THE RADIO EXPERIMENTER'S MAGAZINE

SHORT WAVE CRAFT

August

WORLD'S LARGEST SHORT WAVE CIRCULATION

HUGO GERNSBACK
Editor

THE "Mono-Coil 2" Eliminates Plug-in Coils

See Page 204

If it's a POWERTONE Receiver

You are assured the BEST Short Wave Reception

Universal A.C.-D.C.
ALL-WAVE *Portable* RECEIVER

THE MOST timely short wave receiver for the summer months. Specifically designed for the short wave fans who like to hike or vacation away from home. The Portable will operate anywhere 110 volts A.C. or D.C. current is available. The circuit is one of the most recent types developed. Uses 1—'78, 1—'43 power pentode amplifier tube and 1—25Z5 rectifier tube. It will operate a dynamic speaker, yet a pair of headphones is suggested to pick up the foreign stations clearly. Four BRUNO plug-in coils are furnished which tune the entire wave bands from 15 to 200 meters—covering police signals, ship-to-shore signals, airplanes, amateurs, C.W. and foreign stations. Extremely light in weight—13 lbs. The carrying case is 13 in. long, 9¼ in. wide and 6½ in. deep, with ample space to carry tubes, tube shield and coils. Waterproof fabricoid outside covering.

Complete kit (with 4 BRUNO coils, 15 to 200 meters)... **$9.95**

Wired and tested, extra	$2.00
Kit of R.C.A. licensed tubes	3.25
BRUNO broadcast coil (200-550 meters)	.79
Special set of headphones	.95

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HAS built-in dynamic speaker. Tunes stations from every corner of the globe. Tubes: 2—'58's, 1—'80 and 1—2A5 power pentode output. Special modernistic cabinet of unusual beauty.

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Bruno broadcast coil (200-550 meters)	.79

N ADAM'S *Superheterodyne* S.W. CONVERTER

Tunes Down to 15 Meters

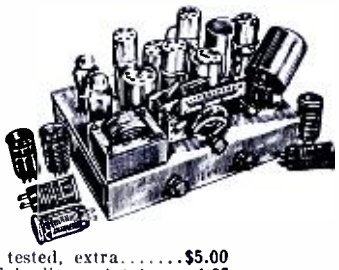
MAKES your receiver a superhet. No plug-in coils. Special BRUNO coil assembly tunes down as low as 10 meters. Full tuning scale on each band. Housed in handsome, crystal-finished cabinet. Hinged top. Tubes: 1—'56, 2—58s and 1—'80.

Kit of parts .. **$17.95**

Wired & tested	$5.00
Kit of R.C.A. licensed tubes	2.75

6 TUBE *Superheterodyne* RECEIVER

15 to 550 Meters



NEW distinctive features: Improved superhet circuit; latest type tubes: 1—2A7, 2—'58s, 1—'55, 1—2A5 and 1—'80; A.V.C.; single dial; low noise level; no background noise and complete tuning of both short and long wave bands.

Complete kit, with 8 BRUNO coils and Dynamic Speaker.. **$24.50**

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Set of 2 Broadcast coils (200-550)	1.50

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TUNES broadcast receiver down to 15 meters. Two latest type tubes: 1—6A7 electron-coupled, pentagrid converter and a 25Z5 voltage doubler heater tube. Walnut finished cabinet.

Complete kit of parts **$4.95**

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Kit of R.C.A. licensed tubes	2.25
Cabinet	1.00

TUNE STATIONS FROM ALL PARTS OF THE WORLD!

W

3 TUBE *Universal A.C.-D.C,* S.W. RECEIVER

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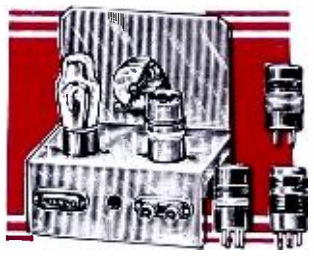
Kit of R.C.A. licensed tubes	3.25
Broadcast coil (200-550)	.79

E

Scout *Battery-Operated* S.W. RECEIVER



BOYS of Scout age throughout the country are becoming interested in short wave reception, either in their homes or at their meeting places. This simple circuit will give them a splendid course in radio construction and operation.

Kit of parts, with 4 Bruno coils... **$3.95**

Wired and tested, extra	$ .55
R.C.A. licensed '30 tube	.55
Broadcast coil (200-550)	.39
Special set of headphones	.95

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Wired and tested, extra	$1.00
Set of R.C.A. licensed tubes	1.95
Broadcast coil (200-550)	.39

S

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THE set chassis and batteries are all contained in a beautiful, leatherette carrying case. Two 230 tubes incorporated because of their low current drain.

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IN THIS ISSUE: PROMINENT SHORT-WAVE AUTHORS

Denton . Mitchell . Shuart . Barnett . Cisin . Victor

SHORT WAVE CRAFT

HUGO GERNSBACK
Editor

H. WINFIELD SECOR
Managing Editor

Contents for August, 1934

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A 3-Meter Short-Wave Transmitter and Receiver, by Dr. W. Moller.

A Portable Transmitter—Crystal-Controlled MOPA, by George W. Shuart, W2AMN.

A T. R. F. 4 Tube, Self-Powered "Mono-Coil" Receiver.

A High-Quality Audio Amplifier and Power Supply, by Eugene V. Cyran.

A Dandy 4-Tuber You Will Like.

A 5-Tube S.W. Receiver With New Features.

Certified Circuits

● SHORT WAVE CRAFT goes to a large expense in verifying new circuits published in this magazine. Whenever you see the seal shown here in connection with any of the sets published in this and future issues of SHORT WAVE CRAFT, this will be your guarantee that this set has been tested in our laboratories, as well as privately, in different parts of the country to make sure that the circuit and selected parts are right. Only "Constructional-Experimental" circuits are certified by us.

When you see our certificate seal on any set described you need not hesitate in spending money for parts, because you are assured in advance that the set and circuit are bona fide and that this magazine stands behind it.

SHORT WAVE CRAFT is the only magazine that thus certifies circuits and sets.

OUR COVER

● THE front cover painting shows the very latest in short-wave receiver designs—the "Mono-Coil 2." It eliminates "plug-in" coils by means of a simple switch—and most important of all, it does this with high efficiency and without dead-end losses. For full details see page 204

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say these Short Wave fans—

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Gentlemen:—

Your "Official Short Wave Manual" just received. It is the classiest book I have seen for a long time, a fine binding, very good paper, good readable printing and diagrams. Who could ask for more?

It was well worth waiting for.

Many thanks.

(s) H. H. PEEBLES,
6512 Carnegie Avenue,
Cleveland, Ohio.

"WOULDN'T TAKE $10.00 FOR IT"

Gentlemen:—

I received my copy of the OFFICIAL SHORT WAVE RADIO MANUAL (and autographed too) this morning. I have just finished looking it over, and say, **I wouldn't take a ten-spot for it.** Everything a ham could want between the two covers. I certainly am satisfied with my copy and know everyone else who gets one will be satisfied and proud too.

I am sure that this is the finest and most up-to-date book out, and consequently would like all of it.

Verly truly yours,
(s)LOUIS SCHMADELBECK
Beaver Dam, Wis.

"WORTH MORE THAN YOU ASK FOR IT"

Dear Mr. Gernsback:

I am in receipt of the 1934 OFFICIAL SHORT-WAVE RADIO MANUAL, and wish to state after looking it over I think it is one of the finest Manuals I ever saw published on Short Waves, and I certainly wish to congratulate you on your effort of compiling such a fine Manual. It is sure filled full of good Radio Material, and I am proud of my Manual.

It is worth quite a bit more than what you ask for it.

FERREL THOMAS,
1328 Locust Street,
St. Louis, Mo.

"GLAD TO OWN ONE"

Gentlemen:—

I received my "SHORT WAVE RADIO MANUAL" and it is a real joy to read and study the book. I waited long for it, but it was worth waiting for.

I am introducing it around to all of my friends, and I am glad to own one of these books.

Yours respectfully,
(s) VINCENT KRAJNAK,
100 West 119th Street,
New York City.

WORLD'S GREATEST SHORT WAVE BOOK!

We are proud to present the first modern and complete book on Short Waves which has appeared in the field.

There has been a big boom in short waves during the past two years in spite of the depression. Tremendous progress has been made, but up to now there has not been an adequate book depicting all the progress that has been made. The 1934 OFFICIAL SHORT WAVE RADIO MANUAL now fills this need completely.

It is a big book in which you will find **everything** on short waves, regardless of what it might be. It is not only a complete manual, but a veritable encyclopedia of facts, information, hookups and illustrations. Lack of space does not permit a complete description of this comprehensive volume.

The Manual has been edited by Hugo Gernsback, Editor of SHORT WAVE CRAFT, and H. W. Secor, Managing Editor. If you are a reader of Mr. Gernsback's other publications, you know just about what to expect from this book—**his greatest effort in the short-wave field.**

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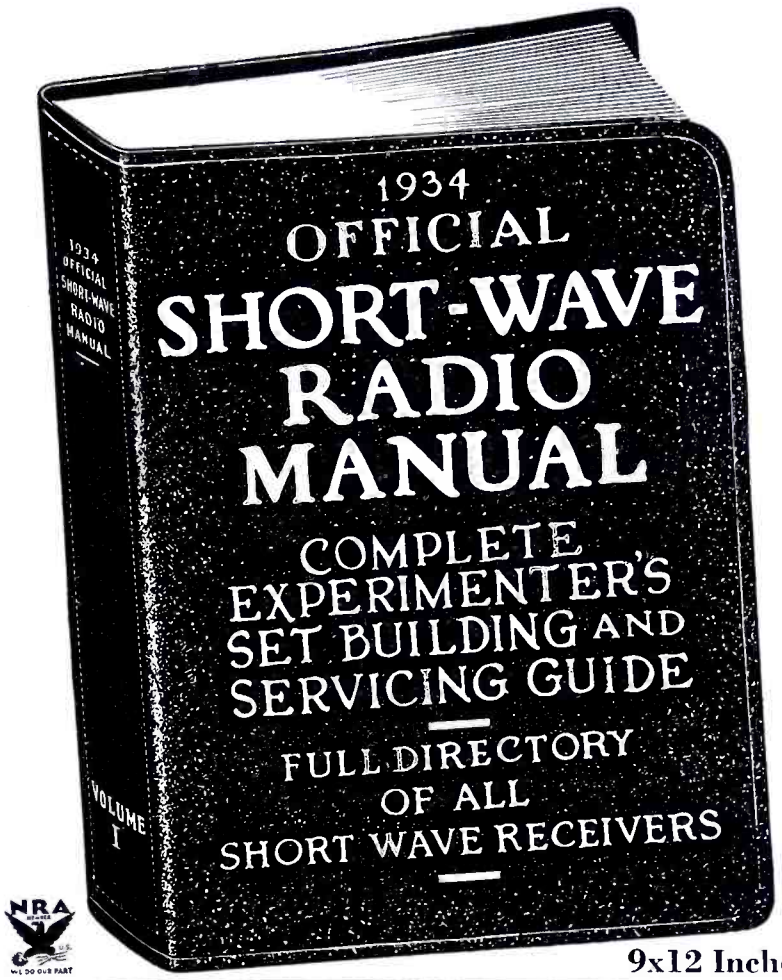
15 VALUABLE FEATURES

- A large section featuring the most important Short-Wave Receivers and how to construct them.
- Short-Wave Transmitters in all their phases.
- A complete Ultra Short-Wave Section featuring construction of 1, 3, 5 and 10 meter receivers.
- A complete Short-Wave Beginner's section. These vary from 1 to 7 tube receivers.
- A section devoted exclusively to coil winding with all information about it.
- A section on Commercial Short-Wave Receivers. Every important commercial receiver, including all-wave sets, is represented. **Full servicing data is included which makes it invaluable for Service Men.**
- A section devoted to A.C. Short-Wave Power Packs and how to build them.
- A section for the Short-Wave Experimenter and short-wave kinks—hundreds of them.
- A section on the important new art of Short-Wave Therapy (treatment of diseases by short waves).
- A section devoted to Short-Wave Converters and their construction. Full servicing data on all commercial models is included.
- A special section on Short-Wave Antennae and noise eliminating procedures.
- A section on Short-Wave Superheterodynes. This section tells how to build them, including many commercial models of receivers. The latter with complete service data.
- A section on Amateur 'Phone Transmitters and how to build them.
- A Short-Wave Physics section on theoretical short-wave data for the advanced experimenter and radio student.
- A most interesting section on Super-Regeneration in Short-Wave Receivers.



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HUGO GERNSBACK, EDITOR H. WINFIELD SECOR, MANAGING EDITOR

Short-Wave Marvels

An Editorial By HUGO GERNSBACK

● AS the art of radio progresses, it becomes more and more apparent that short waves, and particularly the so-called microscopic, ultra-short waves, hold the promise of many marvels that we, of today, hardly appreciate.

Every day brings new discoveries and new applications of the ultra-short radio waves. As these waves get shorter and shorter, they take on entirely different properties from those with which we are familiar. For instance, every one knows that the ordinary radio set, which operates on broadcast waves, can be used with an indoor antenna. The broadcast waves go through stone and brick as though they did not exist. With the ultra-short waves, however, particularly when we get down to about 4 inches (10 centimeters) or so, it is necessary that the transmitter and receiver be *in actual sight of each other!* The waves no longer follow the curvature of the earth but, if an attempt is made to use a radio receiver with a transmitter beyond the horizon, it is found that the waves shoot off into space, never to return.

The ordinary broadcast waves are reflected around the Heaviside Layer, as though the upper ionized atmosphere were a curved mirror. The ultra-short waves—4 inches and thereabouts—seem to ignore the Heaviside Layer, and no longer reflect from this mirror, but shoot right out into space, never to return. In this respect, these short waves are similar to the rays of a searchlight directed heavenward; the light beams go out into space and never return, and so with the ultra-short waves. We have to use parabolic mirrors to confine these waves, just as if we were using a real optical searchlight.

It has often been asked, what use these microscopic short wavelengths may have? Particularly for the layman, let us state that these wavelengths can be used for any service for which other waves are used. In other words, we can transmit speech and the usual forms of aural entertainment over these short wavelengths, just as successfully as we can do it on the higher wavelengths.

As these waves pierce fog and mist (although they do not go through stone and earth) they can also be used for aircraft landing beacons; and, of course, they can be used for television transmission, as long as the transmission is within "sight" of the receiver. That means that, in the future, television impulses may be relayed by telephone wires, just as radio programs are relayed by telephone wires today. Each city will have a television transmitter to broadcast these microscopic waves from an elevated point; so that the television signals can be received by individual antennas throughout the town. And, of course, the transmitter would transmit, not only the television impulses, but the musical entertainment as well; *all over the same microscopic wavelength!*

What wavelength we will finally use for *television* is, as yet, difficult to state. One thing is certain, however—that it will be below 6 meters! The actual wavelength, has not, as yet, been chosen, because sufficient experimental work has not yet been done in this particular art. As a matter of fact, we know practically nothing of what happens to radio waves out in space; that is, during the interval of time after the radio wave leaves the transmitter and before it arrives at the receiver. There are many good guesses about the subject, but we *know* little; and I am afraid that it will be many years before we get an inkling as to what actually takes place.

There are many other uses for the ultra-short wavelengths, and each particular wavelength has its own special field of utility. As we have reported many times in this magazine, short waves are used for therapeutical (medical) purposes. Similar wavelengths are used for killing certain insects which infest various grains. It seems that, in time, every possible insect pest will be fought successfully by short waves, once we know which wavelength is the best to use against each particular pest which now creates havoc with our crops. It seems certain that agriculture, in the future, will utilize extensive short-wave installations whereby entire fields will be sprayed with short waves, while the crop is growing, in order to kill off many varieties of insects. The same principle will be used, not only for grain crops, but by fruit growers and cotton growers as well.

In mining, that is, in explorations for precious metals, ore, oil, etc., the ultra-shortwaves require a special technique; and already many companies in this country, as well as abroad, are successfully prospecting by means of ultra-short waves.

There are no doubt many other marvels which remain, as yet, to be discovered; because the surface has not even been scratched—of what short waves will do in the future. Remember, that all the applications listed here are comparatively new. During the next twenty-five years you may expect many surprises; and it is evident that most of them will come out of the short-wave and ultra-short-wave research laboratories.

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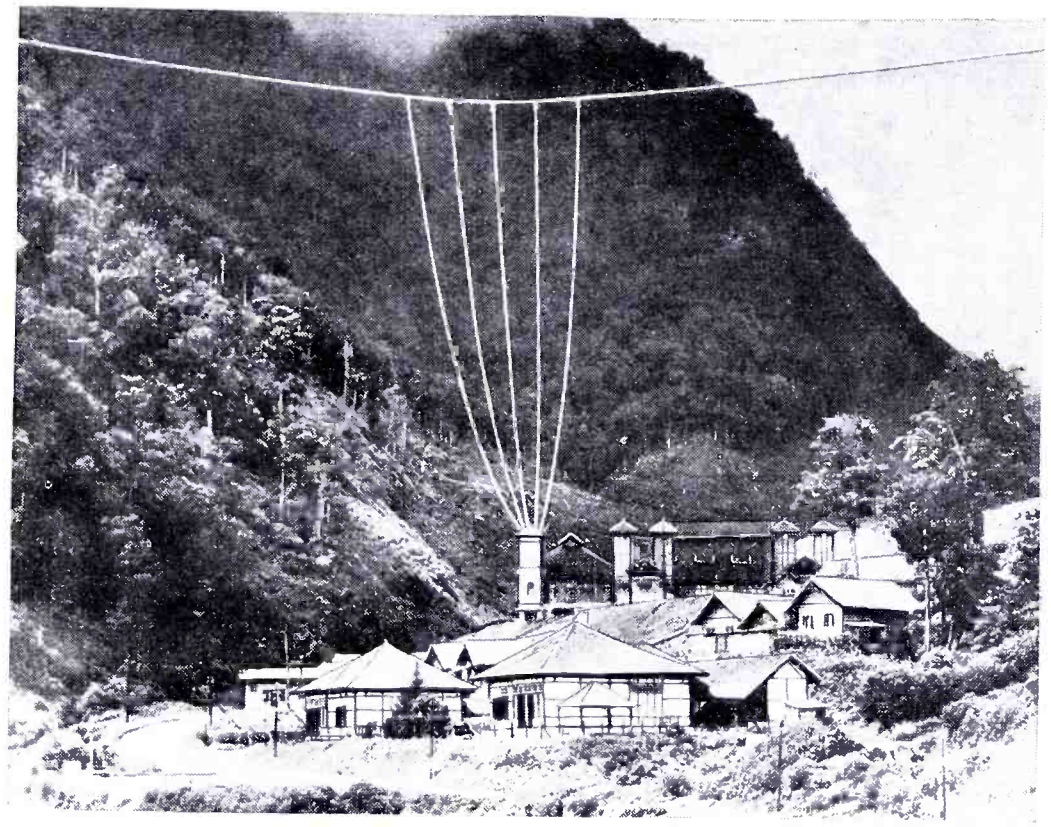


SHORT WAVE NEWS

Short Waves From Java

The photograph shows the wires comprising the antenna, the wires appearing exaggerated as they have been retouched to make them clearer. A second group of wires which are not visible in the picture is used as part of the antenna radiating system. With this system in operation calls from the East Indies can be made direct to California, instead of passing through the old round-about circuit half way around the world, by way of San Francisco to New York, London, Amsterdam, and Bandoeng. Thanks to this new high power short-wave radiophone transmitting station at Malaban, the old circuitous route will be abandoned.

● THE photo, above, shows one of the most interesting short-wave transmitting stations in the world—that located in Java. The buildings shown house the radio telephone transmitting stations operated by the Netherlands Indies Telephone Administration at Malaban, near Bandoeng, Java. This station is designed to carry the East Indian voices across the Pacific Ocean 8,700 miles to Point Reyes, California, the receiving station of the Bell System.

A "Walking" Short-Wave Station

Here's the very latest style in short-wave receivers for the police force—the batteries are carried in the leather pockets on the belt.

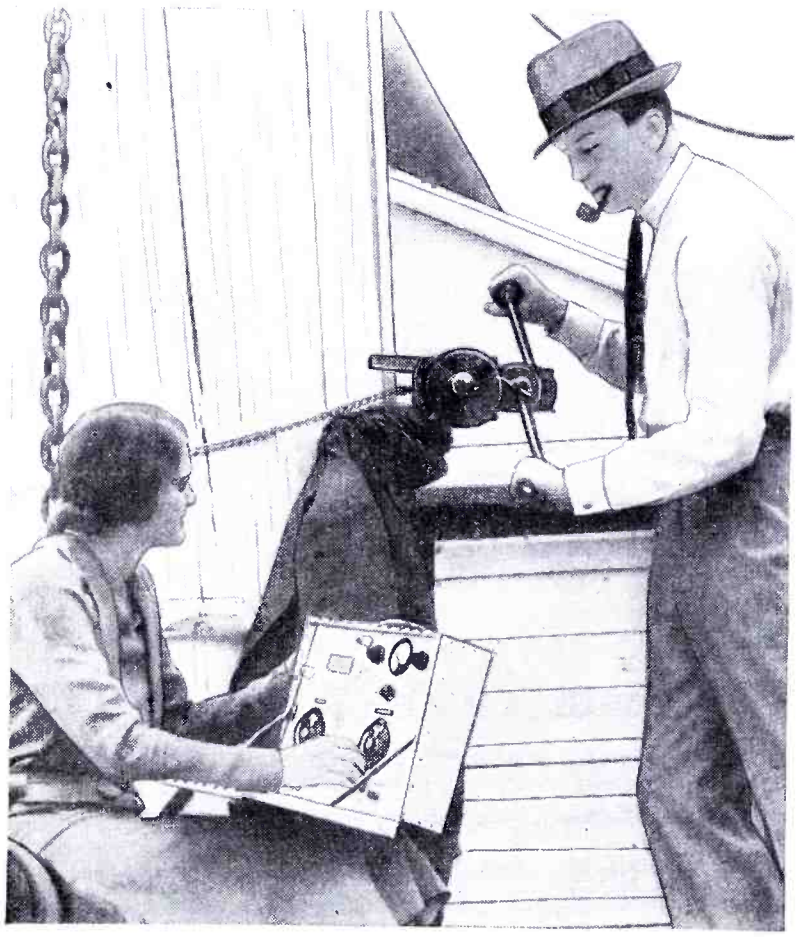
● WHILE "personal" short-wave receivers to be carried "on the hip", as it were, have been designed and used to some extent by members of one of the European police organizations, one of the very first portable short-wave receivers designed to be carried by American policemen is that here illustrated. The batteries are carried in the leather pockets on the waistline belt. The receiver comprises a 1 tube set with a small control knob for the volume, off-switch, and tip jacks for the head phone

(*Continued on page* 242)

Lightweight, Two-Way Short-Wave Set

● THE photo, below, shows one of the smallest, high efficiency, two-way, short-wave sets ever built. It was successfully tested recently on the schooner "*Golden State*", before being packed as part of the scientific equipment carried by the Darwin Memorial Expedition.

This two-way set has a transmitter rated at 15 watts I.C.W., output. The short-wave receiver incorporated in the cabinet has a frequency range from 300 to 20,000 kc. Power for operating the transmitter tubes is supplied by a hand-driven generator which the man is shown cranking in the picture. The combination transmitter and receiver cabinet weighs twelve pounds and the hand-driven generator weighs 10½ pounds. The gentleman shown cranking the generator in the picture is Neville Priestly, relief air plane pilot; the young lady is Miss Lillian Gorman, secretary to Wolfgang Von Hegan. The expedition is engaged in a scientific foray into the lands and waters of the Central Americas and the wide range of equipment carried includes gas guns for "knocking out" wild animals; under-water cameras to photograph deep sea phenomena, a diving bell and an airplane.



Left: Combined short-wave transmitting and receiving set, together with hand-driven power generator, especially designed for use on a Scientific Expedition going to Central America.

Dr. Lee de Forest, who has become twice a hero in the world of Radio, first as the recognized inventor of the three-electrode tube or "triode," and equally important, now the recognized inventor of the famous "feed-back" or "regenerative" circuit.

Dr. de FOREST Wins FEED-BACK Verdict

By H. WINFIELD SECOR

¶ Dr. Lee de Forest, after twenty-two years of constant patent litigation through the highest courts, has at last been awarded the credit due him for the invention of the *feed-back* audion circuit. The previous court opinion awarded this credit to Edwin H. Armstrong, who has contested the honors for originating the *feed-back* circuit through these many years. Not only is it a distinct pleasure to see the honors awarded to the real inventor of the *feed-back* audion circuit, but it is extremely interesting and important to note that Dr. de Forest, not only was the inventor of the *feed-back* or *regenerative* receiver circuit, used by thousands of short-wave fans all over the world today, but he also receives honors for the invention of the audion or vacuum tube *oscillator*. This means that every "Ham" or commercial vacuum tube transmitter owes its allegiance to Dr. Lee de Forest, as well as the *regenerative* or *feed-back receivers*. Also, the far-famed *superheterodyne* receiver would not be in existence today, if it were not for the oscillating vacuum tube devised by Dr. de Forest.

● PROBABLY the greatest radio patent fight in history has now come to a close, and for Dr. Lee de Forest we hope that the recent Supreme Court decision handed down on May 21 by Judge Cardozo will bring a hard-earned peace of mind as the inventor of the regenerative vacuum tube circuit, and further, that honor is at last given where honor is due.

Summed up in a few words, this twenty-two-year-long legal battle, which has repeatedly passed through the highest courts in the land, was actually based on the argument as to whom first conceived and used the *feed-back* audion (vacuum tube) circuit. Today, twenty-two years after Dr. de Forest conceived the brilliant idea of connecting the audion output (plate) circuit so as to feed-back into the input (grid) circuit, thousands of radio *fans* and *hams* all over the world are busily turning the knobs on their *regenerative short-wave receivers* and bringing in stations from half way around the world as a regular daily performance.

Dr. de Forest Gets Double Honors

Dr. Lee de Forest has now become twice a hero to the radio fraternity throughout the world; first, he took the really insensitive two electrode vacuum tube devised by Fleming, the English inventor and scientist, and, in a flash of brilliant scientific introspection, conceived the idea of inserting the third element or *grid* into the so-called Fleming valve. Immediately new possibilities began to develop, so far as the vacuum tube was concerned, as a detector and amplifier of radio signals. It has been stated many times by eminent radio engineers that without Dr. de Forest's conception of the third element or grid which he added to the original two-electrode valve or tube, that the future of the vacuum tube in radio circuits would have been extremely limited indeed. After Dr. de Forest had performed this very worthy service in the practical application of radio, he now comes in for highest honors again by his conception of the *regenerative* audion circuit.

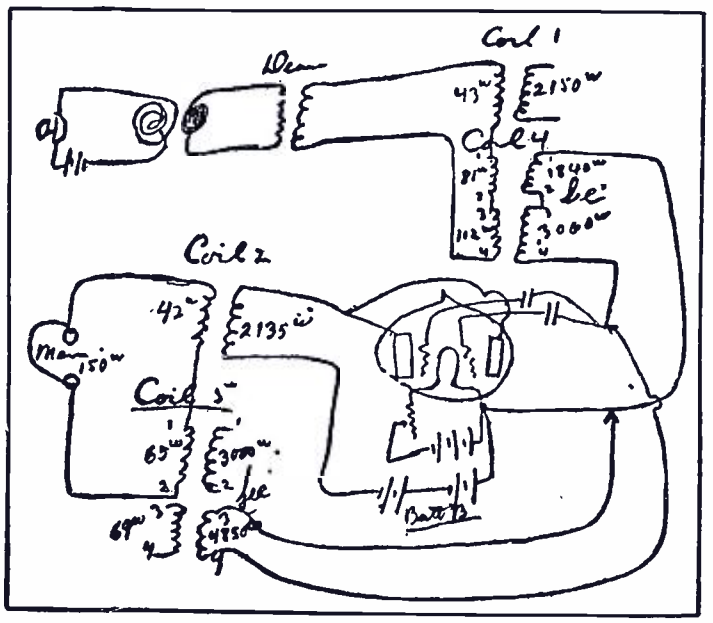
What the "Feed-Back" Circuit Does

Thousands of our new friends in the short-wave field perhaps do not realize what a difference the de Forest invention of the *feed-back* circuit means. Simply explained, we might say that if the grid and plate circuits of a three-electrode tube, for example, are not inductively or electrostatically related, then the signal that you would hear in the phones coming in from a certain station would be very weak—so extremely weak as to be nearly, if not quite inaudible in many cases. Now by a single stroke of radio magic, we wind a few turns of wire adjacent to, and in inductive relation to the grid coil, these few extra turns of wire being known as the *tickler*, and we connect it in the plate circuit of the tube. A tremendous improvement in the strength of the signal is now noticed immediately and the degree of regeneration is varied until the signal is of the greatest clarity. This is done in any one of several ways; for example, by turning the tickler coil on its axis in close proximity to the grid coil; or by the use of the well-known "throttle" variable condenser, as in the popular Reinartz circuits.

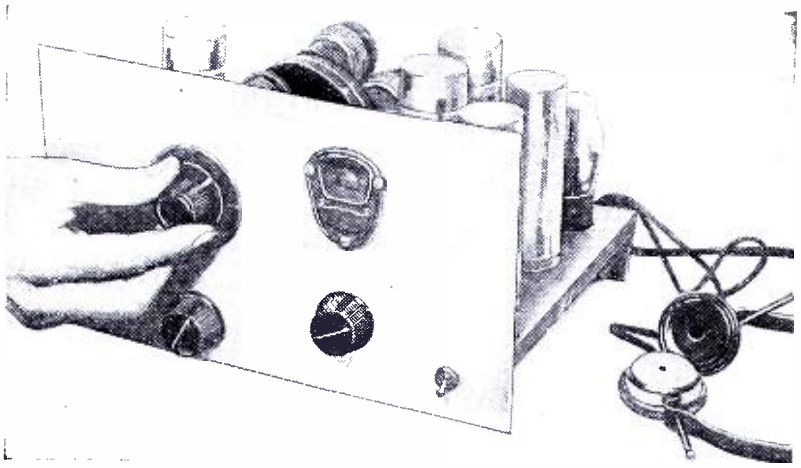
Pages and pages of testimony have been given in the various court fights through which Armstrong and de Forest have carried the legal battle as to whom was the true inventor of the *feed-back circuit*.

Dr. de Forest in a recent letter addressed to Hugo Gernsback, editor of SHORT WAVE CRAFT, states that while he was experimenting and setting up audions (vacuum tubes) in cascade telephone repeaters during the summer of 1912, that on one occasion, having only one operative audion tube on hand, momentarily, Mr. H. E. Van Etten, his assistant (and Dr. de Forest) endeavored to make this single audion tube do double duty by deliberately connecting its output circuit back into inductive

(*Continued on page* 231)



Here is Dr. de Forest's original basic diagram showing the "regenerative" principle or "feed-back" between grid and plate circuits. This diagram will go down in radio history as the basis of one of the longest and most expensive patent litigation contests the world of science has ever seen.

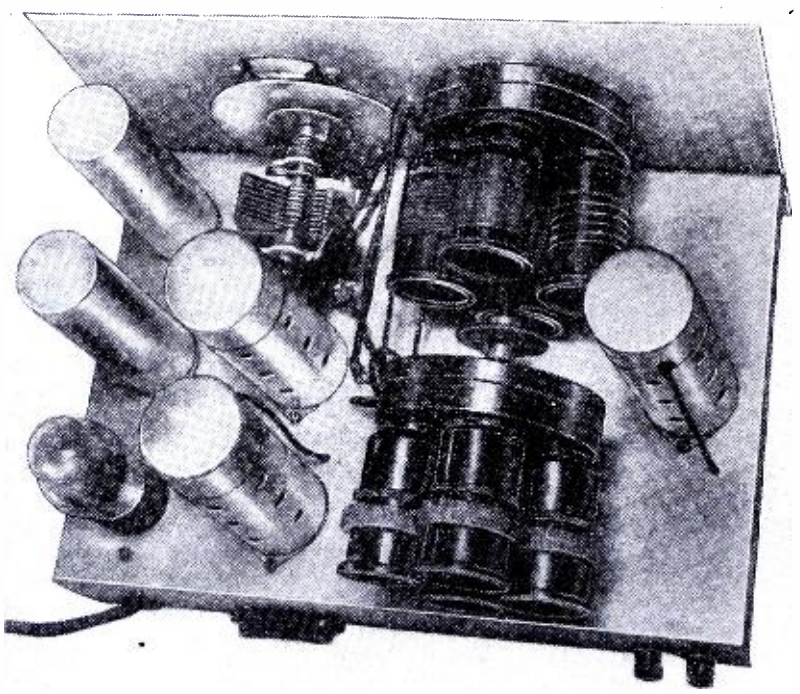


One-eighth turn on the coil—selector switch changes the band to which the receiver can be tuned. The tuning condenser dial is shown at the right.

15 to 2000 Meters on this Receiver—all on One Switch

By CLIFFORD E. DENTON

Here's a "red-hot" receiver hook-up which permits tuning in waves extending over three bands—short-waves from 15 to 200 meters; broadcast waves from 200 to 550 meters, and the third band from 550 to 2,000 meters. Thanks to the new Na-Ald S.W. coil-switch selectors, a "twist of the wrist" gives you command of all waves from 15 to 2,000 meters—all without having to change a single plug-in coil. This set works on 110 volts A.C. or D.C.



Here's the secret of the 15 to 2,000 meter receiver—a "tandem gang" of Na-Ald coils plugged into two Na-Ald switch units, both switches being ganged on a single control shaft.

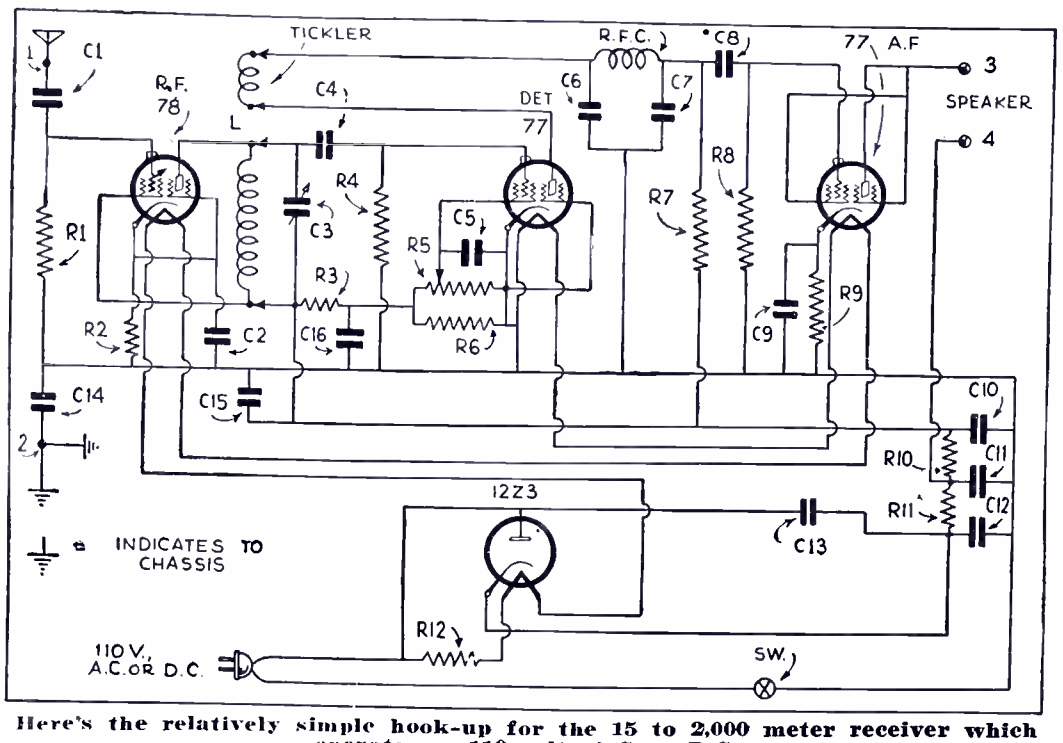
● THE problem of designing a simple set for "all-band" reception has been simplified by the recent developments of coil and tube manufacturers. Thus it is possible to build a receiver that will tune from 15 to 2,000 meters with the minimum of coil changing, at the same time retaining all the benefits of the plug-in type of coil. This new coil selector arrangement, which just appeared on the market, is the answer to the requests of many short-wave fans for some practical method of using plug-in coils in switching circuits.

While this receiver is primarily designed for operation on the short-wave band, say from 15 to 200 meters, the coils can be obtained on the open market which will enable the set operator to tune in the 200 to 550 meter broadcast band, and also from 500 to 2,000 meters. This requires a total of ten coils for all band coverage.

Circuit Description

A study of the circuit diagram indicates the use of a small blocking condenser C-1 in series with the antenna which minimizes the possibility of short-circuit between the power line and a grounded antenna. Condenser C-14 goes from the chassis to the B-line which runs around the bottom of the chassis and is insulated from the chassis. This is a very important consideration, and this condenser is absolutely necessary to insure the maximum sensitivity. The simple "grid-loading" resistor R-1 of 6,000 ohms, completes the input antenna circuit to the grid of the 78 type tube. The circuit consisting of L and C-3 form the tuned plate circuit of the receiver. Coil L, which is the "two-winding" coil being changed to cover the various bands. The grid condenser C-4 and the grid leak R-4 connect in the grid circuit of the 77 type tube, which is used as a "high-gain" detector. Regeneration is controlled by R-5 and the by-pass condenser C-5, and as this control is conventional in this particular circuit, it works out very smoothly and satisfactorily.

In order to complete the *grounding* of the tuned circuit L and C-3, condenser C-15 connects from the low potential end away from the plate to the B-line, which is also the common connection of the grid-leak resistor R-4. The plate circuit of the 77 high gain detector connects to the radio frequency choke and the two by-pass condensers C6, C7. The "plate-loading" resistor R-7 (250,000 ohms) affords ample "gain" and as the plate current of this tube as a detector is low, satisfactory effective voltage can be obtained.



Here's the relatively simple hook-up for the 15 to 2,000 meter receiver which operates on 110 volts A.C. or D.C.

C-8 is comparatively small, compared to the general run of coupling condensers, due to the fact that suitable attenuation is desired on 60 cycles, thus reducing the apparent hum output of the receiver.

Audio Stage Uses 77 As a Triode

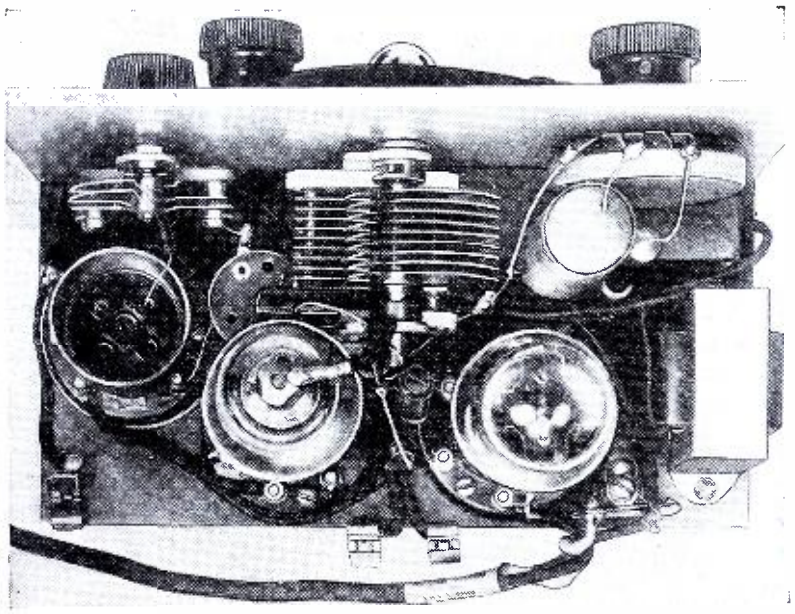
In the audio stage a 77 type tube is used as a triode. The suppressor and screen-grid were connected to the plate circuit and this tube gives an effective

(*Continued on page* 241)

My 2-Tube A.C.-D.C. 'Wave Master'

By HAROLD MITCHELL

How many times have you longed for a handy 2-tube A.C. receiver about the size of a lunch box, one that you could plug into any 110 volt A.C. or D.C. lamp-socket? Here's just the set, and tests showed that it has very smooth tuning qualities. It uses a 6F7 as detector and A.F. amplifier, with a 37 as a rectifier.



In this receiver, Mr. Mitchell makes "two tubes do the work of three"—without reflexing! The 110-volt line current supplies the plate potential.

● "AN economical set"— a phrase that has been used and misused, many many times in the description of short-wave radio sets. The writer believes that this phrase should be used only with a receiver that is economical in every respect. By this is meant a set that is inexpensive to build, inexpensive to outfit with tubes and last but not least *inexpensive to operate.* With all this in mind the "TWO-TUBE WAVE-MASTER" was designed. The parts although of the best possible makes were chosen with the pocketbook in mind and should not cost over seven or eight dollars.

The set uses but two tubes, one 6F7 and one 37, both of them being of the 6.3 volt variety. The heater current drawn is only .3 amperes thereby making them ideal for use in the series heater arrangement of the Cisin A.C.-D.C. circuit. (Pat. App. Serial No. 592,586.) This circuit is a real break for the "S.W." Fan who does not have the necessary cash for a power transformer.

The first of these tubes that we will discuss is the 6F7. This tube through its versatility is used as a screen-grid regenerative detector and a resistance-coupled audio stage. The 6F7 is a tube consisting of two individual units, a pentode unit and a triode unit, both contained in the single bulb and built around a common cathode. The tube has a small seven-prong base and a cap connection for the pentode control grid. The 37 is a general purpose triode of the heater-cathode type. It is used as a half-wave rectifier in this circuit and as most every fan has used one before, we will not dwell on it.

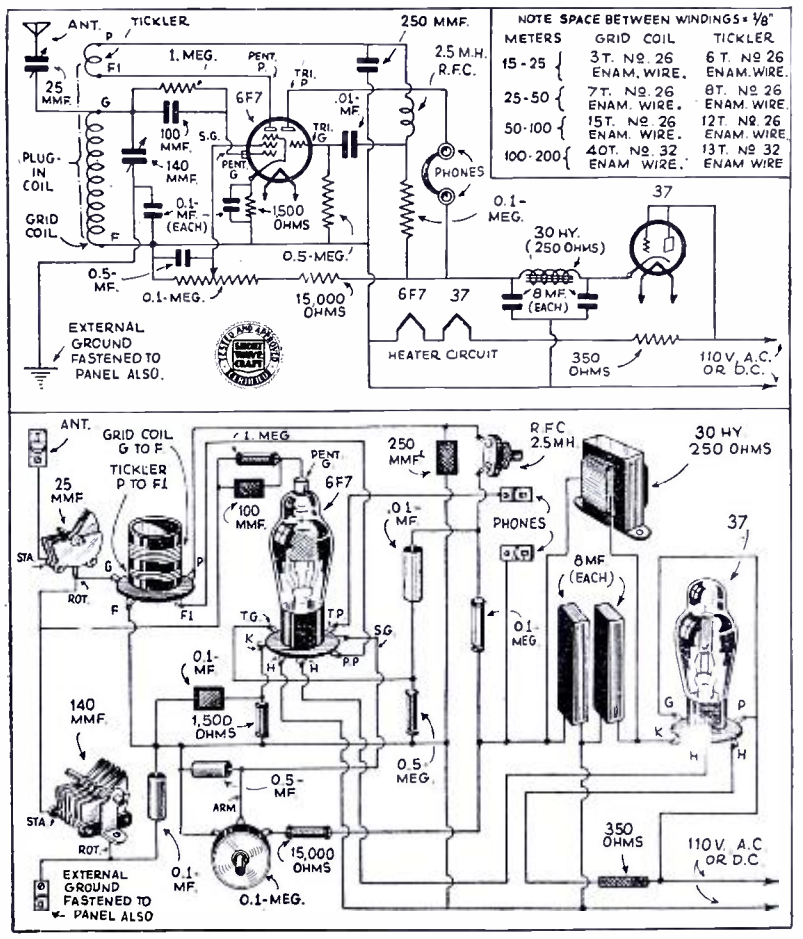
Now that we know what's in the set—let's build it.

Tuning in European symphony orchestras and vocal programs is a cinch with this very smooth working 2-tube receiver, which is intended for headphone reception.

Start with the front panel; a piece of aluminum of approximately 6x7 inches is procured and then drilled to accommodate the tuning condenser, the aerial trimmer condenser, the regeneration control and the mounting holes. Next mount these parts in their respective holes, being sure to insulate the aerial condenser from the panel. Now hold the panel in place against the base-board and arrange the parts so that the instruments on the panel will not interfere with them when it is fastened in place. Do not fasten the panel securely in place until the parts are all in position on the base and partly wired. The base-board used in the original model was rather small and if the constructor finds that the parts would be too crowded for his comfort in wiring it, it could be enlarged to suit his convenience. About 6x8 inches is an ideal size.

Fasten down with wood screws, the four, five and seven prong sockets. Then the filter choke and filter condensers can also be screwed down.

(*Continued on page* 233)



Diagrams for building the 2-tube "Wave Master."

How I Brought The 5-

You will be agreeably surprised at the ease with which the 5-meter stations "roll in" on this improved "Bear-Cat."

By CLIFFORD E. DENTON

● THE problem of building 5 meter short-wave receivers has received considerable attention of late from set designers. The circuit to be described is exceptionally simple and after many tests in the field has proven its ability to satisfy the most exacting demand for this type of reception.

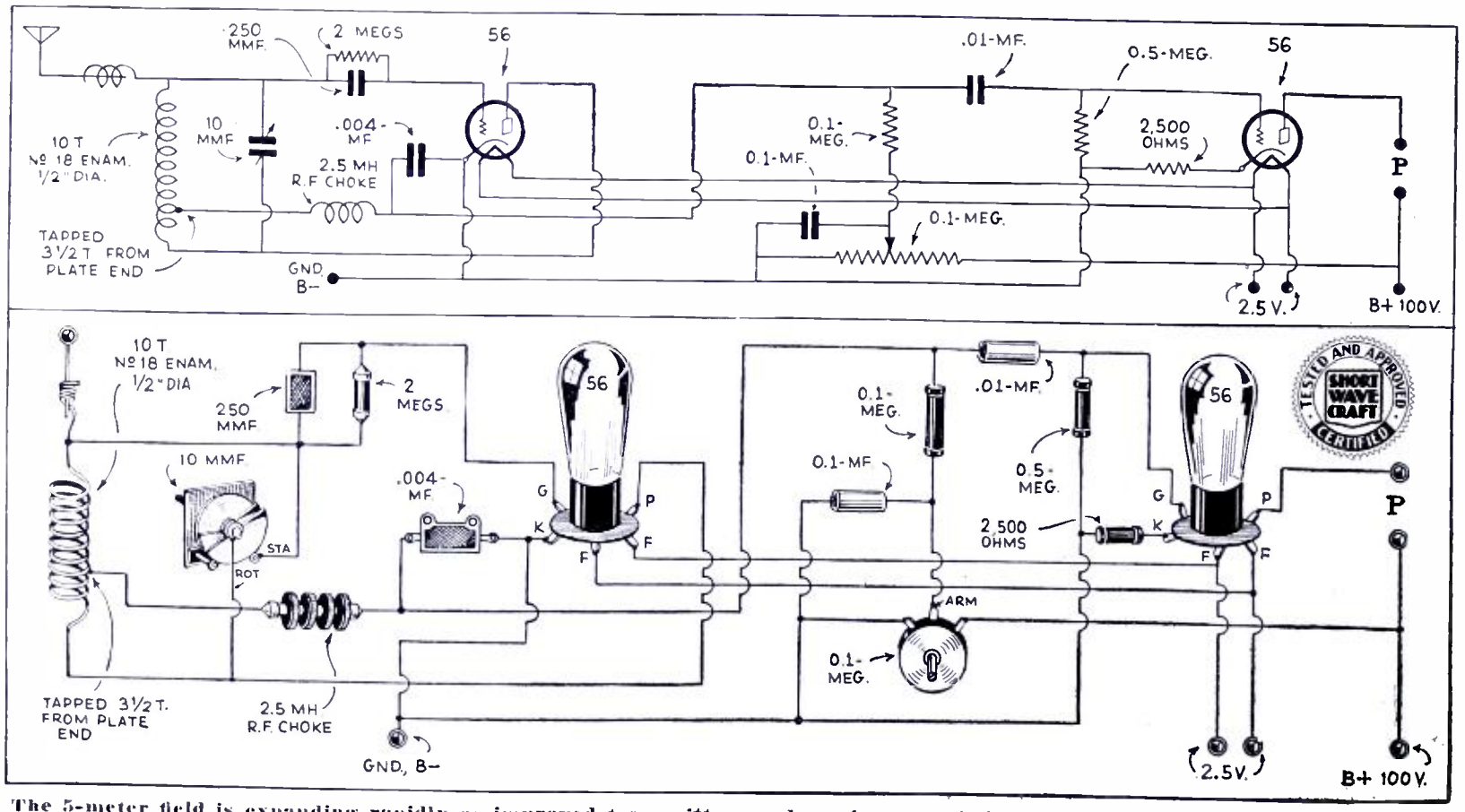
The Circuit

An analysis of the circuit diagram shows that two tubes are used. The first tube combines the function of the regenerative detector and the local *quenching frequency* generator. This is a modification of the popular electron-coupled circuit so widely employed in short-wave regenerative receivers. The output of this first 56 type tube is resistance-coupled to the 56 audio tube, which of course, can be connected to a pair of earphones or to the *input* of an audio amplifier if further amplification is desired. The combination regeneration and quenching frequency *control* consists of a 100,000 ohm potentiometer connected between the plate voltage lead of 100 volts and the ground. The quenching frequency in this receiver will be around 14,000 to 15,000 cycles, dependent upon the accuracy of the 2½ millihenry choke and the .004 mf. condenser connected between the plate coupling (.1 megohm) resistor and the cathode of the first 56 type tube. This condenser and the 2½ millihenry choke coil form a series resonant circuit and except for the effect of the plate coupling resistor and of the grid-leak and condenser their constants will determine the quenching frequency.

It is interesting to note that the main tuning condenser bridges from the grid to the plate circuit and that a positive potential is applied to the grid of the first 56. Of course, this potential is applied through the 2 megohm grid-leak, which shunts the 56 detector circuit grid-condenser. Any current drawn by the grid in this condition will cause a voltage drop across the 2 megohm grid-leak, thus there will be a very small positive charge on this grid. Suffice it to say that this point is quite contrary to the ordinary circuit operating condition, and while many students of the subject may conclude that this would not be satisfactory for really good operation, a few tests, even in bread-board style, will show that this circuit is capable of exceptionally smooth results. This receiver has been tested out on many types of antennas, all of which seem to prove satisfactory; in fact, everything from a 12-ft. wire inside the room of an apartment house, to a 100-ft. antenna stretched out high above the roof and free and clear works well.

Duplex Communication

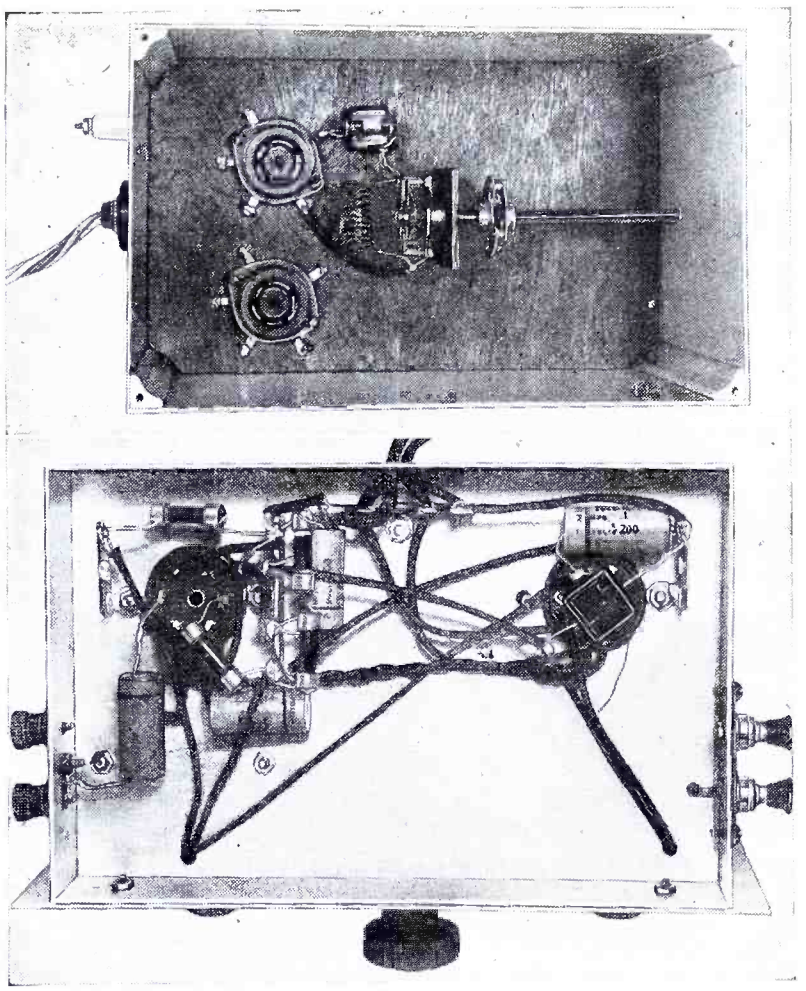
In every instance the receiver performed satisfactorily and in most cases duplex communication was held on 5 meters with this receiver, in a manner that highly pleased those amateurs who were permitted to use it. The antenna is



The 5-meter field is expanding rapidly as improved transmitters and receivers are being designed to facilitate the tuning of these extra low-wave stations. Both picture and schematic diagrams are given above for the Improved 5-Meter "Bear-Cat."

Meter "Bear-Cat" Up-To-Date

Here is one of the simplest imaginable 5-meter super-regenerative receivers. The author carried out a large number of experiments with this receiver and satisfied himself that it was a really "smooth-working" job before he offered to describe it to the readers of SHORT WAVE CRAFT. The set is easy to build and inexpensive so far as the cost of materials is concerned. Only two tubes are used and instructions for operating the receiver are given. It uses 2—2.5 Vt. A.C. or 2—6.3 Vt. A.C. or D.C. tubes.



The two photos, above, show respectively top and bottom views of the Improved 5-Meter "Bear-Cat" Receiver. As will be seen but few parts are required to build this super-regenerative set.

coupled to the main tuning coil, that is, to the small series antenna condenser, which consisted of a piece of bus bar or No. 16 tinned copper wire, around which No. 19 push back wire was wrapped three times, with the insulation of the wire serving as a dielectric and with a total capacity of a few micromicrofarads.

It is absolutely imperative that the main tuning condenser be operated from an insulated shaft, and also insulated from the hand, to prevent short-circuits to the ground and also to minimize *hand-capacity* effects which would be present under ordinary conditions. In this circuit, by ground we mean the aluminum case, as no regular ground can be made to the chassis, as it consists of a piece of wood cut to fit inside the aluminum box. The grid coil consists of 10 turns of No. 18 enameled wire wound on a diameter of ½ inch and supported in the air. The plate coupling tap, if it may be called that, is made 3½ turns from the plate end of tha coil. The audio stage is very conventional and of course

(*Continued on page* 240)

An Ultra Short-Wave Transmitter

● FIGURE ONE shows a very simple construction for an ultra short-wave transmitter. The tube is mounted between the choke coils upside down in order to have the connections to the grid and to the plate as short as possible. The midget condenser of about 15-20 mmf. which controls the wavelength is connected across the oscillator coil and is clearly seen on the photograph. Fig. 2 gives the diagram of the circuit, an ordinary 3-point oscillator. For this transmitter a power output tube (type 45 or 71) is used. A by-pass condenser of .05 mf. is connected across the filament to protect it from accidental voltage surges, which during the previous tests destroyed one of the tubes. The modulation is performed in the plate circuit, but without the aid of a special modulator tube. For this purpose an A.F. push-pull transformer is used, of which the secondary is connected in the plate circuit. One of the primaries is operated from a buzzer, while the other primary is connected to the output ends of a 2-stage audio amplifier, in order to also enable telephony transmission. The plate tension of 200 volts is supplied from the D.C. line. However, satisfactory results can be obtained with 150 volts from batteries.

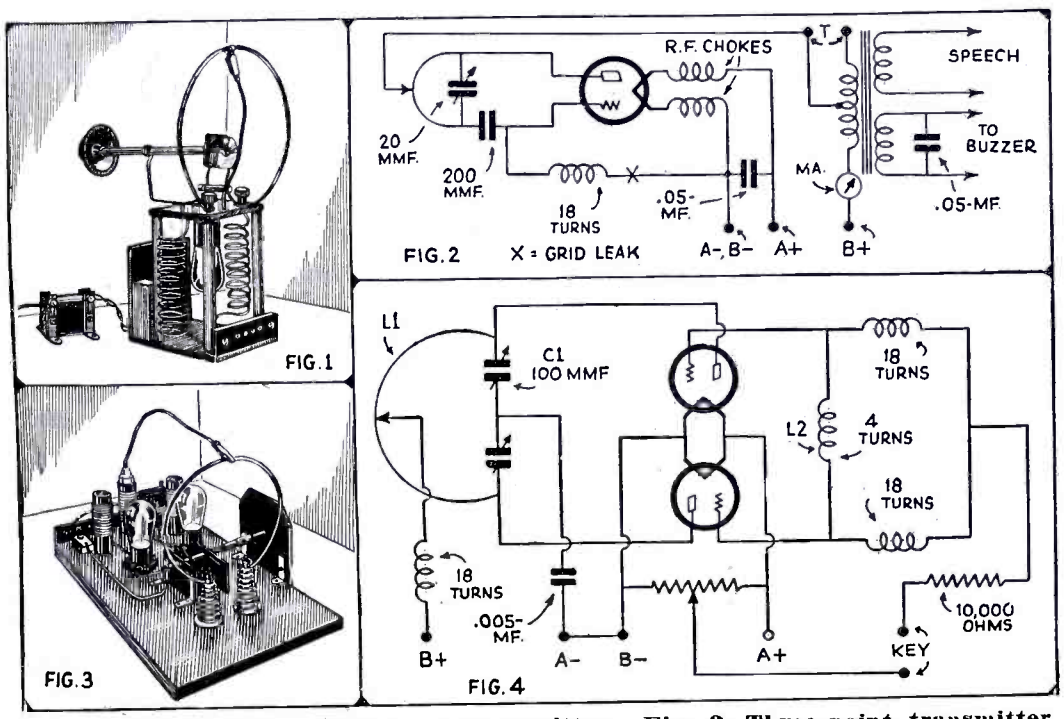


Fig. 1. Simple ultra short-wave transmitter. Fig. 2. Three-point transmitter circuit. Fig. 3. Construction of a push-pull transmitter. Fig. 4. Circuit of the push-pull transmitter.

We gave a description of the transmitter without mentioning its faults. The main trouble lies in the unsteadiness of the wavelength, a fact which makes impossible a more or less accurate work. We observed also a variation of the loudness, which cannot be explained here by the phenomenon of fading. These faults are almost completely eliminated with the construction of a *push-pull* transmitter, a type which is used by the majority of the American

(*Continued on page* 242)

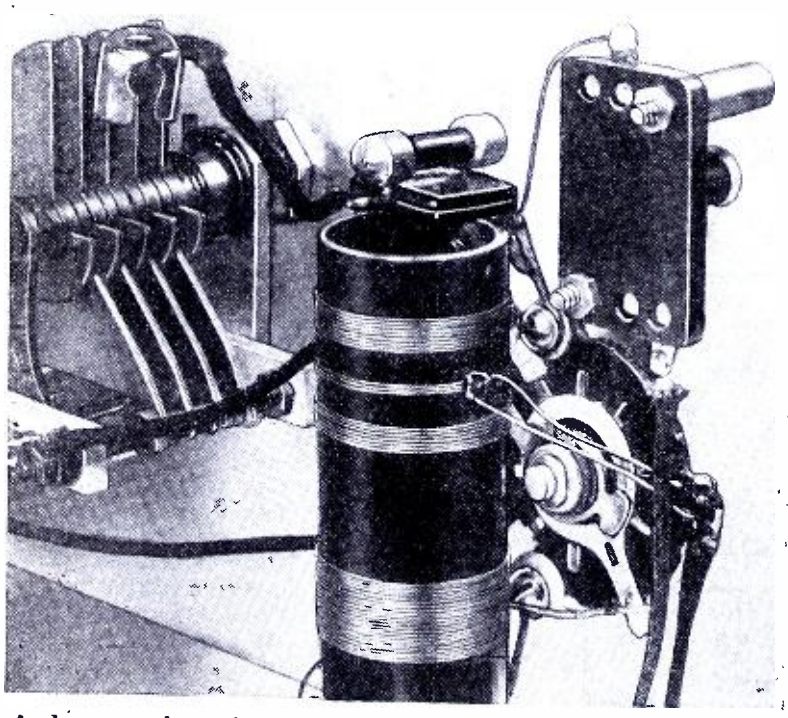
The "MONO - COIL 2"

—It Eliminates

No wonder the young lady wears such a pleasant smile—for it is truly a wonderful experience to note the ease with which "foreign" short-wave "speech" and "music" programs come in on this "plugless" 2-tuber.

● THE King is dead—Long live the King. The plug-in coil has long been the Monarch of short-wave radio. While they are not dead by any means they are pretty ill and it's about time someone severed the "royal neck" and lays the "ole boy" gently to rest for ever and two days. It is not good manners to kick a fellow when he is down, but a few blows from the worthy "hammer" will "sorta" help to hasten his downfall.

Plug-ins have always been the *sore-spot* in the average short-wave receiver. A careful check-up on the plug-in coil will show that it is not only a nuisance but a very inefficient piece of apparatus. Consider the connections for instance; on the average coil there are four soldered connections to the pins, four friction contacts when the coil is plugged into the socket and four more soldered connections to the terminals of the socket. Quite a few weak points for only one part of a set, and the most important part at that! As for the inconvenient part of it, little need be said; even plugging them in through the *front* of the panel doesn't help so very much. The idea of using plug-in coils is so deeply rooted in the minds of the short-wave public, that manufacturers hesitate to bring out something new for fear that it will be a general "flop." However, some of them have made an attempt at it and "hats off" to them for their courage. Nevertheless there is still plenty of room for improvemen and probably will be for many "moons" to come.



A close-up view of the "Mono-Coil"—the heart of Mr. Shuart's newest receiver. It does away with "plug-in" coils.

A Receiver to Cover the S-W "Broadcast" Bands

The short-wave programs broadcast from *foreign* countries hold the most interest among the short-wave "Fans." Few other than regular Amateurs or "Hams" are interested in the so-called code or "Ham Bands." Set manufacturers have realized this and are now making "all-wave" sets covering only the international *broadcast* channels. This is a very wise move and it will only be a short time when the general public will learn that what goes on in the *private* channels such as the telephone, police and airplane channels is none of their business, even if it has to be called to their attention by legislation. So-oo-oo why not build our sets to have maximum efficiency on those frequencies that are intended for our enjoyment and keep our "wash" on our own "clothes-line"?

It sure is a joke, when one stops to consider for a moment, that in order to cover the entire short-wave spectrum, we have built our sets after a fashion that spoils the most interesting part of the game that is, the international *broadcast* channels, by jamming them into a couple of points on the dial. That's our price for not minding our own affairs —seems foolish, doesn't it?

How Single Coil Was Developed

After many months of hard work on fancy band-switching arrangements, the writer stands ready to take back anything that he may have said about plug-in coils being the only thing to use in short-wave sets; and sadly admits possessing a "one-track" mind. The coil used in the set shown in the photographs took a long time to develop because it is so *very simple*. After wasting many switches and miles of wire, the light began to dawn and this *simple* and most *efficient* assembly came into being. It is a well known fact that a sectional coil with taps, if constructed properly, can be made to work just as efficiently as separate coils. The problem has always been to obtain *smooth regeneration* in a detector using this method.

A single tickler winding can be made to produce oscillation over a fairly great frequency range, but it will not allow a very high degree of sensitivity or rather, *an equal degree of sensitivity, on both ends of the tuning range of the coil.* A tapped tickler can be used but this necessitates the use of a two-gang switching arrangement. In fact, if a two-gang switch were used, individual coils and forms could be used and probably work out as well as the system used in this receiver. But we don't want separate coils—we had that in "plug-ins."

The final point of attack was to build a coil, having taps, as efficiently as possible with a single moving contactor and worry about *regeneration* later. The coil was wound on a one-inch diameter bakelite tube, three inches in length. The winding consisted of three sections with two taps brought out so that two of the sections could be "shorted" out. With the proper number of turns and the correct spacing between the sections, this coil when tuned with a 25 mmf. (.000025 mf.) variable condenser, had a tuning range of from 16 to 55 meters. It was necessary to use close-wound coils (no spacing between turns), in order to have the fields of the windings as small as possible, to prevent losses due to the

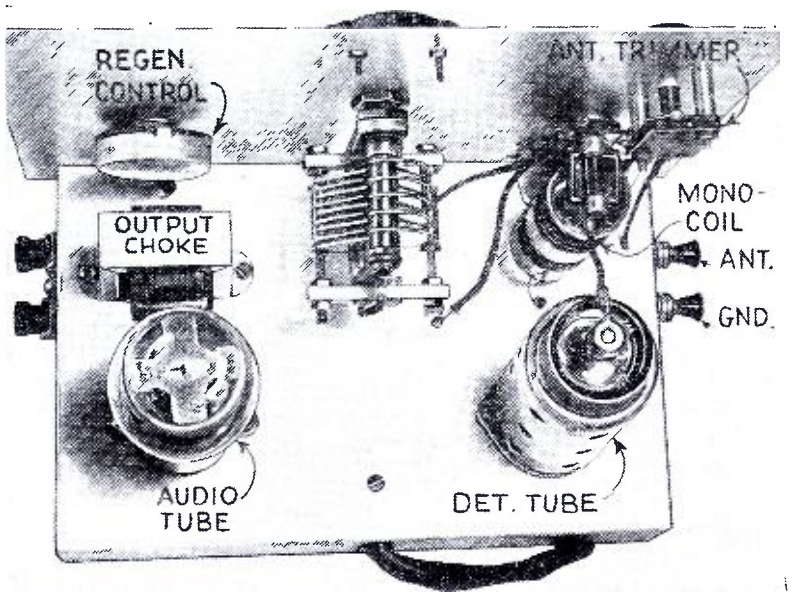
At last—a real solution to the problem of "how to eliminate plug-in coils" is here offered by Mr. Shuart. The "Mono-Coil 2" is a 2-tube receiver which will cost only a nominal amount to build; it covers the short-wave "broadcast" bands, 19-25, 25-38, and the 49 meter channels by merely turning a switch. The benefits of "band-spread" are included! Uses 2.5 Vt. or 6.3 Vt. tubes.

"Plug-In" Coils Efficiently

By GEORGE W. SHUART, W2AMN

NO MORE PLUG-IN COILS!!

The "plug-in" coil has been a sore spot in the realm of short-wave receivers for a long time—at last this great "bugaboo" of pulling out and pushing in short-wave coils has been wiped out by a single stroke of masterly genius—thanks to the extensive researches of George W. Shuart, who here describes the "Mono-Coil," which permits changing of bands *even more efficiently* than by the use of plug-in coils! Only one very simple single-pole switch is required for changing the bands with the "Mono-Coil"; and the beauty of it is that this coil lends itself particularly well to "T.R.F." and "Superhet" receivers, all the switching being done with one single knob. The "T.R.F." Mono-Coil receiver will be described in the *Next Issue!* Don't miss it!



Rear view of the "Mono-Coil 2"—it eliminates "plug-in" coils. In the design here offered, it brings in all of the short-wave "broadcast" bands—including the 19, 31, and 49 meter channels. A "band-spread" tuning effect is also obtained.

close proximity of the *unused windings*. A careful check proved that there was no appreciable loss when the unused coils were "shorted" out. However, when they were not shorted (short-circuited), losses ran very high and at points, it was found later, they prevented the detector from oscillating. So far we have a combination that will cover the

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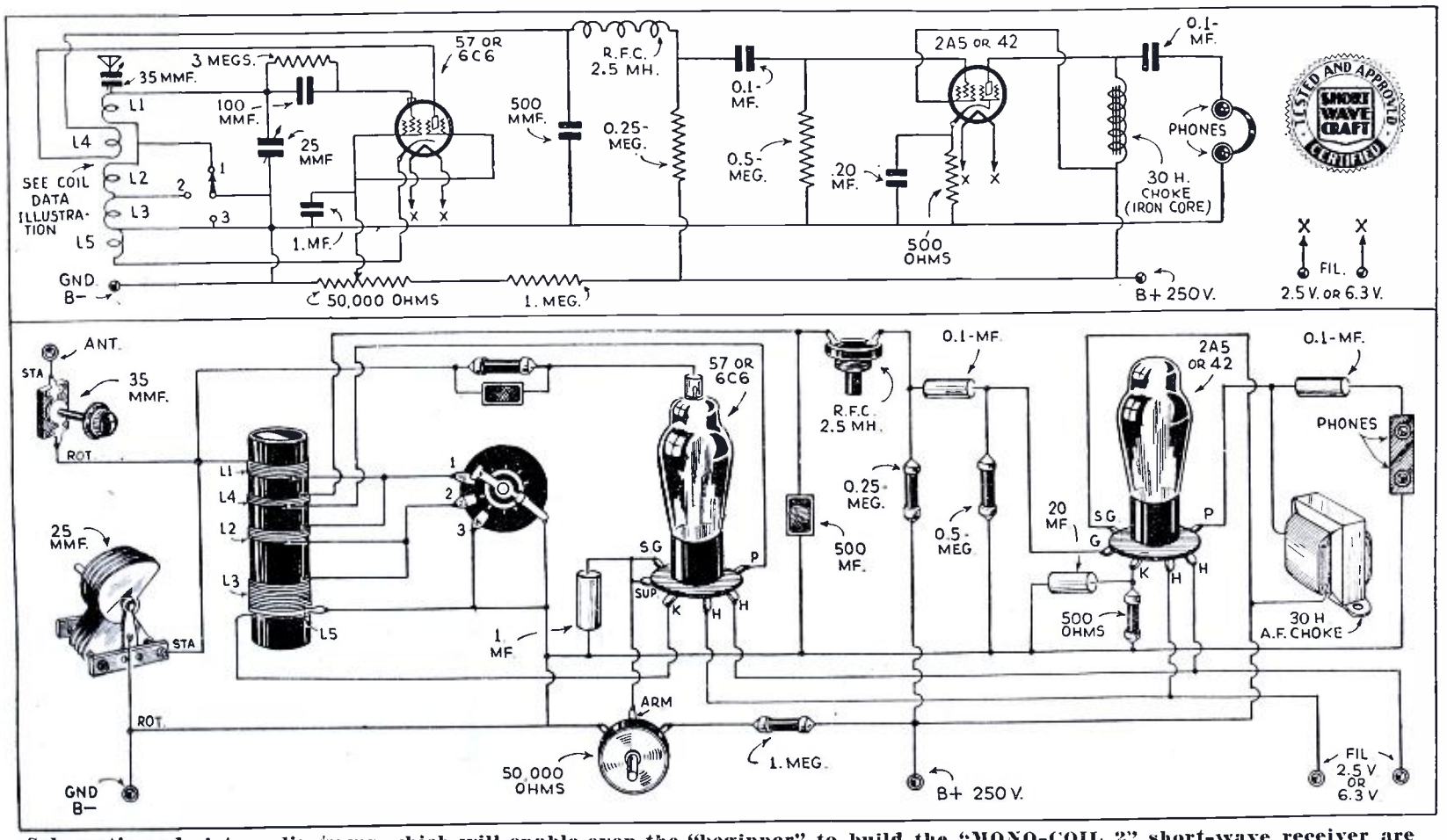
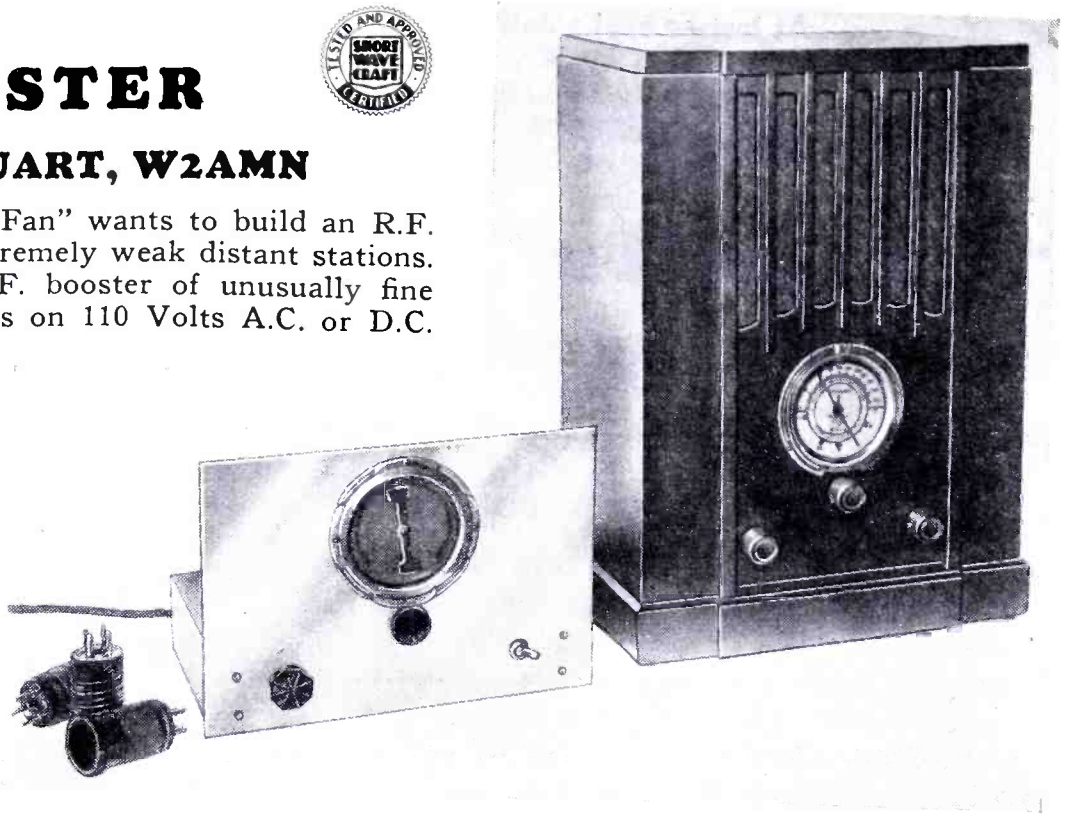


Schematic and picture diagrams which will enable even the "beginner" to build the "MONO-COIL 2" short-wave receiver are given above. This set is particularly designed for the short-wave "FAN," who wishes to listen to the European and other "foreign" and domestic musical and vocal programs broadcast daily.

How To Build A Simple Booster

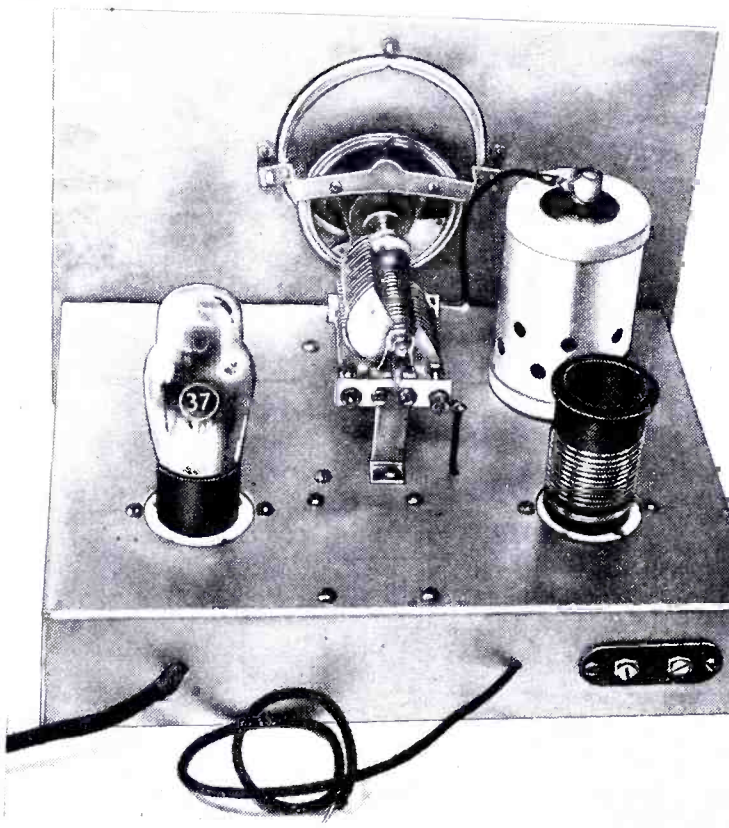
By GEORGE W. SHUART, W2AMN

Every dyed-in-the-wool short-wave "Fan" wants to build an R.F. Booster, which will amplify those extremely weak distant stations. Here is a "corking" single-stage R.F. booster of unusually fine design and low initial cost. It works on 110 Volts A.C. or D.C.



● THERE is nothing more annoying than receiving a station just a little too weak to enjoy. Many of our readers have asked us to describe a simple and inexpensive booster stage, one which can be added to any type of short-wave receiver from a one-tube battery set to a multi-tube superheterodyne.

The booster shown in the photographs is the answer to their request and it sure is a "life-saver" when it comes to those hard-to-get stations. It is a decided benefit to those living in poor locations where the *back-ground* noise is high and the average station is none to strong. While selectivity is not materially increased with a tuned R.F. stage, there is a decided increase in over-all signal strength and the signal-to-noise ratio is slightly better than without the benefits of a "preamplifier".



Directly above, we see the single-stage R.F. booster connected to a Midget all-wave receiver (right).

Left: Rear view of the one-stage R.F. Booster of simple, yet highly efficient design.

"A.C.-D.C." Circuit Used

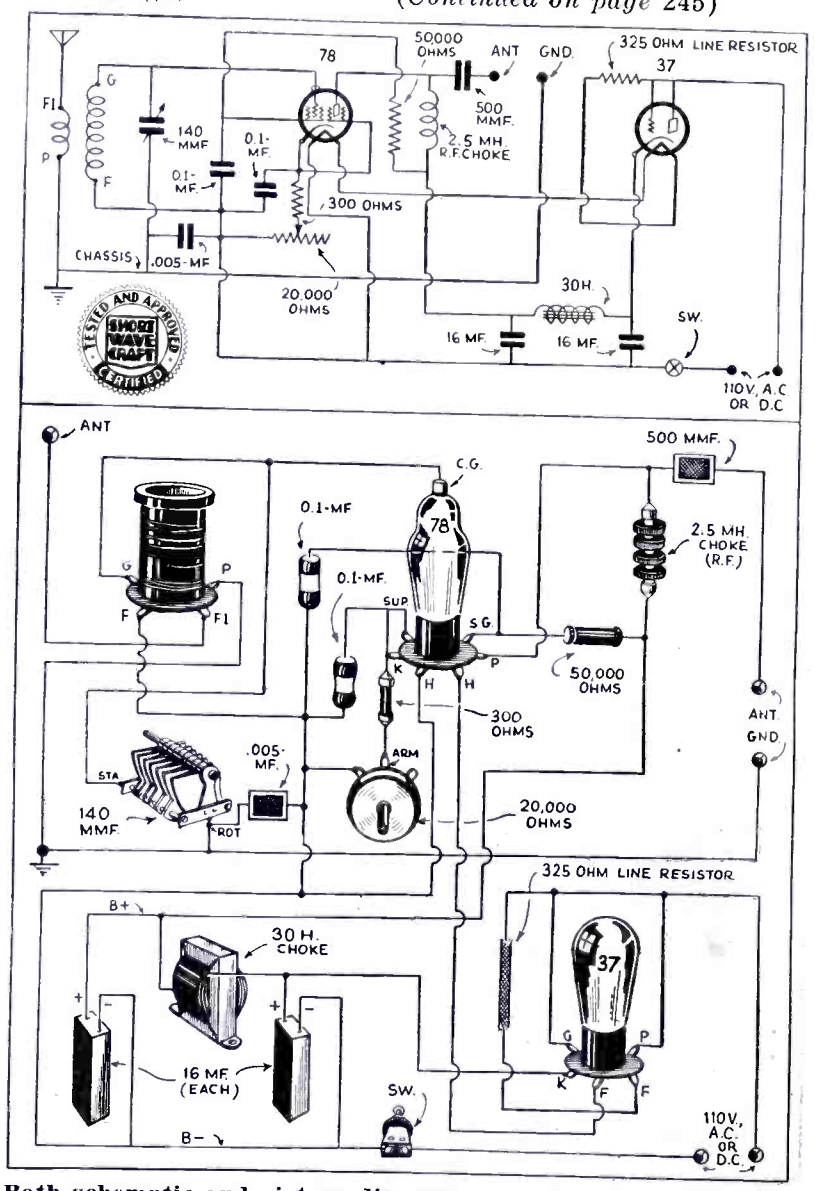
It was decided to make this booster an "all-electric" affair, which could be operated from either A.C. or D.C. house mains, bearing in mind that about ninety per cent of the S-W fans live in homes having 110 volt lighting systems. This, of course, does not mean that the booster can't be built for battery operation. The same circuit can be used on batteries by just disregarding the rectifier and filter parts in the diagrams. A 6-volt battery is then needed for the filament supply and 90 volts of "B" batteries to furnish the plate voltage.

The chassis used to build up this amplifier is larger than necessary and some folks may wonder at the use of a precision dial being used. The whole story is that the chassis is to be used for another set and it was a pure economic move. The builder can use any convenient size chassis and the entire unit can even be mounted on a wood base-board.

Amplifier and Rectifier Tubes

A 78 tube is used as the R.F. amplifier and a type 37 is used for the rectifier; the filaments are in series and the voltage-dropping resistor is incorporated in the 110-volt "line" cord. The filter choke and the electrolytic filter condensers are mounted underneath the chassis. If you

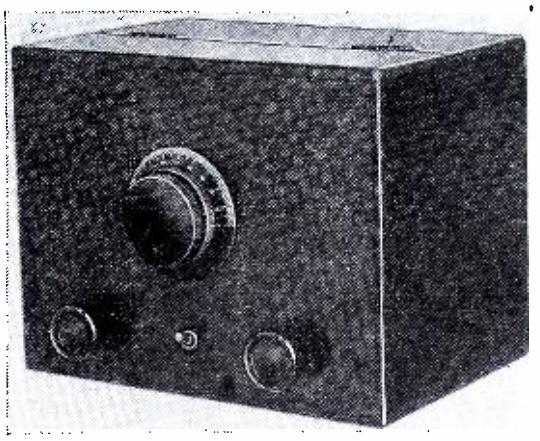
(*Continued on page* 245)



Both schematic and picture diagrams are given above, so that even the tyro can build one of these R.F. boosters and amplify those weak DX stations.

My Idea of A Good Battery All-Wave Portable

By MANDER BARNETT, England



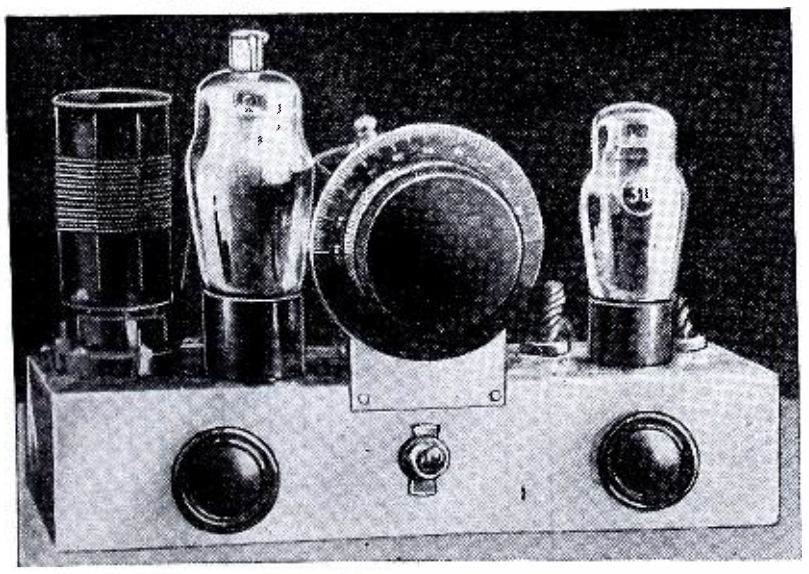
A very neat job indeed, Mr. Barnett, and we are sure that this 2-tube portable battery receiver will make a host of friends for you.

Specifications for a very "smooth-working" little receiver suitable for portable headphone reception, using a 32 type tube as the detector, and a 30 tube as the A.F. amplifier. This set is especially designed for battery operation, thus making it thoroughly portable and independent of electric line current supply. The "A" battery comprises two 1.5 volt dry cells and the "B" supply requires either one or two 45-volt batteries.

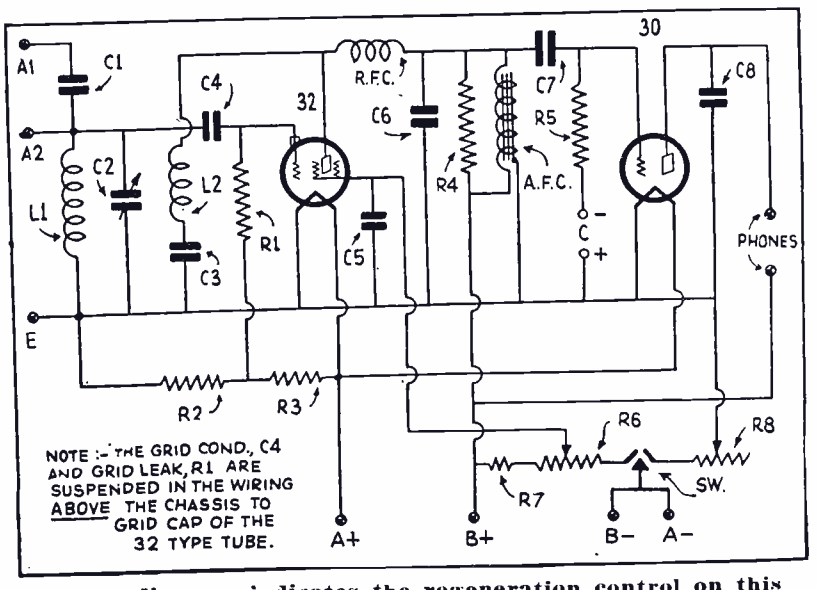
● THERE are many good reasons why a portable short-wave receiver should be an attractive proposition and it is rather a pity in some respects that more attention is not given to the development of this type of receiver. The particular set to be described here is a portable receiver of the semi-midget class, covering all waves from about 14 to 550 meters and producing really good headphone reception from short wave stations all over the world. It is not so small as some A.C. midget receivers, chiefly owing to the necessity of including batteries for A, B, and C supplies in the same case but on the other hand, it is not too large for portable use and won't take up much extra space when packing your baggage for the summer trip to the mountains. Even if you're not considering a trip to the wilds this summer, a set of this type will be very handy for semi-permanent use and makes a good auxiliary receiver for use where there isn't room for a twelve or fourteen tube super-boopadyne. As this portable was designed to be really *serviceable*, it was not considered worth while to cramp matters very much in the way of battery supplies, such as could be done by using perhaps about 20 volts B supply consisting of midget cells. Receivers of this type can be perfectly successful but their use is limited and this receiver was required to stand up to fairly heavy use and receive distant foreign stations with as much punch as possible Needless to say, it is exceedingly sensitive and easy to handle and with a normal antenna will bring in many short wave stations at good headphone strength, whilst the writer, using the set in England has heard good signals from W8XK in Pittsburgh, using only about two feet of antenna wire. Now for some of the technical data: It was a wise gentleman who said that a radio receiver was no better than its tubes and the tubes for this receiver were carefully chosen to produce the best possible results, *combined with economy of battery consumption*, particularly in the case of the filament supply, and for these reasons a type 32 was chosen for the detector tube, followed by a single 30 output tube. In a receiver of this size and type a power tube such as the 31 is unnecessary for output purposes and whilst advantages could be gained by using a pentode output of the 33 type, the filament consumption would be greatly increased, thus reducing the service life of the A battery, the total drain on which, when using the above tubes, amounts to only 0.12 ampere. The total anode (plate) consumption is between three and four milliamperes so that a small capacity battery will give very good service with this receiver. A 60-volt battery was used as this is the standard European size of small B battery but tests were made to settle the fact that the receiver would work perfectly well with a 45-volt battery so that an American battery of this type can be used perfectly well. The filament battery consists of a small two-cell dry battery, giving 3 volts when new, whilst the C battery is a single 1.5 volt dry cell which is mounted permanently under the chassis. Two 45-volt blocks could be used if preferred, in which case a 4.5 volt C battery would be necessary and as there is hardly room for this under the chassis, extra leads would have to be taken from the chassis and the C battery placed alongside the other batteries.

The regeneration control on this receiver is really *smooth* and is smooth on all the short wave bands. This is due partly to the potentiometer control used and partly to the method of biasing the input grid of the 32 tube. Instead of using a variable potentiometer to provide the correct bias, the grid leak is taken to the centre point between two resistors, R2 and R3, both of which are of identical value. Their actual value is not important so long as they are identical and are of a size which will produce a negligible drain on the filament battery. For convenience's sake, the two resistors actually used have a value of 500 ohms each. Without this arrangement, that is, by taking the leak

(*Continued on page* 245)



Here is the chassis of Mr. Barnett's well-designed 2-tube battery type receiver, which is intended for headphone reception.



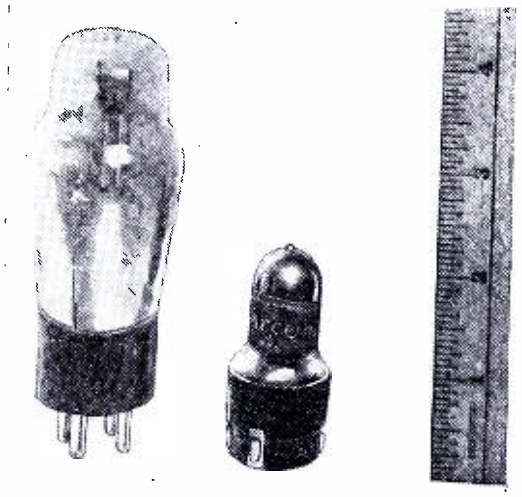
As the diagram indicates the regeneration control on this 2-tube receiver is so arranged as to provide maximum smoothness in adjusting the set to its highest sensitivity.

WORLD-WIDE SHORT-

New Small Size Tubes

● IN AN advance release to this magazine, the Marconiphone Co., Ltd., has just announced a new type of tube of extremely small size. At present two types of these tubes are made, both triodes, one with a higher mutual conductance than the other.

The applications of these small tubes should be numerous as they are also economical in battery consumption. They operate



The small size of these diminutive triodes is evident. Note 230 at the left.

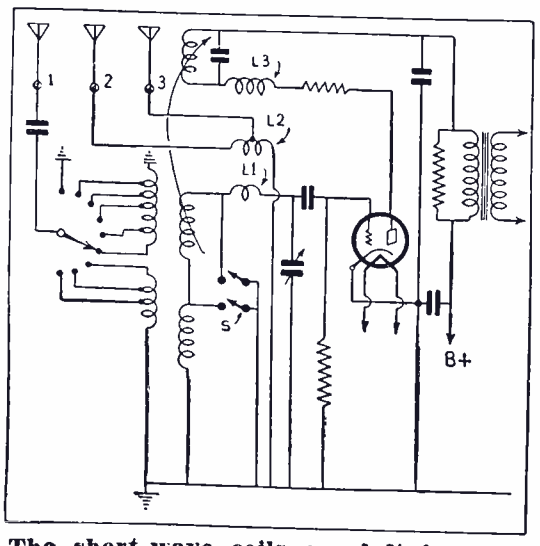
at 1 volt and require 0.1 ampere to heat the filament.

Extremely small portable receivers, deaf-aids and other devices are possible by the application of these tubes. Portable transmitters and receivers for personal use, such as police personal units could be made both light and small in size by their application. A photograph of one of the new British tubes is shown here.

All-Wave Switching Scheme

● IN A recent issue of *Funk-Technische Monatschefte*, a German magazine published in Berlin, a novel arrangement for switching from one wave-band to another was described. While this scheme is not entirely new, it is probably novel to many readers of this column.

As most of the short-wave broadcasting stations operate within a certain frequency band, most of these can be covered by one set of well-designed coils. It is well known that the switches used in all-wave sets introduce some loss, especially if numerous sections and circuits are changed to accommodate four or five wave bands.



The short-wave coils are left in the circuit for long-wave reception.

● 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.

To do away with this difficulty, the scheme shown here was devised. The short-wave coils are L1 (grid coil), L2 (aerial coil), and L3 (plate coil). These coils are connected permanently in the circuit in series with the regular broadcast coils. When reception on the broadcast band is desired, the switch S is thrown to the open position. This removes the short-circuit from the grid coil and places both the broadcast and short-wave coils in the circuit. For broadcast reception, aerial connection No. 1 is used. The fact that the short-wave coils are in the circuit has no effect on reception as they are so small that no practical difference is made.

For short waves, on the other hand, the switch S shorts out the grid coil of the broadcast band tuner. The aerial is shifted to posts Nos. 2 or 3, which eliminates the aerial coil. The tickler coil for the broadcast band tuner is made with a small condenser across it. This acts as a by-pass for the short waves which effectively removes this coil from the circuit.

On the broadcast band, the small condenser across the tickler coil simply tunes the coil to a slightly lower frequency which has the effect of increasing the regeneration somewhat. The latter effect is easily compensated for.

Where only a single short-wave band is needed, this method is both simple and effective; and as the switch is only in one circuit, it does not reduce the efficiency of the set to a measurable degree.

The Octode Tube

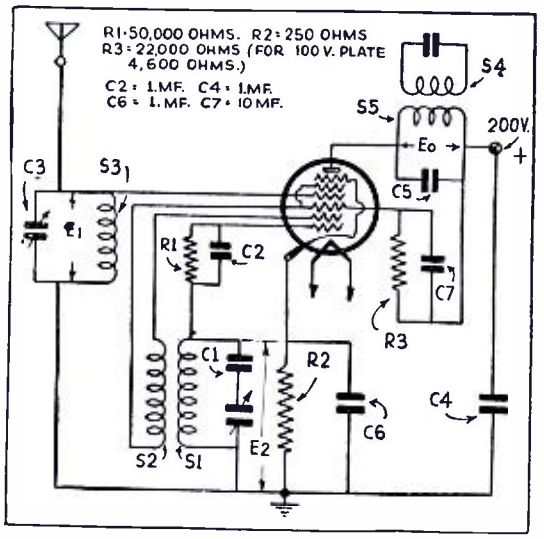
● IN A recent issue of *Toute La Radio*, a newcomer in the French Radio publishing field, an interesting tube was described. This tube is called the "octode" because of the number of elements (8) contained within its glass envelope.

The octode is similar in purpose to those friends of American short-wave "fans"—the 6A7 and 2A7. In other words it is an electron-coupled frequency converter tube. However, it differs in one important respect from these two tubes. It contains one more grid, which is internally connected to the cathode, and acts as a suppressor for the screen-grid section of the tube, thus making it in effect an R.F. pentode.

From the short-wave angle, this is most important, as the pentagrid converter tubes are not particularly effective on very high frequencies. The new French tube is efficient on frequencies as high as 43,000 kc. (7 meters.)

The efficiency of frequency conversion is also improved, according to the description in *Toute La Radio*, as conversion efficiencies up to 250 have been attained. This is much higher than the usual 50 or 60 obtained with the 2A7.

While this new tube is not available in the U. S. A. at present, it is quite possible that in the near future similar domestic tubes will be introduced.



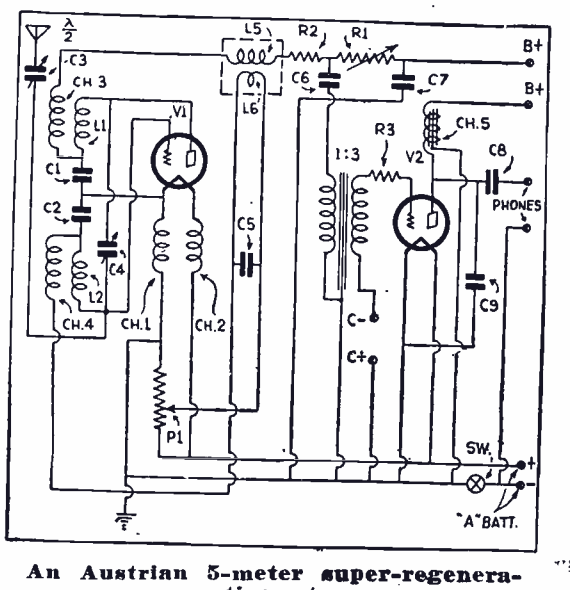
A typical circuit for the "octode" tube.

Short-Wave Super-Regenerator

● AN interesting circuit for a short-wave super-regenerative set appeared recently in *Radio Amateur*, a magazine published in Vienna.

This circuit is shown here. The values of the parts are as follows: L1 and L2 each contain 5 turns of number 14 copper wire on a 1 in. form for the 5 meter band; L5 contains 800 turns of number 32 enamel wire on a 1 in. form with L6 adjacent to it; L6 contains 500 turns of the same wire; C1 and C2 are 5 mmf. each; C3 is 50 mmf.; C4 is 35 mmf.; C5 is .01 mf.; C6 is .5 mf.; C7 is 1 mf.; C8 is 2 mf.; C9 is .02 mf.; Ch1 and Ch2 are wound with 35 turns of number 18 D.S.C. on a ½ in. diameter form; Ch3 and Ch4, 50 turns of No. 32 D.S.C. on a ½ in. form; Ch5 is a 20 henry choke; R1, 50,000 ohms; R2, 15,000 ohms; R3, 1,000 ohms; P1, 5,000 ohms.

It will be noticed that the various circuits of the set are carefully isolated from one another. This is necessary for that smoothness of operation so essential to correct operation on short waves.



An Austrian 5-meter super-regenerative set.

WAVE REVIEW ..

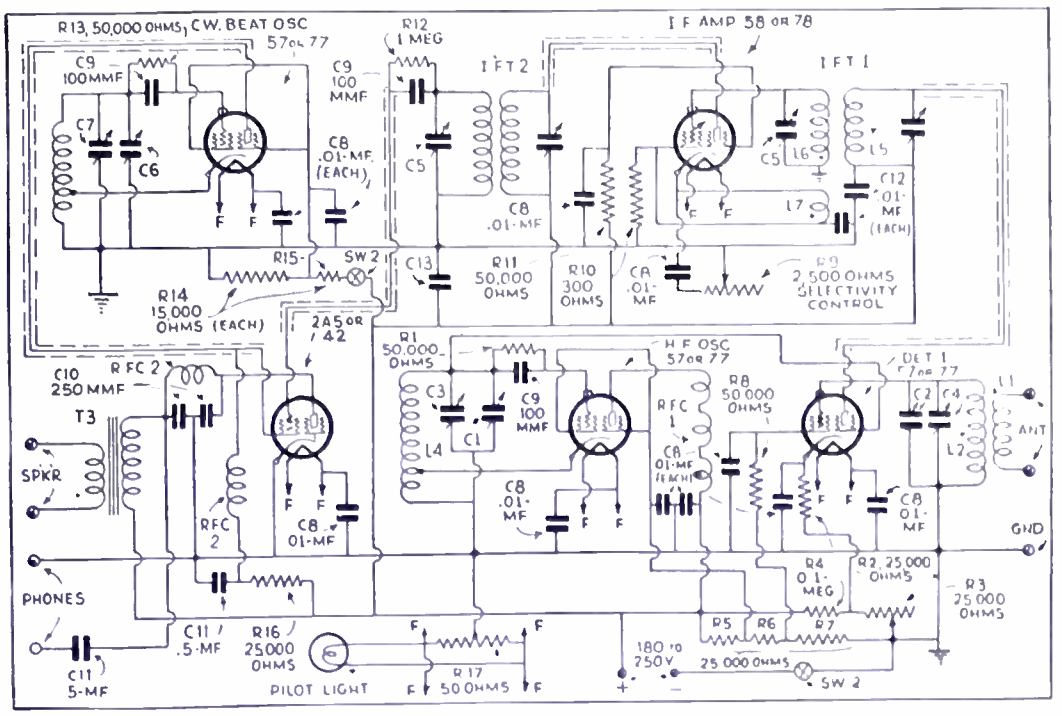
Edited by C. W. PALMER

An Australian Single-Signal Set

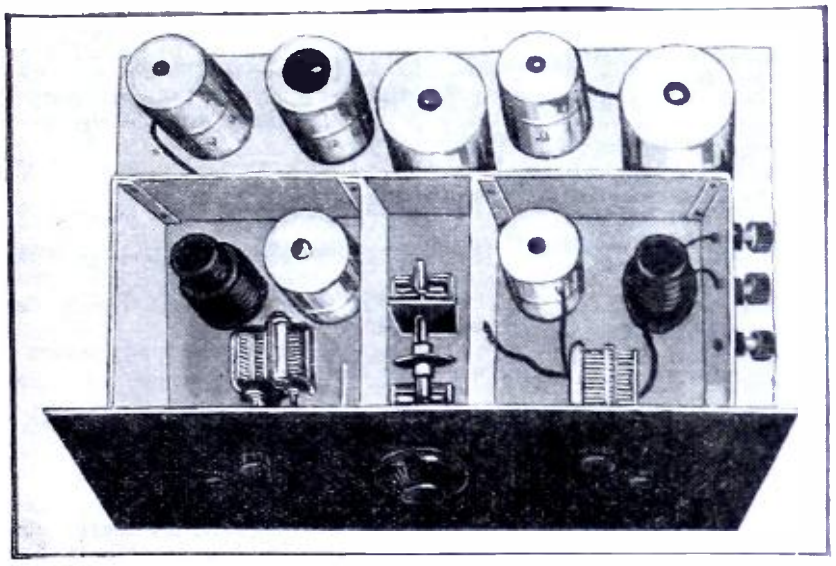
● PERHAPS one of the greatest problems of amateur radio today is that of interference. The narrow channels allotted to amateurs have complicated the situation considerably and have necessitated large improvements in transmitter and receiver design.

In C.W. reception with an autodyne receiver identical beat notes are obtained from two signals of different frequency, one beat note frequency higher than the local oscillator (detector) and the other beat note lower. It can be seen that a considerable amount of interference can take place from other undesired signals that may be several kilocycles away from the desired signal frequency. This type of interference is eliminated, together with quite a lot of noise and other interference, by the use of a *single-signal* superhet. This receiver is similar to the usual super, but has the addition of either a piezo-electric quartz filter or regeneration in the I.F. amplifier to give high selectivity. The separate beat oscillator gives an audio beat note for C.W. reception, it being tuned to a frequency suitably different from the intermediate frequency.

In a recent issue of *Australian Radio News*, an interesting receiver of the above type was described. It is much simpler in construction and design than previous types. The circuit of the set is shown on this page, together with a view of the interior of the original set.



The circuit of the Australian single-signal super-het.



The layout of parts for the set. Note the neat arrangement of the parts; also the carefully designed shielding, a very important feature in such a complicated set as this.

In this set, an intermediate frequency of 465 kc. was used. There is nothing unusual about the I.F. amplifier except for the regeneration introduced into the first I.F. transformer. As shown it consists of a coil added to the manufactured coil. The small tickler coil is bunch wound and is made up of 25 turns of 32 D.S.C. wire slipped over the form on which the other coils are wound.

The tuning coils are made as follows:

	L1	L2	L4	
3.5 mc.	10	28	28	tapped at 9
7.0 mc.	4	12	12	tapped at 4
14 mc.	3	8	8	tapped at $2\frac{1}{2}$

All coils are wound with 26 D.C.C. wire and the aerial coil is spaced $\frac{1}{4}$ inch from the grid coil. The aerial coil is adapted for use either with a doublet lead-in or with a straight Marconi type aerial. The tuning condensers C3, C4 and C7 are 23 plate midget units and the trimmers are 5 plate units (this applies to C1, C2 and C6).

Pentagrid Converter Data

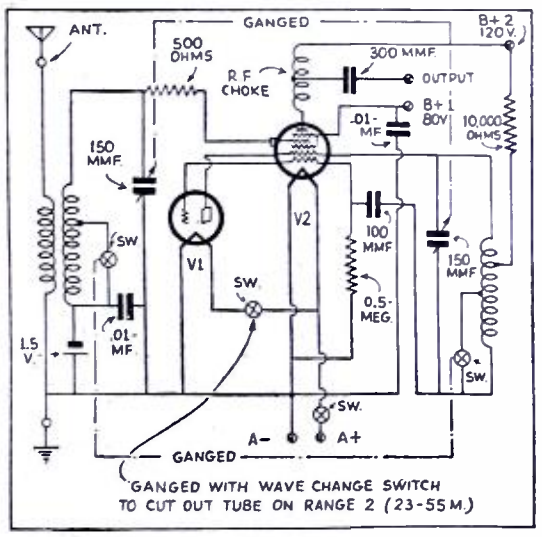
● IN A copy of *World-Radio* lately, we noticed some notes on the use of pentagrid converter tubes for short-wave use.

One of the outstanding facts presented was a means of compensating for the loss of oscillation on the smallest coil. This is an effect that has been noticed by many fans who find this type of tube otherwise superior to the use of a separate oscillator and first detector. (The 2A7 and 6A7 are the American tube numbers.)

Apparently the European fans have encountered a similar trouble with their pentagrid tubes.

The solution to the problem was found in the addition of a triode tube connected in parallel with the triode section of the converter tube, but with a switch in the filament circuit of the external tube so that it could be turned on or off at will. Then by the addition of a separate section on the wave-change switch, or by manual control, this tube can be turned on for the highest frequency coil.

The external triode tube increases the mutual conductance of the triode portion of the converter tube which increases the tendency to oscillate.

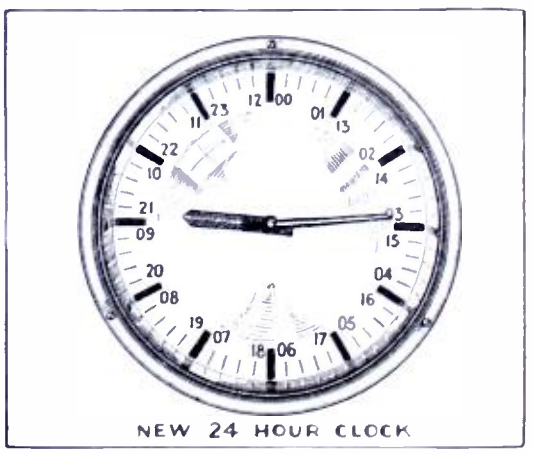


The triode V1, permits oscillation on high frequencies.

What Is 00.00 O'Clock?

● THE British Broadcasting Company, with several other commercial organizations in Europe, are adopting the twenty-four-hour method of time notation. For the benefit of American readers, we are illustrating a twenty-four-hour clock and a suitable time-conversion table, which will enable the American Short-Wave "Fan" to thoroughly familiarize himself with the new method of keeping time. Glancing at the table, we find three sets of figures, one, GMT; one, English time (this is the twelve-hour method generally used in England at the present time), and which the authorities are trying to replace by the 24-hour method; while the other column includes the corrected Eastern Standard Time. (Add one hour for daylight saving time.)

(Continued on page 250)



New double-numbered English clock dial which enables one to read the time by the 12 or 24-hour system.

Short Wave SCOUT NEWS

Report from Official Listening Post of Heinie Johnson, Big Springs, Texas

(Winner of 1st Short Wave Scout Trophy)

● PERHAPS you are tired of tuning for a certain station at a certain hour because some station list had that station listed as being on the air at that certain hour. After tuning awhile you decide either your set won't bring them in or the list "lied." It's an unpleasant feeling and doesn't help make a good short-wave "Fan" of you.

At such a time it would be a good policy for you to turn your attention to a study of "world" time-tables and figure out what percentage of the distance between your set and the location of the station you are trying to hear is in darkness and what percentage is in daylight; also which end of the space in question is in *daylight*. Then consider the fact that signals between 10 and 28 meters can be expected to circle the world easily, providing daylight is encountered all along the route, while those from 30 to 50 meters will do the same thing under a condition of tuning which allows darkness to be encountered along the path of the carrier. And don't forget the fact that people of all nations sleep at night, and most broadcasting is done in the early evening hours, *their time*. The exceptions are those big stations which put on special short-wave programs for "DX" purposes. A study of the above rules will reveal that you and I who listen "here in America" should hear European signals on 19 meters at 8:30 C.S.T. (9:30 E.S.T.), to 9:00 a.m. with as much signal strength as is ever possible during the 24-hour day—and this will prove true. We will, at that hour, have no trouble hearing DJB, GSF, and FYA—*all good*.

Right now, GSF is the best signal, while FYA will be the weakest. It will require a big map and some study to show you why, but you'll find the answer is due to the above mentioned rules.

Here in Texas, and I don't see why it would not also be true across the nation either way, the best hour to hear the Japanese signal on 38 meters is now 3:30 a.m., E.S.T. The signal is very clear at that time and is good until around 5 a.m., C.S.T. or 6 a.m., E.S.T.

Nevertheless, it begins to weaken here at about 4 a.m., and listeners in central states will do well to drop off listening then and try for the big Chinese station on 49 or 50 meters.

This signal, when working, which is irregular, proves surprisingly loud and clear up until the time of sunrise at your location. Their programs are well arranged and very interesting, which makes them well worth tuning for, over a period of several mornings—if necessary.

Six months ago VK2ME was best early Sunday morning—say 6 a.m., C.S.T. Now they are best from 12:30 to 1:30 a.m. I believe they are, at this season, better at the above mentioned time than at any hour in any other season.

The League of Nations station on 38 meters is mighty fine right now. This signal can only be heard Saturday afternoons at 4:30 to 5:30 at this location.

I believe they come on the air a little earlier than 4:30 C.S.T., but, we have no luck until that time—then they come with a bang. They only operate on Saturday.

Most of the South American 49-meter signals are crawling behind the noise level—very poor listening is the result and will continue to be so until late fall. This is also true of the Santo Domingo signals.

Notable exceptions are HJ1ABB, HIX, and YV3RC. This last station was formerly YV3BC, but they have recently changed call letters.

PSK in Rio de Janeiro, Brazil, operating on 36 meters around 5 p.m., C.S.T., is, of course, about perfect right now for central states' listeners.

DJC on 49 meters is heard almost every evening after 8:30, C.S.T.

An interesting program was the Beer Advertising recently put on the air over this station for American listeners by American students attending German colleges.

The most notable event of the month is the return of PHI to the 16-meter band, where they are somewhat stronger than they were on 25 meters.

▼ ▼ ▼

Report from "O. L. P." of John Sorensen, New York City, N. Y.

(Winner of 2nd Scout "Trophy")

● IN regard to the bell signal used as interval and identification calls by many of the short-wave broadcasting stations now, it's very difficult to tell what notes are being used by the different stations, XEB, XEBT—also use gong or bells, and I seldom know whether they are bells, chimes, gongs, piano, clocks—or what. To be absolutely sure of the notes just by listening to them is quite difficult. I am afraid there will be many contradictions, as very few people can tell the notes accurately the way they come in. I have heard chimes on RNE and listened all Sunday night to a broadcast from RNE to Siberia, White Island and the Arctic—but no chimes that night.

Here are a couple more before the "deadline": May 29, 7:35 p.m., E.S.T., RNE, 25 meters, Chimes—talk in Russian. Lecture on Labor, chimes. 7:55 p.m., E.S.T. Came over fine.

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

CJRX, Winnipeg, Can., Saturday 26, 10 p.m. 25.5 meters R9—QSA4 (11:45 p.m. and 48.75 meters).

Have veri from XEB, Mexico City, Mex. They do not state time on air or wavelengths. I heard them on 49.75 meters (approx.) many times; report sent around May 10; best between 8 and 10:30 p.m., E.S.T.

I think I have cornered ZTJ (Johannesburg, So. Africa, 49 m. 6122 kc.), but I better wait for my veri. My time as here given is all E.S.T. (Eastern Standard Time).

I am now using an outside 200 foot long (15-60 ft. high) aerial outside. I have also a 15 ft. inside—75 ft. outside aerial.

May 29—10 p.m. Transmission from U.S.S. California on 43 meters (about) sending fine programs to New York. Also testing with Rocky Point, L. I., R9, QSA4. Later Rocky Point and U.S.S. Saratoga talking and testing; 43 meters also.

U.S.S. California was 350 miles southeast of New York, just near Cape Hatteras.

PHI is good on 16.8 meters. Mornings also GSG—GSF fine around noon; France, Germany, England, very good evenings on 25 meters. I expect more veris soon but next report will be sent about June 27. I have plenty of harmonics here. I am "gunning" for Norway and other elusive S-W stations. GSB is grand after midnight—XETE also—31.25 meters.

(*We are working on a list of the chime and bell signals used by the various Short-Wave "broadcasting" stations and hope to present this in the next issue.—Editor*)

▲ ▲ ▲

News from Chas. Guadagnino's Post, Detroit, Mich.

(Winner of 3rd Scout "Trophy")

● RECEPTION on short-wave for May has been fair, with some fading. Heard the following:

LSQ, Buenos Aires—on 15.3 meters, testing between 1:00 and 3:00 p.m., E.S.T. This is a new station in Argentina.

PSK, Rio de Janeiro, on 36.6 meters, is still relaying programs of PRA3. This station is irregular.

DJB, Zeesen, Germany—19.7 meters—6:45 to 9:45 a.m.

DJD—Zeesen, Germany—25.5 meters—8:00 to 11:00 p.m.

DJC—Zeesen, Germany—49.8 meters—8:00 to 11:00 p.m.

IRM—Rome, Italy—30.5 meters—3:00 p.m. to 6:00 p.m. This station has been relaying 12RO.

EAQ—Madrid, Spain—30.4 meters—5:10 p.m. to 7:00 p.m.

JYT—Japan—19.0 meters—6 p.m.; JYK—Japan—22 meters—6 p.m. Testing with Dixion, California. These Japanese stations are "new" ones.

HJ2ABC—Cucuta, Colombia—50.2 meters. On daily from 6:00 p.m. to 9:00 p.m., E.S.T.

HJ1ABB, Barranquilla, Colombia—46.5 meters. On daily, 6 p.m. to 10 p.m., E.S.T.

VK3ME—Melbourne, Australia—31.5 meters. Wed., 5:00 a.m. to 6:30 a.m. Saturdays, 5:00 a.m. to 7:00 a.m. Very good lately R-7 to 8.

GSE on 25.2 meters—8:45 a.m. to 11:00 a.m.

GSD on 25.5 meters—1:00 p.m. to 5:30 p.m.

GSB on 31.5 meters—1:00 p.m. to 5:30 p.m.

This is my "listening post" report for 15 days of May.

Hope to have a better report of "foreign" stations next month.

▼ ▼ ▼

Report from Fred Bente, Brooklyn, N. Y.

(Winner of 4th Scout "Trophy")

My report for last month is nil as I have taken up summer residence and have not used the set regularly this month. In regards to identifying stations by musical notes, I cannot give the scale notes used just yet, only the type or kind of note.

1.—German stations at Zeesen. The notes are a few bars taken from an old German folk tune, as played by the chimes of the Garrison Church at Potsdam, in which lies the tomb of Frederick the Great.

2.—England uses the chimes of "Big Ben".

3.—VE9HX, Halifax. Signs off with chimes.

4.—YV3BC, Venezuela. Plays bells on the hour.

5.—PSK, Brazil. Plays chimes when signing off.

6.—HJ4ABE, Medellin, Colombia. Plays bells.

7.—TGX, Guatemala. Plays a two-tone high frequency signal.

8.—Station in Equador. Plays chimes throughout the whole program.

▼ ▼ ▼

Hub City S-W League

At last we are getting the equipment to build a S.W. receiver for the club, as we are not certain about the circuit we intend to use, I will not go into the receiver until next report.

We have a good "club library" now.

I can assure you that I will try and do my best to send reports in once a month.

M. R. McCALLUM,
Secretary, Hub City S.W. League,
521 Ninth Street,
Saskatoon, Sask., Canada.

SHORT WAVE SCOUTS

Sixth "Trophy Cup" Winner—Edward M. Heiser, Brecksville, Ohio

● MORE honors for the "home-built" short-wave receivers—Edward M. Heiser, the winner of the Sixth Trophy in the Contest ending June 1, rolled up his high winning score of 78 short-wave stations with the required number of verifications, all on a "home-built" set. Mr. Heiser used the hook-up of the Tetradyne H-2. We take pleasure in congratulating Mr. Heiser on his very fine list of 78 short-wave stations heard over a thirty day period, and also wish to compliment him especially for the very neat style in which he prepared his list of stations.

We are still receiving quite a number of inquiries from readers asking if the list of stations submitted in the contest has to be for the 30-day period immediately preceding the closing date. As we have clearly explained several times in the past, the list of stations submitted may be for *any* 30-day period, which gives the contestant plenty of opportunity to obtain his verification cards from the foreign stations. Another point the judges wish to mention is that in any case, it is always the best practice to submit the verification cards, together with the list of stations, oath, and letter, etc., *all at the same time* and not to attempt sending in a list of stations with various bunches of "veris" stringing out along over a month or so. The editors are too busy to keep track of all of these "veris" sent in such spasmodic fashion, and it would require the services of a special clerk to take care of them. Another question that has been asked many times recently is whether or not "old veris" can be submitted; it should be evident that the "veris" submitted should, of course, be those obtained after writing to the stations *heard during the 30 day period over which the list is being compiled.* Other queries are concerned with the matter of the 30 day period, whether they can run from the first to the last of the month, or if they can run from the 15th of one month to the 15th of the next, etc. This is OK, and the judges do not care what dates the 30 day period is for, and in any case the opening and closing dates of the 30 day listening period should be stated at the head of the list of stations; also arrange the *verified* and *unverified* stations in separate lists.

Mr. Heiser's Letter Accompanying His List of Stations Submitted in May Contest

Editor, SHORT WAVE SCOUT AWARD:

Enclosed find my list of stations, together with the verifications and notarized statement. There are many verifications which I have not received yet as it takes a long time to receive a reply from some stations. The set I am using is the Tetradyne H-2 which was described in *Radio-Craft.* I have made several changes in the set and have it working fine.

I am using a 4-wire cage aerial, 30 feet long, strung in the attic with a 30-foot drop to the set for the lead-in.

I wrote a letter to *Radio-Craft* describing the results I had with it (which was published in *Radio-Craft*).

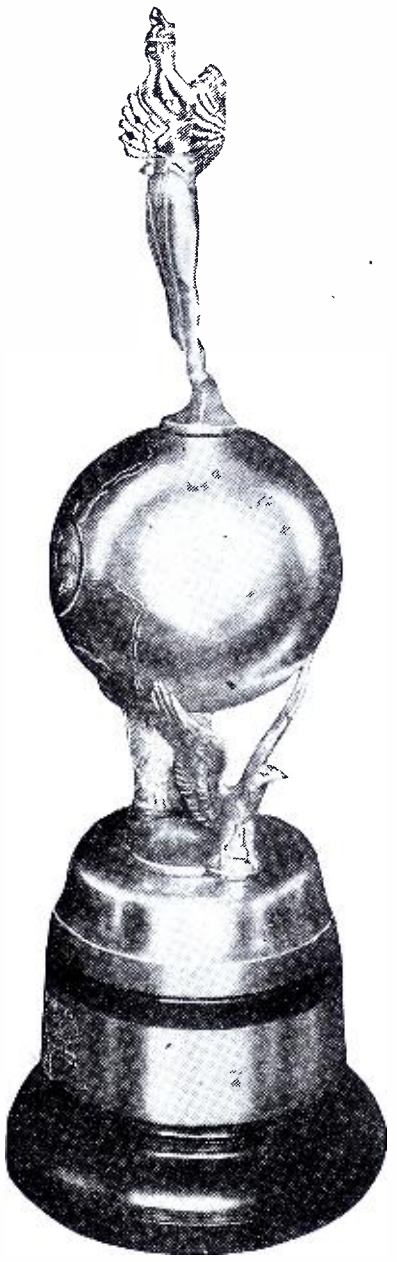
I am now able to tune down to 16 meters.

EDWARD M. HEISER,
Route 2, Box 124,
Brecksville, Ohio.

Verified Short-Wave Log—Time Given Is Eastern Standard

FYA—19.68; Station Radio—Coloniale, 98 Boulevard Haussman, Paris (8E), France. "Marsellaise" at sign off.
FYA—25.20; Station Radio—Coloniale, 98 Boulevard Haussman, Paris (8E), France. "Marsellaise" at sign off.
FYA—25.60; Station Radio—Coloniale, 98 Boulevard Haussman, Paris (8E), France. "Marsellaise" at sign off.
EAQ—30.40; Radio Difusion Ibero—Americana, P. O. Box 951, Peligros, 2 Madrid, Spain. Steadiest on air.
I2RO—25.40; Radio Roma Napoli, Rome, Italy. Lady announcer.
G6RX—30.64; English Post Office Dept., Rugby, Warwickshire, England. Sends test programs.
GBB—22.08; English Post Office Dept.. Rugby, Warwickshire, England. Phone to New York and Montreal.
HJ1ABB—46.53; La Voz de Barranquilla, E. J. Pellet, P. O. Box 715, Barranquilla, Colombia, S. A. Coffee of the tropics.
YV3BC—48.78; Radio Difusora, Venezuela, Caracas, Venezuela, S. A.
HC2RL—45.00; Station HC2RL, P. O. Box 759, Guayaquil, Ecuador, S. A. Ecuador. N. Anth., Ann. in Eng.
LSX—28.98; Transradio Internacional, San Martin 329, Buenos Aires, Argentina, S. A. San Lorenzo march at sign off.
YNCRG—44.70; Compania Radio Granada, Granada, Nicaragua, C. A. "On Lake Granada."
PSK—36.65; Radio Club of Brazil, Rio de Janeiro, Brazil, S. A. Give call in English.
COC—49.92; Cuban Tel. & Telegraph Co., P. O. Box 98, Havana, Cuba. Give call in English.
VE9GW—49.22; Canadian Radio Commission. Bowmanville, Ont., Canada. Very deep voiced announcer.

(*Continued on page* 243)



SIXTH "TROPHY CUP" WINNER

Presented to
SHORT WAVE SCOUT
Edward M. Heiser
Brecksville, Ohio
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 Yorks 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 commercial phone stations, in a period not exceeding thirty 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; at least fifty per cent must be "verified".

HONORABLE MENTION AWARDS

Samuel J. Emerson, 1097 Galewood Drive, N. E., Cleveland, Ohio. 60S; 37V.

R. Alea Valbuena, Lacret baja 55, Santiago de Cuba. 44S; 29V.

Albert E. Emerson, 1049 E. 147th St., Cleveland, Ohio. 28S; 14V.

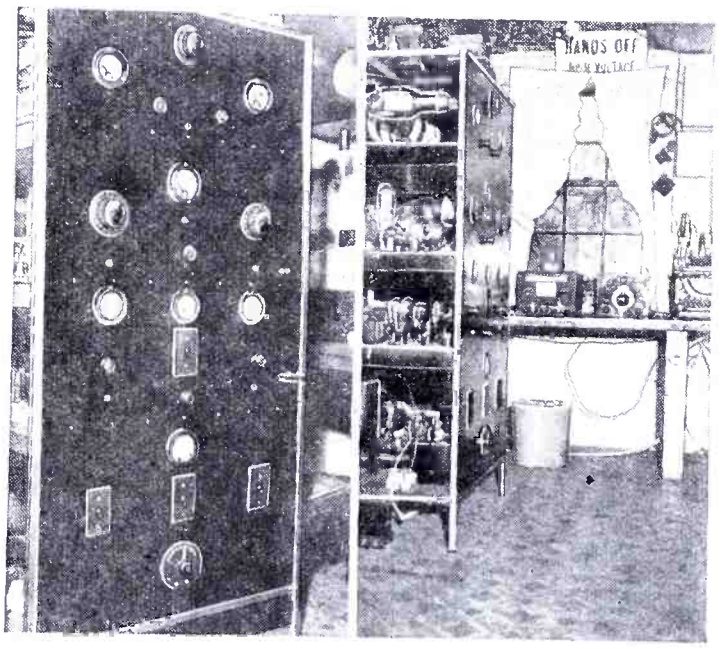
L. O. Lindbergh, 1221 Mountain St., Montreal, P. Q., Canada. 38S; 19V.

S—Total number of stations submitted.
V—Total number of verifications submitted.

SHORT WAVES and

A Real High-Powered "Ham" Station

"Prize-winning" station photo awarded One year's subscription to SHORT WAVE CRAFT.



Chauncey B. Moore, WSIDJ, of Oneonta, N. Y., is the proud owner of this particularly fine transmitting and receiving station. The transmitter is rated at approximately one kilowatt and the receiving equipment includes a National FBXA receiver.

Editor, SHORT WAVE CRAFT:

WSIDJ has been on the air since December, 1932. This station has worked all districts the first month on air with a 210 in the final stage. To date has worked three continents and many countries. Have been heard in several countries in Europe and New Zealand on 80 meters. Have also had many "DX" foreign cards on 40 meters.

The transmitter at present is a 247 crystal oscillator, 246 doubler, 246 buffer, W.E.242-A buffer, 852 buffer, and a pair of 204-A's in push-pull in the final running with one kilowatt input. The receivers are a National FBXA and a home-made receiver using a 58 r. f., 57 det., and a 56 a. f.

Antenna's used are an 80 meter Zepp, 131 ft. 3 in. flat-top with 55 ft. feeders and a 40 meter Zepp 64 ft. 8 in. flat-top with 33 ft. feeders. The receiving antenna is a *transposed doublet.*

There are four power supplies being used, a 350 volt supply on the oscillator using an 83 rectifier, a 500 volt supply on the 246 doubler and buffer stages using 281's as rectifiers, on the W.E. 242-A buffer stage is an 800 volt supply using 2—866's as rectifiers and on the 852 buffer and final stage there is a 5 k.w. 2,300 volt supply, using four 866-A's in bridge rectification. G. E. oil-tank filter condensers are used throughout for filters, except on the oscillator stage.

The frequencies mostly used are 3,530, 3,784 and 7,060 kc. We will be "working" on the 40 meter band mostly this summer but are planning to work on 75 meter phone the coming Fall and Winter.

W8IDJ is a member of the ARRL and USNR and an ORS. We are always glad to QSP and "chew the rag."

The bottom shelf contains the high-voltage power supply, the second shelf the 247 crystal oscillator, 246 doubler, 246 buffer and power supply for the oscillator and buffer; the third shelf contains the W. E. 242-A buffer and 852 buffer and power-supply for the 242, and the last shelf the two 204-A in push-pull as the final. On the top of the rack is the antenna tuning condenser and harmonic suppressors. At the right of the picture are the two receivers and typewriter.

CHAUNCEY B. MOORE, W8IDJ,
11 Hazel St., Oneonta, N. Y.

(*Hotcha! Chauncey—what a "ham" station! With a powerful "set-up" like yours, one could have an elegant time any rainy Sunday, calling up "the rest of the world."—Editor*)

A "Hot" SWL Station

Editor, SHORT WAVE CRAFT:

I have wanted to answer your request for pictures for quite a while, so I finally decided to send you a picture of my listening station here.

The receiver is a Pilot Universal Super Wasp, with which you may be more or less familiar and it operates through a nine-inch dynamic speaker which is set in a tapestry covered Celotex baffle, which may be seen at the end of the receiver nearest the windows. Many short-wave broadcast and amateur stations, both phone and C.W., are heard very well from all parts of the world with this receiver. My antenna is a Lynch "Doublet" cage antenna, with the regular transposed lead-in, and it is strung from two 20 foot steel masts, one on each end of the roof of the house. I have built several of the receivers described in your magazine, one of them the "A.C. Band-Spreader 2" by George W. Shuart in the February, 1933, issue, which gave me excellent results prior to my purchasing my present receiver. Many countries are represented in my QSL collection, some of which may be seen in the picture. I will appreciate any correspondence from amateurs or SWL's from any QRA, and I will gladly exchange my card or a photo of the "rig" here with anyone who wishes to do so.

I will now say 73 and may SHORT WAVE CRAFT enjoy future success.

EMILE A. BERUBE,
151 West Street,
Lawrence, Mass.

(*Congratulations, Emile, on your success in building and operating the "A.C. Band-Spreader 2" and also on your excellent log established with the Pilot receiver.—Editor*)

Above—Emile A. Berube of Lawrence, Mass., who has rolled up a lengthy list of "DX" short-wave stations.

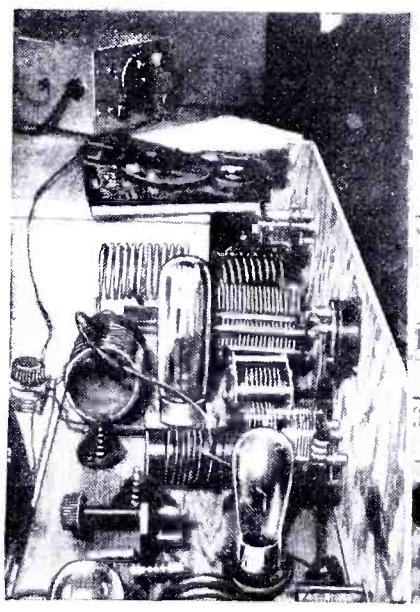
W2CSM—A "Live" Station!

Editor, SHORT WAVE CRAFT:

I am sending two pictures of my station that you may be able to use. Number 1 (left) is an end view of the transmitter with the receiver in the background. The transmitter in the upper right-hand corner is the 160-meter phone.

Number 2 (right) I guess you can figure out for yourself—Hi. "Yours truly" is in the picture.

ARTHUR OZSVATH, W2CSM,
169 Greenridge Ave.,
White Plains, N. Y.



Left—End view of the transmitter at station W2CSM; below—The operator and owner, Arthur Ozsvath, himself, at the "control desk."

LONG RAVES . . . OUR READERS' FORUM

Our Sets "Work"!

Editor, SHORT WAVE CRAFT:

I have been a reader of SHORT WAVE CRAFT for some time and have promised myself I would send a photograph for publication. So here it is.

I can't do any bragging about the layout—but boy! does it work! Well, I'll tell the world!

On the right, built on top of a "B" eliminator is your 10-meter Pigmy, using one No. 19 tube, which was described in one of your recent issues; also a single-button carbon mike that is home-made.

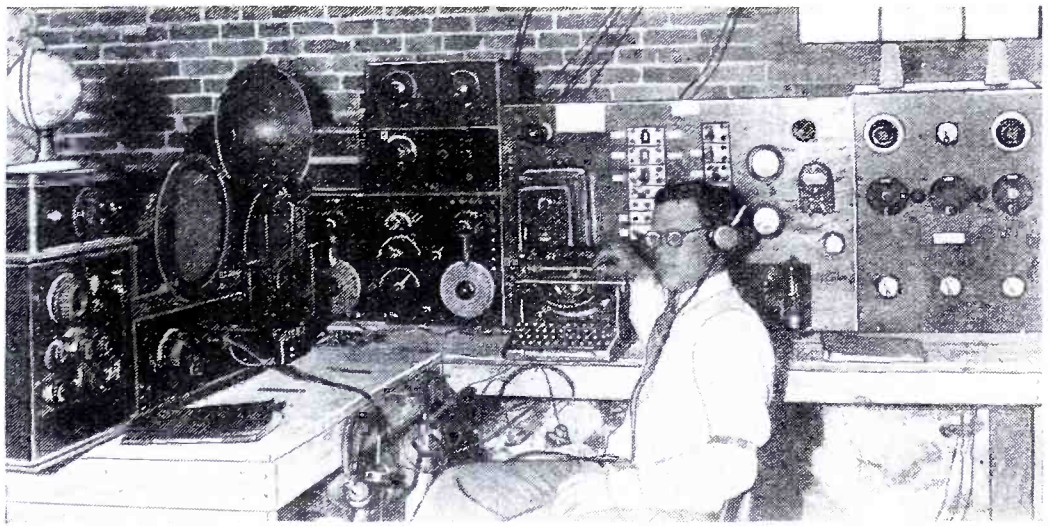
On the left, is your "station inhaler" known as the "*Globe Trotter*" receiver. I have heard stations all over the United States, Canada, Europe, Arip and Irip and that's something. Hi! On the top of the "*Globe Trotter*" receiver is a small oscillator as described by your magazine in another issue. Best 73, and give us some more articles such as we have been getting.

EDGAR S. BUTCHER,
BOX 34,
North Windham, Conn.

(*Well, you certainly have been busy, Edgar, and we are glad to know that you have found the sets described in our articles satisfactory.—Editor*)

Edgar Butcher caught in the act of enjoying the operation of his short-wave station at North Windham, Connecticut.

Oh! Lookie! Here's "Ham's Heaven"!



For the love of Mike—will you look at this station, W1IAD, away up in Skowhegan, Maine? Who couldn't enjoy themselves in such a station! The proud owner and operator is Howard E. Cook.

Editor,
SHORT WAVE CRAFT:

I have been reading your magaine all winter and I certainly enjoy it. I am a new "ham": have been on the air only a few weeks. In response to your request for more station photos, I am sending you one of mine, with "Yours Truly" working a station.

The transmitter is a 47 crystal oscillator, a 46 buffer and two 46's in parallel in the final amplifier. I intend to add a "big bottle" (tube) soon. I use two 45 "keying" tubes to prevent "key-clicks." I have separate filament transformers.

For a receiver I use a 32 screen-grid detector, and two 30's as audio amplifiers. This output is fed into a Kolster K5 power amplifier. I have had broadcast stations from every continent and have started collecting a stack of QSL cards. In the picture from left to right is my monitor, a type 110 Federal rebuilt for short-wave work, short-wave receiver with K5 amplifier, BCL receiver, "long-wave" receiver, control panel, and finally the transmitter itself. I derive a great deal of pleasure from this station and also from reading SHORT WAVE CRAFT. I would be glad to get a call from any "ham" at any time.

HOWARD E. COOK, W1IAD,
9 Silver St., Skowhegan, Maine.

(*Shades of "Heinie" Hertz! Boy, Oh Boy, what a station! Even to look at the apparatus should give any real "ham" a never-to-be-forgotten thrill, let alone the joy of handling the "controls" of such a business-like looking station as this.—(Editor)*

One Year's Subscription to SHORT WAVE CRAFT FREE for the "best" Station Photo

Closing date for each contest—60 days preceding date of issue; July 1 for Sept. issue, etc. The editors will act as judges and their opinions will be final. In the event of a tie, a subscription will be given to each contestant so tying.

Oliver Amlie—A Well-Known "DX-er"

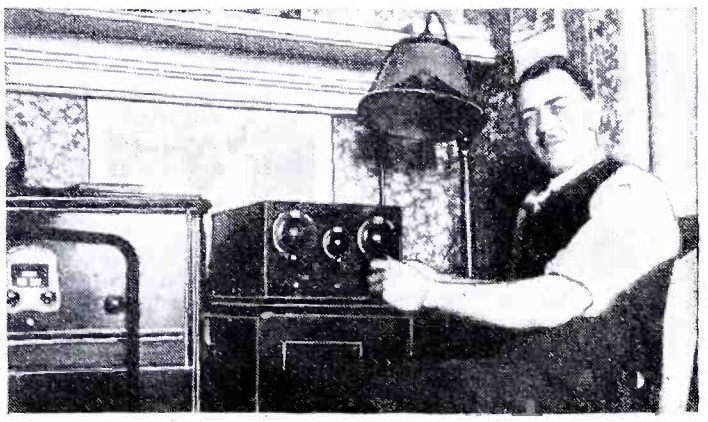
Editor, SHORT WAVE CRAFT:

I see you are asking for photos, well here's one of "yours truly" at the controls of the Amlie Big 4 DX'er. The receiver at the left is the Roberts, and this receiver is just nine years old, and still as good as the day I built it. Both receivers use 01A and a 12A in the last stage; the Roberts has a DX record of 3,900 miles, and the Amlie Big 4 has a record of 12,500 miles, all stations received on a 106 RCA loud speaker, which sets just 10 feet away from both of the receivers.

Both of the receivers are operated by one 6-volt storage battery, a Stromberg "B" eliminator. I use a Westinghouse trickle charger and a relay control system. I have switches which throw from one set to the other; in this way I just need one storage battery for both sets. I have used this method also for the Amlie DX'er which was published in the May issue, 1932, of SHORT WAVE CRAFT. When the set is used, the charger is off; when the set is not used, the charger goes to work. Only twice a year do I have to fill the storage battery with water.

I have received 33 S.W. stations on a test of 12 days, 23 of them "Foreign" stations. Here's what we do; where I am seen sitting in the photo, we tune in a good program of orchestra music at 7:30 A.M. from GSE; at 1:00 P.M. we hear a concert program from GSC; at 6 to 8 P.M. we hear a good program on GSA; of course we cannot miss BIG BEN and the news at 7:45 P.M. Signal strength is perfect from 7:30 A.M. up to closing down of the British programs at 8 P.M. All reception is heard like "locals" on this receiver. I personally invite any reader of SHORT WAVE CRAFT to come up and hear this world-beater; when I "double-beat" the R.F. tube on this receiver, well you should just hear it.

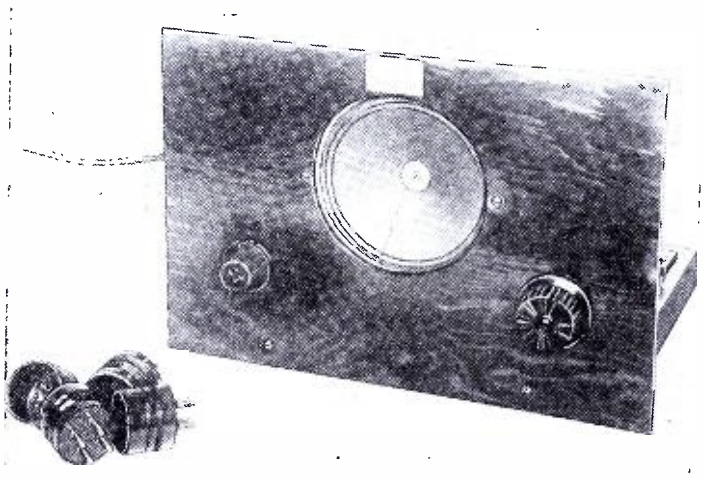
(*Continued on page* 239)



Oliver Amlie, well-known to readers of this magazine as the designer of a popular 4-tube receiver, the "Amlie DX'er." Oliver "twists" the dials and Boy! Do those "DX" stations roll in!

The 4-Tube Short-Wave "Space-Explorer"

By H. G. CISIN, M. E.



Front view of the short-wave "Space-Explorer" designed by Mr. Cisin and which brings in "foreign" stations on a loud-speaker.

Here is a very attractive and economical loud-speaker set which uses but four tubes, including a 25Z5 rectifier. The circuit comprises a tuned regenerative detector and two audio stages. The detector is a 6C6, the first audio tube, a type 37, and the A.F. output tube a 43. This set is designed for use on 110 volt A.C. or D.C. circuit. It is complete and needs no separate plate or "B" supply.

● THE Space-Explorer is a very sensitive short-wave set, capable of bringing in foreign stations with full loud speaker volume. In its initial tests, this set brought in Rome at about 10 A.M., London at 6 P.M. and Germany at 9 P.M., from a poor location in New York City. It employs standard four-prong plug-in coils, four being used to cover the band from 15 to 200 meters.

The Circuit

The circuit employed consists of a tuned regenerative detector stage and two audio stages. The new 6C6 tube makes a marvelous detector. A 37 tube serves as the first audio tube, while a 43 tube is used in the output stage. This combination seems to be just right for good short wave reception. The "hard-to-get" signals detected by the 6C6 tube, are amplified by the two audio stages to room volume.

The variable tuning condenser is a .00014 mf. Regeneration is controlled by the potentiometer at (7). The trimmer condenser at (1) gives antenna control to provide for varying length aerials and also is useful in helping to tune in weak signals. Another feature of the circuit is the use of a plate impedance at (11) in place of the usual resistor. This results in higher plate voltage and added sensitivity.

A.C. or D.C. 110 Vts. Can Be Used

The popular A.C. - D.C. circuit simplifies the construction by eliminating the power transformer. Furthermore, it makes the set more flexible, permitting operation interchangeably on alternating or direct current.

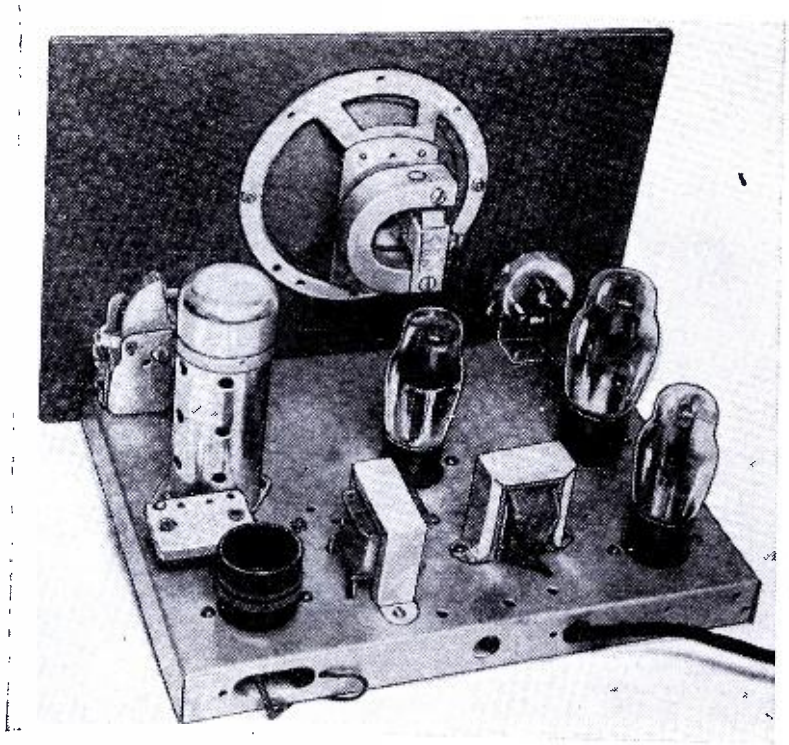
A 25Z5 rectifier is used. The filaments of all four tubes are connected in series with a wire-wound resistor, which serves the purpose of bringing the voltage down to the correct values required by the tubes.

It will be noted that the filtering is more than adequate. The importance of this feature is immediately apparent to anyone who has tried to tune in a weak signal, only to lose it on account of hum from the power supply. The Space-Explorer is inexpensive, but nevertheless it brings in the distant stations as well as the higher priced short wave sets.

The Space-Explorer is easy to build, first because the circuit is simple, few parts being used; second because plenty of room is provided to mount the various components.

Construction Hints

The five sockets are mounted first, fastening the shield base at (6). Next, the twin binding posts are mounted on the rear chassis wall. The variable condenser (3) is mounted on top of the chassis at the right front. It need not be insulated from the chassis. The speaker is mounted on a wood panel, which also serves as a baffle. Of course, a hole is cut in the wood, slightly smaller in diameter than the cone of the speaker. Three ply veneer is suggested,

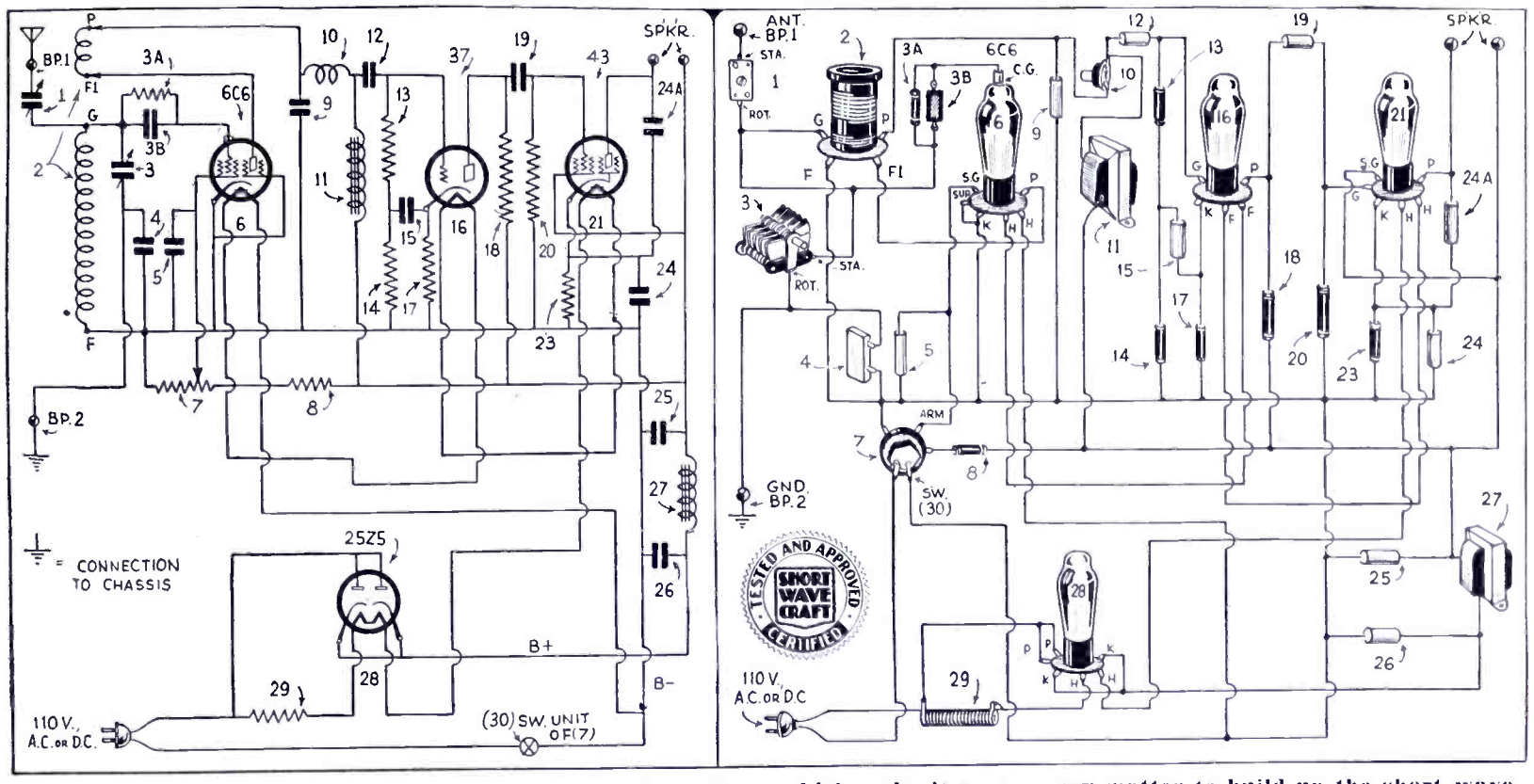


Here's how the "Space-Explorer" receiver looks from the rear. Four tubes in all are used, including the rectifier.

with the wood stained oak or walnut. The combination potentiometer-switch may be mounted on a bracket or it may be fastened to the panel. The panel should not be fastened to the chassis until all the assembling and most of the wiring has been completed.

Parts (1), (11) and (27) are mounted on top of the chassis in the positions indicated on the top view. Then the chassis is turned upside down and resistor (29) is fastened to the inside rear chassis wall. The r.f. choke (10) and the electrolytic condensers (25) and (26) are fastened to the underside of the chassis; also the metal case condenser (4). The other small fixed resistors and condensers are soldered in place during the wiring process. For best and neatest results, push-back hookup wire should be used. The filament circuits should be wired first. Grids are wired next, then plates, cathodes, by-pass condensers, antenna circuit, etc. The ground binding post may be grounded to the chassis, but the chassis should not be depended upon for negative returns.

If trouble is experienced due to local interference, a noise-eliminating aerial lead-in system such as the Lynch will get rid of this trouble and permit the set to reach out and bring in plenty of foreign stations.



Wiring diagrams, both schematic and physical, are given above which make it a very easy matter to build up the short-wave "Space-Explorer" here described by Mr. Cisin.

Complete List of Parts Required for the "Space-Explorer"

1—Hammarlund Variable Condenser, .00014 mf., type MC-140-M (3).
1—Hammarlund Ant. Trimmer Condenser, 3 to 35 mmf., type EC-35 (1).
1—Hammarlund Tube Shield, type TS-50 (6).
1—Set of four Na-Ald Short Wave Coils, type 704-SWS, 15 to 200 m. (2).*
1—50,000 ohm Potentiometer (7) with Switch (30).

*See page 245 for Coil Data.

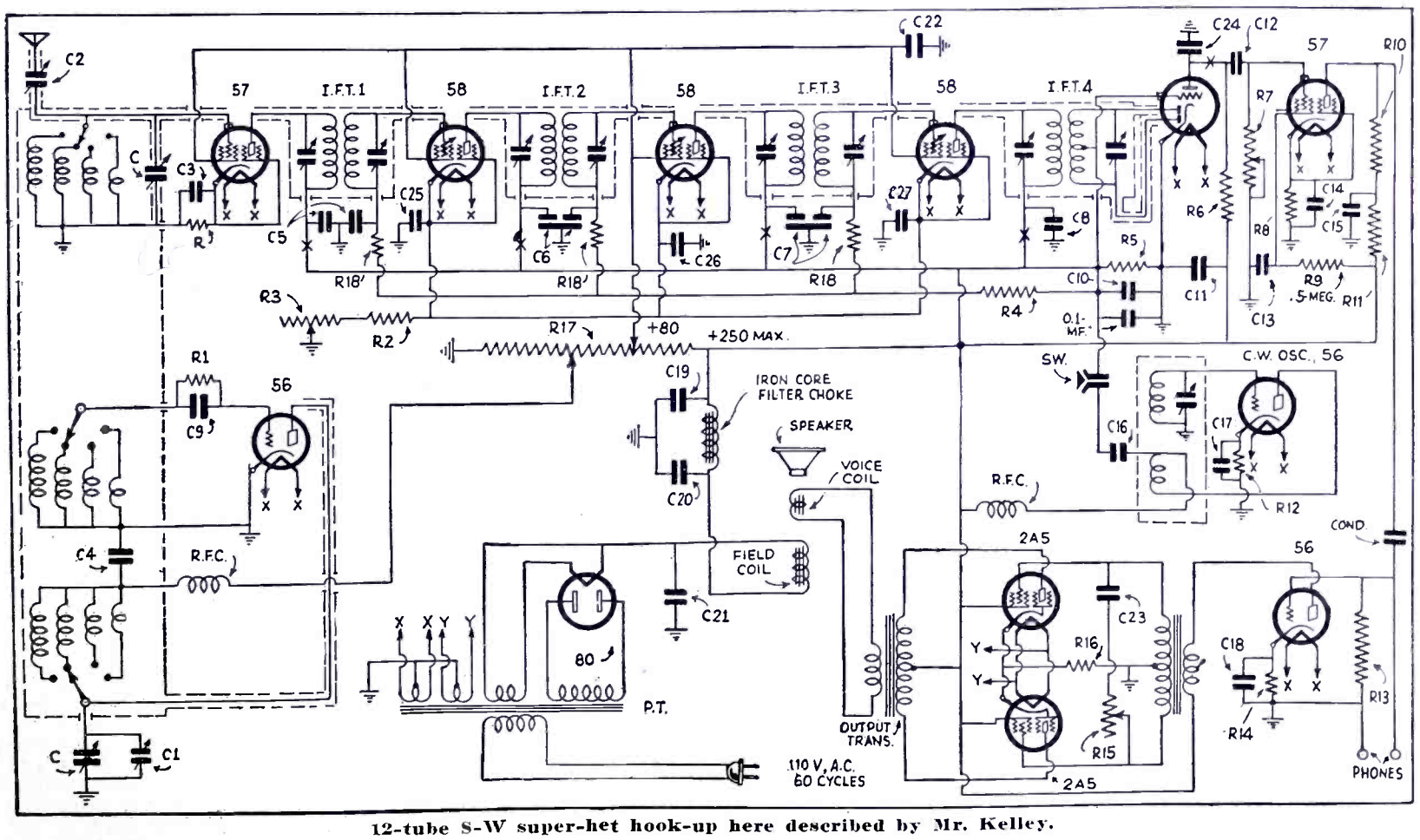
(*Continued on page* 232)

A 12-Tube S-W Receiver

By J. C. KELLEY

● THE trend of radio receiver design today is toward a larger number of tubes, greater selectivity and sensitivity, greater volume and the use of special purpose tubes, and last, but by no means least, complete control of sensitivity, volume control, and also tone control. During tests the receiver performed

(*Continued on page* 246)

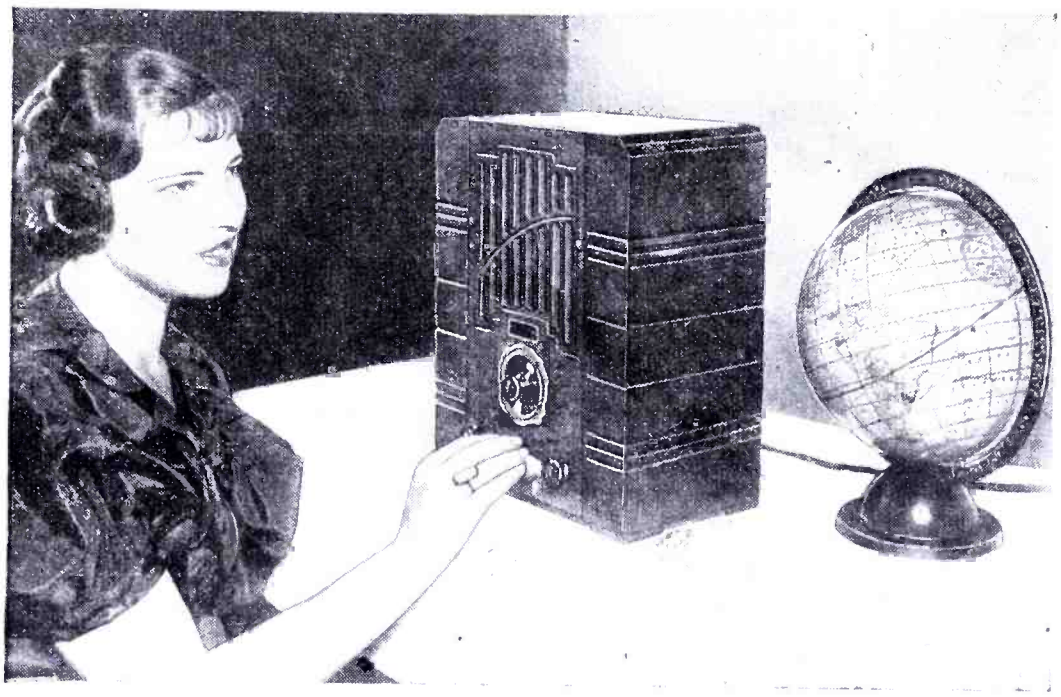


12-tube S-W super-het hook-up here described by Mr. Kelley.

WHAT'S NEW In Short-Wave Apparatus

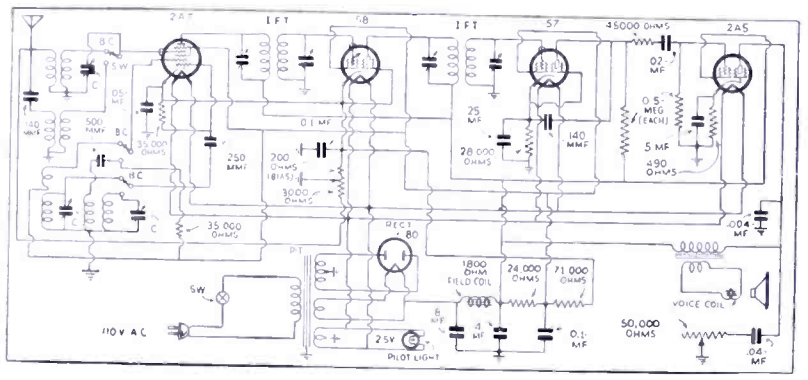
The short-wave apparatus here shown has been carefully selected for description by the editors after a rigid investigation of its merits.

A Really Good "All-Wave" Midget That "Gets" Europe!



The new DeWald short and broadcast wave receiver, which on actual test by the editors, brought in English and other "foreign" musical and vocal programs in the heart of New York City, and in a steel frame building with only a short aerial. (No. 186.)

● A REALLY beautiful addition to any home is this modern 5-tube superheterodyne receiver, which has a frequency range from 540 to 1,600 kc. in order to cover the general broadcast band, and another range from 4,500 to 20,000 kc. to include all the prominent short-wave broadcast (music and speech) bands. It is housed in a beautiful two-toned cabinet of burled walnut and curly maple with marquetry inlay on the front panel.



The special European type dial is so designed that a traveling light illuminates the particular numbers which indicate the setting of the condenser, and is arranged so that when the switch is thrown to the position which receives *broadcast* (200 - 550 meter) band stations, the light appears only in the top half of the dial. When thrown to the short-wave portion, the traveling light only appears on the lower half of the scale.

The tubes used in the receiver are: a 2A7 penta-grid converter, a 58 high gain intermediate frequency stage, a 57 second detector, and a 2A5 pentode audio amplifier, with a 280 as a full-wave rectifier to furnish the plate voltage for the various tubes.

Rear view of the DeWald Short and Broadcast Wave Receiver.

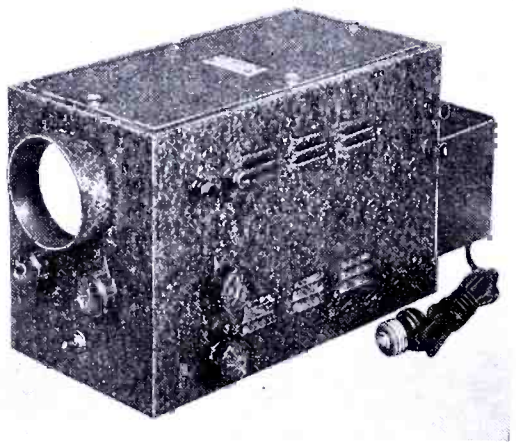
Diagram at left.

A full-sized dynamic speaker furnishes excellent tone quality with sufficient volume for the average home.

The schematic diagram shows the simple, but very efficient, circuit used in this set and for those who are interested, the values of the various parts are given. The rear and front view photographs clearly show the general design of the set and its beautiful cabinet.

New National Cathode-Ray OSCILLOSCOPE

● THE cathode ray tube recently made available to the general public is one of the most interesting of the latest radio developments. This tube properly used will provide *visual reproduction of the radio signal*. It is in this role that it is used in the National Cathode Ray Oscilloscope. When properly adjusted and coupled to some sort of receiver, the Oscilloscope will reproduce visually all sounds picked up by the receiver. In this way it is possible to gauge percentages of modulation in phone transmitters and see whether or not your carrier is free from A.C. modulation due to imperfect power supplies, and numerous other interesting examinations of radio signals can be made. The cathode ray tube used in this instrument is an RCA-906 with the 1,000 volts being supplied by the 280 rectifier in the half-wave circuit. The tube elements of the cathode ray tube must be thoroughly shielded and a cylindrical electrostatic shield is provided and is mounted at the tube socket. The life of these tubes can safely be rated the same as ordinary receiving tubes at approximately 1,000 hours of normal use. The life of the tube, of course, will depend to a great extent upon the type of service it is called upon to perform. If the tube is subjected to overloads or if operated at improper settings of the focusing and brilliancy controls, the life will be materially shortened.

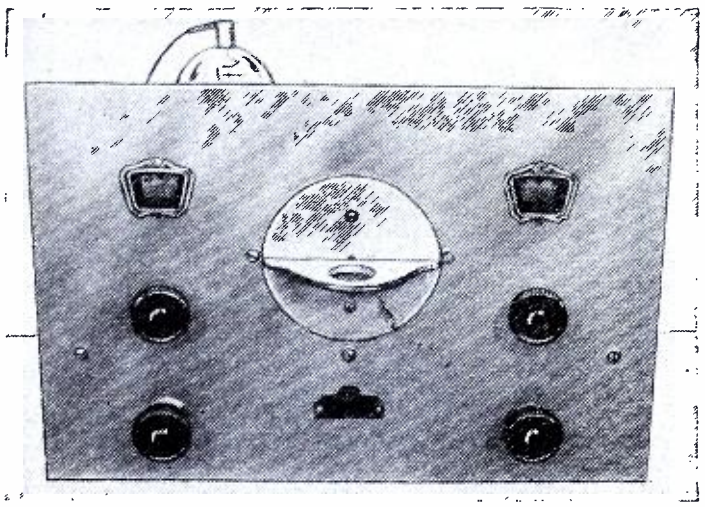


The new National cathode-ray oscilloscope—a moderate priced analyzing instrument, particularly valuable in determining what is going on in short-wave transmitter circuits. (No. 187.)

The two knobs on the front of the Oscilloscope unit are used to adjust the size and brilliancy of the spot; o properly speaking, the clarity and brilliancy of the pattern. Of the two knobs on the right hand side of the cabinet, the lower is a switch and the upper is a potentiometer. The switch controls the horizontal sweep circuit and has two positions. When the switch pointer is toward the front of the unit, the horizontal deflection plates are connected to the two binding posts directly above. When the pointer is turned toward the rear, the 60-cycle A.C. sweep is connected to the horizontal deflection plates, the external sweep being disconnected. The two binding posts at the rear on the right-hand side are connected

(*Continued on page* 250)

Names and addresses of manufacturers of sets described on this and following pages furnished upon receipt of stamped envelope; mention No. of article.



Universal Mascot 2

● THE *Universal Mascot*-2, while really a 2-tube receiver, actually gives a performance equal to three tubes. This is done by using the now famous 19 twin-triode tube as two stages of resistance-coupled audio, following a type 32 screen-grid detector tube.

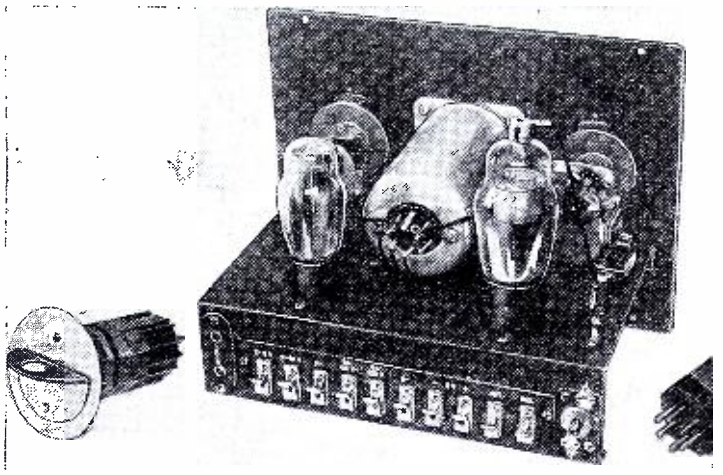
Two other interesting features of this receiver are the coils which are of the plug-in variety and are designed to *plug-in through the front panel*, which is quite a convenient arrangement and should find favor among short-wave "fans" who do not like the old arrangement of reaching behind the panel for plug-in coils. The other feature is, that *band-spread* is available at any point within the tuning range of the receiver. The method of band-spread is the old-familiar arrangement where a very low capacity condenser is connected in parallel with the main tuning condenser, the large condenser serving as a *band-setter* or *band-finder*.

The set is constructed around a metal chassis, the base of which measures 5½" deep by 2¼" high by 9" long. The front panel is 7¼" high by 10" in length. The entire chassis is finished in beautiful crackled-finished baked enamel.

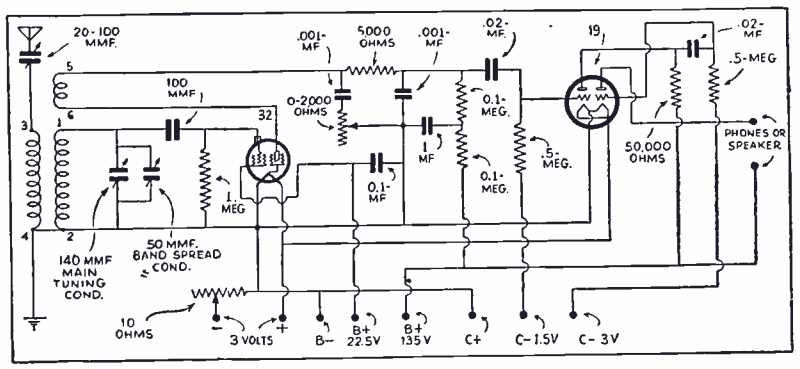
The physical layout of parts, looking at the front panel is as follows: the lower left-hand corner is the regeneration control. The main tuning dial is located just above the regeneration control. Plug-in coils are inserted directly through the center opening in the panel. The large disc in the center of the panel is the front shield-plate of the coil assembly. The band-spread tuning condenser is located on the right-hand side of the panel with the filament control rheostat mounted just beneath the band-spread dial.

The tube "line-up" places the 32 screen-

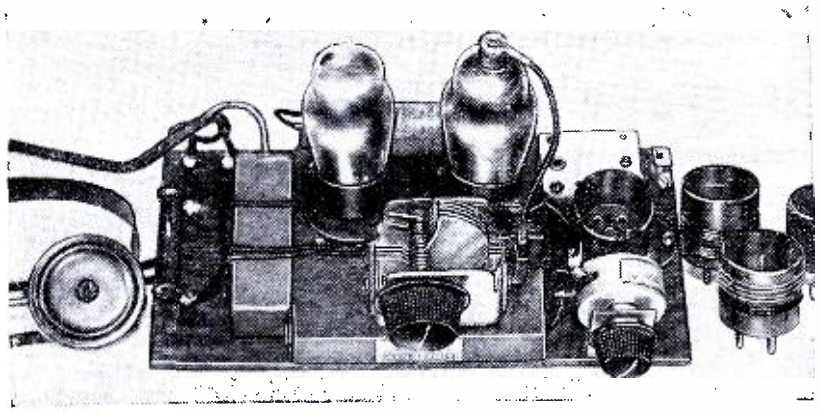
(*Continued on page* 249)



Above: Front view of the new "Universal Mascot 2" receiver. As the photo above and the one at the right clearly show, the plug-in coils can be flipped in and out in a jiffy, thanks to the opening on the front panel provided for that purpose. Below, wiring diagram for Universal Mascot 2. (No. 190)



The All-Electric Air-Scout—By H. G. CISIN, M.E.

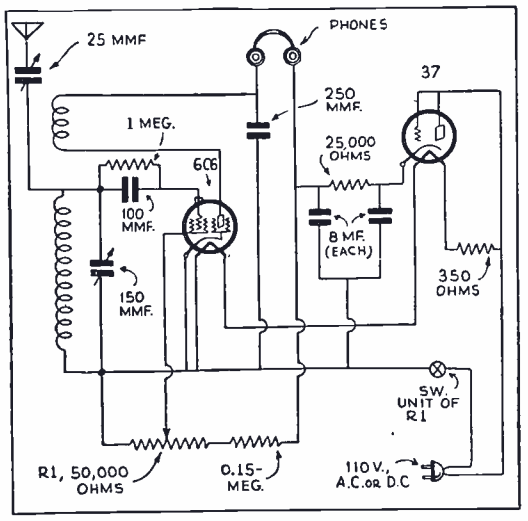


Left: The All-Electric Air-Scout short-wave receiver. It comprises one of the simplest, yet smooth-working receivers of its type. (No. 191.) Below: Wiring diagram for the extremely easy to assemble "All-Electric Air-Scout".

● THE *All-Electric Air Scout* is designed for earphone operation, but on strong local stations it operates a sensitive magnetic speaker exceedingly well. The set is powerful and also highly selective. It uses the new super-sensitive 6C6 tube to pick upthe R.F. signals, detect them and furnish the audio component to the earphone. In fact, it is really the only essential or "working" tube in the receiver. The other tube merely serves the purpose of rectifying when the receiver is used on alternating current. The rectifier tube is a 37-type tube.

A glance at the schematic circuit or at the illustration of the receiver, immediately reveals the extreme simplicity of the set. All the usual paraphernalia of the ordinary electric set are conspicuous by their absence. There is no bulky power transformer to take up room and add to the expense. No filter choke is necessary. Even the conventional cabinet is no longer used. The set operates directly from any houselighting circuit. It

(*Continued on page* 249)

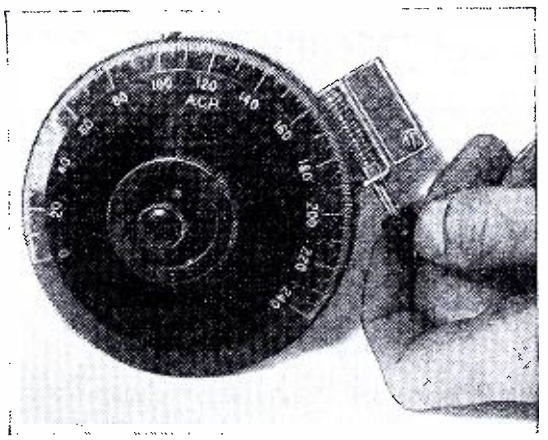


This ingenious circuit permits the use of the new 6C6 tube to good advantage.

A Worm-Gear Dial

● THE dial shown in the photograph is a recent addition to the short-wave vernier dial family and has many unique features.

The vernier adjustment is accomplished by a worm-screw mounted on the side of the dial, which is equipped with teeth along its outer edge. It can immediately be appreciated that this is an extremely high ratio



This new vernier dial employs the well-known mechanical principle of the "worm-drive." (No. 192)

dial, and very useful for tuning in the short waves, where micrometric adjustment is a prime necessity.

This particular dial is about four inches in diameter, however it has a smaller brother which measures only three inches in diameter. The small knob in the center of the large knob is for locking the dial to the vernier mechanism. By loosening this the dial can be quickly rotated over its full 240 degrees.

Postal Deluxe Super-Converter

By S. MILLER *

● THE essential difference between this "Deluxe Converter" and the conventional type is that it performs *three* important functions, all of which are prime requisites for short wave reception on broadcast receivers.

A brief review of these functions will clearly indicate why this efficient device, and not the broadcast receiver is the determining factor in the overall performance of the combination.

The fixed Tuned I.F. stage (545 kc.) employed in the "Deluxe Converter" is a feature of paramount importance for the following reasons: first, because it adds an additional high-gain stage to the receiving system and thereby increases its overall sensitivity; second, because a fixed tuned stage can readily be designed for maximum amplification and more effective suppression (rejection) of undesired adjacent frequencies; and third, because the use of a pre-tuned I.F. output stage will enable the user to easily "resonate" the input circuits of the set to the tuned output of the converter by tuning the broadcast receiver for "peak" volume.

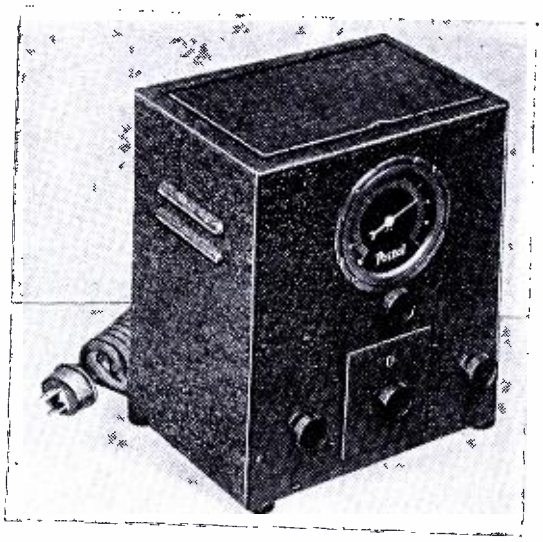
When resonance is thus established, maximum transfer of energy takes place from the converter to the receiver, and perfect tracking of the oscillator is assured for the entire series of short wave bands.

Coil-Changing System

Notwithstanding the fact that coil systems represent the heart of short wave equipment, it seems almost unbelievable that such an important item should receive such scant attention. The two most popular systems in use today, simple plug-in coils or some switching arrangement, are both representative of the improvised methods used for band changing in the earliest of radio receivers.

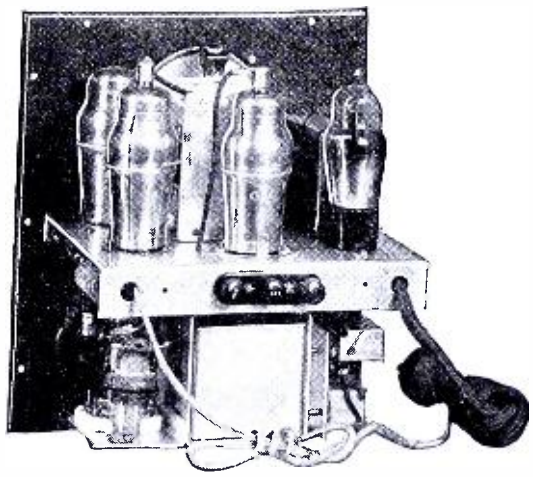
Simply because it has been customary to use either one of these systems for band changing it should not be assumed that better means cannot be found to accomplish the same objective with a decided improvement in performance and operating efficiency. From a standpoint of radical design,

(*Continued on page* 247)

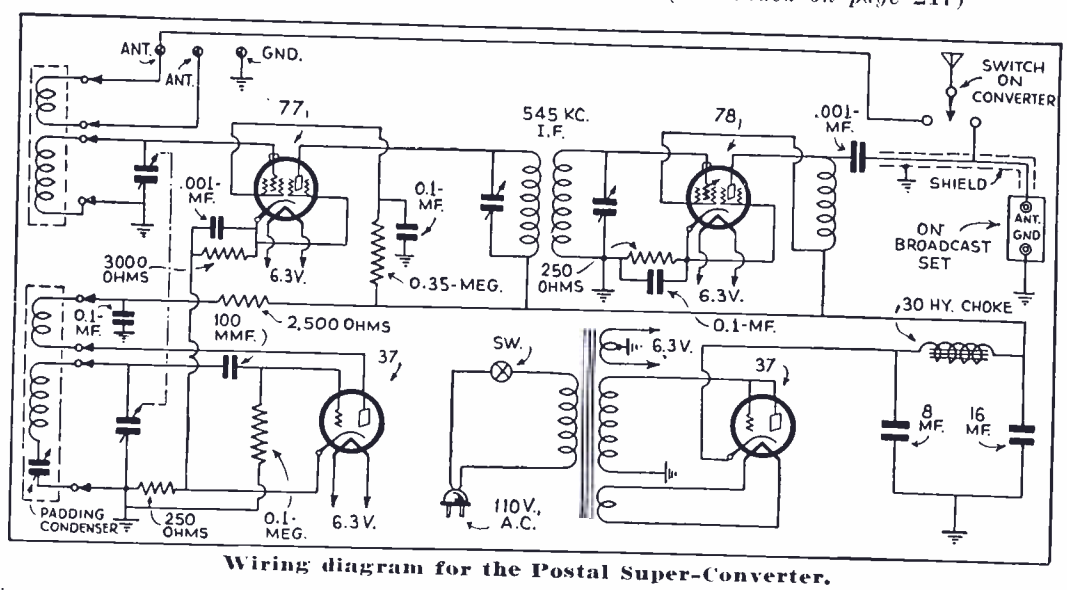


Front view of the new Postal DeLuxe Short Wave Super-Converter. It brings in the short-wave stations on your B.C. receiver. (No. 188.)

* Chief Engineer, Postal Radio Corp.

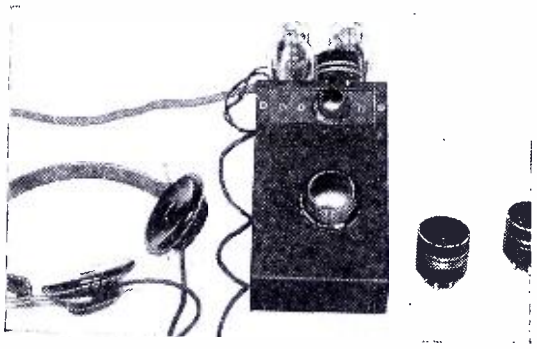


Rear view of the Postal Super-Converter.



Wiring diagram for the Postal Super-Converter.

New World-Wide All-Wave Receiver



Appearance of the Ace 2-tube short-wave receiver, which uses plug-in coils. (No. 189.)

● WHAT appears to be a very inexpensive long and short wave receiver is being distributed by the Ace Radio Laboratories.

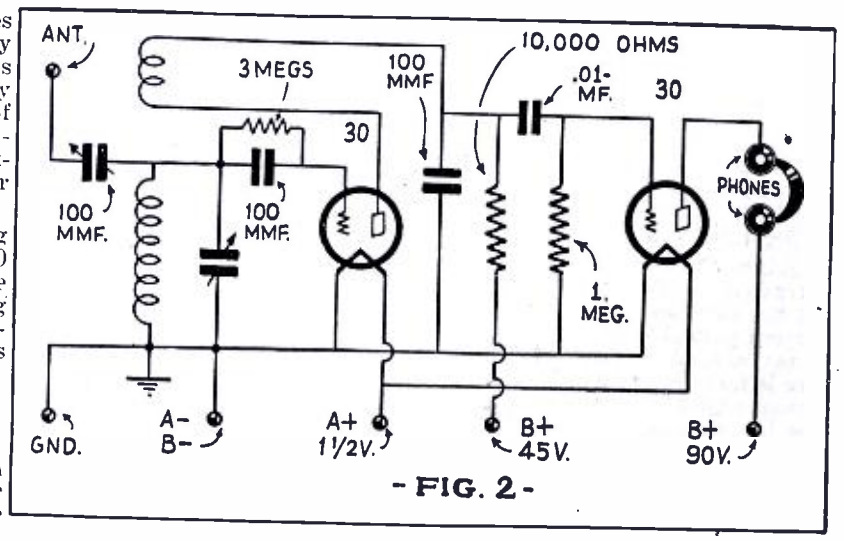
A new style of construction that utilizes a one-piece metal chassis and sloping panel affords extreme compactness and maximum shielding. The careful elimination of superfluous parts without impairing the remarkable efficiency results in a receiver of exceptional simplicity, both of construction and operation. It is admirably suited for portable use.

Two models are available. A one-tube regenerative receiver for headphone reception and a two-tube set with a stage of audio amplification. Storage battery or the new economical dry cell tubes may be used. A special non-microphonic tube to operate on only one dry cell gives excellent results. Only one "B" battery is needed, but two may be used. By virtue of the low current consumption, the batteries last for months!

Having a tuning range of 15 to 600 meters these sets are capable of receiving short wave broadcasts from all parts of the world, and police, airplane, and amateur transmissions, as well as the regular local stations. Its unusual flexibility adapts it for use on any type of antenna having a length of 40 to 90 feet.

These sets may be obtained ready wired and tested, ready to operate, or in complete construction kits for those who desire to gain the experience of wiring their own. By their close adherence to basic fundamentals these kits clearly illustrate the working principles of radio and offer the ideal introduction to short waves for both the experimenter and the radio fan. Boy Scouts es-

(*Continued on page* 251)



The hook-up used in the Ace two-tube short-wave receiver.

- FIG. 2 -

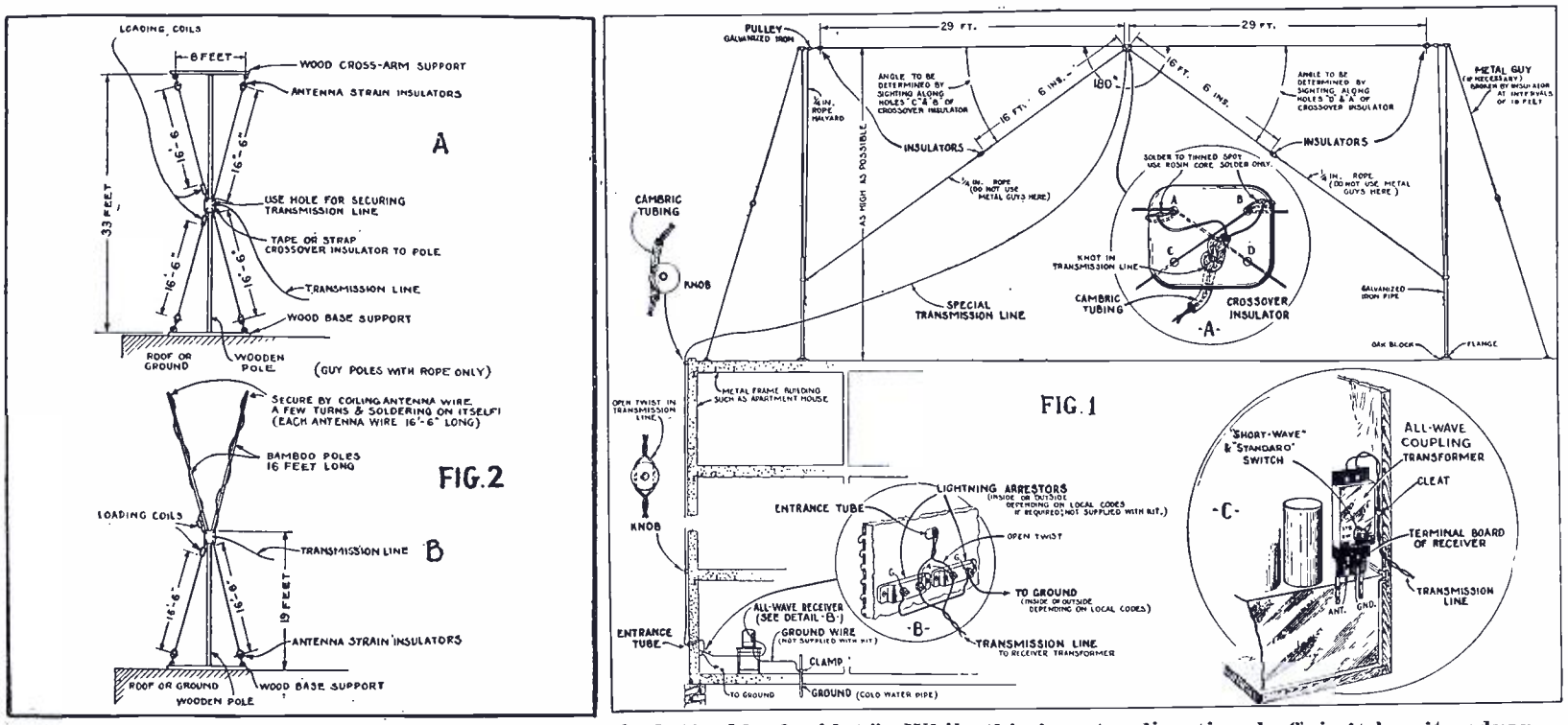


Fig. 2 shows the general construction of the vertical "double-doublet." While this is not a directional affair it has its advantages, in that it can be erected in a much smaller place than a large horizontal installation. Loading coils are inserted to make the effective length 29 ft. for each side. Fig. 1 shows the complete horizontal "double-doublet." Dimensions are given for those wishing to construct an antenna of this type. (No. 193.)

The Latest—A "DOUBLE-DOUBLET" Antenna

The "double-doublet" is a most efficient compromise in short-wave "noise-free" antennas; it actually comprises two separate doublet aerials designed to give maximum response on all bands.

● THE *world-wide antenna system* has been developed after considerable research. It provides, primarily, an efficient means of collecting the shorter-wave signals on a special "double doublet" or Duo Dipole Antenna.

The purpose of this arrangement is to approach an ideal antenna system for *all* the short-wave broadcast bands. Theoretically it would be best to have a doublet designed and installed for each band, namely, one each for the 16, 19, 25, 31 and 49 meter bands. This would mean five doublets, and each one should be sufficiently separated from its neighbor to prevent disturbance of the reception. Obviously this would be quite an installation problem and economically prohibitive. Therefore the arrangement evolved by the RCA Victor engineers and shown in Fig. 1 is the best approach to the ideal, as the 29-foot sections tend to tune or match the system toward the lower end (in frequency) of the short-wave broadcast band, namely, toward 49 meters, and the 16½ foot sections tend to tune or match the system toward the higher end (in frequency) of the short-wave broadcast band, namely, toward 16 meters. The connection of both doublets, or the "double-doublet," to the transmission line, tends to give a smooth *match* throughout the short-wave broadcast band.

The proper lengths for each doublet made from the two continuous antenna wires each 46½ feet long (6" allowed for each antenna strain insulator tie), is shown in the drawing. Connection of the transmission line should be made by rosin-core soldered joints as indicated by the detail of Fig. 1. Note that the long and short antenna wires, which are connected together, are located on opposite sides of the center transmission line connection. Height above ground should be considered as the distance from the 29 feet horizontal sections to ground, the latter to be considered as earth ground, if the span is on top of a frame dwelling with no grounded metal roof, or from a building to a nearby pole, tree, or another building. If the span is installed on top of a steel framework building, or any building with a grounded roof, the earth ground is usually considered at the roof.

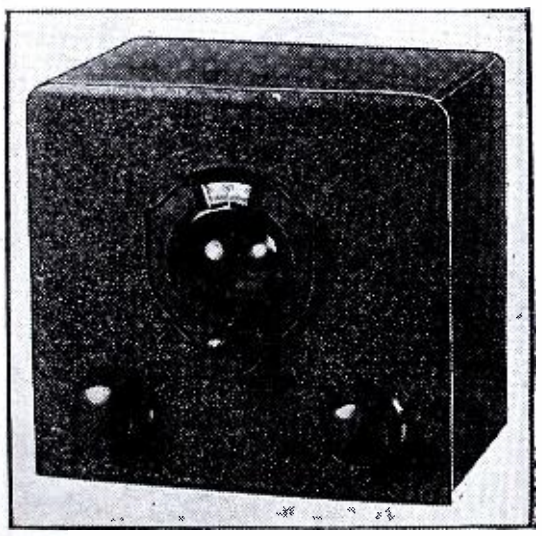
Clearance from wires and buildings is necessary so as to prevent these objects from casting radio shadows on the antenna system with consequent reduction in signal strength pick-up.

Clearance or distance from wires, buildings containing electrical machinery, highways, trolley lines, etc., is very important. For good results a minimum of 30 feet above ground is recommended. The signal strength received varies with the height above ground.

There is no directional effect with the

(*Continued on page* 252)

3-Tube 12,500 Mile Receiver Now A.C.-D.C.



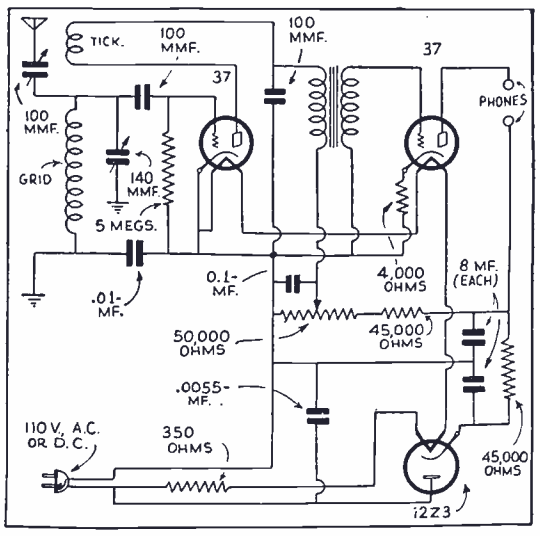
Front view of the A.C.-D.C. 12,500 mile receiver. (No. 194.)

● THE popular 12,500 mile short-wave receiver has heretofore been available in either the *battery* model or the *A.C.* model. Both of these types require an *outside* power source. The battery model is operated on dry cells, while the A.C. model uses a power-pack to supply A and B voltages. The New A.C.-D.C. model requires neither batteries nor an outside power-pack, but plugs in directly to the A.C. or D.C. house line. The line voltage can be anywhere from 105 to 125 volts and can be any frequency—25, 50 or 60 cycle.

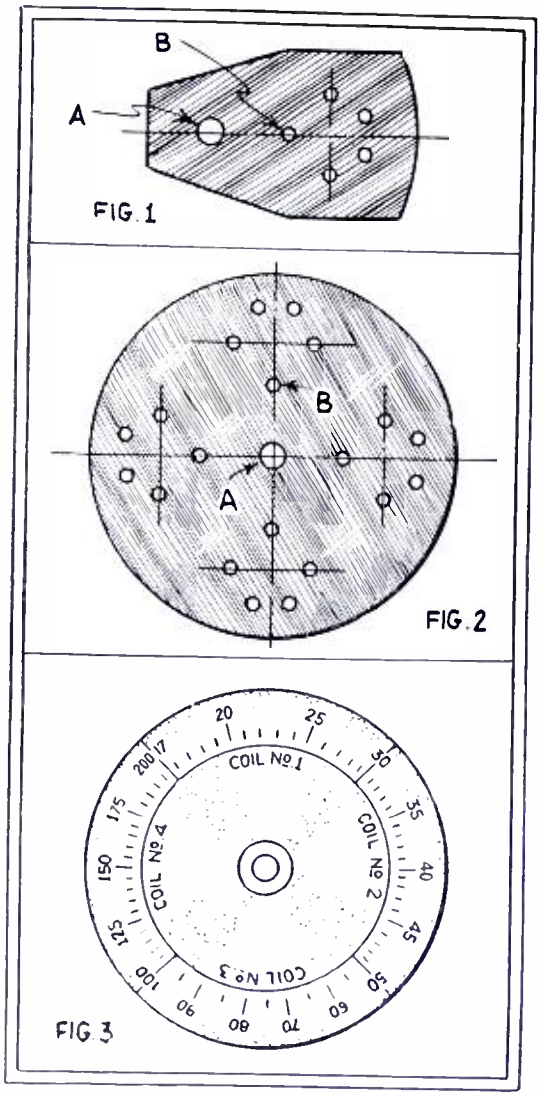
This set is available in both kit form and also completely wired. It comes complete with all necessary parts and full detailed instructions and can be easily assembled and wired by anyone. As soon as it is wired and the tubes inserted in their sockets, the set is ready to plug-in to the house line.

This set gives remarkably clear and hum-free reception. The use of full size, modern type tubes makes this set more powerful and more efficient.

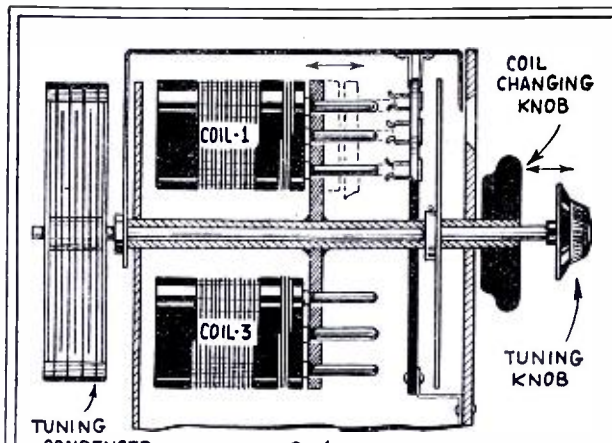
(*Continued on page* 251)

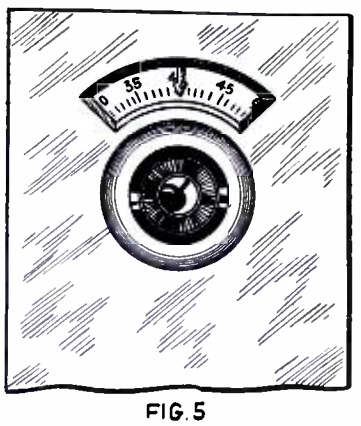


Circuit connections for the 3-tube A.C.-D.C. receiver.



The drawings, Figs. 1 to 5 above, show how to make dial as well as dual shaft arrangement, whereby the various plug-in coils may be switched into circuit as required. The center knob controls the tuning condenser.





Switching Those S-W Coils

● THERE is nothing more convenient when tuning in on short-wave receiving sets, than to be able to change from one tuning coil to another without actually taking one out and replacing it with another. The more simple that this can be accomplished, the less wiring and switches that are used, the better will the set work. Expense is quite an item also; you will notice that this device is quite inexpensive, the biggest cost being for labor; the material needed is three pieces of ⅛" bakelite, a hollow ¼" shaft, one solid ⅛" shaft, two dial knobs, and one plug-in socket (4 or 5 prong); my illustration shows a five prong socket for the reason that I am using Pilot plug-in coils.

How to Make

First procure a piece of cardboard or tin (tin preferably) and cut out exact size as in Fig. 1; next drill a ¼" hole at A and an ⅛" hole at B. Now take one of your pieces of bakelite and cut out a circular piece 3½" in diameter. Drill a ¼" hole in the center, and place your tin plate (Fig. 1) so that the ¼" holes match up; now mark and drill the hole at B. When this is done replace the tin plate and fasten to disc with a bolt; this will hold your tin plate in place while you drill the other holes. Now, move your tin plate one quarter way around on the disc and proceed as before. Care must be taken to have each setting exact otherwise you will have trouble when operating the set, the disc when finished should look as in Fig. 2. Now insert your plug-in coils. Drill a hole in center of bottom through each coil and fasten to disc with a bolt.

Next make another circular disc three and one-half inches in diameter and lay off your meter figures as in Fig. 3, with a ¼" hole in the center and collar attached to fasten to the ¼" shaft. Now insert the ⅛" shaft and on the rear end fasten your tuning condenser; Fig. 4 gives you a good idea of the finished "plug-less" tuner.

The operation as you will notice is very simple. Push in on the large knob, turn to the desired coil and pull back into place; this gives you not only the coil that you want, but also the meter range of that particular coil. Only two coils are shown in the drawing. Fig. 5 is a front view, showing the two dial knobs, the opening in the panel giving you the meter reading of coil No. 2 and also the tuning condenser for logging.—A. F. Kuenzle.

Two Useful S-W Wrinkles

Underground Aerial!

● THIS experiment worked in excellent fashion on the 40 meter band. A length of hose is secured, rubber hose for best results, about 15 feet at the least and not more than fifty feet. It is a most difficult matter to get your antenna wire through a hose but a method I used worked fine.

First put a weight on one end of the wire. Then get up on your roof or any high place and extend the hose straight down and let the weight draw the wire down through the hose. One end of the hose can then be stopped up with a cork and a short lead-in connected to the set.

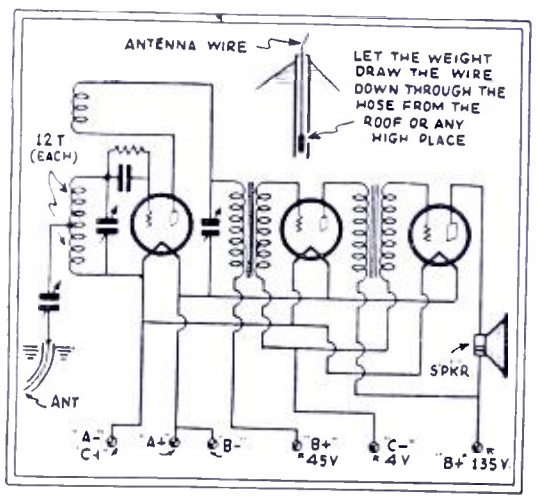
This hose should be buried as deep as possible in the ground. The one I used was about three feet deep.

With a set arranged as diagram shows, I received with a 3 tube set using 135 volt eliminator, stations W3XAL, Bound Brook, N. J., W9XF, Chicago, with fine loud speaker volume and a surprising absence of constant fading, encountered when using an elevated antenna.

If interchangeable coils are to be used, use 5-prong A.C. sockets and use the fifth prong for tap.

The coil for 40 meters I used was wound on a tube base (12 turns, tapped for antenna at the fourth turn). The tuning condenser is a 13 plate S.L.F. condenser and antenna condenser is a 3 plate type.

The stations mentioned were received in the daytime about 12:00 o'clock—McKoy Kendrick.

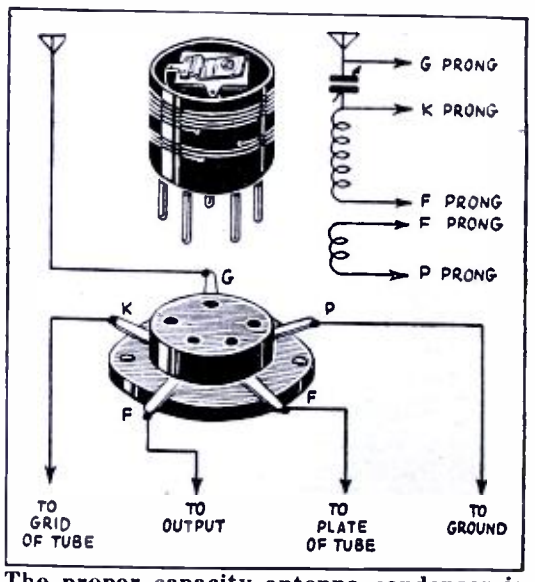


A number of good features are claimed for this buried antenna made from a piece of "garden hose."

Automatic Aerial Condenser

● MR. Hugo Gernsback in his March *editorial* requested an automatic adjustment of antenna condenser with each change of plug-in coils. I am here-

(*Continued on page* 251)



The proper capacity antenna condenser is automatically taken care of for each plug-in coil, by using the stunt shown.

A Low Cost POWER UNIT For Receivers

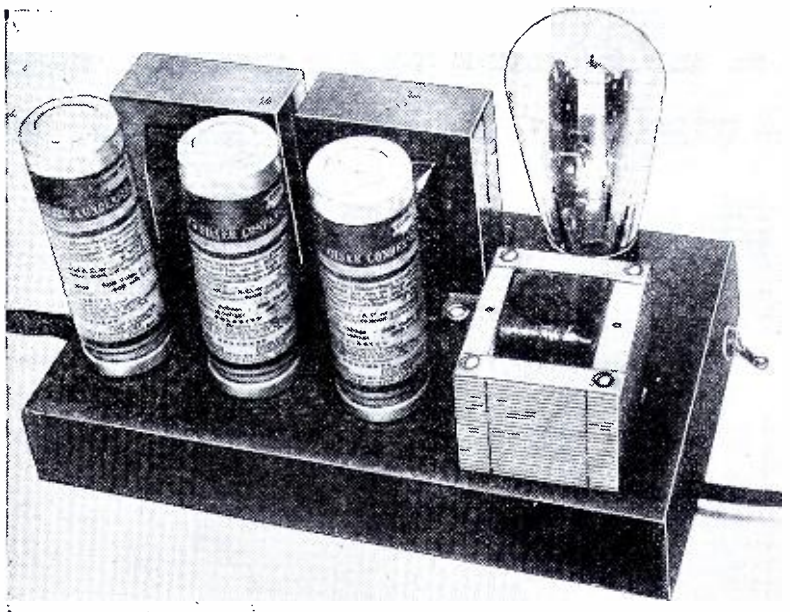
By Leonard Victor

Many 2 to 5 tube S.W. receivers are described from time to time, but lack data on power-supply units. Constructional data on an excellent power-supply is here presented.

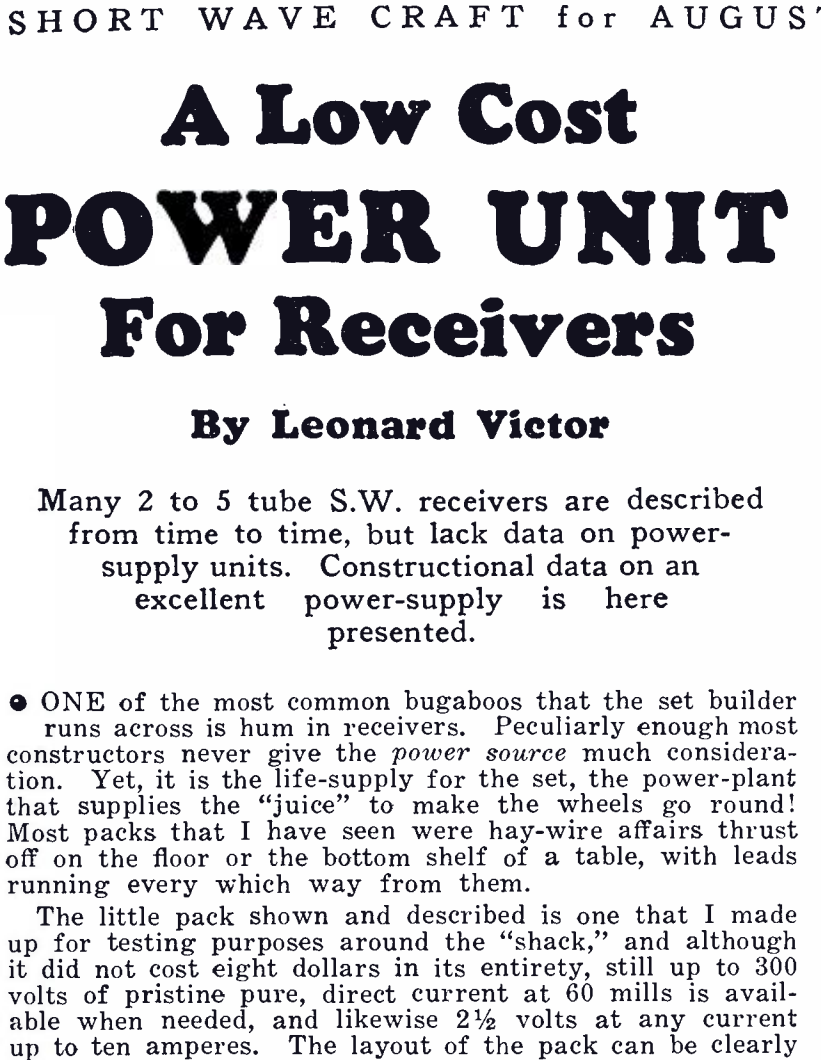
● ONE of the most common bugaboos that the set builder runs across is hum in receivers. Peculiarly enough most constructors never give the *power source* much consideration. Yet, it is the life-supply for the set, the power-plant that supplies the "juice" to make the wheels go round! Most packs that I have seen were hay-wire affairs thrust off on the floor or the bottom shelf of a table, with leads running every which way from them.

The little pack shown and described is one that I made up for testing purposes around the "shack," and although it did not cost eight dollars in its entirety, still up to 300 volts of pristine pure, direct current at 60 mills is available when needed, and likewise 2½ volts at any current up to ten amperes. The layout of the pack can be clearly seen from the picture and schematic diagram.

There is nothing unconventional in any part of the pack circuit. A midget power transformer provides the high voltage, rectifier filament voltage, and the 2½ volt winding for filament supply on the unit with which the pack is used. A 280 is used as a conventional full-wave rectifier,



Top and bottom views of the "power-supply" unit, suitable for the average 2 to 5-tube short-wave receiver, are shown above. This unit is designed for operation on 110-volt A.C. 60-cycle lines and supplies 300 volts plate potential.



Schematic and picture diagrams of the "power-supply" unit are shown above.

followed by a two section filter system and a bleeder resistor. The "B" and filament currents are connected to a five-foot cable which is used for connection to sets. The filter system consists of three 8 mf electrolytics and two 30 henry, 100 M.A. chokes. The following are general truths that can always be followed in choosing apparatus for power supplies.

Transformers

When purchasing a power transformer for a receiver, make sure that it will supply enough current for all the tubes in the receiver. For instance, if the set is a four tuber, with a '47 in the output, it will draw about forty milliamperes. Hence the rating of the high voltage winding should be at least 50 mills (M.A.), at the required voltage (300). For short-wave work, the best type of transformer is one that has an electrostatic shield. This is a winding between the primary and high-voltage winding, which is connected to the core of the transformer and grounded; this shield frequently eliminates annoying hums. Likewise be sure that the filament winding on the transformer will supply sufficient amperage for the set. Even the cheapest of transformers will stand some overloading, but it is good practice, and eliminates quite a few "headaches" if all apparatus is run *underloaded*. If the transformer is to be used, reused, and then once more reused, (as in most experimental shacks), get one with soldering lugs, as the type with wire leads will perhaps cause trouble in some instances, due to too short a lead or frayed and sloppy connections.

The Rectifier

A 280 is the most common choice for the rectifier, but if there is to be a heavy drain and the transformer is built to give a 3-ampere, 5-volt winding, a 5Z3 should be used. The 5Z3 is the big brother to the 280, and will give more current, with lower voltage drop in the tube. Never use mercury vapor tubes, such as the 82 and the 83, as this is only courting trouble from various types of *hums*.

(*Continued on page* 248)

Transmitter that WON FRENCH

Amateur Station F8YG Wins Award for "Telephony

By P. DAUGNET, ENGINEER

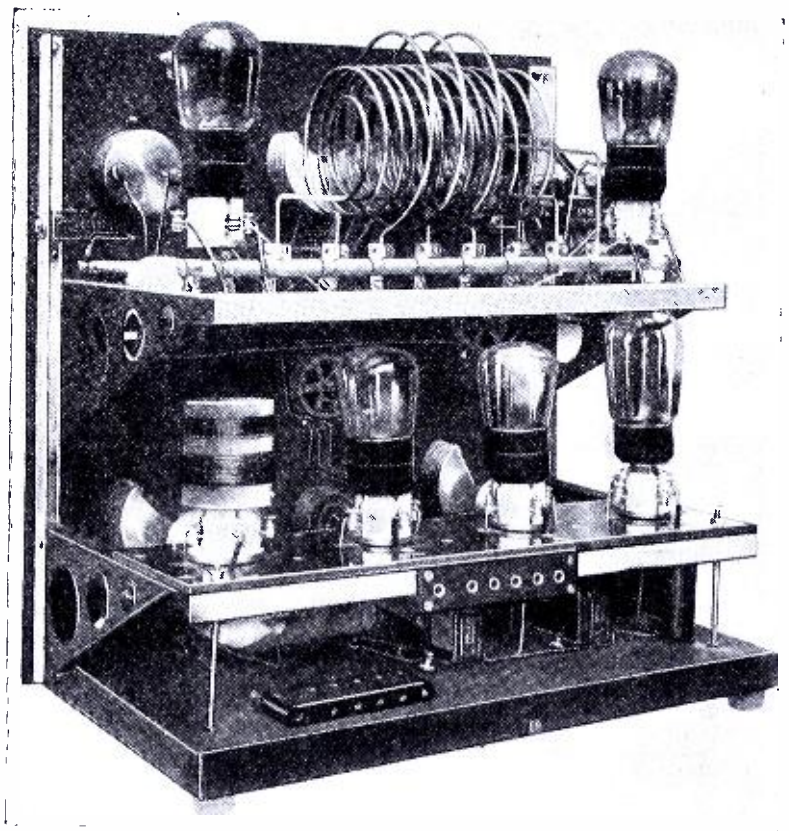


Fig. 4. Rear view of the combination transmitter-receiver used at station, F8YG. The transmitter occupies the top shelf while the receiver is built on the lower shelf; controls mounted on the front panel.

● SOME amateurs believe that transmission of short-waves with little power does not carry, while others, to the contrary, have been astonished at the ranges covered and successfully communicated over tremendous distances with less than 5 watts.

The prime cause for such success is because of the following reasons:

1. Highest insulation of the R. F. (radio frequency) part of the oscillator.

2. The clearance (isolation or freedom from nearby absorbing materials) of the antenna and its insulation.

While in installations for medium and long wavelengths, hard rubber, glass, porcelain and bakelite insulation gives good results—but when it comes to short waves the French prefer quartz, which, on account of its physical and electrical properties, contributes greatly to the maximum power gain of an R. F. generator. The use of quartz is therefore recommended where the R. F. generator has a rating of a few watts only.

We have observed that among the licensed French amateur stations, the F8YG set, winner of the "*Telephony with Little Power*" contest organized in September, 1932, by the "*Réseau des Emetteurs Francais.*" R. E. F. (Network of French transmitters), seemed to be the best from the point of simplicity and efficiency, and offers a model set for the beginner, who wants to be initiated into the art of the radio amateur and whose purse is often of "low power."

The combination transmitter-receiver is shown on the photographs and has the following external dimensions: 16"x16"x10".

The Transmitter

The circuit used is a symmetric self-controlled oscillator of the Mesny type. There are three R. F. coil windings, namely: antenna, plate and grid. The plate and grid coils have a tap exactly in their middle and are mounted on a quartz rod 12" long and ⅜" in diameter. Two tube sockets, insulated with quartz, are attached to the ends of the quartz rod in order to reduce the length of the connections, thus securing a higher efficiency. These inductance coils are made of silvered wire and allow the oscillator to cover a range of 20-60 meters, when a .0005 mf. variable condenser is connected across the grid winding. With an additional padding condenser the upper range may be extended to 80 meters.

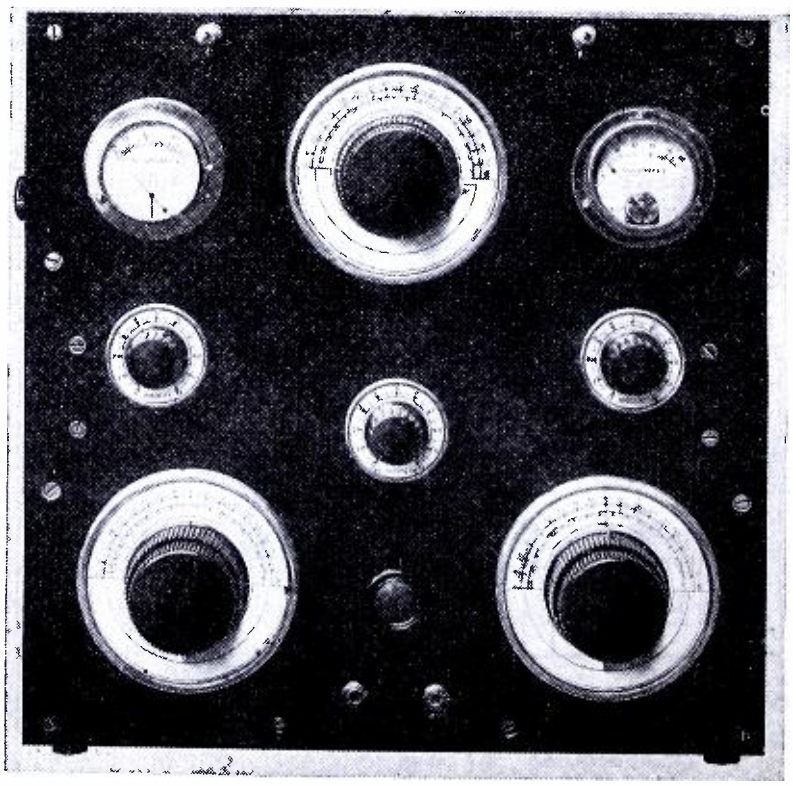
Tubes

The original B405 (French type) have never been changed and are still operating after several years' use. Through carelessness they have been left burning for several nights continuously. They permitted the owner to establish more than 2000 code and phone connections with 34 countries on four continents, using 120 volts plate potential, with 35 ma. plate current.

On the 16,000 ohm variable grid resistor, only 5000 to 6000 ohms are used. On account of the middle tap on the plate coil, the R.F. choke coil, wound on a quartz rod, is not an absolute necessity, but its presence does no harm. A lamp bulb from a pocket flashlight is placed in series with the incoming B plus wire, acting as a fuse to prevent a "catastrophe" in case of an error on the operator's part.

Modulation

In order to simplify and to avoid possible troubles, the modulation in this small transmitter is effected by inserting in the grid circuit the secondary of the modulating transformer having a ratio of 1 to 60. The primary is connected in series with the microphone button, using granulated carbon, and current is supplied either from a small flashlight cell or, which is more preferable, from the heater storage battery, as the current drain may be above 150 ma. The rate of deepest modulation is attained by increasing the voltage of the current supply; i. e., the microphone will use 2 volts for 2-3 watts, while 5 watts will require 4 volts. In order to get an idea whether the modulation is almost equal to the task of modulating the carrier, let's say 95% (one has not to forget that it is impossible to have 100% modulation in a self-controlled-oscillator without introducing distortion) the operator has to watch the milliammeter in the plate circuit while speaking in front of the microphone. If the modulation were correct, the milliammeter will show a slight tendency to increase. Should there be a too violent jump of the needle, that will mean that the modulation is greater than necessary and a decrease of the voltage across the microphone is required.



Front panel of the prize-winning combination short-wave trans-receiver built by F8YG, France.

CONTEST

With Little Power"

It should be remarked, that this system of modulation is not adapted for re-transmission from a pick-up; the assistance of a tube amplifier would be required.

Manipulation (Keying)

A key opens the H. T. (plate voltage) circuit and a 400 ohm resistor is connected across the contacts of the key in order to avoid sparking. A relay is often used for keying in the antenna, but we are not going to talk about it now, as the construction of relay is somewhat complicated for the beginner.

Before keying, pull out the plug from the jack on the left side, thus disconnecting the microphone and insert it in the jack of the key.

With an antenna well insulated and rigidly mounted, over 200 ma. can be read on the thermoammeter, when a wavelength of 40 meters is used. As far as possible the keying should be done on another table than that, which carries the transmitter in order to avoid vibrations (shocks). Otherwise, at least a pad of sponge rubber should be used.

The Antenna

In this installation an antenna of the Zeppelin type is used and is formed of a horizontal wire ½ wave length long and two feeders ¼ wave length each. It is taken in consideration that the allowed bands are 20.80-21.40 m., 41-42.80 m. and 75-80 (we omit the bands of 5, 10, and 160 meters, which cannot be worked with the described arrangement.

It is possible to install an antenna tuned up to 41-42 meters, which will work as a pseudo-Zeppelin on 80 meters. To work on 20 meters it is preferable to install a special antenna tuned up to that wavelength.

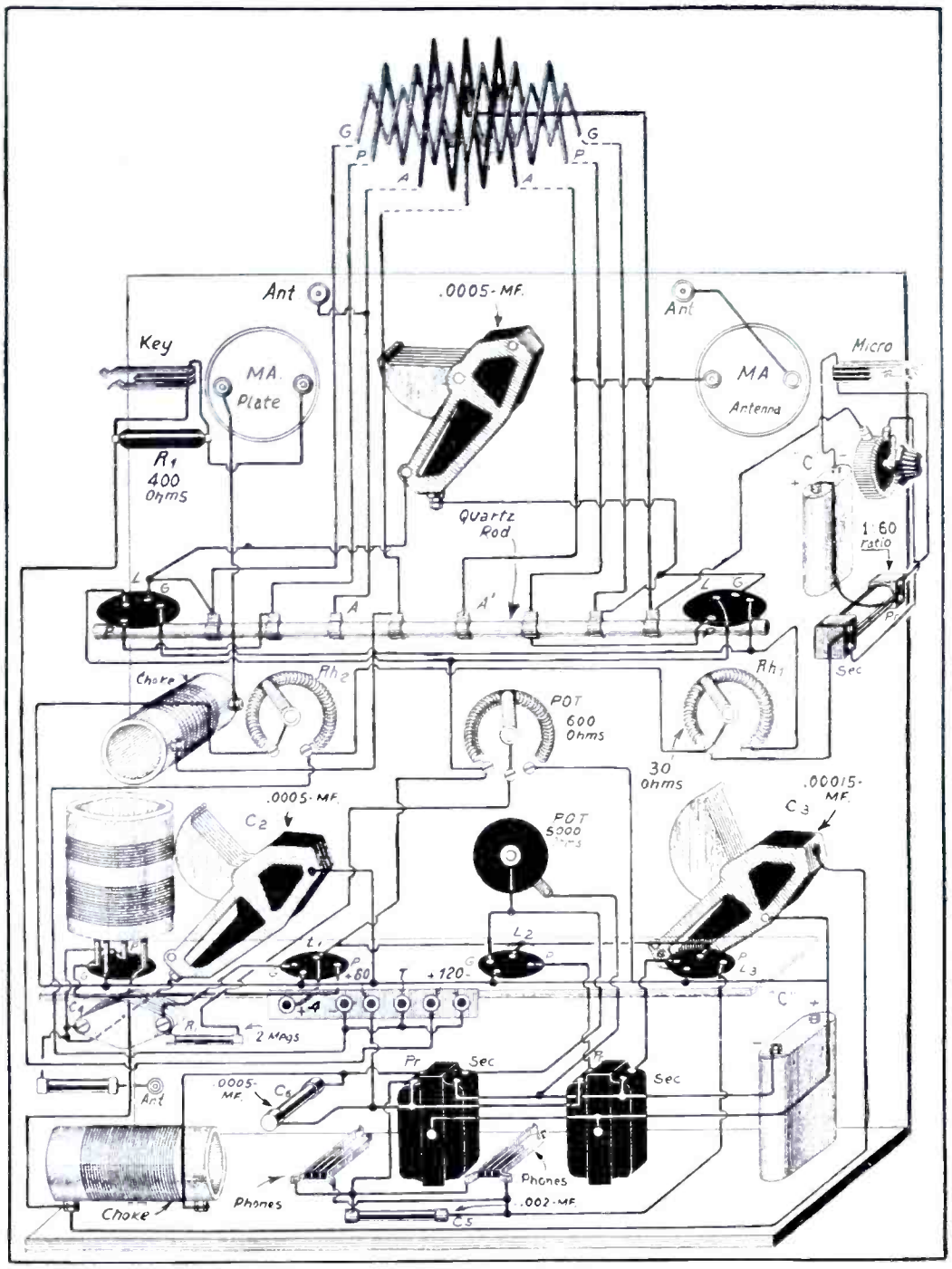


Fig. 5. General layout of the transmitter and receiver used at station F8YG.

The ends of the radiating antenna should be well cleared from any mass and given a maximum insulation by the use of *quartz* (isolantite used in this country.—Editor) insulators. The feeders should be 8 inches apart and spaced approximately six and one-half feet with quartz rods. One of the feeders must be insulated from the horizontal wire. The crossing through walls or any other separating media shall be arranged at points nearest to the base of the feeders and quartz (bakelite or isolantite used here mostly) tubing should be used. Avoid sharp curves; the entire system shall be tightly stretched in order to prevent a lack of stability of the carrier. This may occur if the wind can swing the antenna and the feeders. It is good practice, when possible, to make the free end of the antenna slightly higher. One has to remember that the total length of ¼ wave length for each feeder is counted, starting from the antenna coil of the transmitter.

> We publish this article of the French transmitter, which happens to be the one that recently won a French contest for the set that transmitted the greatest distance with the least power, and our principal purpose in illustrating and describing this set is to show our American readers what a neat job one of our French cousins made of his combination phone transmitter and receiver. Incidentally all of the insulation is of quartz which is reputed to have a very high insulating value for high frequency currents. Possibly we shall be using quartz insulators in this country before long.

Adjustment

When mounted as explained the adjustment is quite easy; let us suppose that the antenna is tuned up to the 40 meter band (7000 kc.). Take from the antenna coil only 2 turns and watch the thermoammeter needle. If two maxima are observed, reduce the coupling to 1½ turns. With the 80 meter band the coupling will require three turns, while the 20 meter band will use no more than half a turn. The stability of this transmitter is remarkable and allows a fair modulation of the carrier.

This station, beside the fact that it was rated "*first*" in the contest, has communicated over the three channels allotted to amateur telephony, with France, England, Ireland, Belgium, Germany, Spain, Italy, Portugal, Romany, Holland, Finland (20m. R4), Algeria (R8), Morocco (20m. R1), the steamship *Maréchal Lyautey* somewhere in the Mediterranean south of Spain. In code it communicated with the entire Europe, Asia, Africa and America and also with many French and English steamships. The received reports are marked: UR, FBCC—UR—T9OK—xtal—for the telephony super OK-carrier. UR phone R9 on loud speaker, have you a crystal control?

Receiver

The receiver is of the classical Schnell type followed by two ordinary A. F. stages and uses quartz as insulating material when it concerns the detector stage. The inductance coils are wound on quartz forms and cover a range of 15-90 meters. We *(Continued on page 237)*

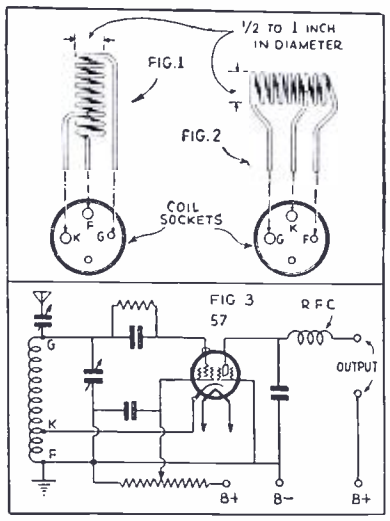
$5.00 FOR BEST SHORT WAVE KINK

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 paid for at regular space rates. 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.

$5.00 PRIZE

ULTRA LOW-LOSS COIL

The most efficient coil is one with the losses reduced to a minimum. Most set-builders have reduced these losses by using the special coil forms made of low-loss material such as Isolantite, etc. I have reduced the losses to a still greater extent by using no form at all. These coils are shown in Figs. 1 and 2. They are wound with No. 12 or No. 14 solid enameled wire, with a diameter of one to one-half inch.



The coils are very easy to make if used in "electron-coupling" circuits, as only a single coil is required with a tap one-third of the total number of turns from the ground end. Such a circuit is shown in Fig. 3.

These coils will work very well with the "Two tube set" on page 401 of SHORT WAVE CRAFT for November, 1933, and also with the "Super-Regenerative Receiver" described by George W. Shuart on page 593 of SHORT WAVE CRAFT for February, 1934, providing a four-prong "Isolantite" socket is provided for the coil.—George C. Sholin.

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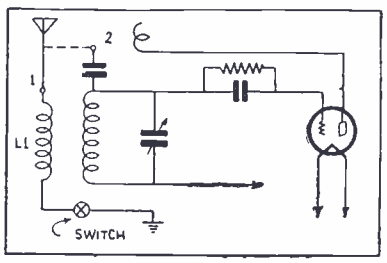
COUPLING METHODS

Some perfer coupling the antenna to the grid-coil through a three-plate midget condenser, while others prefer using an added primary coil L1. Having tried both



methods, and liking each of them, my present receiver is using the above idea. When the antenna is connected to post one and the switch is closed, the primary coil coupling is in use. When the antenna is connected to post two, and the switch is opened (a closed switch causes unpleasant regeneration effects), the grid-coil coupling is in use. The antenna coil has a fixed winding of seven turns of No. 18 d.c.c. wire and is slipped over the top of the various regular plug-in coils. Some interesting experimenting may be done by using both coupling methods at the same time.—Arthur Griep.

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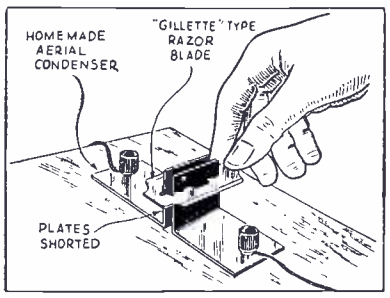
USE FOR OLD RAZOR BLADES

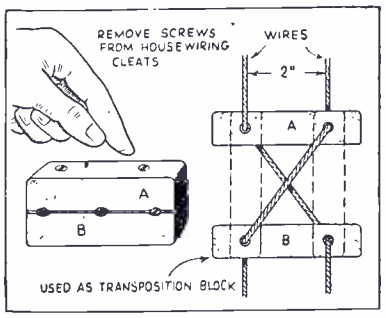
I have found that by shorting the brass plates of a home-made aerial condenser



better results and more amplification can be derived on the higher wave lengths. This also gives a higher wave length range to the set. This has proved successful on several sets especially with the "amateur band receiver" described in a back number of SHORT WAVE CRAFT. A razor blade of the "Gillette" type works fine.—S. Bean.

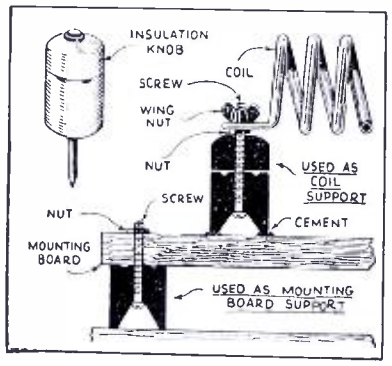
USE FOR KNOBS AND CLEATS

Efficient and economical insulators for supporting transmitters and transmitting coils can be made with ordinary split knobs used in electrical house wiring. These knobs are usually sold for 3 for five cents,



and can be purchased at any electrical supply or Five-and-Ten-Cent Store. The nail is removed from the knob and a machine screw of sufficient length is inserted. The knob can be used as a supporting insulator for the transmitting mounting board; Figure 3 shows the knob used as an insulator for supporting the transmitter coils. The wing nut A facilitates removing of the coil when changing frequencies. The knob can be fastened to the mounting board securely with Duco Cement, Peerless Cement or any other suitable cement or glue.

The Figure shows a pair of ordinary house wiring porcelain cleats. These, taken apart, make very efficient and economical transposition blocks as shown in drawing. Once being placed into the position, they are securely held there by the wire. It is best to use 4 cleats arranged as shown. Incidentally, two or three of these cleats connected in series also make very good insulators for the aerial.—William L. Duerr.



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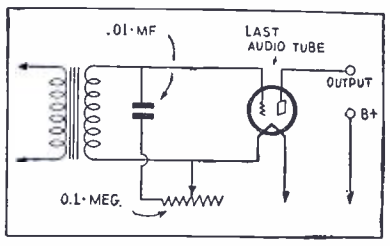
AUDIO SELECTIVITY

I believe that most of you fellows have at one time or the other wished you had something to twist and turn to get the other fellow's signals when the Q.R.M. comes sailing in. Well, there is something, and it's so simple it's a wonder all sets aren't equipped with it. It's nothing but a "tone control" such as our B.C.L. friends have been using for the past two years. A glance at the sketch will show anyone how simple it is, and a trial will show the effectiveness. It can be attached to any set regardless of the audio system used. The values of the two units, .01



mf. for the condenser and 100,000 ohms for the volume control, are average and will work well with all transformer-coupled systems.—W. G. Currie, W9EAM.

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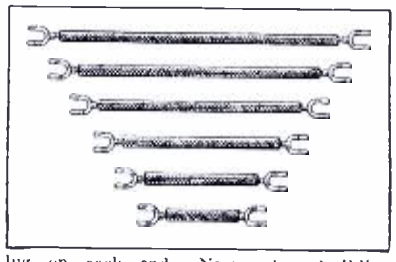
SOLVING SOLDERING BUGABOO

Some experimenters who do not have electricity available have been confronted with the problem of soldering.

A small torch isn't very satisfactory because it scorches the bakelite and rubber parts. Neither is a small hand iron satisfactory, for it will not hold heat very long. I have been confronted with this situation and to remedy it I used only parts which had binding post or screw connections on them. I even fasten binding posts to all grids and by-pass condensers. Then one day I took some hook-up wire and soldering lugs to a friend of mine in town who had an iron. There I made about 100 leads from two to twelve inches in length with a



lug on each end. Now, when building a set I no longer worry about "scorched fingers" and "poorly soldered" connections, but instead I only use a pair of pliers and a screw-driver. In this manner I can build a set in half the time and the beauty of it is, the thing never fusses around because of some poorly soldered connection. Another feature is the factory-like appearance of the sets. Every lead is the right length and every soldered joint is good. This costs practically nothing, yet it saves many hours of tedious soldering.—Dwight L. Brown.

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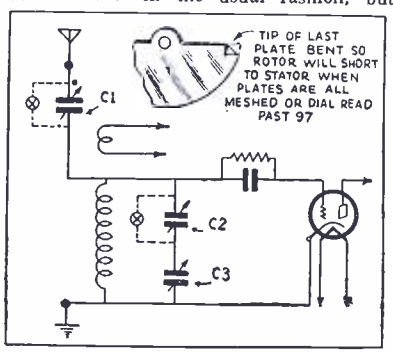
AUTOMATIC CONDENSER SWITCH

The idea is to bend the tip of the last plate of a variable condenser so when the plates are all in or at the highest capacity, the rotor becomes "shorted" to the stator. The diagram shows where this kink is used twice in a regenerative detector circuit. With the dial of C1 reading from 0 to approximately 97 the antenna series condenser works in the usual fashion, but

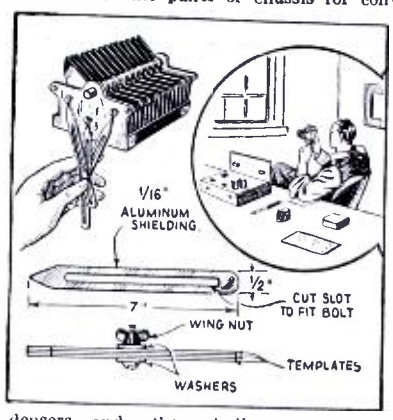


when at 100, the condenser automatically shorts itself out thereby permitting experiments with short, indoor, or freak aerials.

The second use for this idea is in the tuning circuit. When C2 is "shorted" out the tuning is done with the usual condenser C3. With C2 "in", any degree of band-spreading can be had on the higher frequency end of the coil used. For example, on the 20 to 40 meter coil the 20 meter amateur band and the 25 meter broadcast band can be band-spread. Of course C1 and C2 must be insulated from the metal panel. C1 and C3 are of standard capacities. C2 may be almost anything from 50 mmf. to 500 mmf.—Peter Y. Miyake.

DRILLING TEMPLATE

This kink is a screw hole "template" that makes it easier to transfer screw-hole locations to the panel or chassis for con-



densers and other similar parts. The template consists of three pointed aluminum strips, each one-half inch by seven inches, with a slot in the middle of each connected by a short bolt and nut that has enough room so that the aluminum strips can be slid easily up and down and then screwed together in position.—Joe Green.

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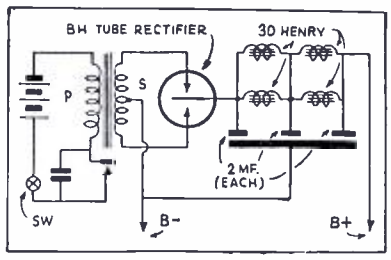

"B" SUPPLY FROM 6 VTS.

Here is "B" power unit to be used in conjunction with a six-volt storage battery; it will supply enough power for the average six-tube set, and also a low-powered or small transmitter. It is made by rewinding the secondary of a Ford coil, one used in a model T, with 16,000 turns of 30 d.c.c. wire, with center tap at 8,000 turns, using a BH rectifier tube, 2 double chokes (30 henry each), three 2-mf. electrolytic condensers, as shown in the diagram.—Clinton Eaton.

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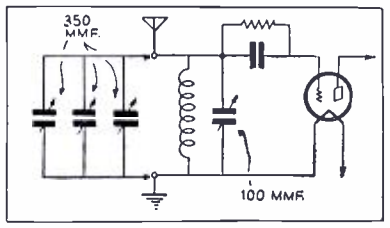
TUNING IN LONG WAVES

Recently I became interested in reception above 550 meters, and, since no coil forms were available on which to wind the high wave-length coils, the coils for the broad-



cast band were used. Three .00035 mf. variable condensers or fixed condensers, preferably variable, are connected in parallel across the grid-winding of the broadcast coil. After this the high wavelength stations come in easily. The set on which this was tried was a Doerle two-tube D.C. receiver. Many code and phone stations have been received with the above circuit.—Roger F. Vore.

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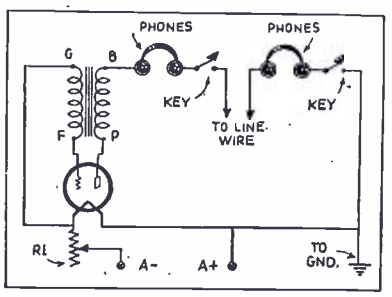
2-WAY CODE PRACTICE

The best way to learn the code is for two persons to practice together. With this in mind the audio oscillating circuit was altered as shown. The tone and volume of the signal may be varied by R1. For key 1 to send, key 2 closes his key, or the reverse if key 2 desires to send. The line may be any size wire, in tests No. 36 dsc. (telephone induction coil windings), 1 mile long was used without changing the volume or tone of the signal. The only caution is that the line wire must be well insulated from anything which will ground the circuit. Parts used: Audio transformer, tube and socket (any D.C. tube), 15 ohm variable resistor.—D. E. Tisdale.



SHORT WAVE STATIONS OF THE WORLD

New!! "Complete" Grand List Broadcast, Police and Television Stations

We present herewith a complete, revised and combined 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, with one or two exceptions of the time stations, 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.

DON'T FORGET TO VOTE!

● PLEASE note that we have set up the list of short-wave stations and their call letters this month in the old (June, etc.) style, with the stations arranged in order by "frequencies." It is up to you as to which style you prefer, the one we used last month (alphabetically by call letters), or the present one. Please mail us a post-card and simply state thereon—"I prefer No. 1 (June style), or No. 2 (July style) for S-W Station List." Address your cards to the Editor.

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 to mid-afternoon, and particularly during bright daylight, listen between 13 and 22 meters (21540 to 13000 kc.).

To the east of the listener, from about noon to 10:00 p. m., the 20-35 meter will be found very productive. To the west of the listener this same band is best from about Nine 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.

Short-Wave Broadcasting, Experimental and Commercial Radiophone Stations

21540 kc. W8XK
-B- 13.93 meters
WESTINGHOUSE ELECTRIC
PITTSBURGH, PA.
7 a. m.-2 p. m.; relays KDKA

21470 kc. GSH
-B- 13.97 meters
BRITISH BROAD. CORP.
DAVENTRY, ENGLAND
See "When to Listen In" Column

21420 kc. WKK
-C- 14.01 meters
A. T. & T. CO.
LAWRENCEVILLE, N. J.

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

20700 kc. LSY
-C- 14.49 meters
BUENOS AIRES, ARGENTINA
Tests irregularly

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

19900 kc. LSG
-C- 15.08 meters
BUENOS AIRES, ARGENTINA
Calls Spain, daytime

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

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

19600 kc. LSF
-C- 15.31 meters
BUENOS AIRES, ARGENTINA
Calls Spain, daytime

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

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

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

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

18680 kc. GAX
-X- 16.06 meters
RUGBY, ENGLAND

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

18370 kc. PMC
-C- 16.33 meters
BANDOENG, JAVA

18345 kc. FZS
-C- 16.35 meters
Saigon,
INDO-CHINA

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

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

18240 kc. FRO,FRE
-C- 16.44 meters
ST. ASSISE, FRANCE

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

18115 kc. LSY3
-C- 16.56 meters
BUENOS AIRES, ARGENTINA
Tests irregularly

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

17810 kc. PCV
-C- 16.84 meters
KOOTWIJK, HOLLAND

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, 9 a. m.-3 p. m. every day

17775 kc. ★PHI
-B- 16.88 meters
HUIZEN, HOLLAND
Daily except Tues. and Wed.
7:30-10 or 10:30 a. m.

17760 kc. IAC
C- 16.89 meters
PIZA, ITALY
6:30-7:30 a. m.

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

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

17120 kc. WOY
-C- 17.52 meters
LAWRENCEVILLE, N. J.

17080 kc. GBC
-C- 17.56
RUGBY, ENGLAND
Calls ships, morn & early aftern'n

16270 kc. WLK
-C- 18.44 meters
LAWRENCEVILLE, N. J.

16270 kc. WOG
-C- 18.44 meters
OCEAN GATE, N. J.

16233 kc. FZR
-C- 18.48 meters
SAIGON, INDO-CHINA

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

15810 kc. LSL
-C- 18.98 meters
BUENOS AIRES, ARGENTINA
Calls Brazil and Spain, daytime

15760 kc. JYT
-X- 19.04 meters
KEMIKAWA-CHO-CHIBA-KEN, JAPAN
Irregular in late afternoon
Around 6 p. m.

15330 kc. ★W2XAD
-B- 19.56 meters
GENERAL ELECTRIC CO.
SCHENECTADY, N. Y.
Relays WGY daily. 2-3 p. m.

15300 kc. CP7
-B- 19.6 meters
LA PAZ, BOLIVIA

15270 kc. ★W2XE
-B- 19.65 meters
ATLANTIC BROADCASTING CORP.
485 Madison Av., N.Y.C.
Relays WABC daily. 10 a. m.-12 noon

15250 kc. W1XAL
-B- 19.67 meters
BOSTON, MASS.

15243 kc. ★FYA
-B- 19.68 meters
"RADIO COLONIAL"
PARIS, FRANCE
Service de la Radiodiffusion,
103 Rue de Grenelle, Paris
8-11 a. m.

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

15200 kc. ★DJB
-B- 19.73 meters
GERMAN S-W STATION
Broadcasting House, Berlin, Ger.
12:35-2:30 a. m., 7:45-11 a. m.
Also 4-5:30 a. m. on Sundays

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
5:00 to 5:15 a. m., except Sunday. Saturday at 10 a. m.

15055 kc. WNC
-C- 19.92 meters
HIALEAH, FLORIDA

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

14590 kc. WMN
-C- 20.56 meters
LAWRENCEVILLE, N. J.

(Time given is Eastern Standard Time)

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

14470 kc. WMF
-C- 20.73 meters
LAWRENCEVILLE, N. J.

14440 kc. GBW
-C- 20.78 meters
RUGBY, ENGLAND
Calls U.S.A., aftern'n & even'g

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

13610 kc. JYK
-C- 22.04 meterss
KEMAKAWA-CHO, CHIBA-KEN, JAPAN
Phones till 11 p. m.

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

13390 kc. WMA
-C- 22.40 meters
LAWRENCEVILLE, N. J.

13210 kc. WOO
-C- 22.71 meters
OCEAN GATE, N. J.

12840 kc. WOY
-C- 23.36 meters
LAWRENCEVILLE, N. J.

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

12825 kc. ★CNR
-B, C- 23.39 meters
DIRECTOR GENERAL
Telegraph and Telephone Stations, Rabat, Morocco
Sunday, 7:30-9:00 a. m.

12800 kc. IAC
-C- 23.45 meters
PIZA, ITALY
Mornings

12780 kc. GBC
-C- 23.47 meters
RUGBY, ENGLAND
Calls ships, after'n & early eve'g

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

12260 kc. FTN
-C- 24.47 meters
ST. ASSISE (Paris), FRANCE

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

12000 kc. RNE
-B- 25 meters
MOSCOW, U. S. S. R.
Sat. 10-11 p. m.
Sun. 6-7 a. m., 10-11 a. m.
Mon., Wed., Fri., 4-5 p. m.

11950 kc. KKQ
-X- 25.10 meters
BOLINAS, CALIF.

11880 kc. ★FYA
-B- 25.25 meters
"RADIO COLONIAL"
PARIS, FRANCE
11:15 a. m.-2:15 p. m.-3-6 p. m.

11870 kc. ★W8XK
-B- 25.26 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
PITTSBURGH, PA.
4:30-10:00 p. m.
Relays KDKA

11865 kc. ★GSE
-B- 25.28 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

11810 kc. ★I2RO
-B- 25.4 meters
ROME, ITALY
Daily 11:15 a. m.-12:15 p. m.
1:15 p. m.-5:30 p. m.

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

11780 kc. ★CJRX
-B- 25.47 meters
WINNIPEG, CANADA
8-11 p. m.

11760 kc. ★DJD
-B- 25.51 meters
GERMAN S-W STATION
BROADCASTING HOUSE, BERLIN
12:30-4 p. m., 5-10:30 p. m.

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

11720 kc. ★FYA
-B- 25.63 meters
"RADIO COLONIAL"
PARIS, FRANCE
6:15-9 p. m.
10 p. m.-12 midnight, Daily

11680 kc. KIO
-C- 25.68 meters
KAHUHU, HAWAII

11340 kc. DAN
-C- 26.44 meters
NORDEICH, GERMANY

11181 kc. CT3AQ
-B- 26.83 meters
FUNCHAL, MADERIA
Tues., Thurs., 5:00-6:30 p. m.
Sunday, 10:30 a. m.-1 p. m.

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

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

10550 kc. WOK
-C- 28.44 meters
LAWRENCEVILLE, N. J.

10530 kc. GBX
-X- 28.49 meters
RUGBY, ENGLAND

10520 kc. VLK
-C- 28.51 meters
SYDNEY, AUSTRALIA

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

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

10350 kc. ★LSX
-C- 28.98 meters
BUENOS AIRES, ARGENTINA
Tests irregularly 9 p. m.-12 midnight

10330 kc. ORK
-C- 29.04 meters
RUYSSELEDE, BELGIUM
1:45-3:15 p. m.

10300 kc. LSL2
29.13 meters
BUENOS AIRES
Calls Europe, evenings

10250 kc. LSK
-C- 29.27 meters
BUENOS AIRES, ARGENTINA
Calls Spain, U. S., afternoon and evening

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

10055 kc. ZFB
-C- 29.84 meters
HAMILTON, BERMUDA

9950 kc. GCU
-C- 30.15 meters
RUGBY, ENGLAND
Calls N.Y.C., eve'g & early a. m.

9890 kc. LSN
-C- 30.33 meters
BUENOS AIRES
Calls New York, evenings

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

9860 kc. ★EAQ
-B- 30.43 meters
P. O. Box 951
MADRID, SPAIN
Daily except Saturday and Sunday, 5:15-7 p. m.; Saturday, 1-3, 5:15-7:30 p. m.; Sunday, 5:15-7:30 p. m.

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

9800 kc. LSE
-C- 30.61 meters
BUENOS AIRES, ARGENTINA
Tests irregularly

9790 kc. GCW
-C- 30.64 meters
RUGBY, ENGLAND
Calls N.Y.C., eve'g & early a. m.

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

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

9675 kc. TI4NRH
-B- 31 meters
HEREDIA, COSTA RICA

9600 kc. CT1AA
-B- 31.25 meters
LISBON, PORTUGAL
Tues. and Friday, 4:30-7:00 p. m.

9600 kc. YV5BMO
-B- 31.25 meters
MARACAIBO, VENEZUELA

9600 kc. XETE
-B- 31.25 meters
MEXICO CITY, MEXICO
Irregularly, 6 p. m.-1 a. 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
See "When to Listen in" Column

9590 kc. W3XAU
-B- 31.28 meters
NEWTOWN SQUARE, PA.
Relays WCAU
11 a. m.-5 p. m.

9585 kc. ★GSC
-B- 31.30 meters
BRITISH BROAD. CAST.
DAVENTRY, ENGLAND
See "When to Listen In" Column

9580 kc. VK3LR
-B- 31.31 meters
Research Section.
Postmaster Gen'ls. Dept.,
61 Little Collins St.,
MELBOURNE, AUSTRALIA
Relays 3LO and 3AR
3.30-7.30 a. m. except Sun.

9570 kc. ★W1XAZ
-B- 31.35 meters
WESTINGHOUSE ELECTRIC & MFG. CO.
SPRINGFIELD, MASS.
Relays WBZ, 6 a. m.-12 midnight

9560 kc. ★DJA
-B- 31.38 meters
GERMAN S-W STATION,
BROADCASTING HOUSE, BERLIN
Daily 6:45-11 a. m., 5-8:15 p. m.
also 4-5:30 a. m. Sundays

9550 kc. LKJ1
-B- 31.41 meters
JELOY, NORWAY,
Relays Oslo till 6 p. m.

9530 kc. ★W2XAF
-B- 31.48 meters
GENERAL ELECTRIC CO.
SCHENECTADY, N. Y.
Relays WGY. 6:45-10 p. m. and also Sundays, 10-11:30 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., 5-6:30 a. m.; Saturday, 5:00-7:00 a. m.

9510 kc. YV3RC
-B- 31:55 meters
CARACAS, VENEZUELA
Irregularly 10:30 a. m.-1 p. m.

9330 kc. CGA
-C- 32.15 meters
DRUMMONDVILLE, CANADA

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

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

9120 kc. CP6
-B- 32.88 meters
LA PAZ, BOLIVIA

9020 kc. GCS
-C- 32.26 meters
RUGBY, ENGLAND
Calls N.Y.C., evenings

8928 kc. TGX
-C- 33.50 meters
GUATEMALA CITY, C. A.

8920 kc. GCX
-X- 33.63 meters
RUGBY, ENGLAND

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

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

8560 kc. WOY
-C- 35.05 meters
LAWRENCEVILLE, N. J.

8380 kc. IAC
-C- 35.8 meters
PIZA, ITALY

8185 kc. ★PSK
-C- 36.65 meters
RIO DE JANIERO, BRAZIL
7-7:30 p. m.
Relays PRA3

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

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

7880 kc. JIAA
-B- 38.07 meters
KEMIKAWA-CHO-CHIBA-KEN, JAPAN
From 5 a. m.

7830 kc. PDV
-C- 38.30 meters
KOOTWIJK, HOLLAND
After 9 a. m.

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

7770 kc. PCK
-C- 38.60 meters
KOOTWIJK, HOLLAND

7150 kc. HJ4ABB
-B- 41.6 meters
MANIZALES, COLOMBIA
Various times during evening

6990 kc. LCL
-B- 42.92 meters
JELOY, NORWAY
Relays Oslo 11 a. m.-6 p. m.

6977 kc. EAR110
-B- 43 meters
MADRID, SPAIN
Tues., Sat., 5:30 p. m.

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

6860 kc. KEL
-C- 43.70 meters
BOLINAS, CALIF.

6840 kc. CFA
-C- 43.80 meters
DRUMMONDVILLE, CANADA

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

6666 kc. HC2RL
-B- 45.00 meters
P. O. BOX 795, 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
PIZA, ITALY
Evenings

6611 kc. RW72
-B- 45.38 meters
MOSCOW, U. S. S. R.
1-6 p. m.

6447k c. ★HJ1ABB
-B- 46.53 meters
BARRANQUILLA, COL., S. A.
6-10 p. m. daily
p. m. daily
Thurs., 8-10:30 p. m.

6425 kc. ★W3XL
-X- 46.70 meters
NATIONAL BROADCASTING CO.
BOUND BROOK, N. J.
Relays WJZ Irregularly on Friday, 4 p. m.-12 midnight

6383 kc. HC1DR
-B- 47.00 meters
QUITO, ECUADOR
8-10 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.

6275 kc. HJ3ABF
-B- 47.81 meters
BOGOTA, COLOMBIA
7-11 p. m.

6272 kc. HI1A
-B- 47.84 meters
DOMINICAN REP.
Daily, 1-2:30, 8:30-10:30 p. m.
Sunday,
2:30-5:30, 8:30-10:30 p. m.

6150 kc. ★YV3RC
-B- 48.78 meters
CARACAS, VENEZUELA
Generally 4:00-10:00 p. m.

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

6130 kc. ZGE
-B- 48.94 meters
KUALA LUMPUR,
FED. MALAY STATES
Tue. and Fri., 6:40-8:40 a. m.
Sun., 7-9 a. m.

6122 kc. ZTJ
-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. ★W2XE
-B- 49.02 meters
ATLANTIC BROADCASTING CORP.,
485 MADISON AVE., N. Y. C.
Relays WABC, 5-10 p. m.

6112 kc. ★YV2RC
-B- 49.08 meters
CARACAS, VENEZUELA
10:30 a. m.-1 p. m.; 5:15-10 p. m.

6110 kc. ★VE9HX
-B- 49.10 meters
HALIFAX, NOVA SCOTIA
9:30 a. m.-1 p. m.; 6-12 p. m.

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

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

6100 kc. ★W9XF
-B- 49.18 meters
DOWNERS GROVE, ILL.
Relays WENR, Chicago
Tuesday, Thursday, Friday, 3:30-7:00 p. m.; 8:30 p. m.-1 a. m.
Sunday, 3:30-6 p. m.; 8 p. m.-1 a m.

6095 kc. ★VE9GW
-B- 49.22 meters
BOWMANVILLE, ONTARIO, CANADA
Sunday ,10:30 a. m.-7 p. m.; Monday-Wednesday, 1-10 p. m.; Thursday, 2-11 p. m.; Friday, Saturday, 6 a. m.-11 p. m.

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, 10:30 a. m.-8 p. m. and irregularly on week days

6075 kc. XEB
-B- 49.4 meters
MEXICO CITY, MEX.
P.O. Box 7944
Irregular 8-12 p. m.

6072 kc. OER2
-X- 49.41 meters
VIENNA, AUSTRIA
Tues. and Thurs., 8:30 a. m.-4 p. m.

6070 kc. ★YV5BMO
-B- 49.42 meters
MARACAIBO, VENEZUELA
Between 5 and 10 p. m.

6070 kc. VE9CS
-B- 49.42 meters
VANCOUVER, B. C., CANADA
Fri., 12:30-1:45 a. m.; Sun., 12 noon-12 midnight

6065 kc. HIX
-B- 49.46 meters
SANTO DOMINGO,
DOMINICAN REPUBLIC
Tues. and Fri., 8-10 p. m.; Sun., 7:45-10:40 a. m., 3-5 p. m.
Sat., 10:40-11:40 p. m.

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

6060 kc. ★W8XAL
-B- 49.50 meters
CROSLEY RADIO CORP.
CINCINNATI, OHIO
Relays WLW Irregularly

6060 kc. VQ7LO
-B- 49.50 meters
IMPERIAL AND INTERNATIONAL COMMUNICATIONS, Ltd.
NAIROBI, KENYA, AFRICA
Mon., Wed., Fri., 5:45-6:15 a. m., 11 a. m.-2 p. m.
Tues., 3-4 a. m., 11 a. m.-2 p. m., Thurs. 8-9 a. m., 11 a. m.-2 p. m., Sat., 11 a. m.-3 p. m., Sun., 10:50 a. m.-2 p. m.

6060 kc. PK1WK
-B- 49.5 meters
BANDOENG, JAVA
Daily exc. Fri., 5:30-6 a. m.

6060 kc. W3XAU
-B- 49.50 meters
NEWTOWN SQUARE, PA.
Relays WCAU, Philadelphia
7 p. m.-12 midnight Irregular

6040 kc. W1XAL
-B- 49.67 meters
BOSTON, MASS.
Very irregular in early evening

6040 kc. W4XB
-B- 49.67 meters
MIAMI, FLORIDA
Relays WIOD, Sat. evenings

6020 kc. ★DJC
-B- 49.83 meters
GERMAN S-W STATION BROADCASTING HOUSE, BERLIN
12:30-4 p. m., 8:45-10:30 p. m.

6012 kc. ZHI
-B- 49.9 meters
RADIO SERVICE CO.,
20 ORCHARD RD.,
SINGAPORE, MALAYA
Mon., Wed., Thurs., 5:40-8:10 a. m.; Sat. 10:40 p. m.-1:10 a.m.

6010 kc. COC
-B- 49.92 meters
P. O. Box 98
HAVANA, CUBA
4-8 p. m., and irregularly

6005 kc. VE9DN
-B- 49.96 meters
CANADIAN MARCONI CO.
DRUMMONDVILLE, QUEBEC
Sat., 11:30 p. m.

6000 kc. EAJ25
-B- 50 meters
BARCELONA RADIO CLUB,
BARCELONA, SPAIN
3:30-4:30 p. m., Saturday

6000 kc. RW59
-B- 50 meters
MOSCOW, U. S. S. R.
4-6 p. m., daily

6000 kc.
-B- 50 meters
RADIO TANANARIVE,
MADAGASCAR
Sun., 2:30-4 a. m.
Daily except Sun. and Mon.
3-3:45 a. m.

5970 kc. HVJ
-B- 50.26 meters
VATICAN CITY (ROME)
2-2:15 p. m., daily. Sun., 5-5:30 a. m.

5930 kc. HJ4ABE
-B- 50.6 meters
MEDELLIN, COLOMBIA
Mon., 7-11 p. m.; Tues., Thurs., Sat., 6:30-8:00 p. m.; Wed. and Fri., 7:30-11:00 p. m.

5853 kc. WOB
-C- 51.25 meters
LAWRENCEVILLE, N. J.
Calls Bermuda, nights

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

5170 kc. PMY
-C- 58.00 meters
BANDOENG, JAVA

5145 kc. OKIMPT
-X- 58.31 meters
PRAGUE, CZECHOSLOVAKIA

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

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.

4752 kc. WOY
-C- 63.1 meters
LAWRENCEVILLE, N. J.

4320 kc. G6RX-GDB
-C- 69.44 meters
RUGBY, ENGLAND
Tests, 8-11 p. m.

4273 kc. RW15
-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.

4272 kc. WOY
-C- 70.22 meters
LAWRENCEVILLE, N. J.

4109 kc. HCJB
-B- 73 meters
QUITO, ECUADOR
7:30-9:45 p. m., except Monday

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

POLICE RADIO ALARM STATIONS

KGHG	Las Vegas, Nev.	2474 kc.
KGHK	Palo Alto, Cal.	1674 kc.
KGHO	Des Moines, Iowa	1682 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.	1674 kc.
KGPE	Kansas City, Mo.	2422 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.	1674 kc.
KGPN	Davenport, Iowa	2466 kc.
KGPO	Tulsa, Okla.	2450 kc.
KGPP	Portland, Ore.	2442 kc.
KGPQ	Honolulu, T. H.	2450 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.	1658 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.
KGZW	Lubbock, Tex.	2458 kc.
KGZX	Albuquerque, N. Mex.	2414 kc.
KSW	Berkeley, Cal.	1658 kc.
KVP	Dallas, Tex.	1712 kc.
UYR	Montreal, Can.	1712 kc.
WCK	Belle Island, Mich.	2414 kc.
WEY	Boston, Mass.	1558 kc.
WKDT	Detroit, Mich.	1558 kc.
WKDU	Cincinnati, Ohio	1706 kc.
WMDZ	Indianapolis, Ind.	2442 kc.

(*Continued on page* 230)

SHORT WAVE LEAGUE

HONORARY MEMBERS

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

Why We Need "Code-less" 5-Meter Licenses

Editor, SHORT WAVE CRAFT:

I have been reading the arguments on the NO CODE test below 6 meters for a long time, and wish to state my opinion on same.

In this letter I will give an outline of the condition that exists, and tell of some of the operating on the other amateur bands; let's hope that the 5-meter band shows more intelligent operating.

Mr. J. A. Worcester, W2GAU, has written the most sensible letter ever published in SHORT WAVE CRAFT, on the "no-code" argument; his letter and map should be printed on a large sheet, framed and—every short wave fan should have one hung on his wall; also a copy should be sent to every licensed amateur in the United States. His letter states the facts, and *nothing but the facts!*

Commercial interests have started to demand territory in the 5-meter band, and there is plenty of equipment being built by the big companies for commercial use in this band (if you don't believe that, do a little investigating).

At the next International Radio Conference, the amateurs are going to loose at least one-half of the 5-meter band.

I wish I had the time and space to tell all that has happened to amateur radio, since the London convention in 1912. I believe it would make these short-sighted boys see light.

Little by little our bands have been cut down until now, take a look; yes, take a good long look at what we have left. Are we going to let the same thing happen to the 5-meter band? I hope not, but we can not hold it, unless we get it occupied, and there's not enough licensed amateurs in the United States at the present time to hold all of this band, and there will not be enough of us for a long, long time to come, at least not before the biggest part of this band is given to the commercial interests.

The only way we can hold this band is to get it occupied, and the only way to get it occupied, is to abolish the code test below 6 meters.

Let's down this selfishness (for that's one of the things that's wrong with you guys) and try to hold on to our 5-meter band.

The next radio conference will be held at Cairo, Egypt, in 1937, just a little less than four years from now, and at that conference, what will happen to our 5-meter band? Plenty has happened to our bands in the years gone by, and plenty will happen in the years to come.

These fellows that are yammering for code test all the time, undoubtedly know very little about amateur radio, and less about the equipment that they are using.

I wonder, if they know, that there are hundreds of fellows that knows hundreds of times as much about radio as they do, and at the same time, these fellows (that know radio) don't know the code and don't care to learn it.

There are plenty of radio engineers that don't know the code, and don't care to learn it, as it would be of no use to them.

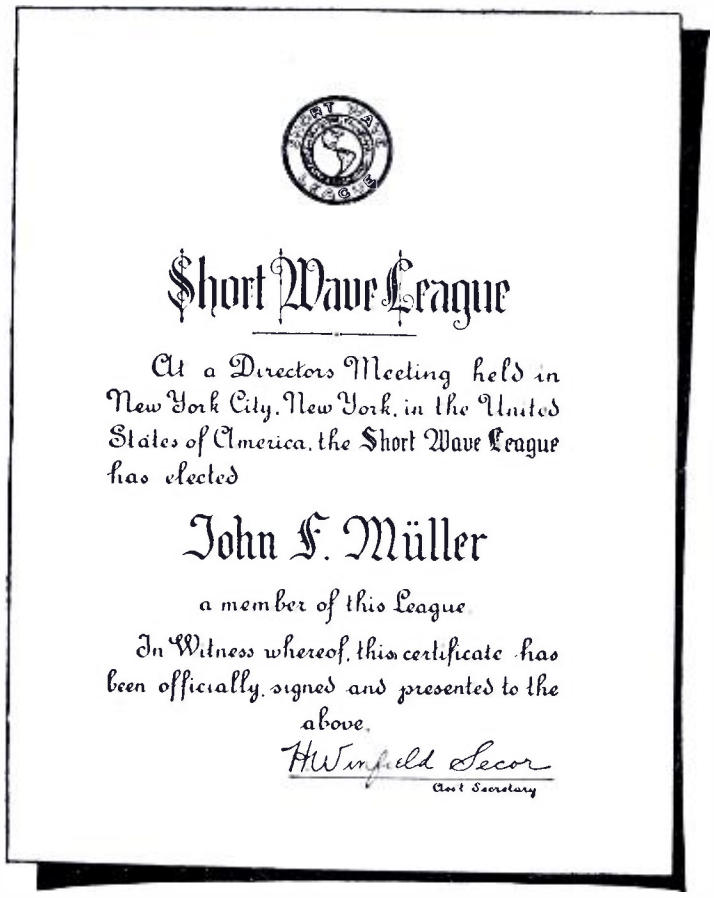
It seems that there are quite a number that can't learn the code for some reason (in fact some are personal friends of mine), that have worked on code for two and three years and more, trying to get the code good enough to get out of the class called the "lids." Some of them had xmitters on the air, on a temporary license, but had to give up amateur radio in disgust, as they were called "lids" and every other kind of a name that one can think of; they were told to get off the air time and time again (if you don't believe that fellows that are not good at code are called names, listen in—you will find out). The same men were told that they did not have brains enough to learn the code. I must say that each and every one of these men are very intelligent, and have B.S. degrees in radio and electrical engineering, and these men were unable to learn the code after two and three years of hard practice.

It's only "lids," the weak-minded, the short-sighted boys, that write letters and say that men of this caliber are too lazy to learn the code. Anyway of what use would code have been to these men, as their interest lay in radio telephone communication, a field that requires far more intelligence than the "code fiend" will probably ever have.

I have had several C.W. men, code operators, that are on the air, speak to me, about the gang that is trying to get the code test eliminated from the 5-meter band; they call the fellows that are trying to get the code eliminated the "brainless gang", the "nit-wits", and every other kind of a name that they can think of.

One of these fellows (one of those making the biggest fuss), can't even build a C.W. transmitter that will work! The fact is that he can't even tune up a three-tube C.W. Xmitter, but sends it away to amateurs in other towns to have it "tuned up", and when he gets it back he soon has it out of tune again, and he operates with it out of tune for a long time, then sends it back again. Now he is talking of building a *phone rig*, and he knows less about a phone Xmitter than he does a C.W. Xmitter; and he knows nothing about a C.W. Xmitter, except how to move a key up and down. I say that he really does know how to do that, and is exceptionally good at sending and receiving code; if this were the only amateur on the air with such a little knowledge of radio, I would not have mentioned him, but there are hundreds more on the air just like him, who know very little about radio, but

(Continued on page 236)



Short Wave League

At a Directors Meeting held in New York City, New York, in the United States of America, the Short Wave League has elected

John F. Müller

a member of this League

In Witness whereof, this certificate has been officially signed and presented to the above.

H. Winfield Secor
Asst Secretary

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

Get Your Button

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

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

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

SHORT WAVE QUESTION BOX

EDITED BY

GEORGE W. SHUART, W2AMN

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

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

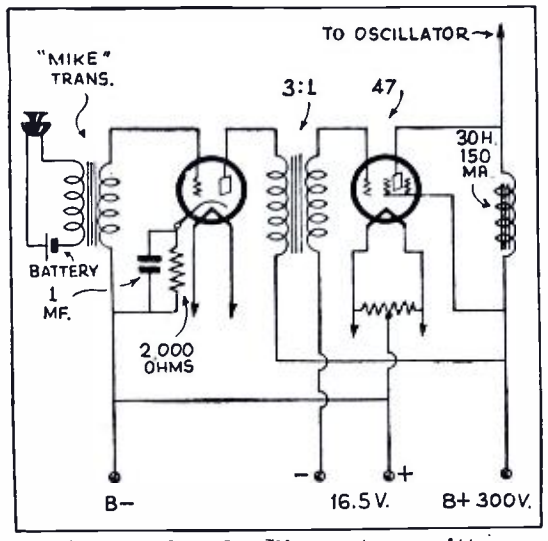
Correspondents are requested to write or print their names and addresses clearly. Hundreds of letters remain unanswered because of incomplete or illegible addresses.

MODULATOR FOR 5-METER PIGMY

A Ham, L. I., N. Y.

(Q) I built the 5 meter transmitter using the 53 tube but could not get it to work and I followed instruction with no result, could you please print in your column in SHORT WAVE CRAFT, a modulator to modulate the 53 tube, say a 247 tube or what you think best and also how to connect to oscillator.

(A) Many of our readers have built the 5 meter Pigmy Transmitter using the 53



Modulator for the Pigmy transmitter.

tube and are obtaining excellent results with it. The adjustment of the grid coil is very critical and if not properly adjusted modulation cannot be obtained without the use of a separate modulator. Above is the diagram for the two tube modulator using a 56 and 47.

LOW POWER TRANSMITTER

W. B. James, Jr., Harrisonburg, Va.

(Q) Can you give me some indication of the cost of the necessary parts and blue prints for the assembly of a transmitter which would be capable of working a distance of about 1,000 miles?

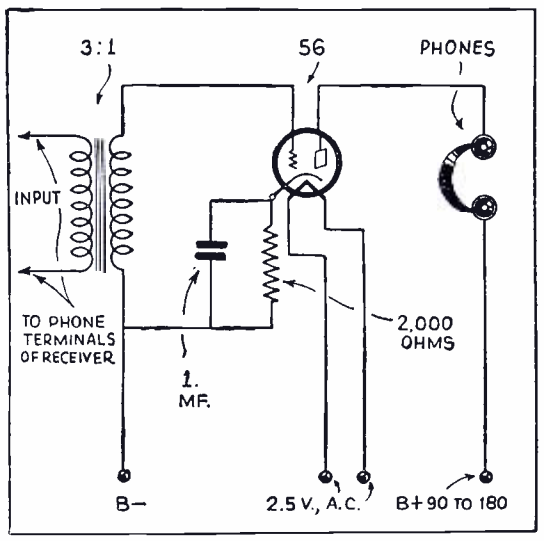
(A) We have had many requests for diagrams and information regarding transmitting apparatus. However, in most cases, we are reluctant to give information unless we are sure that the inquirer has an operator's license or has intentions of obtaining one before building and operating a transmitter. As you know, it is absolutely necessary that a license be obtained before any transmitter can be operated. We advise that you get a copy of our book, HOW TO BECOME AN AMATEUR RADIO OPERATOR.

CLASS B TRANSFORMERS

E. P. Abrams, Los Angeles, Calif.

(Q) I have a 53 that I wish to use as a modulator for a pair of 56's in a push-pull 10 meter oscillator. Could this tube be used in Class B with Class A transformers? What would be the results? Also would two 56's in parallel swing the grids of the 53? If what I have outlined will not work, please give me some idea how I might assemble the above mentioned equipment to get the most power output.

(A) In order to use a 53 in Class B you must have especially designed transformers for this work. Class A transformers are absolutely useless. A 56 will drive a 53 in Class B providing sufficient excitation is available for the 56.



A stage of audio for any S.W. set.

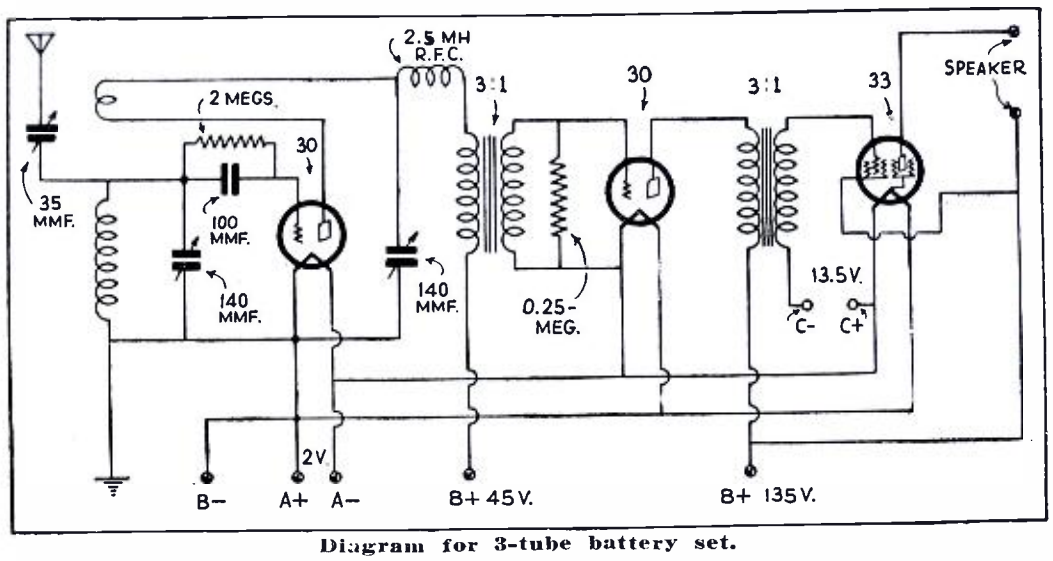


Diagram for 3-tube battery set.

1-TUBE AUDIO AMPLIFIER

A. Dern, Phila., Pa.

(Q) Will you please publish a simple amplifier for the 1-tube Oscillodyne or any 1-tube radio using an A.C. tube?

(A) We are very pleased to print a diagram of one stage of audio to be used with any set. Either a 27 or 56 tube can be used for A.C. operation and for storage battery operation, a 37 would be used.

BEGINNER'S SET

Chas. Anselm, Malden, Mass.

(Q) I built the beginner's set described in the September, 1932, issue and had fine results with it. I changed the coils at a later date and from then on I had trouble. Can you help me?

(A) If the receiver worked OK before you changed the coils, we advise that you reconstruct your coils to conform with data given in nearly every issue of this magazine. This should overcome your trouble.

3-TUBE BATTERY RECEIVER

A. R. Taylor, New Orleans, La.

(Q) Please publish a diagram of a battery operated receiver using a 30 detector, 30 first stage of audio and 33 audio amplifier.

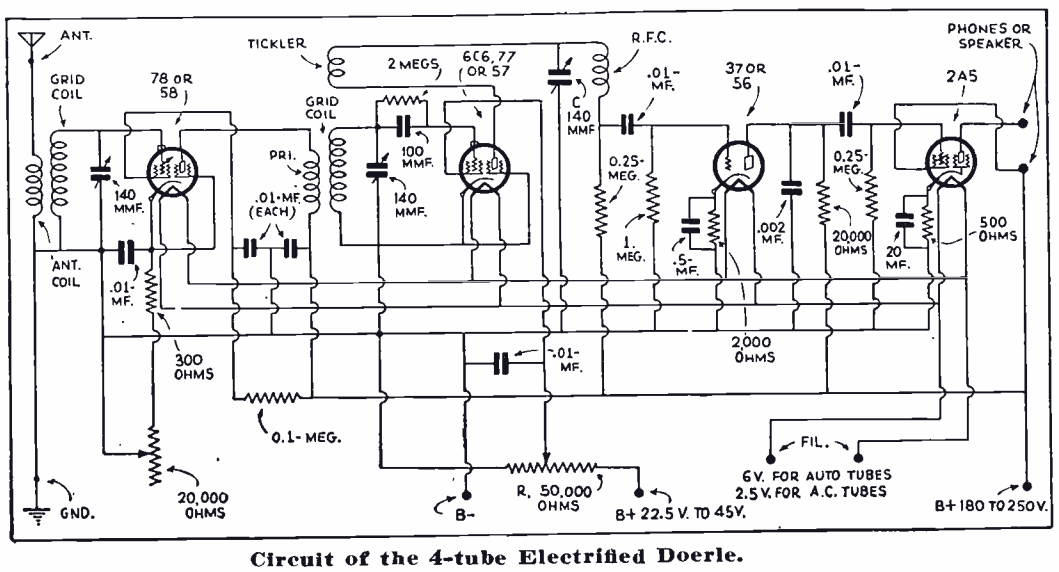
(A) A set using two 230's and a 33 makes a very fine battery operated short-wave receiver and we are pleased to furnish the diagram.

4-TUBE DOERLE DIAGRAM

R. V. O., Sioux City, Ia.

(Q) I would be greatly pleased if you would print a diagram of a 3-tube Doerle A.C. with a pentode audio amplifier of the 2A5 type added, thus making it a four tube A.C. Doerle. I wish to use 58, 57, 56, and 2A5 tubes. This set is to push an R.C.A. magnetic loud speaker.

(A) The diagram showing how to add another tube to the 3-tube Electrified Doerle Receiver is herewith presented. This is a worthwhile improvement and should give full speaker volume on any short-wave station.



Circuit of the 4-tube Electrified Doerle.

Short Wave Stations of the World

(*Continued from page 227*)

WMJ	Buffalo, N. Y.	2422 kc.
WMO	Highland Park, Mich.	2414 kc.
WMP	Framingham, Mass.	1666 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.	2382 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	Middleboro, Mass.	1666 kc.
WPEM	Woonsocket, R. I.	2466 kc.
WPEP	Arlington, Mass.	1712 kc.
WPES	Saginaw, Mich.	2442 kc.
WPET	Lexington, Ky.	1706 kc.
WPEW	Northampton, Mass.	1666 kc.
WPFA	Newton, Mass.	1712 kc.
WPFC	Muskegon, Mich.	2442 kc.
WPFD	Highland Park, Ill.	2430 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.
YPFN	Fairhaven, Mass.	1712 kc.
WPFO	Knoxville, Tenn.	2474 kc.
WPFP	Clarksburg, W. Va.	2490 kc.
WPFQ	Swathmore, Pa.	2474 kc.
WPFR	Johnson City, Tenn.	2470 kc.
WPFU	Portland, Me.	2422 kc.
WPFV	Pawtucket, R. I.	2466 kc.
WPFX	Palm Beach, Fla.	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	1682 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	Binghampton, N. Y.	2442 kc.
WPGN	South Bend, Ind.	2490 kc.
WPGO	Huntington, N. Y.	2490 kc.
WPGS	Mineola, N. Y.	2490 kc.
WRBH	Cleveland, Ohio	2458 kc.
WRDR	Grosse Pt. Village, Mich.	2414 kc.
WRDQ	Toledo, Ohio	2474 kc.
WRDS	E. Lansing, Mich.	1666 kc.

AIRPORT RADIO Stations

AERONAUTICAL (AIRPORT) FREQUENCIES

	(Red Chain)	
3,147.5	3,322.5	5,582.5
3,162.5	5,122.5	5,592.5
3,172.5	5,572.5	5,662.5
3,182.5		
	(Blue Chain)	
2,906	4,937.5	4,952.5
3,072.5	4,967.5	5,672.5
3,088		5,692.5
2,720	6,510: Day only	
2,732	6,520: Day only	
4,110	6,530: Day only	
	8,015: Day only	
	(Brown Chain)	
3,127.5	4,917.5	3,005
3,222.5	5,602.5	2,854
3,232.5	5,612.5	5,377.5
3,257.5	5,632.5	
3,447.5		
3,457.5		
3,467.5		
3,485		
2,640	4,740	6,540
2,644		6,550
2,612		6,560
2,636		8,015
3,467.5		
	(Green Chain)	
2,922	4,122.5	
2,946	5,652.5	
2,986		
2,748	6,590	
4,745	6,600	
	(Orange Chain)	
2,870	5,375	8,220
3,082.5	5,405	12,330
	5,692.5	16,440
2,648	6,570	
3,082.5	6,580	
5,375	8,015	
	16,240	

The various transport companies are assigned frequencies for their use and each transport company's network is given a certain code color.

TELEVISION Stations

1600-1700 kc. 176.5-187.5 m.
W2XR—Long Island City, N. Y.
W8XAN—Jackson, Mich.
2000-2100 kc. 142.9-150 m.
W9XAO—Chicago, Ill.
W6XAH—Bakersville, Cal.
W9XK—Iowa City, Iowa
2100-2200 kc. 136.4-142.9 m.
W2XBS—New York, N. Y.
W6XS—Los Angeles, Calif.
W9XAP—Chicago, Ill.
W9XAK—Manhattan, Kans.
2200-2300 kc. 130.4-136.4 m.
W9XAL—Kansas City, Mo.
2750-2850 kc. 105.3-109.1 m.
W9XG—W. Lafayette, Ind.
43,000-46,000 kc. 6.52-5.98 m.
48,500-50,300 kc. 6.00-6.20 m.
60,000-80,000 kc. 3.75-5.00 m.
W9XD—Milwaukee, Wis.
W9XE—Marion, Ind.
W8XF—Pontiac, Mich.
W3XAD—Camden, N. J.
W2XR—Long Island City, N. Y.
W9XAT—Portable
W2XF—New York, N. Y.
W6XAO—Los Angeles, Calif.
W3XE—Philadelphia, Pa.
W2XAK—New York, N. Y.
W10XX—Portable and Mobile
W8XAN—Jackson, Mich.
W8XL—Cuyahoga, Heights, Ohio

London Plans Radio Cars

Scotland Yard recently issued an appeal for public cooperation in combating a crime wave in London and particularly "smash and grab" motor thieves. After many experiments the authorities have decided to extend the use of radio to fight crime.

A system of patrolling by short-wave radio police cars such as are used in New York and other American cities will be introduced in the metropolitan district of 700 square miles, which has been divided into fifty-two areas, in each of which at least one radio-equipped car will operate both day and night.

One purpose of the Scotland Yard appeal is to encourage greater use by the public of the police telephone boxes provided in most London districts.

British to Investigate Television

An inquiry into the feasibility of television, with which the British Broadcasting Corporation has been conducting experiments during the last few years, will be undertaken shortly under the direction of the British Postmaster-General. A special technical committee will comprise the chief engineer of the B. B. C. and technicians from the Post Office Department, Army and Navy, film industry and radio manufacturers.

Dr. De Forest Wins

(*Continued from page* 199)

relation with the input circuit. "A high whistling or squealing note resulted in the headphones," states Dr. de Forest in his letter. "On another date," he continues, "I chanced to place the output transformer in inductive relationship with the input circuit. A certain connection of the leads (wires) here again produced the singing note, while the reversal of these leads permitted the telephone relay action. We immediately recognized what was transpiring and found that by connecting various capacities across the telephone transformer terminals, that the pitch of the whistle could be varied through wide ranges.

"Shortly thereafter, I described these circuits and effects to John Stone Stone in New York," continues Dr. de Forest, "and, in the following spring, again in Palo Alto, I set up the first *feed-back* audion circuit for obtaining heterodyne signals from the South San Francisco 'arc' transmitter. All of these facts and dates were established as evidence in the early days of this litigation, and largely upon this testimony were the various court trials decided.

"Thus," states Dr. de Forest, "Palo Alto was the birth place, not only of the *first* actual audio amplifier, single, and in cascade, but also of the *oscillating* and *feed-back* circuits."

World-Wide Applications of "Feed-Back" Circuit

The tremendous applications of the *feed-back* circuit and also the three electrode vacuum tube that have taken place in the ensuing twenty-two years stagger the imagination. Whenever a *ham* or *commercial* operator presses the key, or talks into the microphone today, he, metaphorically speaking, is making his bow to Dr. Lee de Forest, for without the *three-electrode tube* and the *feed-back* and *oscillator* circuit actions, conceived and invented by de Forest, the thousands of amateur, as well as commercial vacuum tube transmitters and receivers in use today would be impossible.

By the Supreme Court decision handed down on May 21 by Judge Cardozo, the Radio Corporation of America won a victory over the Radio Engineering Laboratories, and by the same decision, this opinion stated in effect that Dr. Lee de Forest, and not Edwin H. Armstrong, was the original inventor of the "feed-back" circuit and vacuum tube "oscillator."

Details of the de Forest-Van Etten experiments already cited were mentioned in the decision written by Justice Cardozo, who continued—"that on April 17, 1913, these two workers received a clear note—the *true heterodyne beat note* from the radio signals at San Francisco Beach, with the aid of the coupled circuits."

In the editor's humble opinion, one of the strongest judicial decisions ever given by any judge was that of Justice Cardozo when, referring to explanations that Dr. de Forest gave in 1913 for not perfecting his invention quickly or applying promptly for a patent, the Justice wrote:

"These explanations, even if not wholly convincing, are not so manifestly inadequate as to lead us to say that the conception of the oscillator as a generator of radio frequencies has been proved in any clear or certain way to have been developed and applied by Armstrong before it was born in de Forest's mind."

The crown for discovering radio's regenerative or feed-back circuit, frequently referred to as the oscillating audion circuit, has been passed back and forth to Dr. Lee de Forest and Major Edwin H. Armstrong by various court decisions since 1922. The decision by the Supreme Court is considered in radio circles as definitely handing the laurels to Dr. de Forest although in August, 1933, Major Armstrong was the recipient of congratulations on being sustained as the inventor of the famous circuit by the United

States Circuit Court of Appeals, Second District.

The Radio Corporation of America has been licensed under both de Forest and Armstrong patents. It was licensed under de Forest patents through the American Telephone and Telegraph Company and under the Armstrong patents through the Westinghouse Electric and Manufacturing Company.

Dr. Lee de Forest, who now resides in Hollywood, California, is the inventor of the three-element vacuum tube, which in 1906, at the time of the invention, he named the *audion*.

Major Armstrong was an officer in the U. S. Signal Corps during the World War. It was at that time that he developed the *superheterodyne* circuit.

Regeneration is an important factor in radio reception. A regenerative circuit comprises a vacuum tube so connected that, after detection, the signal introduced in the plate circuit is led back to or caused to react upon the grid circuit, thereby increasing the original energy of the signal received by the grid. This greatly amplifies the signal. By so doing the efficiency of the vacuum tube was improved a thousand, and in some cases a million, fold.

Furthermore, regeneration leads on to *oscillation*, which makes the circuit become a generator of high frequency current, and that is most important in both transmitting and receiving outfits. Radio experts have long declared that the man who discovered *regeneration* did as much for the advance of radio science, as the man who invented the vacuum tube, because without the *feed-back* principle in operation, the tube would be a comparatively inefficient device.

4-Tube Short-Wave "Space-Explorer"

(*Continued from page* 215)

1—200 ohm, 75 watt Resistor, Slider Set at 190 ohms (29).
1—600 ohm Flexible Resistor (23).
1—1,500 ohm Flexible Resistor (17).
1—Mica Condenser, .0001 mf. (3A).
1—Mica Condenser, .00025 mf. (9).
1—Cartridge Condenser, 1 mf. (15).
1—Cartridge Condenser, 2 mf. (5).
1—Metal Case Condenser, .5 mf. (4).
1—Cardboard Tube Condenser, 10 mf., 25 volts, (24).
2—Double-Section Cardboard Container Electrolytic Condensers, 8 mf. per section (25, 26). Each dual condenser should have sections connected in parallel to total 16 mf. each.
1—15,000 ohm, ½ watt Resistor (8). Lynch.
1—30,000 ohm, 1 watt Resistor (18). Lynch.
2—150,000 ohm, ½ watt Resistors (13, 14). Lynch.
1—500,000 ohm, ½ watt Resistor (20). Lynch.
1—1 meg., ½ watt Resistor (3B).
1—Na-Ald 5-prong Moulded Sockets (16).
1—Line Cord and Plug.
1—Na-Ald 4-Prong Moulded Socket (2).
3—Na-Ald 6-Prong Moulded Sockets (6, 21, 28).
1—Vernier Dial; 1 Knob.
1—Twin Binding Post (BP1, BP2).
1—Find-All R.F. Choke (10).
1—Find-All Plate Impedance (11).
1—30 henry, 250 ohm Audio Choke (27).
1—6C6 Tube (6); 1—37 Tube (16). R.C.A. Radiotrons.
1—43 Tube (21); 1—25Z5 Tube (28). R.C.A. Radiotrons.
1—Trutest Magnetic Speaker (22).
1—Roll Hook-up Wire, Solid Core.
1—Noise Eliminating Lead-in System.
1—Metal Chassis, 10x8x2 inches high. Blan; Insuline.

A High Quality AUDIO-AMPLIFIER and POWER SUPPLY

By Eugene V. Cyran

In the NEXT ISSUE!

My 2-Tube AC-DC Wave-Master

(*Continued from page* 201)

Start the wiring before any other part is fastened in place with the possible exception of the aerial and ground posts and the phone clips. Wire the heater circuits of the two tubes first then the filter circuit next. This procedure gets rid of the long leads on the dual 8 mf. electrolytic condenser that would otherwise be in the way when wiring the rest of the set. The plate and grid of the 37 tube tie in together, and are run to one side of the line cord, the same side of the line is the one in which the filament dropping resistor is connected. The other side of the line cord is the ground side and connects directly to the switch on the regeneration control. From the second terminal of the switch a lead is run to all negative points of the circuit, with the exception of the tuning condenser and the panel. These are grounded to this common point through a .1 mf. tubular condenser. Hooking up the ground side in this manner enables us to use an external ground directly on the panel without fear of blowing the house fuses.

The "B" plus is taken from the cathode connection of the 37 tube and filtered by the use of the thirty henry choke and the dual 8 mf. electrolytic condensers. With the external ground in place this filtering is sufficient for headphone operation on short waves without any annoyance from A.C. hum.

The pentode section of the 6F7 is next wired in place. Start with the plate which is run to the "F" plus terminal of the four-prong socket. This is the end of the tickler winding farthest from the grid coil. The "P" terminal of the coil socket connects to the radio frequency choke and also to the .00025 mf. by-pass condenser, the other end of which is grounded. The screen-grid terminal of this unit is connected to the center arm of the 100,000 ohm potentiometer and by-passed with a .5 mf. tubular condenser. The control grid connection is made through the .0001 mf. grid condenser which is shunted with the 1 megohm grid-leak; this connects to the cap of the tube. The other end of the grid condenser is connected to the stator plates of the tuning condenser and thence to the "G" terminal of the coil socket. The "F" minus terminal of the coil socket goes to the common ground.

Now for the triode portion of the tube: The grid of this unit is coupled to the plate of the pentode unit by the .01 mf. tubular condenser to the R.F. choke and the 100,000 ohm resistor which supplies plate voltage to the pentode portion. The grid resistor for the triode portion is a .5 megohm, ½ watt carbon. The plate of the triode connects directly to the phone clip. The remaining clip is run to the "B" plus terminal. Bias for the tube is obtained through the use of the 1,500 ohm, ½ watt resistor. This is shunted by a .1 mf. tubular condenser for by-pass. The "B" voltage for the screen grid is obtained through the 15,000 ohm, ½ watt carbon resistor to the high side of the regeneration control.

The opposite side of this control connects to the common ground. Now the only thing left to do is to place the tubes in their respective sockets and make a test. Assuming that this has been done, plug the line cord into any house-lighting circuit, either A.C. or D.C. and turn on the switch (you may have to reverse the plug to make the set work properly). The tubes should light to a dull red. If everything is all right up to this point place the coil in its socket, hook up the aerial and ground and "let's go."

Advance the regeneration control until a rushing sound is heard then rotate the tuning dial slowly over the whole scale. At some point a carrier of a station will be heard (the old familiar squeal), retard the regeneration control until the signal comes in clearly, meanwhile adjust the aerial trimmer for best results on that particular

frequency. This trimmer should be varied on every station to get the most out of your set. A little practice and even the beginner can tune in short wave stations from all over the world with little or no trouble.

The writer, when testing this set, listened to England and Germany in the first ten minutes of the test. Volume was such that the phones could be pushed away from the ears and the program heard just as clearly as with the phones in the proper position. If care is taken in the selection of parts any constructor can well expect to duplicate the results obtained with the original receiver.

Parts List

1 .00015 mf. Variable Tuning Condenser. National (Hammarlund).
1 .000025 mf. Midget Variable Condenser. National (Hammarlund).
1 .0001 mf. Mica Condenser.
1 .00025 mf. Mica Condenser.
1 .01 mf. Tubular Condenser, 200 volts.
1 .1 mf. Tubular Condenser, 200 volts.
1 .5 mf. Tubular Condenser, 200 volts.
1 Dual 8 mf. Electrolytic Condenser, 200 volts (Find-All).
1 1,500 ohm ½ watt Carbon Resistor.
1 100,000 ohm ½ watt Carbon Resistor.
1 15,000 ohm ½ watt Carbon Resistor.
1 .5 megohm ½ watt Carbon Resistor.
1 1. megohm ½ watt Carbon Resistor.
1 R.F. Choke, 2½ mh. (Find-All).
1 Filter Choke, 30 henry, 200 ohm (Find-All).
1 350 ohm Line Cord (Find-All).
1 100,000 ohm Potentiometer with Switch.
1 4-prong Moulded Socket (Na-Ald).
1 5-prong Moulded Socket (Na-Ald).
1 Small 7-prong Moulded Socket (Na-Ald).
1 Piece of Aluminum for panel, 6" x 8".
1 ⅞" x 6" x 8" Baseboard.
1 Dial.
1 Antenna and Ground Post.
2 Clips for Phones.
1 Set of 4-prong S.W. Plug-in Coils (Find-All).

The "Mono-Coil 2"

(*Continued from page* 205)

International broadcast (program; music, speeches, etc.) bands with only a *three-point* switch. The capacity of the tuning condenser being only 25 mmf. provides an optimum LC ratio, resulting in a "high-gain" tuning circuit, and last but by no means least, the crowded broadcast bands were not jammed into two or three points on the dial—*the spread being from ten to fifteen degrees, depending on the width of the particular band encountered.*. Weighing these several *assets* against the old plug-in proves that we have really accomplished something.

Solving the Regeneration Problem

Regeneration was next tackled and right here the old "cut and try" method proved to be the only successful method of attack. For a properly designed coil the feed-back must be adjusted to produce maximum efficiency and smoothness of control, on the highest frequency that will be used. Therefore the plate feed-back method was used and the tickler coil (L4) was placed between the two windings L1 and L2 to provide efficient feed-back from 16 to 35 meters the bands covered by L1 and L2 and controlled by taps 1 and 2. The tube now refused to oscillate on the lower frequency range of tap 3. This was with three turns in the tickler coil. It was believed that the number of turns could be increased slightly to produce oscillation on the 49 meter band. This was done but due to the tickler being coupled to the *grid-end* of the coil, the larger number of turns effected too much coupling on the high frequency end of the tuning range and in order to control the feed-back the "screen" voltage had to be reduced to a point where the sensitivity was ruined entirely—*three turns was unquestionably the*

proper number; some other method had to be used to obtain oscillation on the lower frequencies without affecting the efficiency of the circuit at the higher frequencies.

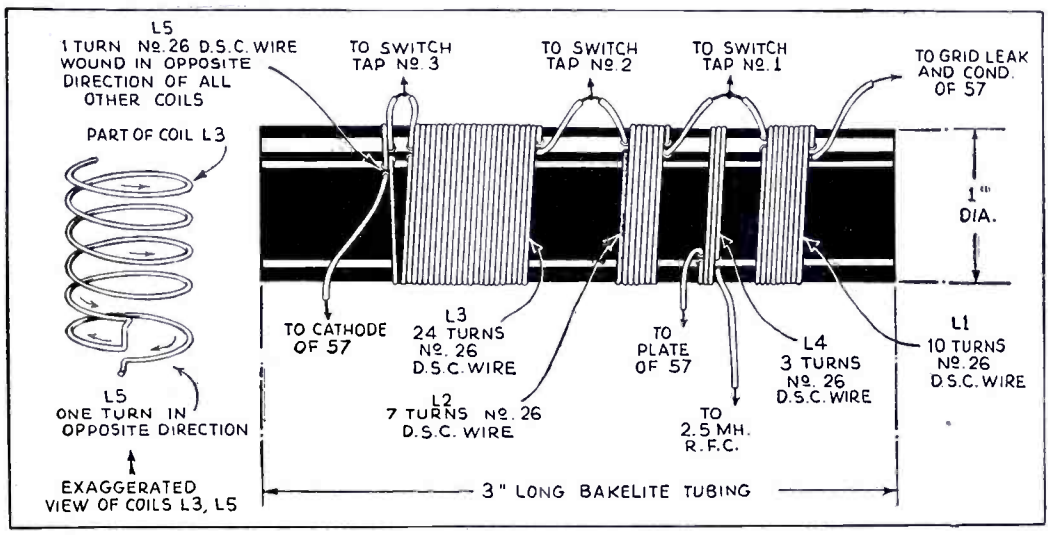
As is usually the case with us mortals, the simpler things are not thought of first and many complicated arrangements were tried without success. Then came the gleaming light—*the one turn cathode coil*, and it sure "did the trick."

Now let's see just how the whole thing operates. When the switch is set on contact No. 3 the entire grid coil is in use with the three-turn plate tickler and the one-turn cathode coil providing just the proper amount of feed-back when the screen voltage of the tube is set for maximum sensitivity. Set on point No. 2 the switch *shorts* out L3, the cathode coil now becomes more or less inactive, which is just what we want. The plate coil is then left to work with L1 and L2. The range of each tap of the coil is of course affected by the adjustment of the antenna condenser but their approximate tuning range is as follows: tap-1, 16 to 28 meters, tap-2, 25 to 38 meters and tap-3, 45 to 55 meters. The drawing clearly shows the construction of the coil and the number of turns. *For best results follow the specifications exactly.*

The rest of the set is orthodox and needs but little mention. A 2A5 pentode is used as a resistance-coupled amplifier and has an output choke and condenser-filter which keeps the plate current of the tube out of the earphones. Follow the instructions carefully and you will find that it is at last possible to build a short-wave receiver which we can operate with the same ease that we now operate our regular *broadcast* (200-550 meter) receivers. All the *foreign* broadcast stations are received on this receiver with far more volume than a receiver using the same type tubes and *plug-in* coils—and that is not just "idle chatter" either. This set is honestly so good that the author is building two more sets using "Mono-Coils"; one is a tuned R.F. set and the other is a superheterodyne; both will be described in coming issues of SHORT WAVE CRAFT. The latter is going to find its place in the "shack" as a regular "Ham" receiver at W2AMN. So-o-o—The King is dead, Long live the King.

List of Parts for "Mono-Coil-2"

1—Chassis 5"x8"x1". Blan
1—Panel 7"x9". Blan
1—Mono-Coil—see text
1—4 pt. single pole switch. Blan
1—35 mmf. Var. Antenna condenser
1—25 mmf. condenser; tuning 270 degrees. National
1—.0001 mmf. fixed condenser (mica)
1—.1 mf.—1 mf. (paper)
1—.0005 mf. fixed (mica)
2—.1 fixed (paper)
1—20 mf. 25 volts (electrolytic)
1—3 meg. resistor (½ watt). Lynch
1—¼ meg. (½ watt). Lynch
1—½ meg (½ watt). Lynch
1—1 meg. (½ watt). Lynch
1—500 ohms 1 watt
1—50,000 potentiometer Acratest
1—J30 H. midget choke (iron core)
2—6 prong sockets. Na-Ald
1—Antenna ground terminal strip. Na-Ald
1—Phone terminal strip. Na-Ald
1—57 or 6C6 tube. RCA Radiotron. (Arco)
1—2A5 or 42 tube. RCA Radiotron. (Arco)



Details of "Mono-Coil" winding.

S-W League

(*Continued from page* 228)

are good on *code*. An amateur told me the other day that he learned the code "plenty easy"—but the technical side of short-wave radio had him "down"!

These men are mentioned as examples; do we want fellows like these on the 5-meter band? I'll say we don't!

And now, these weak-minded code fiends that can't look to the future; that can't see what will happen to amateur radio in a few more years, are trying to keep men that really know radio from operating phone stations on the 5-meter band.

They surely ought to see that if there is a stiff technical examination imposed on those that work this band, only those that know radio will be operating Xmitters on the 5-meter band, and only on this band, for the 5-meter no-code license will be good only for the 5-meter band, and none of the other amateur bands can be operated in with a 5-meter no-code license.

How many of you fellows that are opposing the *no-code license examination on 5 meters*, have ever listened in on the 5-meter band? You can listen there for *hours at a time and never hear a signal;* how long do you think the commercials will keep off, if we leave this band unoccupied like that?

I doubt if you fellows that are making such a yell about codeless license on 5 meters can build an Xmitter that will work on this band, at least some of you operating on the other bands don't show it.

Those jelly-fish nit-wits that haven't got the brains to look to the future in amateur radio and see what will happen in a few more years, shouldn't have licenses of any kind.

Nearly all of the letters opposing the codeless license are written by chaps that don't know what they are talking about. Some of them don't even know how to figure kilocycles and wave length, or they could see how large the 5-meter band is. If they could see how large it is, and figure out how many could occupy that band without undue crowding, I am sure that they would conclude that the best thing to do would be to get as many in the 5-meter band as possible, and as soon as possible, before commercial interests get too strong a hold.

Now fellows let's get together on this, there is room for 40,000,000 of us on the 5-meter band, with no more congestion than we now have on 80 meters. How long do you think it will take to get that many stations operating on this band? WELL, IT WILL TAKE 20,000 YEARS at the present rate of issuing licenses to get 40,000,000 stations operating in this band.

If the code test is abolished below 6 meters, thousands of technical men, radio engineers, and other technically qualified and interested in the higher art of radio phone communication, will build Xmitters and receivers for operating on this band, even then it will be thousands of years before this band has as much bedlam as now exists on the 80-meter band!

I can copy and send code with the best of them, and I am for the codeless license on 5 meters.

The sooner we get together for the codeless license the better it will be for us, as we can wait too long.

In closing may I ask that each and every one of you read W2GAU's letter on page 737 of the April SHORT WAVE CRAFT through, not just once, but several times, and keep it handy for reference all the time, he has given you a very good outline of the 5 meter band.

I hope that you fellows get busy and do something before it is too late, and it will be too late if we keep putting off what we ought to do today.

SHORT WAVE CRAFT is a very "fine business" magazine and I wish it many years of success.

PAUL LOMASTER,
Bentonville, Arkansas.

Transmitter That Won French Contest

(*Continued from page* 223)

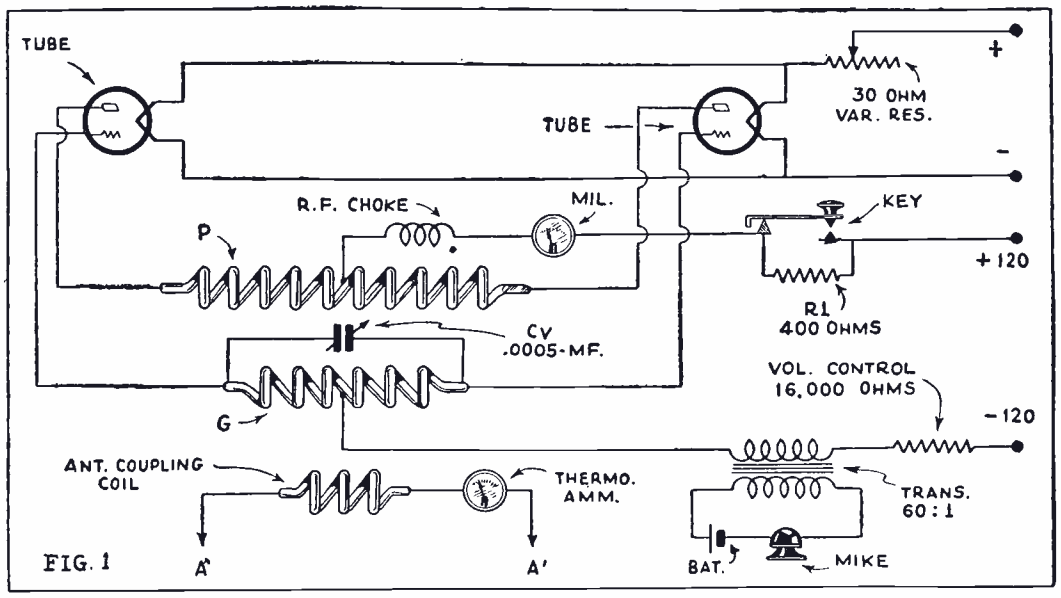


Fig. 1. Circuit diagram for the Mesny transmitter used by F8YG. The variable resistance in the grid circuit is 16,000 ohms.

have here, beside a code receiver also a good CW and telephony receiver and under favorable conditions of transmission most of the stations of the entire world are received without forgetting steamships and airplanes. The diagram and photograph will help to clearly show the arrangement used in constructing this transmitter.

(A modulated oscillator is outlawed in the United States on all amateur bands except on the 5 and 10 meter bands where the new regulations permit its use.)

General List of Parts for F8YG Trans-Receiver

Transmitter

1 set of aerial parts complete.
1 high frequency coil to suit band in use.
1 variable condenser CV .0005 mf.
2 binding posts (ant.).
1 30 ohm rheostat.
1 milliammeter O-100 ma.
1 milliammeter (Thermo) O-250 ma.
1 key.
1 microphone.
1 variable resistor 16,000 ohms.
1 microphone transformer, 1 to 60 ratio.
2 transmitter tubes (approximately corresponding to American 45 or 210 types.
2 jacks.
1 resistance 400 ohms.

Receiver

1 support shelf.
1 set of 3 coils for 20, 40, and 80 meters.
2 variable condensers .0005 and .00015 mf. respectively.
1 condenser .0001 mf.
3 tube sockets.
1 R.F. choke (30-85 mh.)
1 fixed condenser .002 mf.
1 fixed condenser .003 mf.

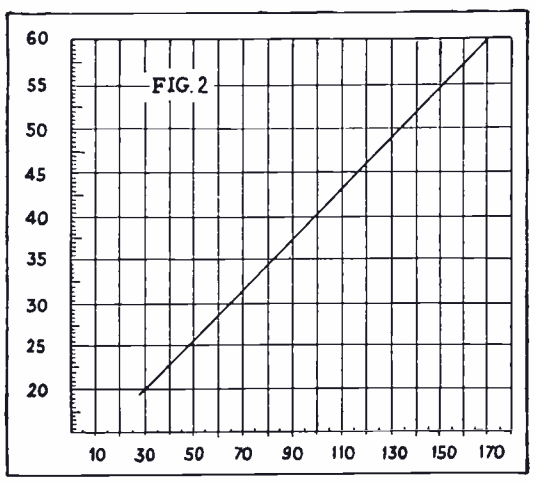


Fig. 2. Calibration curve for the transmitter, with condenser graduations plotted as abscissae and wavelength plotted as ordinates.

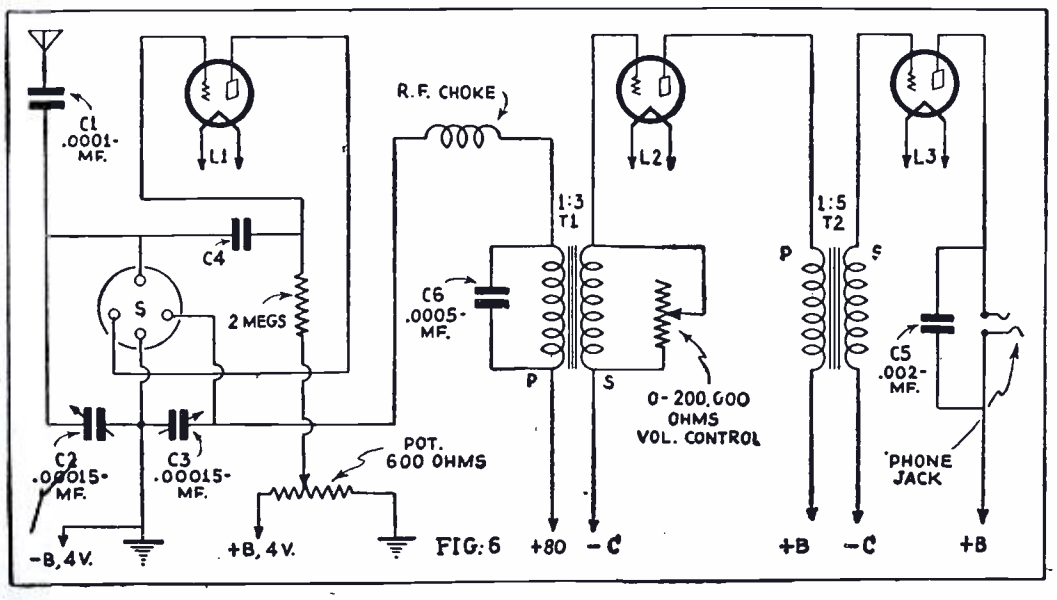


Fig. 6. Diagram of the Schnell receiver used at F8YG, C2, C3, variable condensers of .0005 and .00015 mf.; C1, .0001 to .00025 mf. to suit antenna; C4, .0001 mf.

1 2 megohm resistor.
1 600 ohm potentiometer.
1 30 ohm rheostat.
1 A.F. transformer 3 to 1 ratio.
1 A.F. transformer 1 to 5 ratio.
1 volume control (variable resistor) 0-200,000 ohms.
2 jacks.
3 receiver tubes to suit filament voltage available. Parts common to both sets.
1 6 wire plug.
1 bakelite panel, 16x16 inch. and one sub-panel 16x4 inch.
4 aluminum corner posts, each 16 inch. long.
4 large brackets, 8 inch, threaded rod ⅛ inch diameter.
3 dials for the variable condensers.
2 spring clips.
10 feet of flexible wire (Litz).
65 feet silver-plated wire (ordinary wire such as push-back or else bare tinned copper bus wire may be used).
2 copper brackets.

Necessary A, B and C batteries.

Antenna

3 suspension insulators, Isolantite.
5 feeder spacers; tarred rope, pulleys, etc.

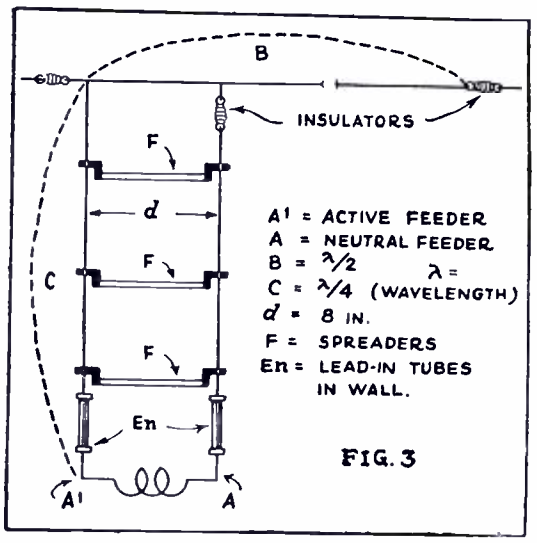


FIG. 3

Fig. 3. Transmitting antenna used at F8YG.

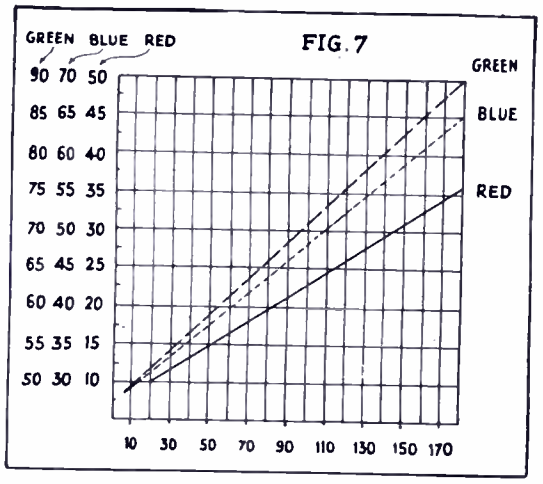


Fig. 7. Calibration curve of the F8YG receiver showing wavelengths for the different coils.

Short Waves and Long Raves

(*Continued from page* 213)

56th City Line Ave.,
Overbrook,
Philadelphia, Penn.
OLIVER AMLIE.

(*Glad to hear from you again Oliver, and we were quite interested to note that you operate your short-wave receivers from a 6-volt storage battery. Yes, the good old battery is one "sure-fire" way of eliminating the hums and groans heard on many poorly designed A.C. operated receivers, especially on the lower wavelengths.—Editor*)

LIKES THE 3-TUBE DOERLE

Editor, SHORT WAVE CRAFT:

I have used the hook-up for the 3-tube Doerle receiver. The set works perfectly and I have had no difficulty in obtaining "foreign" stations as far as 10,000 miles away, such as Siberia and Argentina, DJA, DOA, and plenty of English stations. I get perfect reception and all these stations can usually be received any time during the day and as early as 8:00 o'clock in the morning. I have followed the hook-up throughout, except that I added a 47 power tube after the 56, the first audio. I am using a dynamic speaker and have plenty of volume.

KENNETH R. SCHAFFER,
628 N. Jefferson St.,
Allentown, Pa.

(*Well, well, another name added to the amazing list of "Doerle" rooters. We get so het up reading of the wonderful results you boys get with the "Doerle" family of receivers, we'll have to go back and try one ourselves again.—Editor.*)

DOWN WITH THE "BLOOPERS"!

Editor, SHORT WAVE CRAFT:

About twelve years ago I, with the rest of the boys, was "rolling my own" on oatmeal boxes. I still have around some of the old crystals and "visiting card" grid-leaks we used in those days. After a few months of experimenting with these "advanced" pieces of apparatus, I graduated to a regenerative set using 199 tubes, that is, when I could spare a week's salary to buy one or two.

But after six months of that, I sadly put the set on the shelf. The night air was so full of shrieks and oscillations from the multitudinous "bloopers" that satisfactory reception was impossible. Now, of course, the cheapness of commercial sets has done away with all that.

However, I am afraid that the same situation is going to arise in the short-wave sphere. A very large number of the circuits you publish, and a great many of the *earth circumnavigator* sets advertised, are regenerative without any radio frequency tube to block the oscillations from the aerial. And now, I find that quite frequently reception of some program is marred by squeaks and howls from some "peanut roaster." Would it not be well to use your influence against the construction of such sets? With the increasing vogue of short waves, the condition is bound to get worse.

Although I am but a "screw driver" electrician, as one of your correspondents called himself, I was led about three years ago by your magazine to start experimenting in *short waves*. One set constructed led to another, and I now have a nine-tube superhet which is a composite of every good feature I ever heard of, or could think of. Of course, I don't pretend to land the earth as some of these "one-lungers" do; and I have known the RCA and NBC to fall down more than once on "foreign" reception. But if it's on the air and can be gotten, I can get it!

ALLEN R. HALLOCK,
502 Summer Ave.,
Newark, N. J.

(*That's the spirit, Allen, "if it's on the air . . . I can get it." In the same breath, it is apparent that you've checked up all the stages in your receiver, until they are all working at "peak" efficiency. Some operators use 12 tubes in poorly designed stages and consequently all they hear is "locals." About the "bloopers"—well the world is looking for a genius who will roll the "bloop" out but still leave the "high gain" the boys get on these 1 and 2 tube receivers. A stage of R.F. ahead of the detector will prevent radiation of the "squeal," but there must be a cheaper and simpler method.—Editor.*)

MARCONI'S VERSUS TESLA'S WAVE THEORIES

Editor, SHORT WAVE CRAFT:

I read with great interest the article "Marconi's Ideas on Wave Propagation." With due respect to both he and Dr. Nikola Tesla, I feel that both are wrong. I leave it to you whether the following facts and theories are enough to justify disbelief:

According to Dr. Tesla, radio waves travel via the ground. How then, can the operation of airplane-to-ground systems be explained? Some say this is explained by the fact that the airplane has a capacity to the earth and the two form a condenser. Did you ever stop to think just how minute the capacity of such a condenser would be; just how few micro-micro-microfarads, with an airplane say 2 miles above the earth? Did you ever stop to consider the immensity of the dielectric losses in such a condenser? The transfer of energy would be too minute for consideration.

Static radio interference produced by lightning is another disproof of the ground-wave theory. There is no connection between the earth and the discharge in such an action.

Now Senator Marconi, and thousands of other radio men, believe that radio waves travel through space. How, then, could a submarine establish communication? A radio wave would have as much chance of getting through salt water and breaking loose into space as an oil-burner salesman would have in Florida!

In view of my previous remarks, I can't see how either medium could alone carry the radio waves. Perhaps both mediums are used or perhaps there is no need for any medium, for after all we are dealing with magnetic fields. We are dealing with a form of energy (in electricity) rather than material objects, and it is not so important that we try to make one follow the laws of another.

JOHN A. KIRK, W3CRB,
Woodlawn, Md.

(*A refreshing outlook, to say the least, John. It would seem that both theories are right, to the extent that the space wave is electro-magnetically related to the ground wave. If we blend the two theories the phenomena of airplane to ground radio communication becomes much clearer. What happens with the case of ultra short waves requires a lot more study.—Editor.*)

5-Meter "Bear-Cat" Up-To-Date

(*Continued from page* 203)

adds to the overall efficiency and "gain" of the receiver, but its main purpose is to stabilize the entire receiver and maintain a constant load between the output tube and the 56 detector and quench frequency tube, thus resulting in greater stability with less radio frequency energy appearing in the plate of the audio stage and less body-capacity effect when using earphones.

Arrangement of the Parts

Looking at the front of the receiver, one sees the main tuning dial, regeneration control, insulated phone jack conveniently placed for ear-phone operation (or to be fed with a separate cable through an audio frequency amplifier for further gain, if required). On the rear side of the box one finds the antenna post which is of the high efficiency glazed-porcelain type, and the four-prong socket which conducts the filament and plate voltages from the power supply, whether it be batteries or some type of A.C. power supply unit.

While this receiver was originally designed for use with 56 type tubes, which are of the 2½ volt variety, very satisfactory operation was obtained by using 37's on a 6-volt storage battery. A plate voltage of 100 is still necessary for smooth operation, the same as for the 56 type tube, and no difficulty was encountered with any antenna when using either types of tubes.

Placement of the parts in this oversize aluminum case provides the minimum loss effect from the shielding with the highest possible efficiency. The base-board, which is made of well dried wood, holds the sockets above the grid condenser and "leak" and the main tuning condenser with its flexible drive coupling and bakelite shaft, while the 2½ m.h. R.F. choke and the other associated by-pass condensers and A.F. coupling resistors and bias resistors, are placed underneath. It is absolutely necessary that the 2½ m.h. radio frequency choke be placed at *right angles* to the main tuning inductance. A study of the photographs show just how each part should be placed.

The operation of this receiver is simplicity itself. Connect an antenna to the antenna post; connect a 2½ volt or 6 volt filament source, depending upon whether you are using 56 type tubes or the 37 type tubes and between ground and B+ connect the battery or "B" eliminator capable of supplying around 100 volts. Vary the .1 megohm potentiometer until the familiar superregenerative *rush* or *hiss* is heard and rotate the tuning dial very slowly until signal is tuned in. Readjust the antenna coupling condenser if the receiver does not oscillate by decreasing the coupling. It may be that the antenna is too long, or there are other absorption factors entering into the antenna system which would prevent the detector tube from functioning satisfactorily.

If changes in the condenser do not materially affect the condition of the regeneration and oscillation, advance the plate voltage until such a point is reached where full control can be obtained. In general it would not be necessary to have a voltage higher than 100 volts at any time.

Parts List for Denton 5-Meter Receiver

1—(approximately) 10 mmf. midget variable condenser.
1—.00025 mf. mica condenser.
1—.004 mf. mica condenser.
1—.1 mf. by-pass condenser.
1—.01 mf. fixed condenser.
1—2 megohm grid leak.
1—.1 meg. fixed resistor.
1—.5 meg. fixed resistor.
1—25 ohm fixed resistor.
1—100,000 ohm potentiometer.
2—5-prong sockets.
1—Special inductance (homemade)—see text.
1—2½ millihenry R.F. choke.
2—Type 56 RCA Radiotron tubes.
1—6"x10"x7" chassis. Blan; Insuline.

15 to 2,000 Meters on this Receiver

(*Continued from page* 200)

amplification of around 20 in this manner. Of course, the absolute value of amplification will be determined by the load connected across terminals 3 and 4, but in any case it is much better to use the type 77 tube as a triode in place of the ordinary triode type tubes available on the market, which are of the lower Mu type.

R-9 biases the 77 audio and condenser C-9 is necessary to prevent regenerative action, and also aids in *hum filtering*. The 12Z3 rectifier is used and works out very well as a half wave rectifier; notice the arrangement of the filaments. Starting at the B+ power line we run from resistor R-12 which is the current-limiting resistor in the filament circuit. The series arrangement of the filament of the 12Z3 continues on, going over to the first R.F. stage, then going back over to the first audio stage and placing the filament of the 77 high-gain detector at the lowest potential end, being negative, as indicated in the schematic diagram. In this way we obtain the most satisfactory filament position in respect to hum and balance and it works out very satisfactorily.

Condenser C-13 is a very important unit and takes out any traces of tunable hum which always exists in receivers of this kind. C-13 in many instances can be very small in value, viz., 100 mmf. but in this particular receiver the author had a larger size condenser available, and as it worked out very satisfactorily it was left alone.

The filtering is accomplished by two 5,000 ohm resistors and condensers C-10, C-11, C-12. The output plate circuit of the 77 audio tube connects to the first section of this resistance-capacity filter network and the detector and 78 R.F. stage connect to the output of the entire filter. This works out very satisfactorily, and smooth operation is obtained on all bands.

Operating Hints

There are a few wrinkles in this receiver which should be mentioned. When plugging into the A.C. line in one direction you will notice a very severe ripple. Reversal of the power plug will throw the ground on the proper side and give satisfactory operation and by satisfactory is meant absolutely quiet operation on the loud speaker. Of course, if phones are used with this receiver there will be a certain amount of noise due to the high gain of the 77 detector and the 77 audio stages.

The receiver offers no real problems to the set builder and can be assembled very quickly. The B negative line must be insulated from the chassis and condenser C-2 must also be insulated from the chassis, as the plate voltage of the 78 tube flows to the secondary winding of L. C-3 being connected across the secondary of L, it will be necessary to connect the ground or rotor plate of the condenser to the B— end of the coil. An alternative way of working this out would be to ground the rotor plate and connect Condenser C-15 between the B— and the B+ end of the grid winding of coil L.

All Wave 15-2,000 Meters

Long Wave Coils:

			Width of Coil
Grid	371 Turns	No. 32 D.S.C. (6 MH.)	3/8
Tickler	149 Turns	No. 36 S.S.E. (1.3 MH.)	1/8
Grid	214 Turns	No. 32 D.S.C. (2 MH.)	3/8
Tickler	60 Turns	No. 36 S.S.E.	1/8

Above coils "Universal" wound.

Broadcast Coils:

Meters Wave-length	Grid coil turns	Tickler turns	Distance between 2 coils
350-500	131 T. 2 layers No. 32 D.S.C.	32 T. No. 36 D.S.C. C. W.	1/8"
200-350	68 T. No. 28 D.S.C., C.W.	28 T. No. 36 D.S.C. C. W.	1/8"

Short-Wave Coils:

200-80	52 T. No. 28 En. Wound 32 T. per inch	19 T. No. 30 En. Close Wound (CW)	1/8"
80-40	23 T. No. 28 En. Wound 16 T. per inch	11 T. No. 30 En. C. W.	1/8"
40-20	11 T. No. 28 En. 3-32" between turns	9 T. No. 30 En. C. W.	3/8"
20-10	5 T. No. 28 En. 3-16" between turns	7 T. No. 30 En. C. W.	3/8"

Coil form—2⅛" long by 1¼" dia. 4-pin base.

Parts List

1—Na-Ald 704BSC Coil Kit (L).
1—Na-Ald 704SWS Coil Kit (L).
1—Na-Ald 704LWS Coil Kit (L).
2—Na-Ald Coil Selectors, Type 700.
1—Na-Ald 2.2 mh. Radio Frequency Choke (RFC).
1—Na-Ald Antenna-Ground Strip, Type 600 (1, 2).
3—Na-Ald Insulated Screen-Grid Clips, Type 91L.
1—Hammarlund Tuning Condenser, .00015 mf. (C3).
3—Isolantite, 6-prong Sockets—Hammarlund (National).
1—Speaker Twin Post (3, 4).
1—Aceratest 4-prong Wafer Socket (12Z3).
2—8 mf., 400-volt Electrolytic Condensers (C11, C12).
3—.1 mf., 400-volt Tubular Condensers (C16, C14, C15).
1—Electrolytic Condenser, cardboard type, 8 mf., 400 volts (C10).
1—Tubular Condenser, .01 mf., 400 volts (C2).
1—25 mf., 30-volt Electrolytic Condenser (C9).
1—Type GB By-Pass Condenser, .5 mf., 200 volts (C5).
1—Tubular Condenser, .0025 mf., 400 volts (C8).
2—Aceratest Mica Condensers, .00025 mf., 6WXW (C1, C7).
2—Aceratest Mica Condensers, .0001 mf. (C4, C6).
1—Aceratest Mica Condenser, .003 mf. (C13).
1—50,000 ohm Potentiometer, Type 6156 (R5).
1—Aceratest 6,000 ohm, .5 watt Resistor (R1).
1—Aceratest 300 ohm, .5 watt Resistor (R2).
2—Aceratest 75,000 ohm, .5 watt Resistors (R3, R6).
1—Aceratest 2 meg., .5 watt Resistor (R4).
1—Aceratest 250,000 ohm, .5 watt Resistor (R7).
1—Aceratest 1 meg., .5 watt Resistor (R8).
1—Aceratest 2,000 ohm, .5 watt Resistor (R9).
2—Aceratest 5,000 ohm, 1 watt Resistors (R10, R11).
1—Aceratest Resistor Power Cord, Type 8328 (R12).
1—Power Switch (S).
1—Chassis (Blan.) (Korrol.)
1—Aceratest Dial, Type 7779 and 4043 Escutcheon.
1—¼" to ¼" Brass Coupling (Blan).
1—Flexible Coupling Unit, Hammarlund (National).
3—Tube Shields (Aceratest).
1—Set of Insulating Washers for Potentiometer.
2—Bakelite Knobs.
1—Rubber Bushing.

TUBES

1—Type 78 Pentode, R.C.A. Radiotron (Arco.).
1—Type 12Z3 Rectifier, R.C.A. Radiotron (Arco.).
2—Type 77 Pentodes, R.C.A. Radiotron (Arco.).

BAND-SPREAD COILS (AVAILABLE)
Alden 704SWB (Amateur Bands).
Alden 704SWBC (Short-wave Broadcast Bands).

Flat Rate Service Computer Chart

● PAUL G. FREED of Philadelphia, Pa., has compiled a very valuable service "localizing" and cost chart, available at a nominal price. This chart lists the various ailments of radio receivers and it becomes a very simple matter to at once determine what the charge should be for replacing a burned-out resistor, etc. The "Radio Chuckker" also contains instructions on localizing faults in sets and is the result of a survey among radio servicemen, including 1,000 records of actual repair jobs made by Mr. Freed's company. (Name and address of company upon request: Refer to No. 195.)

An Ultra Short-Wave Transmitter

(*Continued from page* 203)

ultra-short wave experimenters. The principle of push-pull is probably known to every amateur and the advantages derived from such a circuit are quite evident. The construction of this receiver which uses 2 output power tubes (the same type as in the previous circuit) is shown in Fig. 3. The variable gang condenser which has two plates on each rotor and three plates in each stator is seen clearly behind the insulators which support the single turn coil of the oscillator circuit (see circuit diagram in Fig. 4). The diameter of this coil is about 16 cms. (6¼ inches). The grid coil, which consists of four turns 4 cms. (1.6 inch) in diameter is placed between the two tubes.

The most favorable conditions of operation can be found by pulling out or by compressing together the turns of this coil. At the rear end are located the three choke coils, each having 18 turns wound on a tube 25 mm. (1 inch) in diameter. The choke coil in the middle is connected to the oscillator coil by a flexible lead with a slider at the coil end. The displacement of the slider enables you to balance out the circuit in case the tubes are not absolutely identical.

The circuit shown in Fig. 4 is very simple and should not give the amateur any headaches. A series of repeated measurements of the wavelengths of this transmitter in using the Lecher wire system showed that the differences between the separate measurements were very small, a fact which should be attributed rather to the accuracy of the measuring method, than to the variations of the wavelength.

Without the use of an antenna and under the most unfavorable conditions we were able to transmit in the city regularly and without fading effects over a distance of one-half of a kilometer (1,640 ft.). It is worthwhile to note, as we learned from from our experience, that for experimenting with ultra-short waves the receiver (see page 586 of the February issue) is generally the weakest point and that its construction has been completely neglected. For our tests we had to design a special ultra-short-wave receiver using 60 volts on the plate. To check whether the transmitter is oscillating or not, use was made of a coil of the same dimensions as the oscillator coil and which was closed by a small neon bulb. The bulb lights up very bright if the testing coil is placed in the neighborhood of the transmitter in operation.

A "Walking" Short-Wave Station

(*Continued from page* 198)

which weighs only two ounces. The phone has an ingenious clip that is attached to the sweat band of the hat. This set is said to have a reliable range of 10 to 20 miles and has been successfully demonstrated in police work by the Los Angeles, California, Police Department. The complete set weighs 18 ounces. At present, these sets are being manufactured for tuning in two frequency bands, 1,500 to 1,750 kc. and 2,450 to 2,550 kc. A new model to work on approximately 9 meters is nearing perfection.

"PORTABLE TRANSMITTER"

VERY LATEST STYLE

By GEORGE W. SHUART, W2AMN

IN NEXT ISSUE!

Short Wave Scouts

(*Continued from page* 211)

VE9HX—49.10; Maritime Broadcasting Co., Ltd., Halifax, Nova Scotia, Canada. Maritime programs.
CJA2—32.13; Canadian Marconi Co., Drummondville, Ont., Canada. Phone to London.
CGA5—61.11; Canadian Marconi Co., Drummondville, Ont., Canada. Phone to London.
W8XK—25.27; Westinghouse Elec. & Mfg. Co., Pittsburgh, Pa., U. S. Relays KDKA.
W8XK—48.86; Westinghouse Elec. & Mfg. Co., Pittsburgh, Pa., U. S. Relays KDKA.
W8XAL—49.50; Crosley Radio Corp., Cincinnati, Ohio, U. S. Relays WLW.
W3XAU—31.28; WCAU Broadcasting Co., Newton Square, Pa., U. S. Relays WCAU.
W3XAU—49.50; WCAU Broadcasting Co., Newton Square, Pa., U. S. Relays WCAU.
W4XB—49.6; Isle of Dreams Broadcasting Corp., Miami, Florida, U. S. Relays WIOD.
KEE—38.88; Radio Corporation of America, Bolinas, Cal., U. S. Relays Don Lee Broadcasting System.
W2XAF—31.48; General Electric Co., One River Road, Schenectady, N. Y., U. S. Relays WGY.
W9XQ—W9XF—49.18; National Broadcasting Co., Downer's Grove, nr. Chicago, Ill., U. S. Relays WENR.
W3XAL—49.18; National Broadcasting Co., 30 Rockefeller Plaza, New York, N. Y., U. S. Relays WJZ.
KEQ—40.70; R. C. A., Bolinas, Cal., U. S. Works KKP.
KKW—21.77; R. C. A., Bolinas, Cal., U. S. Works KKP in Honolulu.
KNRA—Varies; Schooner "Seth Parker," care N. B. C., New York, N. Y., U. S. Works New York N. B. C.
W1XAZ—31.35; Westinghouse Elec. & Mfg. Co., Springfield, Mass., U. S. Relays WBZ.
WNC—19.92; American Tel. & Telegraph Co., Hialeah, Fla., U. S. Works S. A. and C. America.
W2XE—49.02; Atlantic Broadcasting Corp., Wayne, N. J., U. S. Relays WABC.
W2XE—25.36; Atlantic Broadcasting Corp., Wayne, N. J., U. S. Relays WABC.

Not Verified Short-Wave Log—Time Given is Eastern Standard

GSF—19.81; British Broadcasting Corp., Daventry, England. "London calling."
GSE—25.28; British Broadcasting Corp., Daventry, England. "London calling."
GSD—25.53; British Broadcasting Corp., Daventry, England. "London calling."
GSC—31.29; British Broadcasting Corp., Daventry, England. "London calling."
GSB—31.55; British Broadcasting Corp., Daventry, England. "London calling."
GSA—49.58; British Broadcasting Corp., Daventry, England. "London calling."
*DJB—19.73; Reichs - Rundfunk - Gesellschaft, Berlin—Charlottenburg 9, Germany. Chimes interlude.
*DJC—49.83; Reichs - Rundfunk - Gesellschaft, Berlin—Charlottenburg 9, Germany. Chimes interlude.
*DJD—25.50; Reichs - Rundfunk - Gesellschaft, Berlin—Charlottenburg 9, Germany. Chimes interlude.
HBL—31.27; League of Nations Station, Geneva, Switzerland. Broadcasts talks.
YV1BC—49.02; Caracas, Venezuela, S. A. Chimes before call.
HIX—50.42; San Domingo, Dominican Republic. Announce in English.
LSN—30.30; Buenos Aires, Argentina, S. A. Testing with New York.
YNA—20.6; Managua, Nicaragua, C. A. Works WNC.
GBU—24.41; English Post Office Dept., Rugby, Warwickshire, England. Works Montreal and New York.
VE9CF—49.00; Canadian Marconi Co., P. O. Box 1690, Montreal, Que., Canada. Test program of music.
W9XAA—49.31; Chicago Federation of Labor, Chicago, Ill., U. S. Relays WCFL.
WSDR—55.80; Aero Radio, Inc., Madison, Wis., U. S. Intercity phone.
WOO—63.10; A. T. & T. Co., Ocean Gate, N. J., U. S. Phone to ships.
WOA—44.41; A. T. & T. Co., Lawrenceville, N. J., U. S. Phone to London.
WEA—28.27; R. C. A., Rocky Point, N. Y., U. S. Tests with London.
WEF—31.31; R. C. A., Rocky Point, N. Y., U. S. Tests with London.
WEL—33.32; R. C. A., Rocky Point, N. Y., U. S. Tests with London.
WCN—59.08; A. T. & T. Co., Lawrenceville, N. J., U. S. Transatlantic phone.
WOO—23.36; A. T. & T. Co., Ocean Gate, N. J., U. S. Transatlantic phone.
W8XK—19.72; Westinghouse Elec. & Mfg. Co., Pittsburgh, Pa., U. S. Relays KDKA.
W3XL—46.70; National Broadcasting Co., New York, N. Y., U. S. Relays N. B. C. programs.
VE9DR—49.96; Canadian Marconi Co., Drummondville, Que., Canada. Canadian Chain programs.
CJRX—25.6; James Richardson & Sons, Ltd., Winnipeg, Manitoba, Canada. Canadian Chain programs.
OPM—29.58; Leopoldville, Belgian Congo, Africa. Tests with Belgium.
W3XAL—16.87; National Broadcasting Co., New York, N. Y., U. S. Relays N. B. C.
W2XAD—19.56; General Electric Co., One River Road, Schenectady, N. Y., U. S. Relays WGY.
GCB—32.33; English Post Office Dept., Rugby, Warwickshire, England. Phone to New York and Montreal.
WND—73.21; American Tel. & Telegraph Co., Hialeah, Fla., U. S. Works South America and Central America.
PHI—25.57; Huizen, Holland. Heard best Sunday morning.
*DJA—31.38; Reichs - Rundfunk - Gesellschaft, Berlin—Charlottenburg 9, Germany. Chimes interlude.
W1XAL—25.45; Boston, Mass., U. S. Relays WEEI.
ZFA—59.7; Hamilton, Bermuda. Heard testing.
ZFB—29.84; Hamilton, Bermuda. Works New York and Montreal.
KKP—18.25; Kohuku, Hawaii. Works KKW and KEQ.
2PM—29.06; Rio de Janeiro, Brazil, S. A. Tests evenings with New York.
HJG—20.08; Bogota, Colombia, S. A. Works WNC.
HPT—29.08; Panama, Panama, C. A. Works Manila.

*Last minute verifications.

Trophy Contest Entry Rules

● THE rules for entries in the SHORT WAVE SCOUT *Trophy Contest* have been amended and only 50 per cent of your list of stations submitted need be verified. If, for example, you send in a list of 100 stations with 50 verification cards, you will receive credit for the other 50 per cent or 100 stations total. The trophy will be awarded to the SHORT WAVE SCOUT who has logged the *greatest number* of short-wave stations during any 30 day period; (he must have at least 50 per cent veris) this period need not be for the immediate month preceding the closing date. The complete list of rules appeared in the last issue of this magazine.

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

Only commercial "phone" stations should be entered in your list, no "amateur" transmitters or "commercial code" stations. This contest will close every month on the first day of the month, by which time all entries must be in the editors' hands in New York City. Entries received after this date will be held over for the next month's contest. The next contest will close in New York City, August 1.

The judges of the contest will be the editors of SHORT WAVE CRAFT, and their findings will be final. 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. From this contest are excluded all employees and their families of SHORT WAVE CRAFT magazine. Address all entries to SHORT WAVE SCOUT AWARD, 99-101 Hudson Street, New York City.

Short-Wave Interval Signals

All stations taking the N.B.C. program —such as the Saxonburg, Schenectady, Boundbrook, and Millis transmitters—give the same three xylophone-like notes; you will also pick them up through W9XAA (Chicago), W9XF (Downer's Grove), and W8XAL (Mason).

Some of the Canadian studios have adopted a similar idea. VE9JR, Middlechurch, on 25.58 meters, which takes its broadcasts from CJRC, Fleming (Sask.), sometimes opens up by playing *O Canada*, and between items strikes a gong four times. VE9HX on 49.07 meters, relaying CHNS, Halifax, precedes its announcements by four strokes on a similar instrument. VE9CS, on 49.39 meters, as the short-wave mouthpiece of CKFC, Vancouver, uses two bells for the same purpose.

Of late the South American studios, whose broadcasts are also transmitted on short waves, have offered us a number of diverse signals. HCJB, Quito (Ecuador), on 73 meters, gives its calls in Spanish and English, punctuating them with a two-tone chime; HKB, Tegucigalpa (Honduras), when working on 49.96 meters, emits a cuckoo call, three times, somewhat similar to that heard from Ljubljana on medium waves; YV5BMO, Maracaibo (Venezuela), on 49.39 meters, strikes a gong before announcing and YV1BC, Caracas (49.08 meters), gives four chimes every fifteen minutes.

A bugle call has been adopted by HKC, Bogota (Colombia), on 48.33 meters; and from the Radio Club of Brazil for its transmission on 36.65 meters you will hear three bells.

Finally, VK2ME, Sydney (31.28 meters), is easily identified by the peculiar cry of the kookaburra bird, or laughing jackass; sometimes when distorted it might be taken for the yapping of a small dog; VK3ME, Melbourne, opens its broadcast by relaying clock chimes.

As an example, if you care to tune in to PMC or PLF, Bandoeng, on respectively 16.56 and 16.81 meters, you will pick up, previous to scrambled speech or an operator's call, the sound of notes somewhat reminiscent of a melodious three-note motorhorn (F, D, C).

In the same way the FW group of transmitters at St. Assise (France) working telephony with Rabat (Morocco), Buenos Aires (Argentine) preface the transmission with a Morse letter F, followed at intervals by three notes (A, F. D). ISY, Buenos Aires, will be found to give out on 16.55, 16.70 meters and 14.47 meters four notes (E, E, G sharp, B), as if played on a vibraphone.

DFB, Nauen (Germany) in daily touch with Maracaibo (Venezuela) and Buenos Aires (Argentine) on 17.12 meters, announces itself by a three-tone whistle (D, C, G).

PHI, Huizen, uses a metronome; Moscow gives you the *Internationale* at beginning and end of broadcast.

How To Build A Simple R.F. Booster

(*Continued from page 206*)

build an R.F. amplifier do not fail to incorporate in it a volume control. Without it nearly all the short-wave broadcast stations overload the regenerative detector and the result is very poor quality speech or music. Regular short-wave plug-in coils are used and the data is given herewith.

There are two types of sets that this booster will probably be used on: One having an antenna coupling condenser which couples the antenna directly to the grid of the detector tube and another where the antenna is coupled inductively to the grid coil through a small winding, such as that used in the booster. These sets are usually those having tuned R.F. stages. For each type of set there will have to be a different method used to couple the booster to the input stage. Coupling to the set having an antenna trimmer is an easy matter; it is only necessary to clip the out-put wire of the booster stage on to the antenna binding post and adjust the trimming condenser for best results. Those having the type just mentioned will find the added R.F. stage a decided improvement in that there will be no need for any further adjustment of the trimmer, even when coils or antennas are changed. Dead-spots caused by the antenna are no longer present. Sets having antenna coupling coils will also be improved by the use of an additional R.F. stage but the method of connection between the two is a little different, if full advantage of the booster is to be had. The output lead can also be connected to the antenna post, but better results will be obtained if the amplifier is connected directly to the grid of the first tube. This is done by inserting a small fixed or variable capacity in series with the lead directly at the grid terminal of the tube or coil. This capacity should not be greater than around 50 mmf. (.00005 m.f.) and preferably a little less, a 35 mmf. (.000035 mf.)

After all wiring is done and the connections checked, connect it to the receiver; turn the volume control full on and, while the receiver is oscillating rotate the tuning condenser of the amplifier until an increase in general back-ground sound is heard. This indicates resonance between the two tuned stages and we are now ready to explore the short wave bands, far better equipped than before. Always keep the amplifier and receiver in resonance while tuning. The amplifier will tune quite broad and no trouble will be encountered in its adjustment. The same antenna formerly used will of course now be connected to the new unit.

Alden 4-Pin Plug-in Coil Data

Meters Wave-length	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)	⅛"
80-40	23 T. No. 28 En. Wound 16 T. per inch.	11 T. No. 30 En. C. W.	⅛"
40-20	11 T. No. 28 En. 3-32" between turns	9 T. No. 30 En. C. W.	⅛"
20-10	5 T. No. 28 En. 3-16" between turns	7 T. No. 30 En. C. W.	⅛"

Coilform—2⅛" long by 1¼" dia. 4-pin base.

Parts List for R.F. Booster

1—Metal chassis and front panel; Blan; Insuline; Korrol.
1—Set of 4 plug-in coils; Na-Ald.
1—140 mmf. tuning condenser, National (Hammarlund).
1—.005 mf. fixed condenser; Mica.
2—.1 mf. by-pass condensers.
1—.0005 mf. mica condenser.
2—16 mf. 150-volt electrolytic condensers.
1—300 ohm 1 watt resistor; Lynch.
1—50,000 ohm 1 watt resistor; Lynch.
1—20,000 ohm variable resistor; Lynch.
1—Line cord with 325 ohm resistor incorporated.
1—2.5 millihenry R.F. choke; National (Hammarlund).
1—30 henry filter choke.
1—"On-Off" line switch.
1—4 prong Isolantite socket; National (Hammarlund).
1—6 prong Isolantite socket; National (Hammarlund).
1—5 prong laminated socket; Na-Ald.
1—78 tube; R.C.A. Radiotron; (Arco).
1—37 tube; R.C.A. Radiotron; (Arco).

My Idea Of A Good Battery All-Wave Portable

(*Continued from page 207*)

to positive A supply, the regeneration control was smooth on the shorter wavelengths but above about 30 meters was inclined to be somewhat plonkety-plonk and in this condition did not provide easy reception of the weaker stations. When the method described above was used, this fault was absolutely cured and a smoother regeneration control could not be imagined. The potentiometer R6 has a very high resistance (250,000 ohms), thus keeping the drain on the B battery very small. A three-point snap switch is used for cutting off both A and B supplies simultaneously, in conjunction with a ten-ohm rheostat, R8. Note carefully the wiring of the B— wire to this switch. If this lead were taken permanently to A—, the potentiometer R6 would be continuously consuming current from the B battery, whether the set were in use or not and although this current would only amount to a fraction of a milliampere, it is well worth saving! The three-point switch does the trick.

Antenna, ground and headphone connections are made through the back of the cabinet, taking care that the necessary binding posts of sockets are mounted where they cannot come into contact with the batteries. There are no binding posts or sockets on the back of the receiver chassis and the back edge of the chassis is kept absolutely flat in order to save space for the batteries. The A and B battery leads, together with the output leads are brought out through the top side of the chassis through insulating bushes. The anode coupling choke is mounted underneath the chassis and where it is not found possible to obtain a choke quite small enough, it may be necessary to make the chassis slightly deeper.

The various resistors and condensers are as follows:

C1	—(see text),	R1	—2 megohms,
C2	.00025 mfds.,	R2	500 ohms,
C3	.0003	R3	500,
C4	.0003	R4	100,000,
C5	0.1	R5	250,000,
C6	.0003	R6	250,000,
C7	.01	R7	40,000,
C8	.0003	R8	10.

The condenser C1 consists of the usual two pieces of insulated wire twisted together to form the required capacity. The two wires are connected between the two binding posts on the back of the case, one of the binding posts (A2) being connected direct to the grid end of the tuning coil on the receiver chassis.

The potentiometer R6 will have to be mounted on insulating washers if the spindle is in direct contact with the moving arm. Some models carry insulation here whilst in others the spindle and the moving arm are in direct contact.

Now for some results! The writer, using this receiver on the northwest coast of England has heard most of the usual short wave stations on this receiver and when conditions are at all favorable, most of the prominent American short wave stations can be tuned in with ease.

When a new A battery is first used, the rheostat should be turned only just on, that is, with as much resistance wire in circuit as possible (provided a 10-ohm model is used). It can then be left in this position until the battery voltage drops sufficiently to cause oscillations to stop, the snap switch being used for switching on and off. This will ensure the best tube life.

A 12-Tube S-W Receiver

(*Continued from page* 215)

very well. Amateurs in each district of the United States were tuned-in in the course of an evening, as well as some amateurs in Canada. EAQ on 30.4 meters was received with more than ample room volume; GSB, GSA, GSE and GSC, in Daventry, England, are received regularly and the programs are thoroughly enjoyable.

The oscillator tube is a 56 triode, the plate circuit of which is tuned by one of the .00014 mf. dual condensers. The detector (first) is a 57 pentode, the grid (control) of which is tuned by the remaining 140 mmf. section of the two-gang condenser. The only coupling existing between the first detector and the oscillator is through the coupling of the oscillator and detector coils by utilizing one coil form for both circuits. These coils and tuning condensers are completely shielded for maximum efficiency.

The intermediate frequency amplifier, which is peaked at 465 kc., employs three type 58 variable mu. R.F. pentodes, providing maximum gain, selectivity and sensitivity. The sensitivity of this I.F. amplifier is controlled by varying the cathode resistor. This sensitivity control is a great aid in eliminating noisy reception in districts where static is especially troublesome. This I.F. amplifier is completely shielded and all oscillation is prevented by the use of adequate chokes and condensers in the by-passing of the various circuits.

A type 55 Duplex-diode triode is used as second-detector, automatic volume control and audio amplifier. The use of the 55 eliminates the necessity of using a separate tube to obtain the same results.

The A.F. amplifier is resistance coupled as far as the output stage, this insures good quality of reproduction while the 2A5's in the push-pull out-put stage insure good volume even on the weaker signals. The first A.F. stage is a type 57 which is used because of its high gain. A 56 triode is used in the second resistance-coupled audio stage, so that full output may be realized from the 2A5's in the final stage. The output of this receiver is six watts, which is sufficient for all purposes of reception.

The *beat-oscillator* is a type 56 tube and is helpful in locating stations and a necessity in the reception of CW (code) transmission. This tube is in the circuit at all times and to put it into operation it is only necessary to snap a switch.

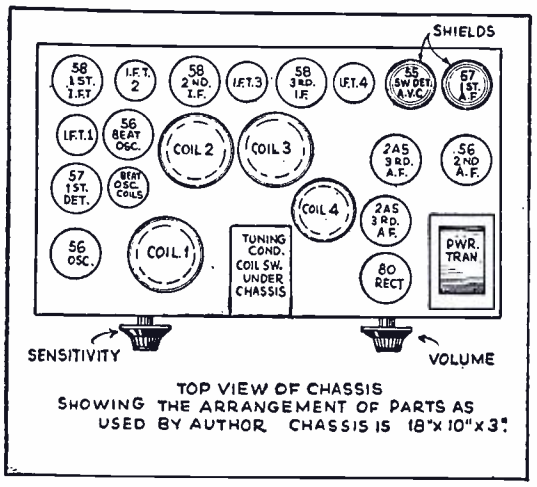
The power supply system uses a type 80 tube and is well filtered, producing a minimum of hum and providing adequate current and voltage for the requirements of the receiver.

The speaker used with this receiver is 11½ inches diameter, and can handle a continuous output of ten watts.

Parts List—Kelley Circuit

CC—140 mmf. Hammarlund Dual Cond. Mids.
C1—35 mmf. Hammarlund Single Cond. Mids.
C2—70 mmf. Hammarlund Single Cond. Mids.
C3—.1 mf. Condenser.
C4—.004 mf. Condenser.
C5—.2 mf. Dual Condenser.
C6—.2 mf. Dual Condenser.
C7—.2 mf. Dual Condenser.
C8—.2 mf. Single Condenser.
C9—.0001 mf.
C10—.0005 mf.
C11—.25 mf.
C12—.02 mf.
C13—.25 mf.
C14—.1 mf.
C15—.25 mf.
C16—.01 mf.
C17—.1 mf.
C18—5 mf.
C19—8 mf. 500 V.
C20—8 mf. 500 V.
C21—4 mf. 500 V.
C22—.25 mf.
C23—.004 mf.
C24—.001 mf.
C25, 26, 27—.1 mf.

IFT, 1, 2, 3—465 kc. Double Tuned Transformers.
FFT4—465 kc. Double Tuned CT Secondary.
The Beat Oscillator Coil is also a 465 kc. Double Tuned I.F. Transformer.
R—20,000 ohms, 1 watt.
R1—10,000 ohms, 1 watt.
R2—2,000 ohms, 1 watt.
R3—50,000 ohms Variable Resistor.
R4—250,000 ohms 1 watt.
R5—500,000 ohms, 1 watt.
R6—100,000 ohms, 1 watt.
R7—500,000 ohms Potentiometer.
R8—2,000 ohms, 1 watt.
R9—500,000 ohms, 1 watt.
R10—100,000 ohms, 1 watt
R11—200,000 ohms, 1 watt.
R12—1,800 ohms, 1 watt.
R13—500,000 ohms, 1 watt.
R14—2,000 ohms, 1 watt.
R15—500,000 ohms.
R16—225 ohms, 2 watts.
R17—50,000 ohms, 75 watts.
R18—.25 megohms.



TOP VIEW OF CHASSIS SHOWING THE ARRANGEMENT OF PARTS AS USED BY AUTHOR CHASSIS IS 18"x10"x3"

Plan layout of 12-tube S.W. receiver.

Postal DeLuxe Super Converter

(*Continued from page* 218)

we feel that the coil changing system employed in the Postal Deluxe Converter has many noteworthy and commendable features.

Tuning Circuit Features

The difficuly ot tuning in short wave stations has been effectively eliminated by carefully coordinating the capacitative and inductive relationship of tuning system.

In order to produce a high R.F. voltage on the grid of the first detector a high LC ratio is employed, that is, a large inductance and small capacity is used in preference to a small inductance and large capacity. This favorable condition is brought about by using space wound coils utilizing solid enameled covered copper wire together with a two-gang tuning condenser rated at 140 mmfd.

In order to further increase the voltage on the grid of the detector tube, the input antenna "loading" is kept unusually low.

Loose inductive coupling is used in preference to capacitative coupling so as to eliminate the introduction of any capacitative losses in the detector grid circuit.

Four coils are used to cover the short wave spectrum in the following steps:

Coil "A" 13 to 30 meters
(23,000 to 9,994 kc.)
Coil "B" 28 to 60 meters
(10,710 to 4,997 kc.)
Coil "C" 57 to 130 meters
(5,260 to 2,300 kc.)
Coil "D" 120 to 299 meters
(2,499 to 1,030 kc.)

It will be noted that each coil has an approximate frequency ratio of 2.3, which provides for broad separation of congested bands so as to greatly simplify the process of tuning as well as the problem of accurate oscillator tracking over the entire tuning range.

The Circuit

The circuit of this converter is shown in Fig. IV. It will be noted that it is appreciably different from the usual run of converter circuits, particularly in respect to the use of a separate oscillator and tetrod detector as well as the inclusion of high gain I.F. stage.

Good engineering principles were adhered to when it was decided to use two separate tubes for the first detector and high frequency oscillator, principally because separating the two jobs provides for a greater oscillator stability. In most pentogrid converter circuits, employing one multi-purpose tube for frequency inversion and detector, the oscillator efficiency of the tube rapidly diminishes the frequencies increase due to decrease of capacitative reactance of the input circuit. The employment of a separate triod oscillator and a separate tetrod mixer (first detector), provides for an unusually efficient form of frequency inversion, in fact continuous and dependable reception can be maintained on the 14 meter band (20 megacycles!).

The antenna feeds into the primary of the 1st detector coil L1 (Fig. 3) the secondary of which is coupled into the tetrod mixer 77 (UT.). A bias resistor of 3,000 ohms is used in the cathode lead of the tube provides suitable bias. The biasing resistor is shunted with a .001 mfd. condenser (C1). The screen is given a lower positive potential than the plate, the voltage being reduced by a 350,000 ohm resistor (R5). A by-pass condenser of .1 mf. (C9) is connected across the voltage reducing resistor in order to insure feedback from signal fluctuations of the screen potential.

For short wave coverage, however, a higher intermediate frequency is always preferable in order to avoid interlocking between the carrier frequency and the oscillator frequency. The Deluxe Converter employs a 545 kc. because of the following reasons: first, because it is the lowest frequency bordering the broadcast band, there is no danger of any broadcast of police call signal forcing its way into I.F. amplifier and causing interference; second, because a more stable gain is possible at this frequency than at any other broadcast frequency; third, because a greater interchannel selectivity (5.45 kc.) is available at this frequency as compared with 15 kc. selectivity at the opposite end of the broadcast band (1500 kc.).

Power Supply System

The Deluxe Converter is completely self-powered. The standard model operates from 110 volt A.C. power lines, and consumes less than 25 watts. Its operation, however, is not restricted from 32 or 110 volts D.C. or from two volt air cells as well as six volt storage batteries.

Universal Antenna Provision

Another valuable feature of great importance in the Deluxe Converter is the provision for use of any type of antenna including doublet, transmission line, shielded systems and special noise reducing antenna. The Deluxe Converter isolates the antenna primary from the chassis by bringing both end leads out to two insulated binding posts BP1 and BP2. A third post, BP3, is connected to the chassis.

When transmission lines are used the line leads are connected to BP1 and BP2. A single wire antenna is connected to BP1 while BP2 is grounded to BP3. If special noise reducing antenna with coupling transformers is employed, the output of the transformer may be treated as a transmission line or single wire aerial depending upon the best results obtained from comparative tests. It can therefore be seen that the Deluxe Converter will operate efficiently with any existing type of aerial without necessitating any internal wiring changes.

Simplicity of Operation

All tuning is accomplished with one full vision illuminated vernier aeroplane dial. Both the oscillator and mixer tuning condensers are "ganged" to this one control—no additional external compensators or trimmers are employed. Perfect tracking is made possible by the use of precision coils and factory aligned circuits wherein due compensation is provided for any discrimination over any portion of the tuning range.

A Low Cost Power Unit For Receivers

(*Continued from page* 221)

Filter System

The filter system consists usually of condensers across the positive and negative output of the transformer—rectifier system, with chokes in series with either the negative or positive lead. Electrolytic condensers are the most compact type, and being generally made with a 500 *volt rating* will usually be good enough for any receiver power supply. One caution though. Always be sure to buy a standard, reputable make of condenser. I had one of the surprises of my life when I saw several cheap brands of so-called 8 mf. electrolytics put across a capacity meter, while in operation. Their capacities ranged *anywhere from two to five mikes* under operating conditions! Likewise, cheap condensers usually have short life, and after a year or so will have to be yanked out and replaced. Chokes should be 30 henry units capable of carrying the current needed. If the pack is to supply 60 mills (M.A.), a choke with a 100 mill rating at thirty henries should be used. Again, as with the condensers, do not buy *cheap* chokes.

Bleeder Resistor

For a pack up to 350 volts, a 25,000, 50 watt resistor is the correct bleeder. Sliders on the resistor will provide any desired voltage between high and ground. Remember to *bypass* every tap to ground through a condenser, even if it by-passed in the set. Should it be desired to get "C" bias from the pack, it is only necessary to use some point above ground as "B" minus and the remainder of the resistor back to the negative point on pack will be at minus potential. This is shown in an accompanying diagram. To obtain bias for a power tube, such as a '45 or a '47, a resistor is put in series with the filament center-tap. This resistor is bypassed by a high capacity, low-voltage condenser, generally 5 or 10 mf. rated at 50 volts. The circuit for this is shown in the diagram. For a single 245, the resistor should be 1500 ohms! for a 47, 450 ohms. These resistors should be of 5 watt rating, wire-wound.

Tunable Hums

One annoyance sometimes encountered with home-made packs is the so-called *tunable* hum, a hum appearing at certain frequencies, particularly when the set is oscillating. This type of hum is unaffected by the amount of filter used. A simple scheme that works perfectly in most cases is shown in the main diagram. It consists simply of by-passing the elements of the rectifier tube with .002 mf. mica condensers. The capacity is not critical and .001 mf. may be used just as well. The little rf. choke between the rectifier tube and the first filter condenser is also a "hum-killing" gadget.

Remember to always use a *good* ground, and be sure that all chokes and transformers are *grounded* to the chassis. Likewise always to ground the centertap of all filament windings, even if they are only *spares* that are not being used on the set.

Parts List—Victor Power Supply

1—Chassis—American Sales Co.
1—Power transformer 325-0-325 V., 70 ma. 2½ volts, 5 volts, R. T. Co.
2—30 henry filter chokes, 70 ma. American Sales Co.
3—8 mf. electrolytic condensers (500 V).
1—½ mf. condenser (200 V).
1—25,000 ohm, 50 watt voltage divider. (With slider.)
2—.002 mf. mica condensers.
1—R.F. choke. 2.5 M.H. Hammarlund (I.C.A.)
1—4 prong wafer socket.
1—"On"-"Off" switch. (I.C.A.)
1—type 80 or 5Z3 RCA Radiotron (Arco)

Universal Mascot 2

(*Continued from page* 217)

grid detector on the left-hand side of the chassis behind the main tuning dial, and the 19 on the right-hand side of the chassis behind the band-spread tuning condenser. The binding posts, or rather the Fahnestock clips, which the various battery leads are attached to, are mounted on a strip across the rear of the chassis. There are ten clips in all. Looking at the rear edge of the chassis, the antenna trimming condenser is mounted at the right of this strip and the phone tip terminals are mounted on the left-hand side.

The circuit is more or less orthodox, the 32 detector being connected in a regular grid-leak detection circuit. The regeneration control is connected in series with the detector plate by-pass condenser. This affords extremely smooth control of regeneration.

The 19 tube, as mentioned above, is the audio amplifier. One section of the 19 is resistance coupled to the output detector tube, and the second triode unit of the 19 is resistance coupled to the first and the plate feeds directly into the earphones.

(*Coil data for 3-winding coils similar to those used in this set will be found in the "Question Box" department of the July issue.*)—*Editor.*

The All-Electric Air Scout

(*Continued from page* 217)

works as well on a.c. as on d.c. It will operate on any voltage from 105 to 120 volts and when used on a.c. it will operate on any frequency from 40 to 60 cycles or even higher. The filaments of the two tubes are connected in series and then they are connected in series with a line cord resistor which drops the voltage of the line down to the right value required for the tube filaments—6 volts apiece.

The set, when used on A.C., employs the 37 tube to rectify the A.C. for the plate supply. The filter system which removes the last vestige of hum and smooths out the current most effectively consists of a 25,000 ohm resistor, by-passed at either end by 8 mf. electrolytic condensers. These are combined in a single compact cardboard container.

The voltage limiting resistor used in the filament circuit is contained in the line cord, thus saving space and at the same time distributing the heat *away from* the electrolytic condensers and other delicate components of the set.

An antenna control condenser in series with the antenna permits this set to be used with any length aerial. This adjustable condenser is also of great value in tuning in weak distant stations. The four prong plug-in coils used have two windings. The longer winding is in the tuned circuit. A .00015 mf. variable condenser of compact, but accurate construction permits the set to be tuned smoothly over all bands from 10 to 550 meters. The shorter winding is used as a tickler winding. It is connected in the plate circuit of the 6C6, providing very efficient regeneration which serves to "pep" up the circuit thus providing the necessary sensitivity for one-tube foreign reception. The regenerative feature also aids the selectivity, so that even in localities where stations are congested, it is possible to separate them without difficulty. Control of regeneration is provided by a 75,000 ohm potentiometer in the screen grid circuit of the 6C6 tube. This control handles very easily and is amazingly smooth. The usual fuss and bother generally associated with the tuning-in of short wave stations is not present in this set. Grid-leak detection is employed and the use of a 5 meg. grid-leak shunted by a .0001 mfd. mica condenser is conventional—but nevertheless the best design possible in this type of set. It will be noted that the screen-grid circuit is by-passed by a good-sized (.5 mf.) fixed condenser.

The R.F. choke in the plate circuit in combination with the .00025 mf. mica condenser, prevents R.F. currents from passing through the earphone.

New National Cathode-Ray Oscilloscope

(*Continued from page* 216)

directly to the vertical deflection plates. One of each pair of binding posts is marked "GND" and is permanently connected to the cabinet.

After the tubes are properly installed and the cover plate fastened in place, the Oscilloscope may be turned on. The focusing and brilliancy controls should be turned as far as they will go counter-clockwise. The switch on the side should be turned clockwise, so that the 60-cycle sweep circuit is connected, and the potentiometer just above the switch turned about one-third of the way on. The tubes should be allowed to warm up for 15 or 20 seconds.

The focusing and brilliancy controls are now advanced slowly until a horizontal line appears on the screen. The length of the line may be controlled by the potentiometer. The width of the line is determined primarily by the focusing control at the left of the front panel and its brilliancy by the righthand control. It will be found that as one control is advanced, the other must be retarded. When properly adjusted, the line will be about one-thirty-second inch wide. The apparent brilliancy will depend largely upon the amount of light that falls upon the screen, the clearest and brightest patterns being obtained when the screen is in the shadow.

What is 00.00 O'Clock ?

(*Continued from page* 209)

We find that 00.00 is midnight G.M.T. or the end of a twenty-four-hour period. This is equivalent to 7 p.m. Eastern Standard Time. Further down the table, we find that 12 midnight, Eastern Standard Time, is 5 a.m., English time or 05.00 G.M.T. For 1:30 a.m., Eastern Standard Time, you would have 06.30 G.M.T. When the English stations announce the time, it will be different in that 9 a.m. will be described as "nine hours" (or 09.00) and 9 p.m. will be "21 hours" (or 21.00). If we check these back on our table, you will find that it is a comparatively easy matter to convert either G.M.T., or English time to Eastern Standard Time. We suggest that our readers save this table as it is the simplest and most easily understood table that has yet appeared, we believe.

During the summer months, "summer time" is used in England; this corresponds to our "daylight saving time." However, the time ratios shown in the table still hold true.

24 Hour method.	English Time 12 hour clock.	E. S. T.
00.00	12 midnight	7 pm.
01.00	1 a.m.	8 p.m.
02.00	2 a.m.	9 p.m.
03.00	3 a.m.	10 p.m.
04.00	4 a.m.	11 p.m.
05.00	5 a.m.	12 midnight
06.00	6 a.m.	1 a.m.
07.00	7 a.m.	2 a.m.
08.00	8 a.m.	3 a.m.
09.00	9 a.m.	4 a.m.
10.00	10 a.m.	5 a.m.
11.00	11 a.m.	6 a.m.
12.00	12 noon	7 a.m.
13.00	1 p.m.	8 a.m.
14.00	2 p.m.	9 a.m.
15.00	3 p.m.	10 a.m.
16.00	4 p.m.	11 a.m.
17.00	5 p.m.	12 noon
18.00	6 p.m.	1 p.m.
19.00	7 p.m.	2 p.m.
20.00	8 p.m.	3 p.m.
21.00	9 p.m.	4 p.m.
22.00	10 p.m.	5 p.m.
23.00	11 p.m.	6 p.m.
00.00	12 midnight	7 p.m.

3-Tube 12,500 Mile Receiver Now A.C.-D.C.

(*Continued from page* 219)

The reputation of the Harrison 12,500 mile receivers is well known. They are distinguished for their ease of assembly, ease of operation, high signal strength, and remarkable long distance coverage. The new A.C.-D.C. version, therefore, due to its greater flexibility is being welcomed with great enthusiasm.

The completed set presents a neat, professional appearance, being housed on a metal chassis and panel finished in black crystal. It is pictured here in a black crystal-finished metal cabinet, which is a valuable additional asset to the receiver. It provides total shielding on all sides, top and bottom, and with its hinged cover, easy access to tubes and coils. The whole set, with the dustproof cabinet, is very compact and makes an excellent "portable" *all-wave* set. The over-all dimensions are 7¼" by 5¼", and it stands 7" high. In addition to occupying little space its light weight (only 6 lbs., 2 ounces), complete with three tubes, a set of phones, and the cabinet, further enhance its value as a portable instrument.

In an attempt to demonstrate the ease with which this set can be built and operated by the merest beginner, a test was conducted. One of the A.C.-D.C. kits was presented to a boy, whose total radio experience had consisted of tuning an ordinary broadcast receiver. He was not permitted to ask any questions. First, he read the instructions through; then, he commenced to build the set, following the instructions step by step. *In two hours and ten minutes he had completed the set and was ready to operate it!* The tubes and phones were inserted and the set was plugged in to the line. Then the fun began! Station after station just poured in, many with ample volume to actuate a small loud speaker. Foreign broadcast stations, police, amateurs all over the world, airplane, and ship transmissions were all received with great ease. The list of stations received was a veritable "Who's Who in Short Waves" and included many of those elusive, "hard-to-get" foreigners. Truly a remarkable and convincing demonstration!

It is gratifying indeed to see a receiver, placed within the reach of all, that really answers the need for an all-wave set which gives bona fide results.

New World-Wide All-Wave Receiver

(*Continued from page* 218)

pecially, will find these sets invaluable in their endeavor for their radio merit badge.

The construction kits have all components mounted on the attractive crystal finished chassis and panel, all ready to be wired. The accompanying instructions feature large clear diagrams that plainly show every connection and make errors impossible to even the most inexperienced. The ease of construction is further emphasized by the fact that only eight connections are needed to completely wire the receiver.

A marvel of modern design, this all-wave radio receiver has thrilled thousands with its amazing performance.

Automatic Aerial Condenser

(*Continued from page* 220)

with submitting a system which I have been using.

It consists of a 5-prong plug-in coil, wound in the usual manner of a 4-prong coil, using the extra prong as a lead to a small trimmer condenser, set inside the coil form. The other terminal of the condenser goes directly to the grid coil.

The coil socket is wired accordingly; the antenna lead is connected to the grid terminal of same. The rest of the terminals on the socket are hooked up in the conventional manner.

By having each coil equipped in this way, and once adjusted to the correct setting, it will always be ready for use each time the coils are changed. The only time it will be necessary to readjust through condensers is when different antennas are used.—*Clarence O. Wahner.*

The Latest—A "Double-Doublet" Antenna

(*Continued from page* 219)

vertical doublet, but, on the other hand, the horizontal doublet usually has a better signal-to-noise ratio. An advantage perhaps is that in some locations a vertical doublet of the type shown in Fig. 2 may be easier to install.

Theoretically, the doublet should be stretched out fully—each half making an angle of 180 degrees with the other, for most efficient reception. If this angle is reduced, due to constructional difficulties to 90 degrees signal strength will be decreased about 30 per cent from the signal received from the doublet in its full 180 degree span. Theoretically it receives best from stations located along the perpendicular and in the same plane to the horizontal span.

The full 110 feet of lead-in cable supplied must always be used, regardless if the doublet antenna system is only, for example, 60 feet of line run from the receiver location. The balance of 50 feet may be coiled up in a coil of convenient diameter, such as one foot, at the receiver end.

The connection of the conductors to the receiver transformer is immaterial, so long as the ends do not short-circuit.

For distances greater than 110 feet, additional length of line must be added in multiples up to two (2) times, or up to 220 feet. After this distance additional lengths can be added, up to 500 feet and can be cut anywhere convenient for connection to the receiver.

Examples:

Line Run to Receiver from Doublet in Feet.	Line Length Used in Feet.	Number of Length 110 Feet.	Lengths of be coiled to in Feet.
95	110	1	15
150	220	2	70
210	220	2	10
300	300	3	*
500	500	5	*

*No coil necessary. Cut off unused portion.

Due to a most efficient match of the "double-doublet" to the receiver for the shorter waves (3.5 (3500 kc.) to 20 megacycles), there would be an unavoidable loss introduced for the frequencies assigned to broadcasting police calls, etc., namely, 550 to 3500 kc. A standard broadcast (STD) Short Wave (SW) switch is therefore provided on the receiver transformer for improving the reception of the stations operating on the frequencies between 550 and 3500 kc.

The matching transformer is a specially developed unit necessary to couple the transmission line inductively to the receiver. The use of electrostatic shielding balances out the *transmission line to ground* capacity.

The transformer is designed to mount directly on the *Antenna-Ground* terminal board of RCA-Victor latest model *All-Wave* receivers, thereby insuring the shortest possible connection to the antenna and ground terminals. The installation of the transformer to a late-production RCA-Victor Model 140 is illustrated in Fig. 1. It is important to note that the length of the ground connection of the special transformer is critical. To insure *maximum noise reduction* keep this connection at shortest possible distance (not over one inch) from chassis ground.

Care should be exercised to prevent the transformer antenna terminal from "shorting" to the chassis. On other manufacturers' receivers' having the chassis *grounded*, the transformer should be mounted on the side of the cabinet (by utilizing holes, spacers and screws provided) in such a manner as to permit having the transformer ground connector, when bent, slip under the ground terminal or a chassis nut. If this is not possible make the ground connection absolutely as short as possible.

Ground wire should be obtained locally, as lengths for ground wire will vary. Use No. 14 rubber covered wire or larger if available and keep the run as *short* as possible.

• Index to Advertisers •

(While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.)

A Practical Line Filter For S-W Receivers

By A. D. LODGE*

● THIS filter proved it could absolutely eliminate every trace of line noise in the short-wave receiver between 11 and 200 meters.

Duo-lateral or "honey-comb" coil with its low distributed capacity was found to be most effective. Incidentally, as the inductances must be able to carry the entire current drawn by the receiver, the heavy wire used in the "Fultest" duo-lateral coils makes them admirably suited for use in this filter.

The condensers should be of the mica type, moulded in bakelite, as they are non-inductive, have low leakage, and are impervious to atmospheric conditions. The value of the four fixed condensers used is 5,500 mmf. (.0055 mf.) each. Other sizes may be substituted but the filter will not be as effective. The variable filter tuning condenser is a compensator type with a maximum capacity of 100 mmf. (.0001 mf.).

Five 100 turn coils are needed. Four are used as they are, but the fifth one (LT) is adjusted by the "cut and try" method until the tuned circuit (LT and CT) is peaked at the most efficient point. The coils are mounted on a bakelite, hard rubber, or wooden panel approximately 3½" x 7", using a small piece of bakelite ½" x 2" to hold L1-L2 and L3-L4 in place. A larger piece is used to mount LT and CT is fastened on top of it.

The remaining equipment needed is a power cord with plug, an outlet receptacle, and a metal shield can approximately 4½" x 8" x 6" high.

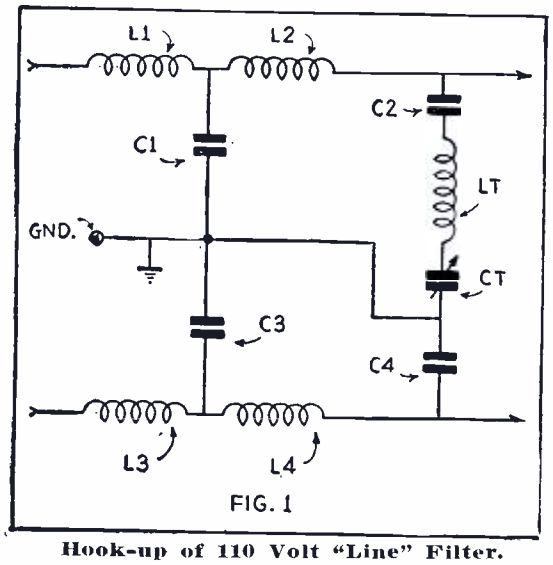


FIG. 1

Hook-up of 110 Volt "Line" Filter.

Locate filter as near the receiver as possible and the power cord between the filter and set should be shortened. The method of connection is clearly shown in the illustrations and needs no explanation. A good ground from a water pipe is connected to the ground post on the filter. Both power plugs should be reversed individually until the best combination is found.

To tune the filter we turn the volume control of the receiver up full and tune the receiver to the frequency at which the background noise is at its highest. Now vary CT from maximum to minimum, listening for a decrease in the noise. If none is noted remove approximately ten turns at a time from LT, varying CT as above until the point of minimum noise is found. The final size of LT may be as small as ten turns as its size is determined by the frequency of maximum interference.

As a final touch the connections to the large coils may be reversed one at a time until the whole filter is functioning at peak efficiency.

*Harrison Radio Co.

Parts List

C1, C2, C3, C4—.0055 mf. Fixed Mica Condenser.
CT—.0001 mf. Trimmer Condenser. Hammarlund.
L1, L2, L3, L4, LT—100 turn Fultest Honeycomb Coil. Harrison.
Shield Can.
Bakelite Sub-panel.
A.C. Cord and Plug.
A.C. Outlet.

When To Listen In

By M. HARVEY GERNSBACK

England Gives Us the Bird!

The bird in question is a *nightingale*. The Daventry stations have been relaying the song of the nightingale direct from the Berkshire Hills of England for the benefit of foreign listeners. The British Broadcasting Corp. has been doing this every summer for a number of years and undoubtedly many listeners in this country "got the bird" from England.

The Daventry stations, by the way, are operating as follows at present: Transmission 1—11:30 P.M.-12:30 A.M. on GSD and GSB, 12:30-1:30 A.M. on GSB and GSA. (After July 28th this transmission will be from 12:15-2:15 A.M.); Transmission 2—6:00-8:30 A.M., on GSH and GSG; Transmission 3—8:45 A.M.-12:45 P.M. on GSG, GSF and GSE (only 2 waves are used at one time, GSG and GSF for about the first 2 hours and GSF and GSE for about the last 2 hours); Transmission 4—1:00-5:30 P.M. on GSD and GSB (GSF may be used in place of GSB, listen for announcements from the station); Transmission 5—6-8 P.M. on GSF, GSD and GSC (2 stations will be used at a time, GSF and GSD will probably be used for the first hour and GSD and GSC for the second. However, there is a possibility that GSF won't be used at all).

Norway

LCL at Jeloy is now working on 31.41 meters (9,550 kc.); the call is apparently LKJ1. This station replaces LCL on 42.92 meters.

Caracas

From YV1BC at Caracas, Venezuela, comes the information that hereafter this station will be called YV2RC and the long wave station which it relays will be called YV1RC.

Moscow

RNE, 25 meters, has decided to transmit in the late afternoon so that American listeners will have a chance to hear it. It will be on Monday, Wednesday and Friday from 4-5 P.M. in addition to their old schedule on Saturday night and Sunday morning.

Winnipeg

Winnipeg, Canada, has been heard frequently of late on 48.78 meters, 6,150 kc., between 7 and 10 P.M. The call used on this wave is believed to be CJRO. This is undoubtedly the old sister station of CJRX-VE9JR, which used to be known as VE9CL. It has been inactive for about 2 years. CJRX on 25.47 meters, is now reported to be on only about 3 nights a week. The operators of both stations are James Richardson & Sons, Ltd., Royal Alexandra Hotel, Winnipeg, Canada. Thanks to S. P. Herren, San Francisco, Cal., and Oliver Amlie of International Amateur & S-W Fan Society of Philadelphia, for information on this station.

Berlin

The German stations now alter their schedules somewhat on the first of every month and as we did not receive the information in time we can not publish it. However we hope to make arrangements to get this information in time. If we do, we will, of course, publish it. The June schedule, the latest at hand, is printed in the Station List on page 225.

Our Station List—Did You Vote?

Do not forget to let us know whether you like the new style in the station list as published last month better than the old style (appearing in this issue). Your votes will determine which style becomes the standard. Next month we will again publish the new style for comparison.

Sydney

VK2ME operates on the following schedule *every Sunday* during July: 12 midnight-2 A.M., 4:30-8:30 A.M., 11:30 A.M.-1:30 P.M. During August the schedule will be the same except for the last broadcast, which will take place from 10:30 A.M.-12:30 P.M. every Sunday instead of 11:30-1:30.

Looking Forward

By the end of the year France hopes to have her new high-power S-W station operating in conjunction with the old Radio Coloniale. The power of the station will be from 25-100 kw., depending on the wavelength being used. Waves have been assigned to this station in the 13, 16, 19, 25, 31 and 49 meter broadcast bands. VK3LR at Melbourne now on 31.31 meters, has also in project transmitters broadcasting in the 13, 19, 25 and 49 meter broadcast bands. These will gradually be brought into service within the next two years. It is hoped to have several in operation by this fall. China is also working on a transmitter with 18.5 kw. power to operate in the 13, 16, 25 and 31 meter bands. The station is to be at Shanghai and the calls will be XGBA, XGBB, XGBC and XGBD.

Argentina is planning a S-W broadcaster also. It will operate in the 19, 25, 31 and 49 meter bands. Reports say that it will start operations some time this year if all goes well. We have no definite information however. Listeners won't lack entertainment when these stations are completed.

(All time quoted is Eastern Standard Time)

The 4 ESSENTIAL SHORT WAVE BOOKS

'ROUND THE WORLD FANS USE THESE GREAT SHORT WAVE BOOKS

These great books contain everything on short waves that is really worth knowing—they are books which have been most enthusiastically welcomed by short-wave fans. The cost of the books is extremely low in comparison with the valuable material which they contain.

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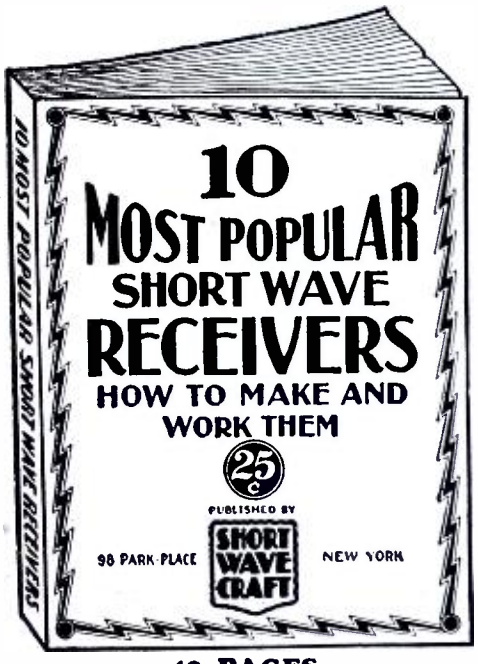
Ten Most Popular Short Wave Receivers. How to Make and Work Them



This new volume is a revelation to those who wish to build their own short wave receivers. 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 worthwhile 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

40 PAGES
OVER 75 ILLUSTRATIONS

IMPORTANT

THERE IS NO DUPLICATION BETWEEN THIS BOOK AND OUR OTHER VOLUME—"HOW TO BUILD AND OPERATE SHORT WAVE RECEIVERS." ALL THE MATERIAL PUBLISHED IN THE NEW BOOK HAS NEVER APPEARED IN ANY BOOK BEFORE.

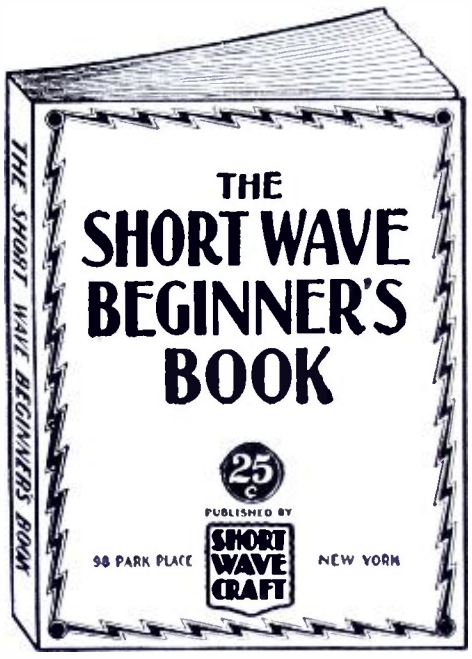
25c

The Short Wave Beginner's Book

Here is a book that will solve 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 with all sorts of photos, explanations and everything worthwhile knowing about short waves—the book is not "technical." It has no mathematics, no "high-faluting" language and no technical jargon. You are shown how to interpret a diagram and a few simple sets are also given to show you how to go about it in making them.

It abounds with many illustrations, photographs, simple charts hookups, etc., all in simple language It also gives you a tremendou amount of very important informa tion which you usually do not find in other books, such as time conversion tables, all about aerials, noise elimination, how to get verification cards from foreign stations, all about radio tubes, data on coil winding and dozens of other subjects.



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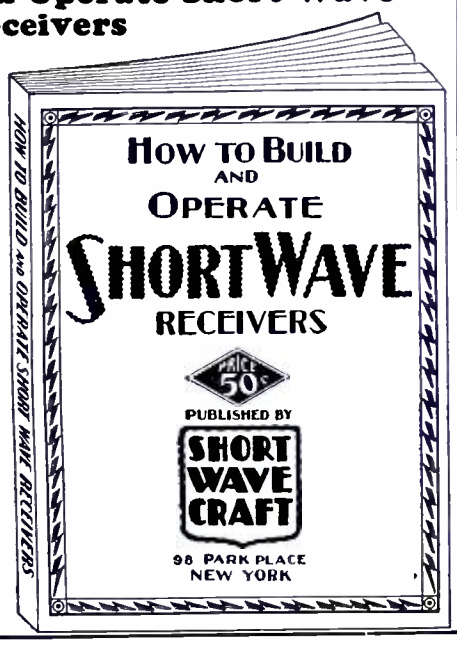
How to Build and Operate Short Wave Receivers

s the best and most up-to-date book on the subject. It is edited and prepared by the editors of SHORT WAVE CRAFT, and contains a wealth of material on the building and operation, not only of typical short-wave receivers, but short-wave converters as well. Dozens of short-wave sets are found in this book, which contains hundreds of illustrations; actual photographs of sets built, hookups and diagrams galore.

The book comes with a heavy colored cover, and is printed throughout on first-class paper. No expense has been spared to make this the outstanding volume of its kind. The book measures 7½x10 inches.

This book is sold only at such 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.



Over 150 Illustrations
72 Pages 7x10 Inches

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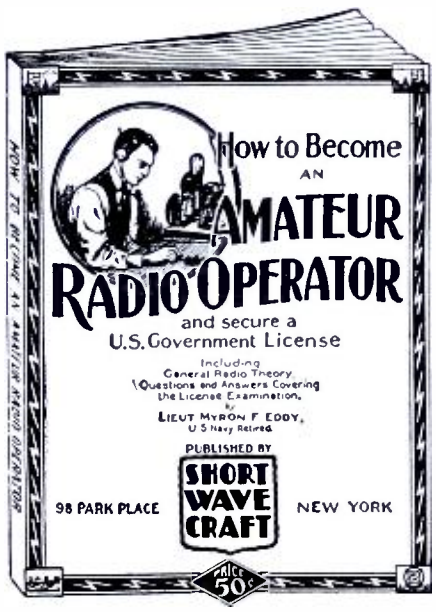
How to Become an Amateur Radio Operator



We chose Lieut. Myron F. Eddy to write this book because his long years of experience in the amateur field have made him pre-eminent in this line. For many years he was instructor of radio telegraphy at the R.C.A. Institutes. He is a member of the I.R.E. (Institute of Radio Engineers), also the Veteran Wireless Operators' Association.

If you intend to beco me a licensed code operator, if you wish to take up phone work eventually, if you wish to prepare yourself for this important subject—this is the book you must get.

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DOERLE WORLD-WIDE RECEIVERS

Official Doerle Receivers

Never in the history of short waves has there been produced short-wave receivers which have taken the entire country by storm as much as the now **famous Doerle receivers.** Mr. Doerle described his first receiver, **the 2-tube 12,500-mile receiver,** in the December-January, 1932, issue of Short Wave Craft. And you must have seen the many letters published in that magazine, lauding this receiver to the skies, and for a good reason! It is a low-priced receiver, yet pulls in short-wave stations from all over the world—**REGULARLY—in practically any location**—not only in this country but anywhere. Thousands of experimenters have built their own and have obtained miraculous results.

Subsequently the 3-tube Signal Gripper was brought out with equal success; and to top it all, we have electrified both of these receivers so that now they are available either in 2-volt battery models or electrified A.C. models.

We list below two of the most popular Doerle receivers, namely, **the 2-tube 12,500-Mile Battery Model and the 3-tube Electrified Signal Gripper.**

Despite the remarkable performance of these two receivers, our technical staff felt that they could obtain even better results with slight modification of the circuit. This is especially true of the 3-tube Signal Gripper listed below. Here, full advantage is taken of the latest type triple-grid tubes, such as the 57 and 58, which are ideally suited for short-wave work. The increase in sensitivity and selectivity of these receivers, due to these modifications, is tremendous; yet, despite all, we have not raised the prices of these instruments to you.

ONLY FIRST CLASS PARTS USED

It may be possible to buy the parts of the completed sets at a lower price elsewhere. We admit this at once. But if you will look over our parts list you will find that only first class material is used. We have done away with all losses. There is no "hand capacity." IN THESE TWO SETS ONLY THE BEST CONDENSERS—AND THAT MEANS HAMMARLUND—ARE USED. We could have produced the sets for considerably less if we used inferior parts (some Doerle imitators do this), but we refrained from doing so because then we could not guarantee results, as we now do. The sets are low in price, yet the quality is excellent considering the low price. Thus, for instance, we use Kurz Kasch vernier dials, because we find them excellent for the purpose. Our chasses are made of heavy-gauge metal, beautifully finished in black crystalline. These panels do away with "hand capacity." The four plug-in coils are of genuine molded bakelite for low losses. In short, despite the exceedingly low price, we have given you quality. You will be pleased not only with their business-like appearance but with their exceptional performance as well.

Only by making these sets in quantities can we afford to sell them at the extremely low prices quoted.

Note the testimonials printed on this page. They alone can give you the true story of the excellent performance of these fine receivers.

The 2-tube 12,500-Mile Set is for 2-volt operation. Although it is designed for earphone reception, many local stations will come in with such volume that a loud speaker may be used. This receiver requires two type 30 tubes, two 45-volt "B" batteries, and two No, 6 dry cells for operation. **The 3-tube A.C. Signal Gripper** requires one 56, one 57 and one 58 tubes for operation; instead of batteries, it requires a power pack. Any good, well-filtered pack delivering 2½ volts for the filaments, 250 volts for the plates and 22½ volts for screens will work very nicely. This receiver is a great deal more powerful than the 2-tuber and will bring in a good many more stations on the loud speaker.

WHAT DOERLE FANS SAY

I received the 3-tube Doerle receiver and the set sure is a wonder. In just two weeks time I have received the following stations: KEE, HS1ABB, W4XB, PHI, W1XAZ, WMA, W8XK, W2XE, W9XF, DJB, GSE, YV1BC, KNRA, XETE, VE9JR, W8XAL, GSB, PSK, W3XL, W3XAU, EAQ, G6RX, W2XAD, HJ1ABB, VE9GW, GOA, FYA, WNC, HJB, YV3BC, LSX, KKQ, HC2RI. I think this is very good as the street car line is two blocks west and the I.C. electric railroad is about 150 ft. east of here. You may, if you wish, use this letter in whole or part in advertising your Doerles. **Mr. Glenn L. Thompson, 3612 Lake Park Ave., Chicago, Ill.**

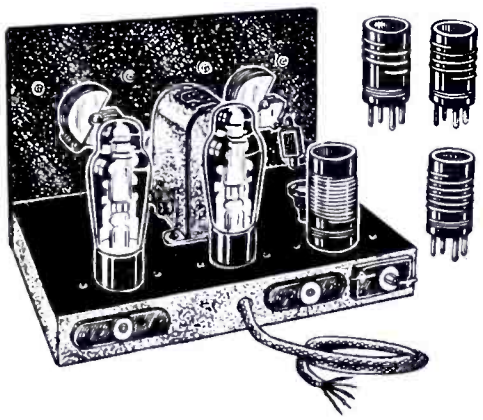
THIS IS GOING SOME!

Today is my third day for working the Doerle set and to date I have received over fifty stations. Some of the more distant ones I shall list. From my home in Maplewood, N. J., I received the following: WVR, Atlanta, Ga.; WGK, Ohio; W9BHM, Ft. Wayne, Ind.; W9AYS, Elgin, Ill.; W8ERK, Girard, Ohio, and best of all XDA, Mexico; PZA, Surinam, South America; TIR, Cartago, Costa Rica; G2WM, Leicester, England. I have also received stations WDC and PJQ which I have not found listed in the call book.

That's not a bad record for three days on a two-tube job, is it? I will answer any questions concerning the Doerle set. **Mr. Jack Prior, 9 Mosswood Terrace, Maplewood, N. J.**

2-TUBE 12,500 MILE BATTERY SET

$8.72



This receiver is exactly as illustrated. Size of panel is 9" x 6¼", base 9" x 6⅛". **List of material used:** 2—Hammarlund .00014 mf. condensers; 1—20 ohm rheostat; 1—high quality audio transformer; 2—Kurz Kasch vernier dials; 3—bakelite low-loss sockets; 1—micamold antenna condenser; 1—.0001 mf. mica condenser; 1—5 megohm grid leak; 2—phone-pin jacks; 1—Ant-Gnd. assembly; 1—set of 4 bakelite plug-in coils; 1—set of hardware, hook-up wire, etc., and complete constructional details and diagrams. Shipping weight, 5 lbs.

No. 2141—2-Tube 12,500-Mile Short-Wave Doerle Battery Receiver, in Kit Form, with All Parts Specified Above **But Not Wired;** Including Blueprint Connections and Instructions, less tubes. Can be assembled in 1 hour. YOUR PRICE.. **$8.72**

No. 2140—2-Tube 12,500 Mile Short-Wave Doerle Battery Receiver, Completely Wired and Tested, Less Tubes. YOUR PRICE..... **9.92**

No. 2142—Accessories Only Including 2 Six-Months Guaranteed R.C.A. Licensed 230 Tubes; 1 Set of Standard Matched Headphones; 2 No. 6 Dry Cells; 2 Standard 45-Volt "B" Batteries. Shipping weight, 22 lbs. YOUR PRICE..... **4.38**

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For details, see page 188 in last issue of this magazine or send 5c postage for our Short-Wave Treatise and Catalog.

3-TUBE A.C. SIGNAL GRIPPER

$13.77

This receiver is exactly as illustrated. The panel measures 10½" x 7¼"; base, 10½" x 8". **List of material used:** 3—Hammarlund .00014 mf. tuning condensers; 2—Kurz Kasch vernier dials; 2—bakelite knobs; 1—volume control potentiometer; 2—tube shields; 1—Ant-Gnd. strip" 1—tip-jack strip; 3—6-prong wafer sockets; 1—special R.F. choke; miscellaneous high quality resistors and fixed condensers; 1—5-prong wafer socket; 1—4-prong wafer socket; 2—screen grid clips; 1 set of hardware, hook-up wire, etc., complete instructions and diagrams for constructing the set. Shipping weight, 7 lbs.

No. 2178—Electrified 3-Tube Doerle Signal Gripper, in Kit Form, with All Parts as Specified Above But Not Wired; Including Blueprint Connections and Instructions. Less Tubes. Can be assembled in 1 hour. YOUR PRICE..... **$13.77**

No. 2177—Electrified 3-Tube Doerle Signal Gripper. Completely Wired and Tested; Less Tubes. YOUR PRICE **15.22**

No. 2179—Complete Set of Tubes; 1—58; 1—57; and 1—56. Special Short-Wave Hum-Free A.C. Power Pack including 280 tube. YOUR PRICE **9.82**

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There is a graduated "Meridian" scale of black enameled metal with the 9" and 12" globes. An additional feature is the movable hour scale found at the north pole—this facilitates determining the hour in any part of the world.

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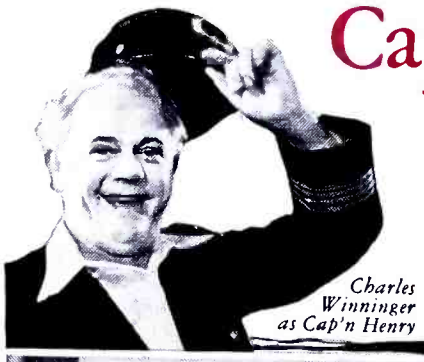
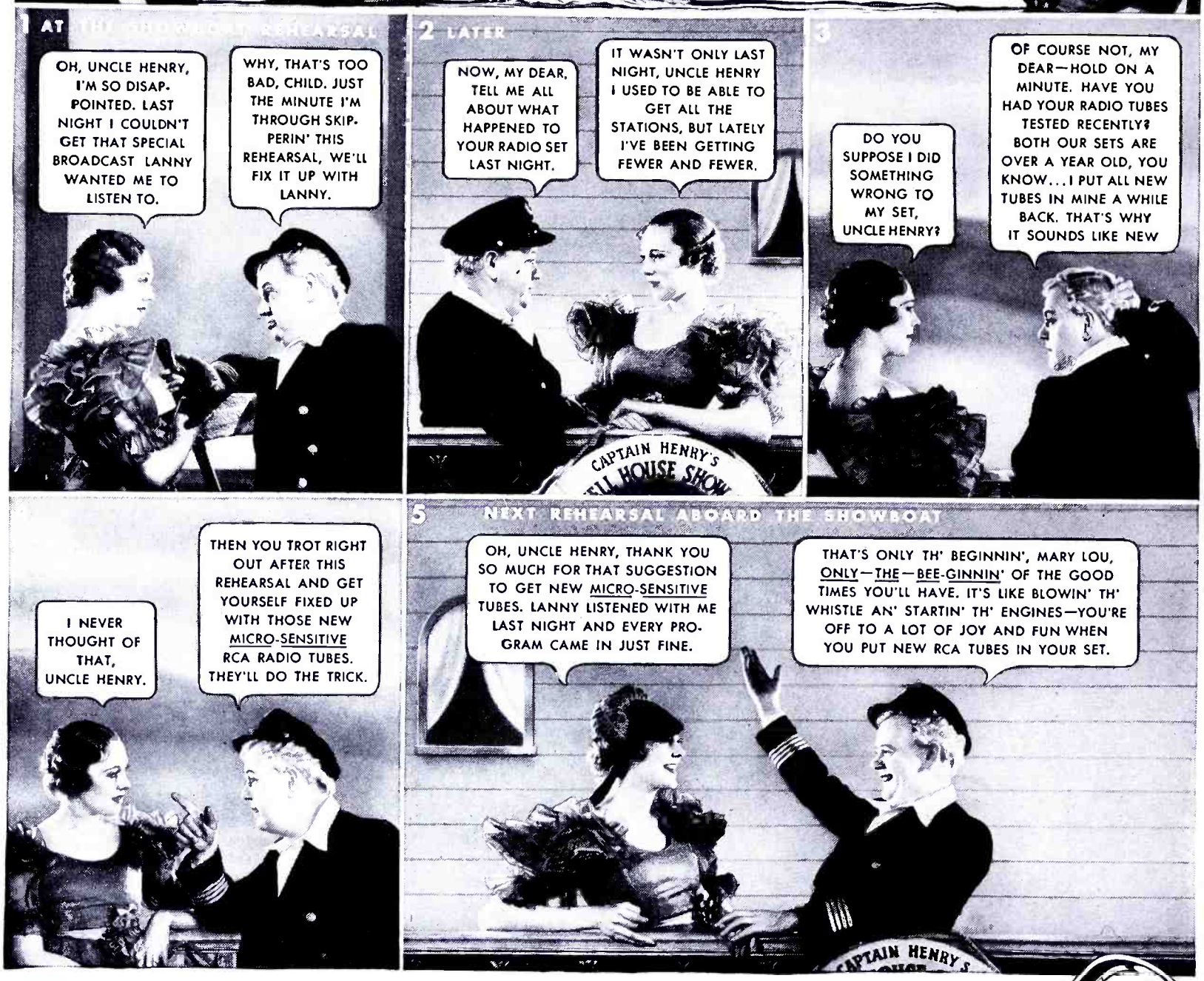
Cap'n Henry pilots Mary Lou to finer radio reception



Charles Winninger as Cap'n Henry

—AND CHARTS A COURSE FOR EVERY RADIO LISTENER



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TO make old radio sets new again... to get all the joy that radio has in store for you today, replace worn tubes with these new Micro-Sensitive RCA Radio Tubes. For true-to-life reception a radio tube must be sensitive enough to pick up a microscopic electrical impulse—the millionth part of a volt. In RCA Radio Tubes you will find such "Micro-Sensitive" accuracy. Have your RCA Radio Tube agent test your tubes today. Replace worn tubes with only radio tubes guaranteed by RCA Radiotron Co., Inc., to give these 5 big improvements: **1** Quicker Start. **2** Quieter Operation. **3** Uniform Volume. **4** Uniform Performance. **5** Every Tube is Matched.

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