNAS

Stanley Johnson, Kansas City, Mo.

(Q) I live in a very poor location for radio reception and have trouble picking up the weak signals. Please tell me where I can get information on various types of antennas.

(A) We suggest that you read the following articles in SHORT WAVE CRAFT: Page 715, April 1935; Page 345, October 1934.



Audio Amplifier diagram for 27 "driver" and a pair of 47 pentodes.

Short Wave SCOUT NEWS

Frank Hogler, Brooklyn, N. Y., Reports

● The following is my report on the Short Waves for the past month.

A new Australian station has been heard here for quite some time, only recently was I able to make out its call letters, it is Station VIZ-3; it is heard between 25,75 meters and 26.10 meters; it is heard testing with Station CJA4, Canada, heard 6 a.m., E.S.T.

PLE—15.93 meters can be heard phoning KWU, and at times sending music, around 7:00 p.m., E.S.T.

OAX4B, Lima, Peru, 48.00 meters, say that their station will have more power, and will be on the air only on Wednesdays from 7:00 p.m. and 10:30 p.m., E.S.T. and may change their call to OAX4F.

CMHB—29.41 meters, is the call letters heard on this wave, but they really are using that call, because they have no short-wave call yet. CMHB is the long-wave station they are relaying, address of this station is as follows:

Dr. Antonio M. Cancio, Box 85, Sancti Spiritus; Cuba.

They broadcast daily from 4 to 6 p.m. and 9 to 11 p.m., E.S.T.

TIRCC—45.81 meters, is on the air since May 1; they share time with TIPH also on 45.81 meters; their identification is "Radio-emisora Catolica Costaricense."

Correction on the Japanese stations in the June report; they should read as follows:

JVT—6,750 kc. Daily service hour for relaying JOAK.

JVP—7,510 kc.

JVN—10,660 kc. 0000—G.M.T. to 2240 G.M.T.

JVM—10,740 kc.

The above is direct copy from veris received and address these stations as follows:

Kokusai—Denwa Ksaiha, Ltd.

Osaka Bldg., Kojimachiku, Tokyo, Japan. —Frank Hogler, 222 Wyckoff Ave., Brooklyn, N. Y.

Geo. D. Sallade, Sinking Spring, Reports

● LAST month I commented on the remarkable reception of the Cairo disseminators, SUV and SUX. This month I am able to present the confirmation covering that particular broadcast. For those DX-ers who are interested in verifications, I print this letter:

Dear Sir:

We thank you for your letter of the 2nd, April 1935, and confirm transmission on SUV (10055 kcs.) and SUX (7860 kcs.) at the time and date mentioned. From the information given by you it would appear you were able to receive both these stations direct.

Yours faithfully,
Marconi Radio Telegraph Co. of Egypt, S. A.
Radio House, Sharia Eloui,
P. O. Box 795, Cairo, Egypt.

Herewith is presented another confirmation which may be of interest to radio fans:

Saigon, 18 April, 1935.

Dear Sir:

In reply to your letter of March 17th, we have the pleasure to confirm your reception of FZR 18.50 meters working commercial telephony with Paris.

Saigon stations are operating commercial telephony and telegraphy (never broadcasting) with two short-wave 15 kilowatts transmitters (Cristal master oscillators and beams—French System—right on France).

FZS 16.33 and 25.02 meters
FZR 18.51 and 31.15 meters
operate at
10.00 gmt. on 16.33 meters or
13.30 gmt. on 18.51 meters).

A third transmitter, FZG—Self-generator 6 kilowatts—is working commercial telegraphy with all our Far East correspondents, on 27.71 meters.

Lastly the Saigon broadcasting station of "la Compagnie Franco-Indochinoise de Radiophonie" — call signals: FJICD — has been off the air for two years on account of the world-wide depression.

We thank you very much for all information sent about the reception of FZR.

Yours faithfully,
Compagnie Générale de Telégraphie Sans Fil Boite 238, Saigon, French Indo-China.

CMHB has changed its call letters to CO9WR. The frequency of this station is 10,200 kc. The address is: P. O. Box 85, Sancti Spiritus, Cuba.

There is a new station testing in Costa Rica. The call letters (if heard correctly) were TIRC. The station I believe is located at Cartago. They are heard from 6:30 to 7:00 p.m. on Sunday, playing records and announcing in several languages.

Latest "Hot" Tips for Short-Wave Listeners from our "OFFICIAL LISTENING POSTS"

Report from Freeport, Pa.

● MANY changes have taken place this month; most of the stations have moved to their summer waves.

PHI on 16.88 meters, heard very well, together with PCJ on 19.71 meters.

"Radio Coloniale" on 25.60 meters sent over English programs every night.

2RO, Rome, Italy, broadcasts the "American Hour" on 31.13 meters now. Their schedule is:

31.13 meters—Daily, 2.30-5 or 6 p.m.

31.13 meters—Mon., Wed., Fri., 6-7:30 p.m.

31.13 meters—Mon., Wed., Fri., 7:45-9:15 p.m.

25.4 meters—daily 9:15-10:15 a.m.

The 20-meter amateur band has been the best picking this month. A great many G's were heard and one CT in Lisbon, Portugal.

DJD on 25.51 is probably the best-heard station in the evenings now, from 5:05 p.m. -9:30 p.m.

DJB on 19.73 meters is broadcasting afternoons till 4:30 p.m.

WNC at Hialeah, Florida, calls HJB, Bogota, every morning at 10 a.m., E.S.T. WNC is one phone station that does verify.

PRADO, Rio Bamba, Ecuador, S.A., should change to 19.65 meters this month. This station has not been heard as yet.—Angelo Centanino, Box 516, Freeport, Pa.

Report from John Sorensen, New York City

● Report for May: B.C.—Stations Heard-and-Logged

GSB—GSC—GSD—GSE—GSF—GSL—DJA—DJB—DJC—DJD—DJE—DJN—FYA—19-25.2-25.6 mtrs.; 2RO—25.4-31.1 mtrs. HBP—HBL—EAQ—RKI—RNE—ORK—PHI—PCJ—19 mtrs.; PHI—16 mtrs.; HAS3—19.5 mtrs.; HAT4—32.8 mtrs.; CSL—48.8 mtrs.

JVM 27.9 mtrs.; VK2ME—VK3ME—VK3LR; ZTJ—49.1 mtrs.; XECR—40.6 mtrs. YV2RC—YV3RC—YV6RV—YV5RMO—YN1CG—16.8 mtrs.; HP5B—OAX4B—OAX4D—PRA10—PRA8—49.6 mtrs.; XEBT—HC2RL—HC2ET—HCJB—36 mtrs.; CO9GC—HIH—HI1A—HI7G—42 mtrs.; TIEP—HJ1ABB—HJ1ABD—41.2 mtrs.; HJ1ABE—19.05 mtrs.; HJ3ABH—HJ3ABD—HJ4ABL—49.18-49.1-49.4 mtrs.; HJ4ABB—HJ4ABA—HIX—50.2 mtrs.; TICPH—PRF5—COC—COH.

CJRX—CJRO—VE9GW—VE9DN—WOU—WAE—W2XE—19-25-49 mtrs.; W8XK—19-25-49 mtrs.; W9XF—49 mtrs.; W3XAL—16 mtrs.; W8XAL—49 mtrs.; W2XAF—W1XK—W4XB.

Amateurs: CO5RY—VP9R—VP5IS—G5VL—G5NI—G5BJ—T12GF—CO2HY—CO2WC—T13AV—ON4AC—CO2LL—CT1DY—EA4OA—VP6DR—HP1A—VE1CR—and many more—both "foreign" and American.

VERIS received this month are as follows: PRA8—La Voz De Norte, Radio Clube de Pernambuco—49.67 mtrs. (No schedule given.); HHK—19.1 mtrs.—Republic of Haiti. (No time on air or correct freq. given.)

HJ4ABA—Ecos de la Montana, Medellin, Col., S. A., 11,710 kc.—11:30 a. m. to 1.00 p.m. —6:30 p.m.—10:30 p.m., E.S.T. 100 watts.

HJ1ABD—41.2 mtrs.—7281.55 kc.—"Ondas de la Heroica."

ZFD—10.335 kc. 2 kw.—St. Georges, Bermuda.

HJ1ABE—6115 kc.—180 watts—11:30 to 12:30 a.m.; 7:30 to 9:30 p.m., E.S.T.

Monday special program dedicated to all U.S.A. Radio Clubs, 10:30 to 11:30 p.m., E.S.T. "La Voz de Los Laboratorios Fuentes" Cartagena, Col., S. A.

Amateur Station Veris Received—W2EDW—Far Rockaway, N. Y.; W2NO—Jackson Heights, L. I.; W1ASK—Bridgeport, Conn.; W9CBX—Broken Bow, Nebr.; CM5RY—Matanzas, Cuba.

Reception here on 16 meters good or fair to noon. 25 meters good from 3 p.m. to 10 p.m. 31 meters good from 4 p.m. to 11 p.m. 49 meters good after dark but very noisy. VUC—VUB—VQ7LO—have not yet been heard, at least not good enough to positively identify them. Many unidentified, have been heard, mostly on waves from 35 to 54 meters.—John Sorensen, 3301 Waterbury Ave., Bronx, N. Y. City.

Listening Post Report from Greenfield, Mass.

● DURING May the reception on the short waves was excellent. The 24-meter band was generally good all day and early evening. The 31-meter band was very good day and night.

The following stations were heard consistently:

DJC—49.83 Germany. Fair, some days good, R6.

DJD—25.49. Germany. Extra strong signal all day. R9+.

DJA—31.38, Germany. Very good, some days strong. R8-9.

DJN—31.45, Germany. Fair, some days fading. R6.

GSC—31.32, England. Strong signal day after day. R9+.

GSB—31.55, England. Strong signal day after day. R9+.

2RO—31.13, Italy. One of the best heard stations. R9.

FYA—25.63, France. Very good some days. R6-8.

PCJ—19.71, Holland. Schedule: Tuesdays from 3-6 a.m. and Wed. 7-11 a.m. for America, also irregular. R8.

PHI—16.88, Holland. Daily except Tuesdays and Wednesdays. 7:30-10:30 a.m. R9.

CT1AA—31.25, Lisbon. Very good, some fading. R7.

KKH—39.89, Hawaii. Was relaying pro-

(*Continued on page* 237)

A 3-Tube All-Wave "Vacation Portable"

(*Continued from page* 203)

inches high, 3⅛ inches wide and 2 inches thick, and are ideal for portable receivers.

The batteries should be fastened to the inside of the case with cleats to hold them in place, with straps to prevent them from falling against the speaker and damaging the cone. As an added precaution it may be advisable to have a small piece of copper window-screening between the wood panel and the speaker to further protect the cone.

Tests Very Satisfactory

During tests this receiver more than came up to expectations and with a very short antenna the results were very gratifying. The first antenna tried was only about 15 feet in length and, believe it or not, all the major long-wave broadcast stations were brought in with enough volume on the speaker to satisfy the whole family.

Of course when we connected the regular 50-foot broadcast antenna to the set we were able to bring in all the broadcast stations on the speaker as far west as Cincinnati, Ohio, with excellent volume. On the short waves reception was accomplished with the aid of earphones plugged into the first stage of audio. Two stages of audio proved to be too much for the phones, but not quite enough for the loudspeaker. If the builder desires more volume on the phones he can connect them to the last stage of audio and be more than satisfied.

For general reception when on a picnic or some other outdoor excursion, it is only necessary to throw a 50-foot length of wire over the limb of a tree or any other suitable support, for good reception on either the short-wave bands or the regular broadcast band. The tone quality of the receiver is all that can be desired and some of our friends who heard it agree that it was quite the "berries" for that vacation trip.

What's New in Short-Wave Apparatus?

(*Continued from page* 218)

given in the accompanying table.

All the parts for the Les-Tet Junior are available in complete kit form. An optional accessory is a neat cabinet with hinged top.

All by itself, the Les-Tet Junior is a fine low-powered transmitter that will hold its own on the crowded ham bands. While maximum output is obtained on the crystal frequency, fine results are also had with the amplifier tube doubling and even quadrupling. With a 40-meter crystal, the writer has worked into the 10-meter band with a power output of 2 to 4 watts.

This is a low-cost as well as a low-powered rig. However, after the owner has acquired some operating experience and some more money, he can easily supplement it with a power-amplifier stage. The combination can be built up to a full kilowatt eventually, with each part remaining in service.

"Les-Tet" Junior Coil Data

Four-prong forms, 1⅝" outside diameter

	20 meters	40 meters	80 meters
L1	same as 40 m. coil, no tap	15 turns, No. 18 DCC, 1/16" space. Tap, 5 turns up.	24 turns, No. 18 DCC close wound. Tap, 8 turns up.
L2	7 turns, No. 18 DCC, ¾" space. Link coil, 4 turns, No. 22, D C C, close wound, ¼" from cold end.	15 turns, No. 18 DCC, 1/16" space. Link coil, same as for 20 meters.	24 turns, No. 18 DCC close wound. Link coil, same as for 20 meters.

Explanation:

For 80-meter output: use 80-meter crystal and 80-meter coils for L1 and L2, and neutralize tube V2.
For 40-meter output with 80-meter crystal, use 80-meter L1 coil and 40-meter L2 coil.
For 40-meter output with 40-meter crystal, use 40-meter coils for L1 and L2, and neutralize tube V2.
For 20-meter output with 40-meter crystal, use 40-meter L1 coil and 20-meter L2 coil.

ing now restored to a state of perfect health. One of them, a lady of 38 who was dying of repeated hemorrhages, has shown a weight increase of 16 pounds, and is coming to Paris from the south of France every two or three months for another treatment. Another case, from whom before the oscillatory treatment, an artificial anus had to be made, now comes and goes as he will, not fearing to make a 75-mile auto trip to Paris for his treatments. The third comes from Macon, where his own physician had condemned him to death, and although he cannot yet undertake any work, is already able to walk about Paris where he remains for ten or twelve days every two or three months when he comes for treatment.

A man with an encysted tumor of the prostate gland goes about his business as before, and to see him, you would never believe that he had been so near death.

It really seems that the multiple-wave Oscillator of Lakhovsky has at last brought new light into the somber problem of cancerous infections. We are, without the slightest doubt, on the threshold of a new era of advanced ideas, one in which the old conceptions of biology will be overthrown, and experiments now hardly begun will be carried to the highest point.

2-Stage Pre-Amplifier and Power Supply

● IN the photograph we see two new Amperite units. One is a two-stage pre-amplifier and the other is its power supply. The pre-amplifier is a *high-gain* unit designed to be used in conjunction with the Amperite public address velocity microphones, one of these "mikes" being shown at the left of the photo.

The amplifier has a total gain of 59 D.B. and uses two 6C6 tubes. Its response is flat within 1 D.B. from 40 to 10,000 cycles with a hum-level of minus 100 D.B. The input and output impedances are 50, 200, and 500 ohms making the amplifier universally adaptable. The power supply uses a 280 rectifier and it is designed to supply heater and "B" potential for the pre-amplifier.

Both units measured 4"x5"x9", making a really compact pre-amplifier system.

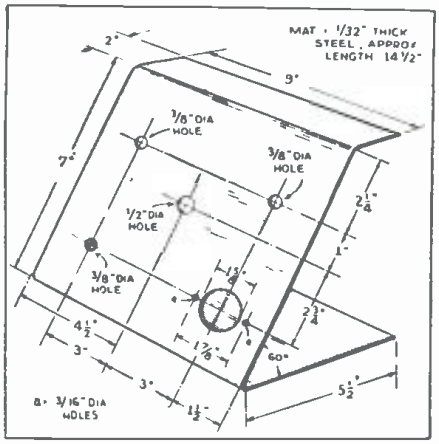
New Amperite pre-amplifier and power supply units for use with "Velocity" mike at left of photo. (No. 298).

Rockwell Kent, Near North Pole, Reports W2XAF Reception Favorable

● ROCKWELL KENT, New York artist and writer, who is spending two years in the northern part of Greenland with his son, Gordon, 13, has radioed W2XAF that reception of the G.E. station's programs are favorable. W2XAF sent its last program to Kent and his boy on May 28 and is planning another for 10 p.m., E.S.T. on June 13. The American artist has a G.E. all-wave battery radio.

1935 "Prof" Doerle Receiver

(*Continued from page* 201)



Dimensions of Chassis

plates or unscrewing the plates and moving them. The "1935 'Prof.' Doerle" has a variable antenna coupling condenser and it is mounted on the panel for convenience of adjustment. Another advantage over the original set is the extra stage of audio amplification provided through the use of a 19 in the audio section, rather than the type 30.

Chassis

Starting with the chassis or foundation of the receiver, we have given a complete set of drawings showing just how to cut and bend it. It can be made of almost any kind of metal which is fairly stiff, so that it won't wabble all over the place. The placement of the holes is shown and the "fan" who is a bit handy with tools can do the job in a few minutes. If you prefer though, the complete chassis—ready-drilled—can be obtained from your regular radio supply house. We gave our chassis a coat of black paint, the kind which gives a crackled finish when dry; even ordinary black enamel will give it a pleasing appearance.

In order to make the chassis rigid it is necessary to construct two brackets one-half inch wide of 1/16 inch thick aluminum or other material, and fasten them on each side along the rear edge of the chassis.

Circuit Very Simple

Examining the diagram we find the circuit really very simple. We have a regular two-winding coil, one winding for the tickler and the other to form part of the tuned circuit which is connected to the grid of the tube. In series with the grid side of this coil, we have a .0001 mf. grid condenser, which should be of the mica variety and across the grid condenser is the grid-leak. The value of the grid-leak is not so critical, although different sizes from two to five megohms should be tried. We found that three megohms was just about right. The other end of the grid coil connects to the filament of the detector. Across the entire grid coil is connected the two tuning condensers; one is a 140 mmf. variable and is used for fast tuning or *band-setting*. The other is a 20 mmf. variable, which is used for *band-spread* tuning and the large vernier tuning dial is mounted on this condenser.

It is a simple matter to tune in stations with the band-spread condenser. The large condenser should be set so that the wave-band to be covered by the small condenser appears in the center of the main tuning dial. All other controls have small dials and knobs, so that it is a simple matter to "log" stations and return to them at any time.

Connected between one side of the tickler and the filament of the detector, we find the regeneration control condenser. This is usually termed the "throttle" condenser and is the same size as the other large grid tuning condenser. During operation of the set, this condenser is adjusted to the point where the detector tube goes into oscillation. This is usually evidenced by a slight hissing sound in the phones. After the station is tuned in, this regeneration control should be adjusted for maximum signal strength and clearest reception of the voice or music.

The Audio Amplifier

From the detector we go to the first stage of audio frequency amplification; thus far we have not changed the circuit of the original receiver, other than to add a few refinements. A regular audio transformer having a ratio of three or four to one is used and couples the detector to

This View Clearly Shows the General Construction of the "Prof" Doerle

the audio tube. The 19 is similar to the 30, except that there are really two tubes in the same glass envelope and it is because of this fact that we are able to have the extra stage of audio amplification *with only two tubes.* The second stage of amplification is resistance-capacity coupled to the first stage and produces very loud signals with remarkable tone quality. Some of the stronger short-wave broadcast stations can be heard comfortably throughout a large-size room when using a loudspeaker; so you can see that we have plenty of volume for the earphones.

The layout of parts used allows very short leads connecting the various parts and besides simplifies the construction and wiring considerably. All connections should be soldered carefully with rosin core solder and a clean hot iron. Use good parts and tubes and you will be more than pleased with the time and effort given to building the set.

The plates of the tubes are fed by two large 45-volt "B" batteries and due to the low amount of current drawn by the two tubes, they will give many months of service; good batteries should last nearly a year. The filaments are heated with two No. 6 dry cells. In order to cut the voltage of the two dry cells down from three to two volts, a 20-ohm rheostat is used. This rheostat is not mounted on the set but can be fastened to the batteries or battery box.

The antenna or aerial used with this little receiver during tests was 75 feet long, right from the binding post on the set to the far end; and we had no trouble in pulling in all the regularly received "foreign" stations.

Parts List 1935 "Prof." Doerle

1—Special Chassis—see drawing, Blan.
2—140 mmf. tuning condensers, Hammarlund (Na-Ald).
1—20 mmf. tuning condenser, Hammarlund (Na-Ald).
1—35 mmf. tuning condenser (Midget padding type), Hammarlund.
1—100 mmf. mica condenser. Aerovox.
1—.1 mf. bypass condenser, Sprague.
1—.006 mf. by-pass condenser, Aerovox.
1—3 meg. ½-watt resistor, I.R.C.
1—50,000-ohm ½-watt resistor, I.R.C.
2—¼-meg. ½-watt resistors, I.R.C.
1—3:1 ratio audio transformer, Kenyon.
1—20-ohm rheostat, Electrad.
1—2.5 M.H. R.F. choke coil. Hammarlund.
1—Set of coils; see coil table. Na-Ald.
2—4-prong Isolantite sockets, Hammarlund.
1—6-prong Wafer socket, Na-Ald.
2—Twin binding post strips, Na-Ald.
3—Small dials and pointers, Crowe.
1—Large Vernier dial, National.
1—4-wire Battery cable.
1—19-tube, RCA-Radiotron.
1—30-tube, RCA-Radiotron.

"Tube-Base" Coil Data

Coil Number	Wavelength Range in Meters	Turns on Secondary Coil	Turns on Tickler Coil	Distance Between Windings
1	19-34	5	5	1/16"
2	31-58	10	5	1/16"
3	54-102	20	5	none
4	100-210	55	11	none

Wound on 4-prong tube base, all close-wound

Na-ald Plug-in Coil Data

Meters Wavelength	Grid coil turns	Tickler turns	Distance between 2 coils
200-80	52 T. No. 28 En. Wound 32 T. per inch.	19 T. No. 30 En. Close wound (CW)	¼"
80-40	23 T. No. 28 En. Wound 16 T. per inch.	11 T. No. 30 En. C. W.	⅜"
40-20	11 T. No. 28 En. 3-32" between turns	9 T. No. 30 En. C. W.	⅜"
20-10	5 T. No. 28 En. 3-16" between turns	7 T. No. 30 En. C. W.	⅜"

Coilforms—2½" long by 1¼" dia. 4-pin base.

Short Wave Stations of the World

(*Continued from page 223*)

5950 kc. HJ4ABE
-B- 50.42 meters
MEDELLIN, COLO.
Mon. 7-11 p.m., Tues., Thurs., Sat. 6:30-8 p.m., Wed. and Fri. 7:30-11 p.m.

5940 kc. TGX
-B- 50.5 meters
SR. M. NOVALES.
GUATEMALA CITY, GUAT.
Daily except Sun., 8-10 a.m., 1-2:30 p.m., 8 p.m.-12m.

5890 kc. HJ2ABC
-B- 50.97 meters
CUCUTA, COL.

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

5850 kc. ★YV5RMO
-B- 51.28 meters
MARACAIBO, VENEZUELA
5:15-9 p. m.

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

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

5780 kc. HI1J
-B- 51.9 meters
SAN PEDRO de MACORIS, DOM. REP.
7-9:30 p.m.

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

5714 kc. HCK
-B- 52.5 meters
QUITO, ECUADOR, S. A.

5660 kc. HJ5ABC
-B- 53 meters
CALI, COLOMBIA
11 a. m.-12 N.
Tues. and Thurs. 8-10 p. m.
Sun. 12 N.-1 p. 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

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
Aparlado 249
GUAYAQUIL, ECUADOR
Reported Wed., Sat. 9-11:30 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, MO-ZAMBIQUE, E. AFRICA
1:30-3:30 p.m., Mon., Thurs., and Sat.

3490 kc. PK1WK
-B- 85.96 meters
BANDOENG, JAVA
Daily except Fri., 4:30-5:30 a. m.

All Schedules Eastern Standard Time

Short Wave Scout News

(*Continued from page* 228)

gram to U.S.A. R7.
LKJ1—31.45 Jeloy, Norway. Heard faintly between 5-6 a.m.
HP5J—31.28 Panama. Daily 11:45 a.m.-1:00 p.m.—7:00-10:00 p.m. R6.
TGX—50.93. Guatemala City. Heard between 11-12 midnight. R6.
HJ4ABL—49.15, Manazales. Identification, "Ecos de Occidesta." R7.—Herman Borchers, 240 Federal St., Greenfield, Mass.

OLIVER AMLIE, PHILADELPHIA, PA.

● DUE to the rush of mail at this post from readers of *Short Wave Craft* asking for the Amlie DX circuit, this post did not have time to log new stations. The mail has been very heavy; this is due to the fact that each month as the Australian reports climb, readers are after the circuit. The Australian reports on VK2ME-3ME-3LR now stands at 155, ending May 1935; the goal is 250, ending September, 1935, these stations best heard now 5-7:30 a.m., E.S.T.

This post has been *commissioned* by the Chief Engineer of the British Broadcasting Corp., to handle (check) all six B.B.C. transmissions. Also by the Italian Broadcasting stations to handle (check) all transmissions of theirs also, and report each month to them.

Readers of *Short Wave Craft* are invited to join the 6,000-12,500 mile "DX" Club, no fees, no dues at any time. For details write this post. BE-A-REAL-DYED-IN-THE-WOOL-DX-er. *Short Wave Craft* will be Club magazine. Your record of reception must be 6,000 miles or over to be eligible for membership.

If you have not as yet become acquainted with Mr. Charles A. Morrison, President of the International DX-ers Alliance, Bloomington, Ill., U.S.A., by all means write him, and ask him for a free copy of *Globe Circular*. It's free for the asking. Know Mr. Morrison as we fellows know him, a real friend to every one, and a true friend. Most all of the winners of *Short Wave Craft* "Trophies" are members of this Alliance.

Oliver Amlie, 56th City Line Ave., Overbrook, Philadelphia, Penn.

NEWS FROM BRECKSVILLE, OHIO

● SHORT-WAVE reception during the day has been very poor on all bands, except 49 meters and only U.S. stations were heard on this band.

Stations on 19 meters could just be heard, but not understood. On Sunday, May 19, at 12 noon, DJB on 19.73 M. was transmitting with directional antenna to this continent and wished to know how their signal was received at this time of day on this wave. Although they faded quite a bit, their signal was very loud, whereas they could not be heard at all on this wave at their regular time for weeks.

On Tuesday, April 30, at 7:40 p.m., an Australian station was heard testing. They gave descriptions of local conditions in Australia and although I listened until they signed off I did not get the call. They came in fairly steady and were operating on about 26 meters.

DJD and FYA have been coming in very loud during the evening.

2RO on 25.4 meters was heard at 12:20 p.m. on May 19. They were fair at times, but rather weak most of the time.

On Sunday, May 12, at 11:50 a.m., HBJ on 20.64 m. was sending a special program to WQV. They came in very loud and distinct. HBH was on at the same time.

England, Cuba, Schenectady and Boston have been very loud on the 31-meter band, during the evening. Rome has been very weak.

GSG on 16.86 m. was heard, but was very choppy.

There were a few days, during this period which were very fine for reception, but in general there was considerable atmospheric interference.

Commercial phone stations on 22m., 29m., and 33m. also came in well.

Edward M. Heiser, Brecksville, Ohio, O. L. P.

REPORT FROM EDWARD SCHMEICHEL, DIAL-TWISTER IN ILLINOIS

● THE 19- and 25-meter is improving so rapidly that the Europeans on these bands are heard very late in the evenings. The 31-meter band also is improving—a great help, since this band is the most reliable. The coming month ought to bring them up 100 percent more. PLE—15.88 meters was heard relaying a special program to Holland on May 6, at 10:00 a.m., E.S.T.

CO9WR—This station formerly operated as CMHB on 10.20 megs. They want reports on their signals to be sent to P. O. 85, Santa Spiritus, Cuba, West Indies.

LSX—Buenos Aires, Argentina on 28.98 meters has been heard testing with W2XAF several times during the past month.

JVM—Nazaki, Japan, is the most outstanding station heard from Asia. They are heard on 27.93 meters daily from 4 to 7 a.m., E.S.T. Their address is: Kokusai Kenwa Kaisha Ltd., Osaka Bldg., Kojimachiku, Tokyo, Japan. They send a very nice QSL card and will answer all accurate reports.

DIQ—29.15 meters was heard on May 7 at 5:30 p.m., E.S.T. relaying a program to the U.S.A. by way of WCG at New York.

PHI—Huizen, Holland, has changed its wave length to 16.88 meters and is being received very well in this part of the country. They are heard between 7 and 11 a.m. E.S.T. daily except Tuesday and Wednesday.

PCI—Huizen, Holland, are back after many years' absence and are being heard in all parts of the world with tremendous volume. They have the same schedule as PHI and are on 19.71 meters.

VIZ-3—Rockbank, Australia, is a new station heard from Australia on 11,495 kilocycles. They are heard phoning CJA4 and the Rugby phones. They are on many times and quite regular in the early morning.

HCJB—Quito, Ecuador, have moved their frequency from 73 to 36.65 mtrs., and are heard daily except Monday from 7:45-10:00 p.m., E.S.T. They also call various stations throughout South America.

HJ4ABB—Manizales, Colombia, have moved their frequency from 42.00 to 49.15 meters. They are heard on Wednesday evenings between 8-9 p.m., E.S.T. reading letters from listeners in English over the air. They are also heard on Saturday evenings beginning at 9 p.m. They welcome reports.

HJ4ABL—Manizales, Colombia, 49.15 meters, is being heard every Saturday evening beginning at 10 p.m. reading reports from listeners. The announcer is a German gentleman, Mr. Van den Enden, and is the same fellow who reads reports over HJ4ABB. He sends a very nice card (HJ4ABL).

HJ4ABA—Ecos del Montana on 25.68 mtrs., is being heard daily in all parts of the world. They begin at 6 p.m. and continue until 10 p.m. Their address is Calle Boyaca, Edificio Encapie Gacet, 3er Piso, Medellin, Colombia. They are anxious to receive reports from all listeners.

HIZ—Santo Domingo, D.R., on 47.5 mtrs., has returned to the fold after being absent almost a year. They are heard daily from 5-5:30 p.m., E.S.T.

HIH—San Pedro, D.R., has been heard on Sundays from 3 to 4 a.m., E.S.T. broadcasting special programs, to foreign listeners. They are on 44.12 meters.

VP6YB — VP6IS — HC1FG — CM2HY — CM5RY — ON4AC — TI2FG — ON4AU — G5BY — G6FL — G6XR — G2BK — G4AD — HB9AQ — CN8R1 — VK2EP — HC1JW — T12GP — X1G — LA1G — VO1I — are just a few of the many amateur stations heard on the 20-meter phone band. For a real thrill I advise everybody to try this band from 4-8 p.m., E.S.T. The hams pound in from all over the world and will send you a nice QSL card if you enclose postage. So to the fan who wants to reach out for a real thrill I advise the 20-meter phone band.—Edward Schmeichel, 2939 So. Loomis St., Chicago, Ill.

OFFICIAL LISTENER'S POST REPORT—GEORGIA

● RECEPTION here for the past three weeks has been rather extraordinary, especially on the 25-meter band. Stations which were barely heard before or not at all, have come in QSA5-R9. In the mornings, stations on the 16- and 19-meter bands have come in like "locals."

Looking through my log I find the following new additions: Suva, Fiji Islands, announced as VPD; reception poor but understandable; JVN was heard every morning for a week about QSA5-R7. RNE and RKI came in very poorly here on the special program to America the morning of the 5th.

HKV in Bogota, Colombia on 8,900 meg. was heard on the 13th at 8:45 p.m., C.D.-S.T., announcing in both Spanish and English. CMHB on 10,250 meg. (location unknown) in Cuba can be heard in the early afternoon irregularly. KPR, broadcasting the National Farm and Home hour, on 15 590, signed off at 4 p.m., C.D.S.T., on the afternoon of the 13th without giving their location.

LSX has been testing with W2XAF at 6 p.m. for several afternoons, and a few nights ago players in Schenectady and Barranquilla carried on a *remote control* bridge game through W2XAF and HJ1-ABB! JVF came through QSA5-R9 at 3:45 p.m. on the 13th. The station on 11,-700 megs. has been heard to announce as HJ4ABA, coming in like a "local" with no heterodyne from FYA.

For the past few days, the BBC has been using GSD in place of GSB for transmission 5 along with GSC. Transmission 6 received regularly QSA5-R9.

Most of the foreign "locals" have been received like our own "locals" during the period (May 3 to 21), including the "Aussies" and also the S.A.'s except on a few evenings when local storms made reception impossible on the 49 meter band.

Amateurs in eighteen countries and all U.S. districts were heard on the 20-meter band.—Douglas Wauchope, 501 S. Chandler St., Decatur, Ga.

A Good Television Hookup

(*Continued from page* 216)

or rather turn at the same speed as the disc at the transmitting station.

Here are the 3 stations I receive most: W9XG, Purdue University, West Lafayette, Ind., using a 60-hole disc, single spiral, at a speed of 1200 R.P.M. Power output—1500 watts.

Time schedules—

Days	Hours (C.S.T.)
Tuesdays	7:30 to 8:30 p.m.
Thursdays	8:00 to 9:00 p.m.

W9XK, State University of Iowa. using a 45-hole 3-spiral disc, at a speed of 900 R.P.M. on 880 Kc.

Time schedules—

Days	Hours (C.S.T.)
Tuesdays and Thursdays	7:30 to 7:45 p.m.

W9XAK, Kansas State College, Manhattan, Kans., using a 60-hole disc, at a speed of 1200 R.P.M. 125 watts of power, on 2050 kc.

Time schedules—

Days	Hours (C.S.T.)
Mondays and Fridays	6:45 to 7:30 p.m.
Wednesdays	8:00 to 9:00 p.m.

If the Radio Commission would give these television stations more power on television, they would get farther and we with the receivers could get them more satisfactorily.

Parts List

1. Ant. binding post.
2. Gnd. binding post.
3. Ant. coupling coil (Primary, 6 turns of No. 24 S.C. wire, close wound. Secondary, 36 turns of No. 27 enameled wire, close wound).
4. R.F. coupling coil (Primary, 5 turns of No. 24 S.C. wire, close wound. Secondary, 37 turns of No. 27 enameled wire, close wound).
5. R.F. coupling coil (Primary, 5 turns of No. 24 S.C. wire, close wound. Secondary, 37 turns of No. 27 enameled wire, close wound) 3-4-5 coils are 1 inch in dia. and 2 inches high and must be shielded. It may be necessary to add a few windings or take off a few turns owing to the variation of wiring and shielding of set.
6. First main tuning condenser (.00035 mf.).
7. Second main tuning condenser (.00035 mf.).
8. Third main tuning condenser (.00035 mf.).
9. First compensating condenser.
10. Second compensating condenser.
11. Third compensating condenser.
12. 235 tube.
13. 235 tube.
14. 224 tube.
15. 224 tube.
16. 245 tube.
17. 5Z3 tube.
18. By-pass condenser (.25 mf.).
19. By-pass condenser (.25 mf.).
20. By-pass condenser (.25 mf.).
21. By-pass condenser (.25 mf.).
22. Molded mica coupling condenser (.01 mf.).
23. Molded mica coupling condenser (.01 mf.).
24. By-pass condenser (.25 mf.).
25. By-pass condenser (.25 mf.).
26. By-pass condenser (.25 mf.).
27. By-pass condenser (.25 mf.).
28. Dry electrolytic condenser (8 mf.) 600 V., D.C.
29. Dry electrolytic condenser (8 mf.) 600 V., D.C.
30. Resistor—400 ohms.
31. Resistor—400 ohms.
32. Resistor—30,000 ohms.
33. Resistor—50,000 ohms.
34. Resistor—100,000 ohms.
35. Resistor—1 megohm.
36. Resistor—100,000 ohms.
37. Resistor—1 megohm.
38. Voltage divider resistor—17,200 ohms, 5 watt (wire wound). Tapped at 4 points—
    A to B—1,800 ohms.
    B to C—1,400 ohms.
    C to D—4,000 ohms.
    D to F—10,000 ohms.
39. Resistor—1,500 ohms. 2 watt.
40. Volume control—50,000 ohms (wire wound).
41. R.F.C. 2.5 M.H. (put in bottom of R.F.C. No. 4).
42. R.F.C. 2.5 M.H. (put in bottom of R.F.C. No. 5).
43. R.F.C. 2.5 M.H.
44. Filter choke—30 henry.
45. Output terminal (connect to neon lamp or speaker).
46. Output terminal (connect to neon lamp or speaker).
47. A.C. switch.
48. Power transformer (large enough to supply 6 or 7 tubes).
49. Center-tapped resistor—20 ohms, 10 watts (use this if power transformer has no center tap).
50. R.F.C. 2.5 M.H.
51. By-pass condenser (.25 mf.).
52. By-pass condenser (.25 mf.).
53. Dry electrolytic condenser (2 mf.) 600 volts D.C.
54. Second filter choke—30 henry.

XX. To all fil. of tubes.

(All by-pass and filter condensers should be in metal containers.)

(The Doerle receiver, a diagram of which has appeared in SHORT WAVE CRAFT, can be used to receive television images if "resistance-coupled" audio amplification is used.)

Herewith is a diagram for the fellows who don't have 110 volts. A.C. This is the amplifier and tuner and it works very good. It can be used to good advantage with 2-volt tubes, 8-30's and a 31 as output.

R—Resistor —0.1 meg.
R1—Resistor—1 meg.
R2—Resistor—0.5 meg.
R3—Resistor—0.25 meg.
R5—Gridleak—3 meg.
C1—Variable condenser—300-mmf.
C2—Variable condenser—.001-mf.
C3—Variable condenser—170-mmf.
C4—By-pass condenser—.01 mf. (all 600 volts D.C.)
C5—Grid condenser—.00025 mf.
C6—Grid condenser—2 mf.

(The illumination of the neon tube is controlled by varying grid bias on output tube.

Short Wave Scouts

(Continued from page 217)

YV6RV—6,520 kc.; daily 5-7 p.m., 9-11 p.m. "La Voz de Carabobo." Valencia, Venezuela.
YV5RMO—5,850 kc.; daily ex. Sun. 11:30 a.m.-1 p.m., 5:30-10 p.m., "Ecos del Caribe." Maracaibo, Venezuela.
HJ1ABB—6,447 kc.; daily 11:45 a.m.-1 p.m., 5:30-10 p.m. "La Voz de Barranquilla," Barranquilla, Colombia.

Europe

GBB—13,600 kc.; irregular, Rugby, England.
GBS—12,015 kc.; irregular, Rugby, England.
HAS—15,370 kc.; Sunday 9-10 a.m. Budapest, Hungary.
HBL—9,595 kc.; Saturday, 5:30-6:15 p.m. Geneva Switzerland.
HBP—7,800 kc.; same as HBL.
FYA—11,705 kc.; daily 6-9 p.m., 10-12 p.m. "Radio Coloniale," Paris, France.
HVJ—15,120 kc.; daily 10:30-10:45 a.m. Vatican City.
ORK—10,330 kc.; daily 1:30-3 p.m. Radio Ruysselede. Brussels, Belgium.
FTK—15,880 kc., irregular. St. Assise, France.
FTM—19,355 kc.; irregular St. Assise, France.
I2RO—9,800 kc.; now on 9,630 kc. Rome, Italy.
I2RO—9,760 kc.; now on 9,630 kc. 2:30-5 p.m., 6-7 p.m. Rome, Italy.
DJD—11,770 kc.; daily 5:30-10:30 p.m. Zeesen, Germany.
DJA—9,560 kc.; daily 5:05-9:15 p.m. Zeesen, Germany.

Africa

SUV—10 055 kc.; irregular. Cairo, Egypt.

Australia

VK2ME—9,590 kc.; Sun. 1-3, 5-9 a.m., 10:30 a.m.-12:30 p.m. Sydney, N.S.W.
3LR—9,580 kc.; daily ex. Sun. 3:15-7:30 a.m. Melbourne, Victoria.
VK3ME—9,510 kc.; Wed., Thurs., Fri., Sat., 5-7 a.m. Melbourne, Victoria.

Read These Rules Carefully

IMPORTANT: Do not fail to remember that all the entries must now be entered according to the new rules which are herewith reprinted for the benefit of those who intend submitting lists of station. Read the new rules carefully!

Briefly they are: The Trophy will go to the person submitting the "greatest number of verifications!" No unverified stations are required! Also, at least 50 per cent of the verifications submitted must be for stations located OUTSIDE of the country in which the entrant resides. Only letters or cards specifically verifying reception of a given station will be considered.

Trophy Contest Entry Rules

● NOTE that we have amended our rules and you will find that the rules now read:

In order to protect everyone, the rules have been amended that a sworn statement before a Notary Public which only costs a few cents to get, must be sent in at the same time.

For the complete article of the Purpose of the SHORT WAVE SCOUTS, we refer to page 393 of the November, 1933, issue.

Here are the rules amended:

You wish to know how you can win this valuable trophy, and here are the simple rules. *Be sure to read them carefully. Do not jump at conclusions.*

1.—A monthly trophy will be awarded to one SHORT WAVE SCOUT only.

2.—The purpose of this contest is to advance the art of radio by "logging" as many short-wave commercial phone stations, in a period not exceeding 30 days, as possible by any one contestant.

3.—The trophy will be awarded to that SHORT WAVE SCOUT who has logged the greatest number of short-wave stations during one month.

4.—In the event of a tie between two or more contestants each logging the same number of stations, the judges will award a similar trophy to each contestant so tying.

5.—Verifications are necessary; these must be sent in with each entry. All cards or verification letters must be sent in at the same time with a statement by the SHORT WAVE SCOUTS, giving the list of stations in typed or written form, with the station calls, wave-lengths, and other able information. (See below.) The verification letters and cards will be returned to the SHORT WAVE SCOUT at the end of each monthly contest. (See Jan., 1933, editorial how to obtain verification.)

Note! All Stations Sent In Must Now Be Verified!

6.—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 per cent 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!

7.—This is an *international* contest in which any reader, no matter where located, can join. It is allowable for SHORT WAVE SCOUTS to list stations in their own countries, if they desire to do so.

8.—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.

9.—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.

10.—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.*

11.—Don't list amateur transmitters or code stations in this contest.

12.—This contest will close every month for the next twelve months on the first day of the month, by which time all entries must have been received in New York. En-

tries received after this date will be held over for the next month's contest.

13.—The next contest will close in New York, August 1.

14.—The judges of the contest will be the editors of SHORT WAVE CRAFT, and their findings will be final.

15.—Trophy awards will be made every month at which time the trophy will be sent to the winner. Names of the contesting SCOUTS not winning a trophy will be listed in Honorable Mention each month.

16.—From this contest are excluded all employes and their families of SHORT WAVE CRAFT magazine.

17.—Address all entries to SHORT WAVE SCOUT AWARD, 99-101 Hudson St., New York City.

FREE BATTERIES TO TROPHY WINNER!

● The manufacturers of the well-known Burgess batteries have offered to furnish FREE one year's supply of batteries—all the batteries that the "trophy" winning set will need for a year—and providing it happens to be a Burgess Battery-powered set. A very fine offer indeed, and the editors are glad to pass on the good word to all of their embryo trophy contestants.

88-Minute Meeting Sets New Record on Transatlantic Pick-ups

● A NEW record in the transmission of a program to an overseas point was established May 22 with the transmission of an 88-minute program over the transatlantic facilities of the A.T. & T. Company. The same program was broadcast by WIXAL of Boston, short-wave station of the World-wide Broadcasting Corporation devoted to international good will and educational programs.

The program was a luncheon of the National Foreign Trade Council, addressed by Francis B. Sayre, Assistant Secretary of State, at which Thomas J. Watson, President of the International Business Machines Corporation, was toastmaster. The addresses, crossing the Atlantic on a short-wave channel, were received at the London offices of the International Time Recording Corporation. Here they were heard by executives of the Company and guests, including members of the staffs of the U.S. Embassy and Consulate, and British Government officials.

The transmission to London and the broadcast from WIXAL were arranged by Mr. Watson, who is also a trustee of Columbia University, as part of the educational program of the World-wide Broadcasting Corporation, whose schedule is integrated with the courses of study at a number of American universities and colleges.

New "B" Supply Unit for Auto Sets

● The newest plate supply unit for sets operated on or near motor cars is the Autonator. This unit is a simple 110 volt A.C. generator which mounts on the motor block of an automobile or any other motor-driven vehicle and it is driven directly from the fan belt.

It is especially useful for operating portable radio transceivers or any other appliance or radio set that requires 110 volts A.C. The unit delivers 110 volts 60 cycle A.C. when driven at 1,800 R.P.M. The device has been so perfected that it is trouble-proof and uses no current from the car battery. Its manufacturers claim that it cannot be burned out due to overload.

It is available in different sizes at a nominal cost, the price of each unit depending upon the watts output desired (refer to No. 299).

Browning-35 All-Wave Receiver

(*Continued from page* 220)

speech comes through clean and crisp, showing that the side-bands of the signal carrier wave are not being slighted.

Diode Detection

The final tuned circuit of the band-pass filter is coupled to the diode elements of a 2A6 tube. This provides half-wave linear rectification, which is impressed on the grid of the high-mu triode, contained in the same tube, as a first stage of Class A audio amplification. The diode detector does not amplify, but this is not needed and it is an excellent detector, giving accurate, quiet rectification of the radio frequency envelope. The diode handles large volume without causing distortion or noise. The rectified carrier current in this diode is also utilized for the automatic volume control of both the I. F. and pre-selector tubes. This prevents the detector and preceding circuits from overloading, regardless of the strength of the received signal. The audio volume may be set as desired by the manual, variable resistor control on the grid of the first audio stage and will remain approximately the same in volume over a very wide range of input signal strength.

Beside the manual volume control there is a variable resistor for adjusting the I.F. amplification. This can be left fully retarded on all local and medium distance reception, and need not be more than half advanced even on the so-called "local" foreign stations, such as England, France, Germany, Madrid, etc. This constitutes the reserve power, the "ace in the hole" which can be called into play when receiving conditions are particularly good and a low atmospheric noise-level makes it possible to "step out" and do some real DX-ing.

It will be noted that the two diode plate elements contained in the 2A6 tube are connected together and used as a half-wave rectifier. This *doubles* their *power handling ability* as compared to a full-wave rectification arrangement and allows for a much more powerful undistorted output to the audio amplifier.

Resistance Coupling Featured

The two-stage audio amplifier makes use of resistance coupling for both tubes. This is done for the sake of efficiency and to preserve the high quality of the signal which is fed to it by the final diode detector.

The first stage of Class A audio amplification is provided by the triode contained with the diode detector in the 2A6 tube. This is a high-mu tube, necessitating resistance coupling, if its full possibilities are to be utilized.

The final stage of power amplification is handled by a 2A5 pentode which is capable of delivering more power than can ordinarily be used in even a good-sized living room (3 watts rated output).

There seems to be a universal tendency today to design radio sets with tremendous power outputs, ranging all the way from 15 to 50 watts. Such outputs might be useful for large auditoriums or outdoor demonstrations, but they certainly serve no purpose in a private home! In a living room an output averaging from one to two watts, feeding into an efficient speaker, will produce more volume than most of us care to listen to. When an amplifier and speaker are designed for such tremendous outputs they are often quite ineffective at the low volume-level it is necessary to hold them to in a living room. From a practical standpoint it would seem far more sensible to design the audio amplifier to deliver good reproduction at the volume which will be used. The full capabilities of the 2A5 tube cannot be appreciated, until it has been heard operating under ideal conditions, in a properly designed circuit with a a high-quality signal input. Under these conditions, even with an inexpensive loud speaker, providing it is mounted on a good baffle, the reproduction, as far as home use is concerned, leaves little to be desired. It is beautifully clear and life-like while the deep bass notes have power and authority, within the usable volume range, which is usually only associated with high-power reproduction.

Quiet Power Supply

The BROWNING 35 contains its own power supply, operating directly from the 110-120 volt A.C. power line. The total power consumption is low, being less than 75 watts for the entire receiver. To help maintain the lowest possible noise-level, an R.F. grounding condenser is used on the A.C. input and a grounded electro-static shield is built into the transformer between primary and secondary. Efficient design has allowed the physical dimensions of the transformer itself to be kept at a minimum.

The filter used in the high voltage supply, includes the 1,800-ohm field of a dynamic speaker and two 8 mf. 500-volt filter condensers. Additional resistance filtering is used in individual tube element leads through the circuit. The effectiveness of this filtering is such that earphones may be used if desired without annoying A.C. hum.

Tuning the Receiver

Absolute single control tuning with continuous band-spread over the entire frequency range is one of the unique features of this set. Such tuning allows full advantage to be taken of the high usable sensitivity this receiver possesses. It leaves one hand free to operate the sensitivity or volume-gain controls so that the dips and rises in the noise-level may be followed as the microvernier tuning dial is turned. Thus the operator does not miss those weak, barely audible, long-distance catches which are so often passed over.

As an additional aid in DX hunting, and to permit the reception of C.W. telegraph signals if desired, a *beat-frequency oscillator* is included in the circuit coupled to the suppressor grid of the I.F. amplifier tube.

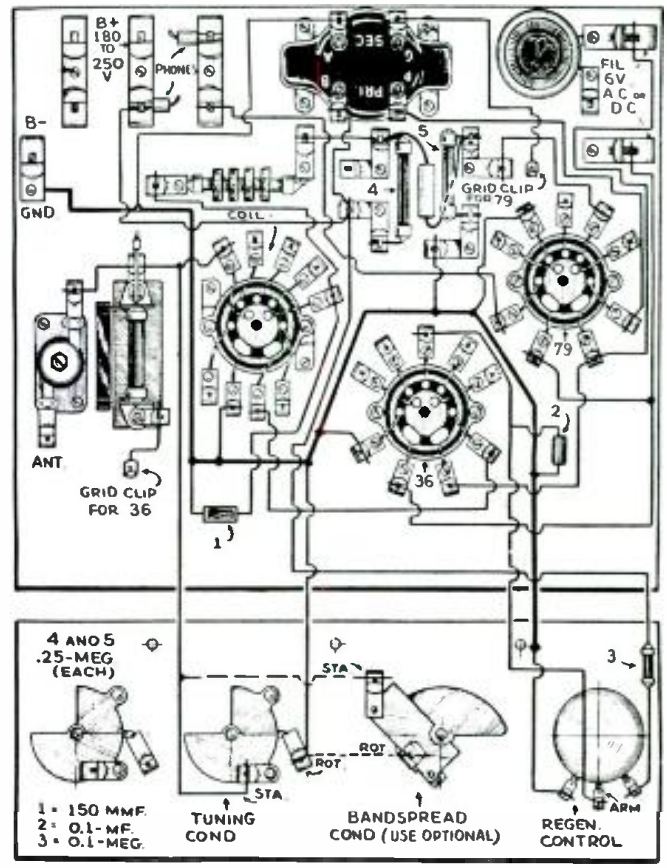
The two manual volume controls regulating the I.F. gain and audio amplification respectively, permit great flexibility and allow the operator to balance the overall gain of the receiver as he chooses in order to meet varying conditions.

In designing the tuning dial, it was decided that no compromise should be made with convention. Accurate, easy tuning and good band-spread over the entire range were of utmost importance, we believed, in such a receiver. After all, this set is designed for radio operators and experimenters who want results and appreciate performance more than conventional appearance. A 5½-inch dial, with knife-edge pointer, and forty-to-one ratio vernier drive, gives a tuning control which is not critical on even the highest frequencies and does not tire the operator by requiring the concentration necessary for minute adjustments. Without doubt this precise, single control tuning is partly responsible for the unusual DX logs which are being made with this receiver.

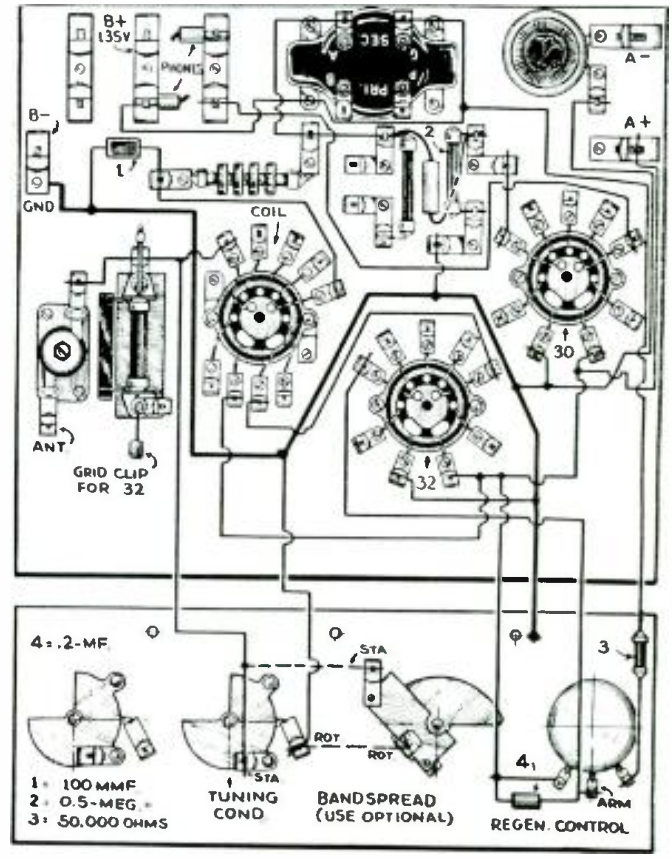
Clipset—All-Wave Hook-up Board

(*Continued from page 205*)

circuit assemblies it is important to have proper labeling of the various parts and connection terminals. The sockets are marked according to the R.C.A. number system, giving the *underside* or wiring view of the socket. For instance, let us examine the underside of a 5-prong tube which may be part of a circuit you're building. Starting with the left heater prong as No. 1, and continuing around in



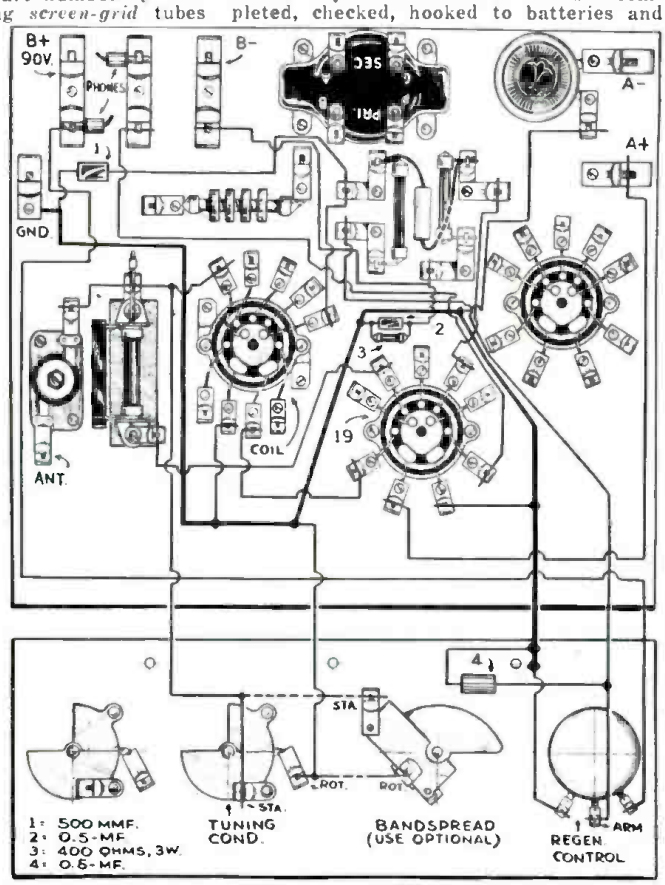
The Triplex "2" as wired with the Clip-Set. The actual work of wiring up a set can be done in a few minutes by simply following the diagram herewith. No soldering required.



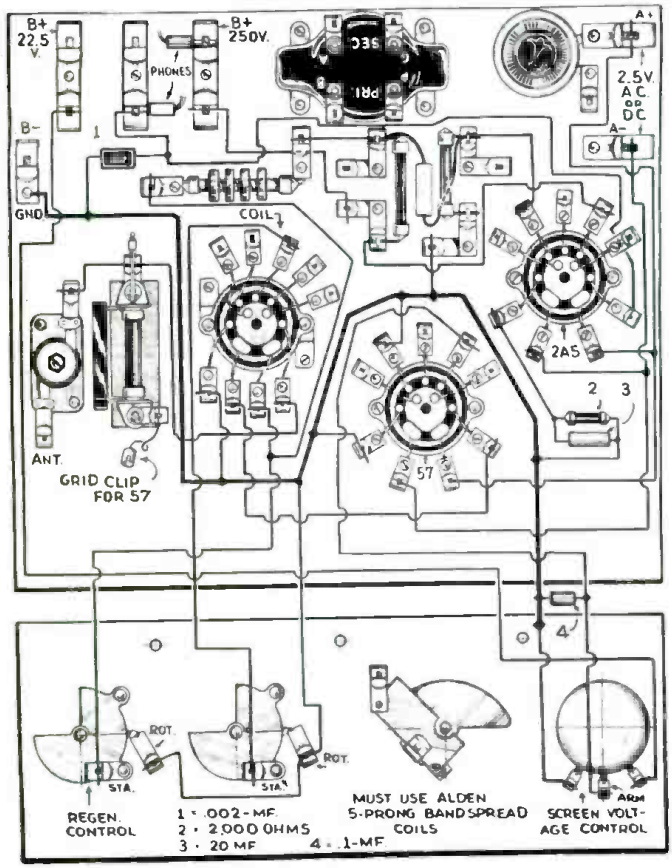
A 2-tube set using impedance-condenser-resistance coupling. This hook-up gives very good quality, thanks to the type of coupling employed.

a clockwise direction, the plate becomes No. 2, the grid No. 3, the cathode No. 4 and the right-hand heater No. 5. Now, to locate the grid connection for this tube on the composite socket (assuming that this tube has no cap on top) it is merely necessary to look for the designation "5-3" since it's a 5-prong tube and the grid connection is the third pin according to the R.C.A. tube chart number system. Of course, for 5-prong *screen-grid* tubes the No. 3 pin would be the screen grid, the control grid being on top.

This *Hook-Up Board* sure does allow speed. In order to satisfy ourselves on this point, we called in a short-wave fan and asked him to construct a simple two-tube regenerative circuit using type 30 tubes. Working casually, (for he did not know he was being timed) it was no more than thirty minutes before he had it completed, checked, hooked to batteries and



The 19 Twinplex, one of the most famous of our 1-tube sets. A set which has made thousands of friends among S-W Fans.



This hook-up will be found very efficient. It represents the Doerle "Band - Spread" set, and has been found excellent for short-wave reception.

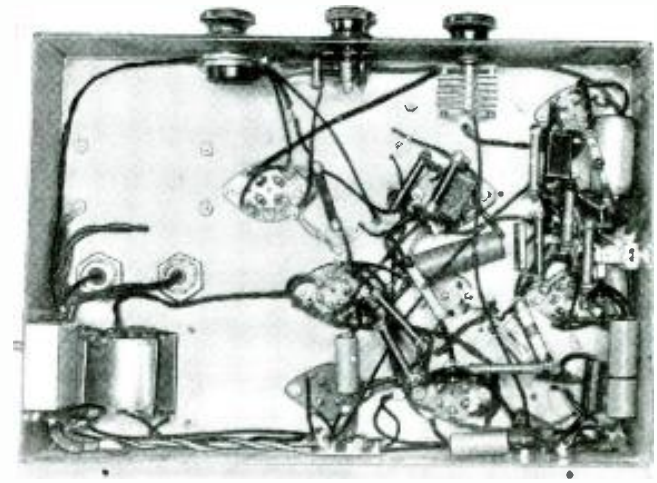
percolating beautifully. So you see, the Hook-Up Board is a decided asset and should be constructed by every radio experimenter.

LIST OF PARTS

2—140 mmf. variable condensers; C1, C2 (Hammarlund Star type).
1—35 mmf. variable condenser; C3 (Hammarlund).
1—35 mmf. variable mica dielectric condenser; C4 (ICA).
1—100 mmf. fixed mica condenser; C5 (Aerovox).
1—0.02 mf. fixed tubular condenser; C6 (Bud).
1—30,000 ohm potentiometer; R1 (Bud).
1—¼ to 20 megohm variable grid-leak; R2 (Aerovox).
1—holder for grid-leak (Aerovox).
2—¼ megohm, one watt resistors; R3, R4 (Lynch).
1—30 ohm rheostat; R5 (Electrad).
3—Na-Ald 4-5-6-prong composite sockets; S1, S2, S3 (Na-Ald).
1—3½ to 1 (or 5 to 1) audio transformer.
Approx. 30 small Fahnestock clips.
Approx. 20 medium Fahnestock clips.
Approx. 10 double Fahnestock clips.
1—wooden baseboard (½" thick). See blueprint.
1—aluminum front panel (⅛" thick). See blueprint.
2—3" tuning dials (Na-Ald).
2—bakelite knobs (Na-Ald).
Miscellaneous hardware, wire, etc.

5-Tube "Super" Does the Work of 8 Tubes

(Continued from page 207)



Bottom view of the 5-tubes = 8 receiver.

part of the job is very important and must be done very carefully. Many set builders are not equipped with test oscillators, so the method outlined is about the easiest way of aligning the I.F. stages.

The I.F. transformers have been peaked at the factory at 456 kc. the primary condenser of the first I.F. transformer should not be touched. Insert the 150-meter coils in their respective sockets and switch on the current. A signal from some station on the band will be heard. Start with the secondary condenser of the first I.F. transformer and tune for maximum volume. Now tune the primary and secondary condensers of the next two I.F. transformers in order, for maximum volume. After this is done, turn to some part of the band where there is no incoming signal. A frying sound will be heard. Up to this point the aligning has been done with the volume control set at maximum. Turn the volume control until the frying sound is almost inaudible and start all over again, tuning for maximum noise. This second adjustment is critical and should be done very carefully. An insulated tool is used to adjust the I.F. transformers and can be obtained at a nominal cost from any radio supply store. The set is now ready for operation. Foreign stations were received with excellent speaker volume and any short-wave fan should be highly pleased with the performance of this 5-tube superheterodyne.

LIST OF PARTS

2—Sets standard 4-prong plug-in coils. (Na-Ald (Hammarlund; Bud.)
1—2 gang 140 mmf. Tuning condenser, Hammarlund.
1—50 mmf. Variable Trimmer Condenser.
1—35 mmf. Variable Trimmer Condenser.
9—.1 mf. By-pass condensers.
1—.2 mf. By-pass condenser.
1—25 mf. 35-volt Cartridge Condenser, Aerovox.
4—100 mmf. Mica condensers, Aerovox.
2—.01 mf. condensers, Aerovox.
1—.006 mf. condenser, Aerovox.
1—Double 8 mfd. Electrolytic Condenser, Aerovox.
1—Single 8 mfd. Electrolytic Condenser, Aerovox.
1—75 ma. Filter Choke. Kenyon.
1—Kenyon Audio Plate Choke (300 to 500 henries).
3—456 kc. I.F., Transformers, Hammarlund.
1—10,000-ohm variable potentiometer with power switch, Electrad.
1—Power Transformer, Kenyon.
1—250-Ohm Resistor 1 Watt, I.R.C.
2—400-Ohm Resistors, 1 Watt, I.R.C.
1—1500-Ohm Resistor 1 Watt, I.R.C.
1—10,000-Ohm Resistor 1 Watt, I.R.C.
1—15,000-Ohm Resistor 1 Watt, I.R.C.
1—20,000-Ohm Resistor 2 Watts, I.R.C.
1—20,000-Ohm Resistor 1 Watt, I.R.C.
1—50,000-Ohm Resistor 1 Watt, I.R.C.
1—100,000-Ohm Resistor 1 Watt, I.R.C.
1—300,000-Ohm Resistor 1 Watt, I.R.C.
1—500,000-Ohm Resistor 1 Watt, I.R.C.
2—1-Megohm Resistor.
2—7-prong tube sockets, Na-Ald.
2—6-prong tube sockets, Na-Ald.
4—4-prong Tube sockets, Na-Ald.
1—Set of Five Tubes, (2A7, 2B7, 58, 2A5, 80) R.C.A. Radiotron.
1—8-inch Rola Dynamic Speaker with 1250-ohm field coil.
1—9¾ x 14½ Chassis, Blan.
1—Antenna Ground Strip, Na-Ald.
1—Phone jack, Na-Ald.
1—3½-inch Airplane-type Tuning Dial, Crowe.
4—Control knobs.
1—6 ft. electric cord and plug.
2—Dozen ½-inch bolts and nuts.

Barranquilla Station Now Sending Verification Cards

● SHORT-WAVE fans who have logged HJ1ABB, Barranquilla, Colombia, short-wave station which has been in contact with W2XAF, G. E. station, on various two-way programs, will be glad to know the South American station is now verifying reception of its programs. Letters should be addressed to Elias Pellet, in charge of HJ1ABB.

High-Lights on the "HRO" Receiver

(*Continued from page* 219)

Herman Kahn of the Leeds Radio Co., N.Y., makes a comparison of the new National HRO with the National SCR58 at the "Hotel New Yorker" station. The HRO is on the right.

genious design of the mechanism the dial can be spun around at a very rapid speed. By merely giving it a sharp twist it will continue to rotate by itself so that it is a very simple matter to tune from the one end of the range of the dial to the other.

This receiver has four high frequency tuned circuits, necessitating the use of four tuning condensers and four inductors or coils if you prefer. These four inductors are enclosed in a single unit which is inserted through the front panels. Inside of this housing are the complete set of coils, the necessary padding, and tracking condensers, in fact, everything associated with each tuning circuit, except the main tuning condensers.

They are designed so that they can be adjusted at the factory and never need be readjusted, allowing truly single control tuning minus the usual padding and trimming condensers commonly located on the panel of most present-day sets. On each plug-in indicator assembly are two charts, one showing the general coverage of the unit and another showing the curve of the amateur band. Each assembly is calibrated and by referring to the chart the set can be tuned to any particular frequency with an astonishing degree of accuracy. The interesting part of these plug-in inductors is that the same assembly is used for the amateur bands and for general short-wave coverage including the many broadcast bands in which numerous short-wave "foreign" stations can be received. By merely turning the adjustment in the back of the receiver, it is possible to switch from calibrated amateur band coverage to general coverage, without disturbing in any way the calibration of the receiver.

The meter shown in the upper left-hand corner of the receiver is known as the "S" meter. This records the signal strength according to the new R-S-T system used in the general amateur communication. By merely pushing a button located underneath the meter it is possible to read strength of an incoming signal at any time.

Before we become carried away too far by the excellent engineering design of this receiver, we had better say a few words regarding its operation and performance. When first operating this receiver, one gets the impression that the amateur bands are not at all crowded, at least nowhere near as much as one would ordinarily expect. However, a careful check showed that the band was just as crowded as ever, but the extreme selectivity permitted by the crystal and the ease with which stations are tuned in and separated from one another with the unusual vernier dial was responsible for our first impression.

Weak foreign stations could be pulled in with excellent volume and clarity even though they were only a kilocycle or so separated from a very powerful local station. From time to time we returned to a given station to find that it was in exactly the same position on the dial each time, showing that there was no back-lash in the dial mechanism and absolutely no instability or *creepage* whatsoever in any of the tuned circuits.

When the set is used in the nonspread adjustment *there is still 20 percent more band-spread than found in the National FB7A with band-spread coils!* And it is really a pleasure to tune in some of the foreign stations such as those located in Germany, Italy, and France, and many other countries, with excellent volume and tone quality.

We found this set not the least bit *fussy* in any respect and absolutely *simple* to operate. After a few minutes at the controls, even an inexperienced short-wave fan was able to tune in more foreign stations than he had ever heard on the air before!

$20.00 Prize Monthly for Best Set Using 1 or More Tubes

● THE Editors are looking for some "brand-new" Receiving Circuits USING BUT ONE TUBE. The tube must be a standard one and any type tube can be used. The new multi-element tubes provide Short-Wave "Fans" with almost limitless opportunities. Send along your set—or a circuit diagram and 200 word description for opinion as to acceptability.

The Editors offer a $20.00 monthly prize for the best short-wave receiver submitted. If your set does not receive the monthly prize the Editors will pay space rates for any articles accepted and published.

You had better write the "S-W Contest Editor," giving him a short description of the set and diagram, BEFORE SHIPPING THE ACTUAL SET, as it will save time and expense all around. A $20.00 prize will be paid each month for an article describing the best short-wave receiver, converter, or adapter. Set should not have more than five tubes and 1-tube sets featuring one of the new "twin-element" tubes are in great demand. Let's see "YOUR" idea of an Ultra-Modern 1-Tube Set!

Sets must be sent PREPAID and should be CAREFULLY PACKED in a WOODEN box!

The closing date for each contest is sixty days preceding date of issue (Aug. 1 for the October issue, etc.). In the event of a "tie" an equal prize will be paid to each contestant so tying.

The judges will be the Editors of SHORT WAVE CRAFT, and Clifford E. Denton, who will also serve on the examining board. Their findings will be final.

Address your entries to:

Editor,
SHORT WAVE CRAFT,
98 Park Place,
New York City.

When To Listen In
By M. Harvey Gernsback

All Schedules in Eastern Standard Time

HONGKONG

● THE new Hongkong station mentioned last month as ZBW is really ZEK. The long wave broadcast station at Hongkong is called ZBW and as ZEK relays this station the call ZBW is frequently heard from this station; ZEK is announced infrequently. This station is also authorized to operate on the following frequencies if it desires: 5410 kc. (55.45 met.); 6090 kc. (49.26 met.); 11740 kc. (25.55 met.); and 15190 kc. (19.75 met.). At present it continues to operate on 8750 kc. We have 2 different schedules of operation for this station. One says 6-9 a.m. daily and the other is 3-7 a.m. on Mon. and Thurs., 6-10 a.m. on Tues., Wed., and Fri., and 6-11 a.m. on Sat. and daily 11:30 p.m.-1:15 a.m.

JAPAN

As many of our readers have probably learned from newspaper dispatches Japan started to send out a daily "American Hour" on short waves on June 1. This program lasts about one hour (8:30 to 9:30 E.S.T.) and at the start was radiated on JVH, 14,600 kc. (20.55 met.). However severe code interference ruined reception so it is probably that a shift has been made to another wave by now. JVH has a power of 20 kw. and is one of the numerous JV stations at Nazaki, Japan. Frequencies of 10,660 and 7,510 kc. are also used, if transmission on the 14.6 m.c. band is unsatisfactory.

GERMANY

The German station continues on the same schedule as last month. On several afternoons in late May, DJB on 15,200 kc. was heard relaying the regular African zone broadcast. DJB was using its North America beam antenna and the announcer said "Hello Africa and North America." He especially requested reports from listeners in North America. It may be that by July this station will operate regularly at this hour (12 noon-4:30 p.m.). Signal strength on these tests about R8.

CARACAS

YV2RC at Caracas on 6112 kc. has now increased its power to 1 kw. and is being heard much better. It is now sending special programs in English to various short-wave clubs in this country. This station now sends out a regular "veri."

HAITI

The station at Port Au Prince, Haiti, in the West Indies can operate in either the 25, 31, or 49 meter broadcast bands and has been heard testing at different times in all three. It has three calls, one for each band—HH2R, HH2S, and HH2T.

DAVENTRY

Daventry is planning to rebuild its 2 present transmitters into one transmitter with double the present power and to construct 2 additional transmitters with about double the power of the present units. When completed there will be 3 high-powered transmitters operating simultaneously. The width of the beam sent out by the directional antennas at Daventry is now about 68 degrees. The new transmitters will utilize new aerials transmitting a directional beam with a width of 40 degrees. Thus a much more intense signal will be concentrated on a smaller area. When the new plant is completed (it will probably take a year or so) the reception from this already excellent station should be greatly improved. At present Daventry has borrowed a third transmitter and is experimentally transmitting on 3 waves simultaneously during part one of transmission four. At present the following arrangements are in effect with the English station. Trans. 1: On GSB and GSD from 11:30 p.m.-1:30 a.m. (till July 27) 12:15-2:15 a.m. after July 27. Tran. 2: On GSG and GSH 6-7:30 a.m., and on GSG and GSF from 7:30-8:45 a.m. (on Sundays this program starts at 6:30 a.m.) Trans. 3: On GSG and GSF from 9-10:45 a.m., and on GSF and GSE from 10:45 a.m.-12 noon.

Trans. 4 (Part I): On GSB and GSD from 12:15 till about 3:45 p.m. GSI (15,260 kc.) is used experimentally as the third wave from 12:15-2:15 p.m., and GSL (6,110 kc.) from 2:30 p.m. till the end of Part I of this transmission.

Part II on GSF and GSB from about 4 p.m. till 5:45 p.m. (Sundays till 4:40 p.m.). Transmission 5 on GSC and GSD from 6-8 p.m. GSF may replace one of these. Transmission 6 is now on a daily basis: GSC and GSD from 10-11 p.m., *daily*.

JAVA

The new 10 kw. short-wave broadcaster in Java is located at Tandjongpriok. It can operate on 3 different waves; 3040 kc. (98.68 met.), 6040 kc. (49.67 met.), and 6120 kc. (49.2 met.) (same as YDA at Bandoeng). 3040 kc. used so far and 49 meter band shortly. Operated by N.I.R.O.M.

GENEVA

The League of Nations' station in Switzerland is now sending a regular program to Asia each Monday from 3:15-3:30 a.m. on 18,150 kc. (16.26 met.). Call HBO.

RCA Institutes Announce 2 New Courses

● THE *School of Communication Engineering* of *RCA Institutes* announces the addition of two courses in communications subjects to the Evening School curriculum.

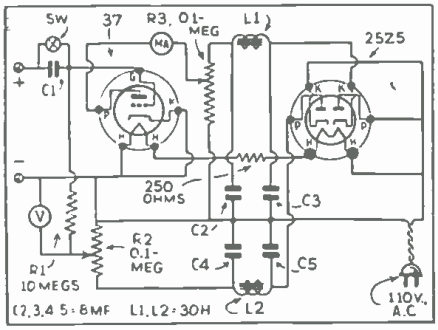
The courses, two in number, each have 60 hours of lecture and 48 hours of laboratory work. The first, Vacuum Tubes, is devoted to the subject which its name implies and covers applications of the vacuum tube as an amplifier, detector, and oscillator.

Circuit Elements is the title of the second of the courses. This unit is a study of the behavior of inductance, capacitance, and resistance, individually and in various combinations at the frequencies commonly encountered in communications work.

While both of these courses have been taught for the last three terms in the Day School, they are being offered for the first time in the Evening School beginning with the 1935 Fall Term.

Vacuum Tube Voltmeter and Power Supply

By L. H. Stantz



Simple Hook-Up of V.T. Voltmeter

● FROM the number of V.T. voltmeters that have appeared in radio periodicals during the last ten years, one would gather that they were a much-used instrument and from the complicated design of some you would imagine its purpose was to measure the intensity of a static wave from Mars after it had bounced off the Heaviside layer three and a half times!

I have used numerous V.T. voltmeters and have seen many more. I have taken the good points of them and added a few kinks of my own to make a good instrument. The accuracy of the instrument has in nowise been adversely effected by the fact that it is A.C.-operated, has only two variables, reads voltages directly, is uneffected by tube variations, needs, no calibration, and is easy and cheap to build.

The diagram is self-explanatory to the initiated experimenter and service-man, but an explanation would not be amiss as anyone can build it who can join a wire to a socket and anyone can operate it who can turn a knob and read a meter.

As will be seen from the diagram the 25Z5 acts as two separate rectifiers in series that is, the negative leg of the plate supply and the positive leg of the bias supply are common. Each circuit is independent of the other so the bias in nowise depends upon the current through the tube. As R3 is across the B supply, the potential on the plate of the 37 may be very accurately adjusted so the tube will draw any desired amount of current (with no bias). R2 is across the C supply so the bias on the 37 may be carefully adjusted to any voltage within the limits of the rectifier.

C2, L1, C3 and C4, L2, C5, are voltage supply filters for the B and C voltages respectively.

The filaments of the tubes are lighted directly from the A.C. line by putting a 250-ohm resistor in series with them.

Before putting the instrument into operation, insert the voltmeter in the circuit and put R2 and R3 to the cathode ends. Now turn on the A.C. After the filaments are thoroughly heated, adjust R3 so that the 37 draws an easily read amount of current. Note this reading very carefully. Now set R2 to the opposite end thus applying full bias on the 37 and apply to the input posts, the voltage to be measured. Leave SW. open for A.C. measurements and closed for D.C. measurements.

Now move R2 back till the tube draws the aforementioned amount of current. The reading on the voltmeter will be the same as the voltage applied at the input. An accuracy of ± 1 percent is easily attained for A.C. measurements. The error is somewhat greater on D.C. circuits where a high resistance is shunted by the V.T. voltmeter. At that the error would only be 3 percent when measuring the voltage across the 300,000-ohm resistance. If high accuracy is desired the voltmeter and milliammeter must have scales that can be accurately read.

As a word of warning, operating instructions should be carefully followed, otherwise, slight complications may be experienced such as a blocking of the 37 grid circuit or a burned-out meter.

This may sound like a more or less complicated process but it is by far the simplest device of its kind I have ever used. Once the filaments are heated I can measure any voltage from 1 to 100 volts, A.C. or D.C., in 15 seconds and you can do the same before you use it half a dozen times.

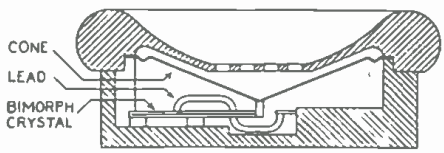
I am sure that anyone that builds this instrument will be more than pleased with its simplicity and accuracy.

Piezo-Electric Phones

● THE new Piezo-Electric headphones have created quite a sensation and we are pleased to print this sectional drawing showing the actual construction of one of these remarkable earphones. The case and cap is similar to the usual arrangement, however, it is the inside *works* of the Brush type A, piezo-electric headphones that are the most interesting.

The drawing clearly shows that the bimorph crystal is used to drive a small cone which measures approximately 1½ inches in diameter. The crystal driving unit consists of Rochelle salt plates ⅝ of an inch square and .010 of an inch thick. The use of this type of driving unit or motor together with the proper construction of the small cone makes it possible to produce an earphone which has a very favorable response from 60 to 10,000 cycles.

These phones represent a very high impedance so far as earphones usually are concerned and makes it possible to operate them directly from some of the commonly used screen-grid tubes. At 1,000 cycles these phones have an impedance of 50,000 ohms. In order to operate the new piezo-electric earphones in conjunction with the regular vacuum tube it is necessary to have a simple output network consisting of either an inductance or a resistor and fixed condensers. Suitable circuits were shown in the July issue on page 153.



Sectional View of piezo-electric phone. (No. 296)

DON'T FORGET!

Another "Clipset" Article in the next issue!

ELECTRIFYING the "CLIPSET!"

You Can Join in Round-The-World Research

By Ralph Stranger

● THE world at large knows very little of what is going on in hundreds of laboratories throughout the world, and it knows still less of the many problems that are worrying the modern scientists, problems that are as complex as their solutions are elusive. Scientists, for instance, are trying to solve problems that involve the exploration of the upper reaches of our atmosphere; problems in connection with the propagation of wireless waves. They have been probing the stratosphere and the ionosphere from the ground by sending up wireless waves and catching them on their return. And they have discovered many things that were suspected but never proved.

Thus they discovered that the sun's radiations change the electrical properties of the atoms that are to be found high above the earth's surface, and that ultra-violet rays and electrified particles ejected by the sun are causing what is known as ionization or electrification of these atoms, with the result that there are vast layers of free electrons which are constantly moving to and fro, layers which with their constantly changing configuration and thickness form spherical shells around our planet.

Of such layers two are known. One of them which is to be found at an average height of sixty-five miles above the earth's surface is called the *Kennelly-Heaviside layer* and is held responsible for sending back to earth long and medium wireless waves that have been sent upwards. In other words, the Kennelly-Heaviside layer reflects long and medium waves.

The second layer is called the *Appleton layer*, named after its discovered Professor E. V. Appleton, F.R.S., of King's College, London. The average height of this ionized layer is about 150 miles above the surface of the earth.

It has been found that the Appleton layer is responsible for reflection of short waves, *i.e.*, waves below 100 metres.

This explains, then, the reasons why wireless waves which have been projected upwards have returned back to earth and have been detected at considerable distances, especially in the case of short waves.

In view of the existence of these electrified layers it looks as if the hopes of many optimistic people who were expecting one day to receive messages from Mars (providing that there are living beings on Mars, and also provided that if they exist their mental processes are of the same order as our own so that we could exchange intelligent signals), are dashed to the ground.

But, still, they need not despair as yet, because no one has yet found that wireless waves of the order of ten metres and less *are* reflected by either of the layers. So it looks as if some of the waves can go through and escape into the interplanetary space.

After all, wireless waves are electromagnetic waves of the same nature as light waves. The latter reach us from the sun without hindrance provided our skies are not overclouded. The light waves have a very small wavelength. It is not improbable, therefore, that the smaller wireless wavelength may be able to penetrate the ionized layers which blanket space from the longer wavelengths.

And there is another thing which, although still a great mystery, supports to some extent the assumption that under certain circumstances wireless waves may penetrate both the Kennelly-Heaviside and the Appleton layers.

A Norwegian engineer, Jorgan Hals, discovered that some short wave signals produced *echoes*. In other words, the same signal is heard again after some delay. He communicated his discovery to Professor Carl Stormer of the Oslo University, who immediately inaugurated a series of special tests in order to check up on Hals.

Cabinet for "Browning 35"

● HERE is a beautiful dark walnut cabinet for your "Browning 35" receiver. The accompanying photo clearly shows the modern design and relative size of the cabinet. The opening in front is just the right size for the Browning receiver, which can be mounted into it with a minimum of effort. Besides being a beautiful piece of furniture this cabinet serves also as a convenient mounting place for the dynamic speaker, supplied with it, which otherwise would have to be housed in a separate cabinet. It is finished in dark walnut with the face edges of the base and top in black walnut, creating a very effective contrast that is further enhanced by the rounded corners and modern grille work.

Neat appearing cabinet designed by Wright-DeCoster engineers. (No. 297.)

FEDERATED SHORT-WAVE ENGINEERS

● A group of Texarkana short-wave "Fans" have organized the *Federated Short-Wave Engineers*, an organization to which any person of any age and owning any type of radio equipment is eligible. I have been reading *Short Wave Craft* since about 1932 and I think it is a grand magazine.—James F. Halsey, Pres. Federated Short-Wave Engineers, 923 East 5th St., Texarkana, Ark.

He also heard echoes and soon Professor Stormer in Norway, Dr. Van der Pol in Holland and Professor Appleton in London were investigating this highly fascinating problem. Very soon the tests gave what is considered as indisputable evidence of the existence of echoes.

Further tests carried out in different parts of the world established the fact that some of the echoes are subject to long delay (in one case the time interval between the original signal and the echo proved to be as long as forty seconds!), and for this reason they were called *echoes of long delay*.

Those of my readers who are familiar with reception on short waves have no doubt heard signals that repeat themselves practically immediately on the original signals. This repetition is due to what is known as *round-the-world* echoes.

As a matter of fact, these are not true echoes, but are due to the fact that the transmitting aerial radiates simultaneously in two directions, so that the receiving aerial gets a direct wave from one direction and an identical wave from the opposite direction which started at the transmitting aerial and traveled all round the world and arrived from the opposite side.

The circumference of the earth is roughly 24,000 miles. Wireless waves, in common with all electromagnetic waves are traveling with the speed of light which is approximately 186,000 miles per second. Thus a wireless wave will take a trifle over one-seventh of a second to go right round the earth. For this reason round-the-world echoes have a time interval of about this order.

In the case of echoes of long delay, let us say of three seconds' time interval—the echo occurring three seconds after the occurrence of the original signal—three seconds mean that the wave has traveled 558,000 miles. This distance covers the up and the return journey, so that the wave was apparently sent back at a point in space situated at half that distance, *i.e.*, 279,000 miles away from the surface of the earth.

What does this mean?

Does it mean that the wave penetrated the two ionized layers and escaped into the interplanetary space (sounds far-fetched, but I have no better name for space at such distances), only to meet some other electrified obstacle and so made to return?

Or does it mean that the wave has reached one of the layers and for some reason or other was made to travel inside the layer and so delayed? If it did go out 279,000 miles into space, what is there to turn it back?

Mystery of the Waves

The mean distance of the moon from earth is 239,000 miles. If the moon were the guilty celestial body what delay would it cause? The total distance traveled by the wave to reach the moon and to come back would be 478,000 miles. This means a delay of about 2.5 seconds.

I gave the above distance as the mean distance; the moon is sometimes nearer and sometimes farther away from earth, so that it may be that it acts as some sort of reflector of wireless waves.

What of the forty seconds' delay? This means a journey of 7,440,000 miles, with the reflecting medium being situated at half that distance, *i.e.*, 3,720,000 miles.

What can there be in space, at that distance, that would reflect wireless waves?

I think you will agree with me that the problem is highly fascinating. It fascinated me all right! I studied every bit of evidence I could lay my hands on, and during these studies I realized one thing.

Up to that time some half a dozen laboratories were working on the problem and all they could do was to study the phenomenon in their immediate neighborhood.

I then and there imagined thousands of listening posts established all over the world, thousands of listeners tracking echoes from either a given station or a number of stations, with the laboratories checking up on the work of this mass listening community. I had a talk with various people and heard a lot of what could not be done.

It is remarkable how people know a great deal of what cannot be done, and very little of what can be done. The cold showers, of course, made me the more enthusiastic, so I went and saw some more people. And then I had the privilege of meeting Professor Appleton, who is one of those rare people who know a lot about what can be done and nothing at all about what cannot be done.

Professor Appleton took an interest in this idea of mine and promised to help. So did Professor Stormer and Dr. Van der Pol.

World-Wide Study

My greatest trouble was, of course, finance. If I were to form a society of some sort for research purposes how was I to keep in touch with the members? The correspondence and the stamps alone would have ruined my slender resources.

And then, at the psychological moment, I mentioned the idea to the Editor of *World Radio*. At the end of the interview *World Radio* became the official organ of the League yet to be formed.

I made an appeal to the listening millions. The response was immediate and voluminous. Hundreds rallied round me during the first week. By the end of the month there were thousands with a large percentage of university-trained people.

Applications for membership in the *World Radio Research League* started to come in from abroad and from the dominions. National leagues with their own official organs were springing up all over the world.

American short-wave experimenters came in *en masse*. The Radio Society of Great Britain, The Wireless League and many local radio societies joined in the game. We are now thousands strong and have over seventy-three countries taking part in the research. The number of men having the B.Sc. or equivalent degree alone runs into some forty thousand all over the world.

If you are interested, write to me, c/o Editor of SHORT WAVE CRAFT, and I shall be pleased to send you all the necessary particulars.

Radio Waves Guide Planes Across Ocean

Development of an ocean spanning *radio direction finder*, radically different in principle from accepted radio theory, was recently disclosed by Pan American Airways.

The company applied some time ago to the Federal Radio Commission for licensing of communications stations for its proposed air transport service between California and China. The new finders use *short* instead of long wave transmission and are effective up to 1,800 miles, airline officials said.

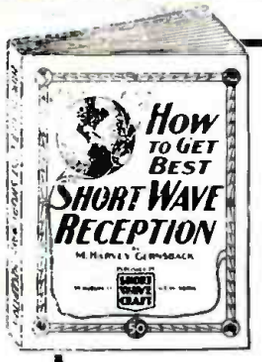
An outgrowth of the radio apparatus which Colonel and Mrs. Charles A. Lindbergh used on their survey flight two years ago, the finding apparatus has been brought to its present stage by extended field work.

Using long waves, 1,200 to 1,500 meters, polarization effects at sunrise, sunset and during the hours of darkness have made ordinary loop or radio compass direction finders subject to serious errors during these periods and limited their consistent range to thirty miles. The new apparatus, however, has made a number of successful records in directing aircraft at night on frequencies as high as 6,000 kilocycles or 50 meter wave length. By overlapping the range of two stations a range of 3,600 miles, or a distance equivalent to that between New York and London, can be attained.

Seven new radio stations, complete from individual power plants to aerial towers and combining both direction finding and communications equipment, are in prospect or erected. The application submitted to the Federal Radio Commission was to cover ground control stations in California, Hawaii, Wake Island, Midway Island and the Philippines.

Here are the Six BEST SHORT-WAVE RADIO BOOKS!

Without doubt you will have to go along 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 two copies today . . . find out for yourself if they are not educational. 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?

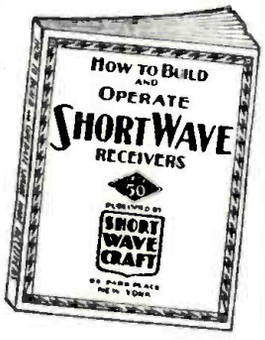
The reason is intimate knowledge of short waves and how they behave. Here are the chapters of this new book:

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**

HOW TO BUILD AND OPERATE SHORT-WAVE RECEIVERS



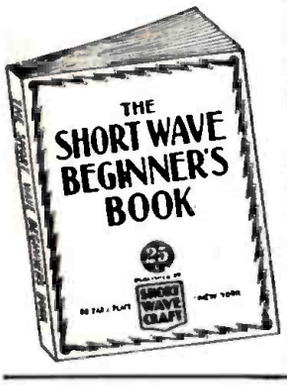
THIS is the best and most up-to-date book on the subject. It is edited and prepared by the editors of "SHORT WAVE CRAFT," and contains a wealth of material on the building and operation of all types of typical short-wave receivers, put short-wave converters. Dozens of short-wave sets are found in this 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.

We know that if you are at all interested in short waves you will not wish to do without this book. It is a most important and timely radio publication.

150 Illustrations, 72 Pages. Stiff, flexible covers **50c**

THE SHORT-WAVE BEGINNER'S BOOK



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

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.

Audio Amplifiers for S-W Receivers.

Learning the Code—for greater enjoyment with the S-W set.

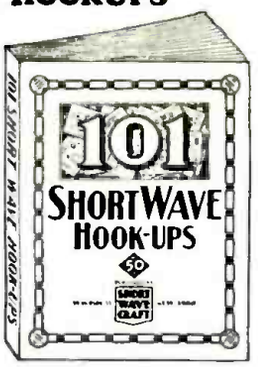
Wave length to Kilocycle Chart.

Wire Chart—to assist in the construction of coils.

25c **75 Illustrations, 40 Pages. Stiff, flexible covers**

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, Dinamore, the "19" Twinplex, Ocilledyne, Denton "Stand-by," Megatyne Triplex 2, "Globe-Trotter," 2-Tube Superhet, Almatyne, "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-Ocilledyne" 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 BECOME AN AMATEUR RADIO OPERATOR

50c **150 Illustrations, 72 Pages, Stiff, flexible covers**

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.

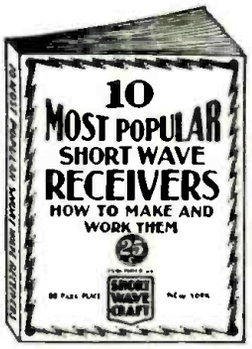
If you intend to become a licensed code operator, if you wish to take up phone work eventually—this is the book you must get.

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 chatter 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 analyzed. 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.

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 Binaweg 2-Tube 12,000 Mile DX Receiver, by A. Binaweg, 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 Dentron "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 TENTODE-4, by H. G. Cisin, M. E.
Louis Martin's Idea of A GOOD S-W RECEIVER, by Louis Martin.

75 Illustrations, 40 Pages, Stiff, flexible covers **25c**

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AN AMAZING NEW RECEIVER

NATIONAL

HRO

Communications Type RECEIVER

The new National HRO Receiver is a high performance professional receiver, not a broadcast receiver with short wave ranges added. Although it offers complete frequency coverage including the regular broadcast band, it is primarily a short wave receiver, designed to provide consistent communication under adverse conditions. It is backed by the experience of a concern that has for years built high performance receivers for government and professional use.

NET PRICE
$167.70
with tubes, less speaker and power supply.

Above: The HRO with steel cabinet and shield removed.

PRECISION-BUILT

The HRO is built for fine performance, not low price. The precision worm drive condenser and micrometer dial alone carry a price of $24.50, ten times the cost of ordinary equipment. With such parts, bargain prices are impossible. It is built for the man who wants the best. Illustrated above is a cut-away view of the drive mechanism of the condenser. Note the ball-bearing thrust, the carefully machined worm and accurately-hobbed, preloaded worm gears. Only such construction can give the precise control necessary with a receiver that has a maximum selectivity of a few hundred cycles (not kilocycles!) The remarkable micrometer dial reads DIRECT to one part in five hundred, which permits permanent, accurate logging of all stations.

OUTSTANDING FEATURES:

- Nine Tubes, not including rectifier.
- Two Preselector Stages.
- Single Signal (Crystal Filter) standard equipment, providing enormous selectivity when conditions require it.
- Ganged Plug-in Coils, with each coil individually shielded.
- Strictly single-control Tuning.
- Calibration for each range mounted on coil.
- Four gang Precision Condenser, with preloaded worm-drive tuning, 20-1 ratio.
- Micrometer Dial, spreading tuning over 500 division, number every 10 division, direct reading.
- Automatic or Manual Volume Control.
- Vacuum Tube Voltmeter with Instrument calibrated in R scale of carrier intensity.
- Electron Coupled, air padded oscillators.
- Two I.F. stages with Litz-wound coils, air condenser tuned.
- Beat Frequency Oscillator for "Offset" C.W. Tuning.
- Phone Jack on Panel.
- 2½ Volt AC and 6 volt AC or Battery models.
- Relay Rack Mounting available.

PLUG-IN COIL FOR HIGH [illegible]

The HRO employs plug-in coils rather than coil switching, for only by having [illegible] free from unuse coils and trimmers can such performance be realized. The four coils in each set—two stages of preselection, detector and oscillator—are ganged together for swift, easy handling and plug-in as a unit. A switching device on each coil permits change from general coverage ranges to band spread ranges which expand the amateur bands over the entire dial. Individually calibrated curves are mounted on the front of each coil. The illustration below shows a complete coil assembly, together with a coil assembly removed from its case. Note the air-dielectric trimming condensers that are used throughout the H.F. and I.F. stages and the insulation of genuine low-loss R-39. Coils for continuous frequency coverage from 4 to 30 megacycles, plus calibrated band spread on the 10, 20, 40 and 80 meter bands is included with the receiver. Two extra coils to extend the range down to 500 kc. are supplied at extra cost.

SEND COUPON FOR DESCRIPTIVE BOOKLET

RELAY-RACK MOUNTING

The HRO is also available for professional use with a standard relay rack, as illustrated in the left.

NATIONAL CO., MALDEN, MASS.

Gentlemen: Please send me immediately your bulletin describing the HRO Receiver, and your General Catalogue No. 240. I enclose 6c to cover mailing costs.

NAME .....

ADDRESS .....

SWC-8-35

SAVE UP TO 50% by BUYING YOUR RADIO Direct from MIDWEST LABORATORIES

Exciting World-Wide Entertainment...Full-Scope High Fidelity...Guaranteed

with Amazing New MIDWEST SUPER Deluxe 16-TUBE ALL-WAVE Radio!

(ALL FIVE WAVE BANDS)

ONLY RADIO COVERING 9 TO 2,400 METERS.
12,000 MILE TUNING RANGE

WORLD'S GREATEST RADIO VALUE

$57.50 with New Deluxe Auditorium-Type SPEAKER (LESS TUBES)

Only Midwest Gives You Multi-Function Dial

The Dial was designed in keeping with the trend of the times, yet is not an airplane dial but a many-purpose dial that performs many functions. Now, Midwest guarantees that inexperienced persons can secure good foreign reception. Send for FREE miniature of actual rotating dial which clearly shows these outstanding advantages:

1. Dial calibrated in Kilocycles, Megacycles and Meters;
2. Call letters of American Broadcast Stations printed on dial and illuminated;
3. Slow Vernier, Smooth-Acting Tuning;
4. Short Wave Group Locator;
5. Electrified Tuning Guide Lights;
6. Simplified Tone Control, Band Indicator;
7. Automatic Pointer Indicator;
8. Silent Station Tuning;
9. Provision for Micrometer Tuning;
10. Centralized Tuning.

Acousti-Tone V Spread Design

This sketch shows the V-Tone Dispersing Vanes that were developed by Midwest engineers as a result of a study of the directional effect of the Full Scope High Fidelity speakers, used by Midwest. These Vanes spread the beautiful lace-work of the "highs" throughout the entire room in a scientific manner . . . directing the High Fidelity waves uniformly to the ear. Send for FREE 40-page catalog. It pictures the complete Midwest line of beautiful 1936 Acousti-Tone V-Spread consoles . . . and chassis . . . in four colors.

V-FRONT

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TERMS as low as $5.00 DOWN

BEFORE you buy any radio write for the new FREE catalog and see for yourself the many reasons why 110,000 satisfied customers bought their radios direct from the Midwest Laboratories and saved from ⅓ to ½. Why pay more than the direct-to-you laboratory price?

You, too, can make a positive saving of from 30% to 50% by buying this more economical way. Learn why Midwest outperforms sets costing up to $200.00 and more. Never before so much radio for so little money! Midwest gives you triple protection with: **One-Year Guarantee, Foreign Reception Guarantee, Money-Back Guarantee.**

50 ADVANCED 1935 FEATURES

Many exclusive features include: Micro-Tenuator . . . Fidel-A-Stat . . . Separate Audio Generator . . . Ceramic Coil Forms, etc. Only Midwest covers a tuning range of 9 to 2400 meters (33 Megacycles to 125 KC)—enabling you to easily and successfully tune in even low-powered foreign stations up to 12,000 miles away with crystal-clear, loud-speaker reception.

All 5 Wave Bands enable you to enjoy today's finest High Fidelity American programs. In addition, you get Canadian, police, amateur, commercial airplane and ship broadcasts and derive new delight and new excitement from unequalled world-wide broadcasts . . . England, France, Germany, Spain, Italy, Russia, Australia, etc. Send today for money-saving facts!

SENSATIONAL HIGH FIDELITY RECEPTION

This bigger, better, more powerful, clearer-toned, super selective, 16-tube radio gives you absolute realism—assures you of life-like, crystal-clear tone—unlike anything you have ever experienced before. You will hear one more octave—overtones—that cannot be brought in with ordinary radios. Now, hear every instrument, every voice, every shade and inflection of speech.

Take advantage of the amazing 30-day FREE trial offer. Send for FREE catalog.

DELIGHTED WITH SUPER PERFORMANCE

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