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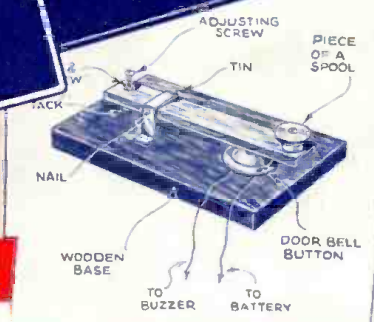

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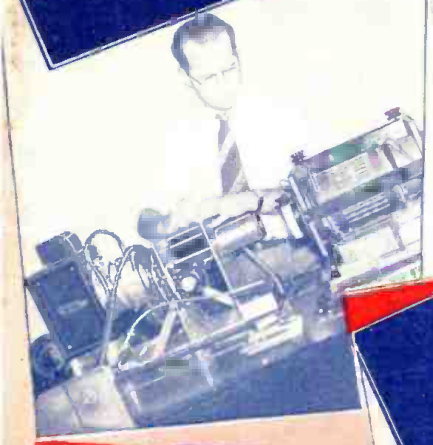

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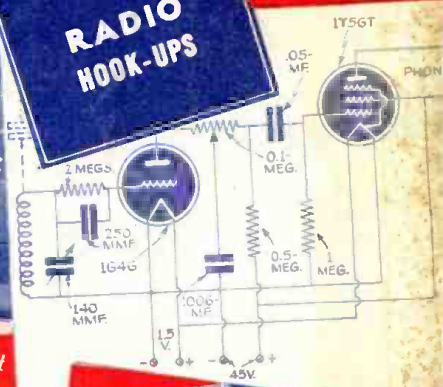

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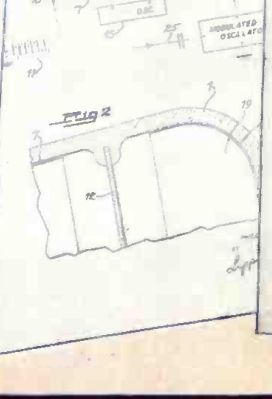

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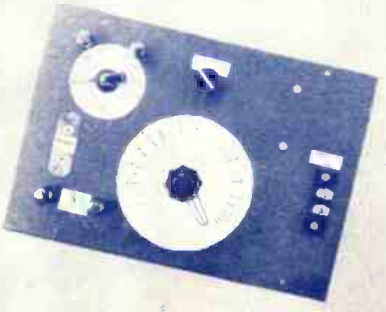

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HUGO GERNSBACK
EDITOR

AMATEUR & EXPERIMENTAL RADIO NOV

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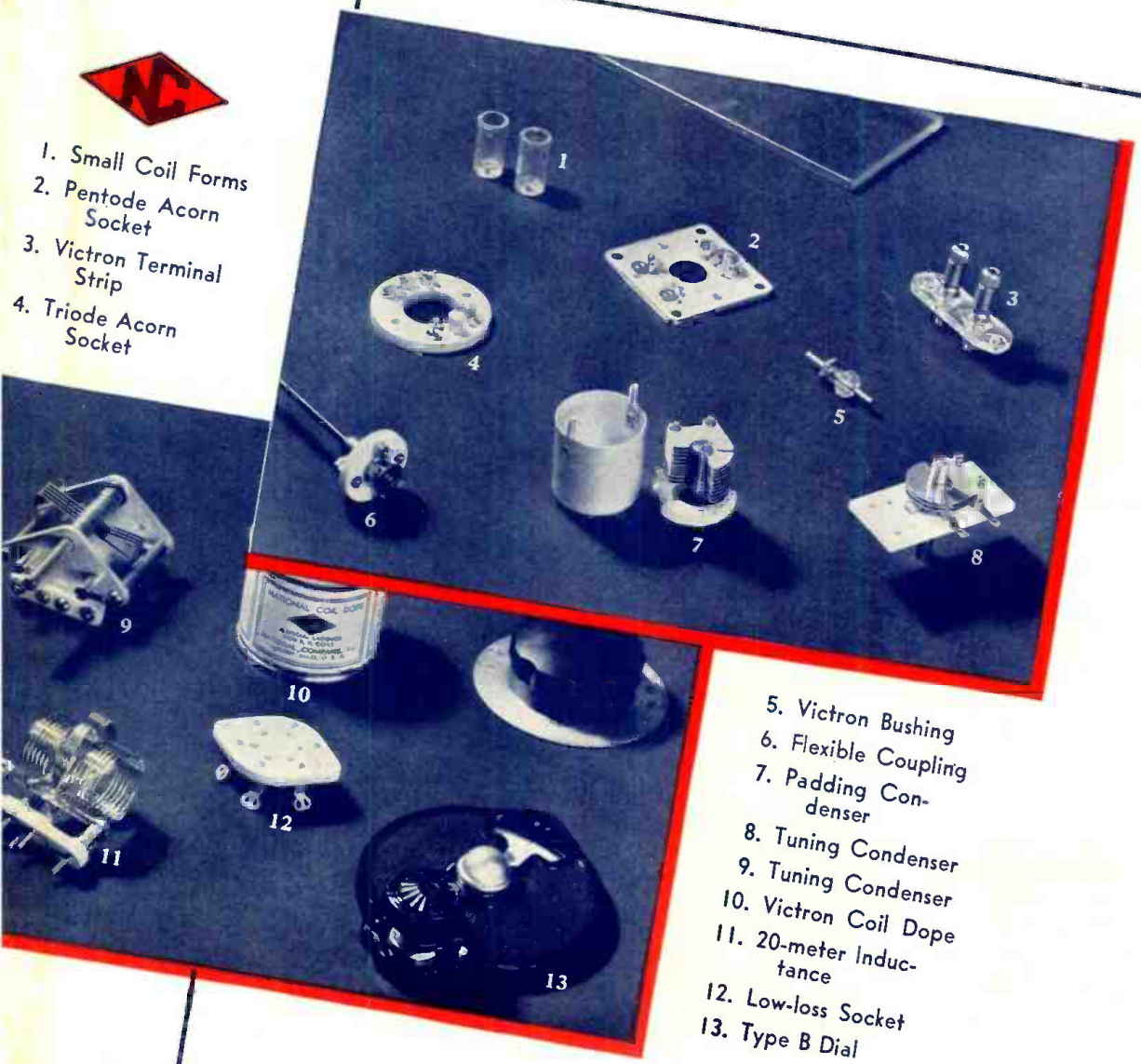

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RADIO & TELEVISION

The Popular Radio Magazine

November — 1940
Vol. XI No. 7

HUGO GERNSBACK, Editor
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In This Issue

Cover Composition by Hugo Gernsback and Thomas D. Pentz

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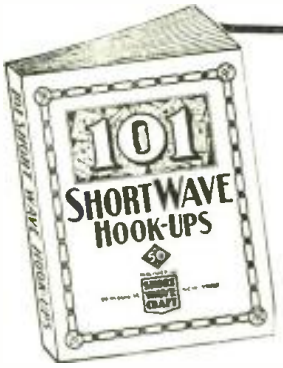

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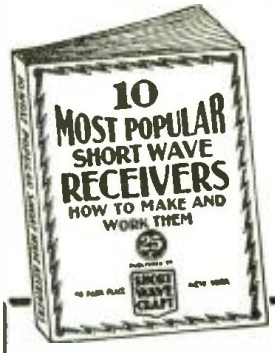

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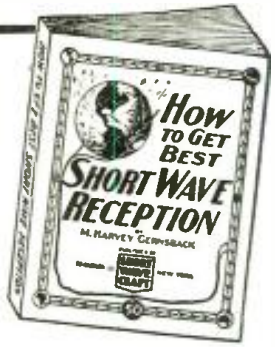

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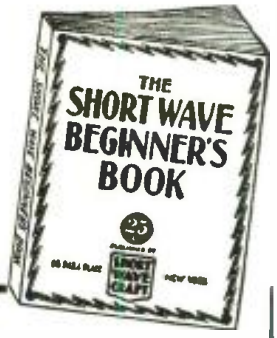

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Editorial

RADIO SOLVES WAR PROBLEMS

By HUGO GERNSBACK, Editor

PERHAPS it is a trite saying by now, that it would be quite impossible for any nation to conduct a modern war without the use of radio, and all its ramifications. Where instant communication is necessary between all units of the armed forces, be they on land, water or air, it is unthinkable that the efficient modern results could be had without radio.

Indeed, radio has become so important a war adjunct, that more and more attention is paid to it by the military authorities of all countries, while the warring nations are trying to outdo each other in springing surprises on the enemy.

During the middle of September, the press informed us that the British had given up the use of their searchlights when fighting German night raids over London. It was said that a new "weapon" was used, making it unnecessary to use searchlights, because the anti-aircraft guns were now being trained automatically on the enemy planes by other means.

The reason that searchlights will soon be obsolete, is for the obvious reason that enemy airplanes usually try to put searchlight batteries out of the running by bombing or machine-gunning them at close range. Thus, both the Germans, as well as the English, have destroyed many searchlight stations by this means.

A much more effective way to deal with enemy planes is short-wave radio, by means of the so-called "micro waves." Years ago experiments were made, both in Europe and the United States, and it was found that it is not difficult to train a special radio beacon skyward, and have these waves reflected back to earth where they are intercepted by a specially built radio receptor. With this radio instrumentality, it is possible to locate enemy airplanes accurately, and then point the anti-aircraft guns automatically on the target thus revealed. I feel certain that this is the "new" weapon that the British are using today in effectively blasting enemy airplanes out of the sky without ever having recourse to the obvious nuisance of searchlights. Searchlights are also ineffective in fog, as well as when clouds intervene between the ground and enemy aircraft. Radio waves are not hindered by such obstacles, as they pass right through fog and clouds as if they did not exist. There is nothing new about all this, except that during the five or six years interim when this new means was first tried out, many improvements have obviously been made. It is patent that the British have perfected the "radio searchlight," and from all accounts, the device seems to work well.

I first spoke of this invention some years ago, and I am reprinting one of my former editorials which appeared in the November 1935 issue of this magazine (then called SHORT WAVE CRAFT).

Incidentally, it will be noted that practically all of the predictions made by me five years ago, are now actual fact.

I am equally certain that radio, in the near future, will play an increasingly important rôle in warfare, as it is now conducted.

SHORT WAVES AND WAR

An Editorial by HUGO GERNSBACK

(Reprinted from the November, 1935, issue of SHORT WAVE CRAFT)

● DURING the World War, the vacuum tube had just begun to make its appearance and it was not until the end of the war that really good vacuum tubes had been perfected. Short waves at that time were not much in vogue and had only been used experimentally. Not very much was known of their behavior in space and whatever signalling was done during the war was done at the higher wavelengths, rather than on short waves.

The next war will see profound changes in all branches of warfare and one of the most interesting ones will no doubt be that involving instrumentality of short waves.

Short Wave Craft has repeatedly chronicled the latest inventions used in conjunction with short waves. Recently the so-called *mystery ray* has been given quite a good deal of publicity in the press. It seems this particular ray, which is nothing but micro short waves, was simultaneously developed by the United States Army, also in Germany, and by several other powers as well. These *micro waves* appear to pierce fog and even clouds, and work along optical lines. It will be impossible hereafter for an airplane to hide in the fog and even behind clouds, because the mystery wave directed against it is reflected down to earth where it is used for recording or alarm purposes.

A city, during the next war, will easily be protected against unheralded enemy aircraft by having a barrage of such micro waves surrounding the entire city, the action being automatic in such a manner, that automatic recording instruments will immediately sound the alarm when an airplane appears overhead within the confines of the city. It will be impossible, in the future, for an enemy airplane to get through such a short-wave barrage.

This, however, is only one of the more spectacular war uses of short waves. For propaganda purposes all of the short-wave stations of the various nations will be worked at full blast! One nation will outshout the other, in trying to tell the enemy population certain war facts which the home government may wish to suppress at all costs. We will then have the interesting experience where one government, in order to defeat this purpose, will try to "jam" the enemy station from sending out such propaganda by broadcasting on approximately the same wave. This would then nullify the enemy's efforts because listeners could no longer make out what the foreign messages were.

For communication purposes, between Army units, exceedingly short short-waves will be used; each battalion will have its own short-wave set, which will be so small that one man can easily carry it. In this manner it will be possible to keep in touch with headquarters all the time. Of course, it will be argued at this point that the enemy will hear all these messages. This is true, and it should not be forgotten that we also hear the ones from the other side as well. This need not disturb us, because the messages can be in special codes, so that if the enemy gets the information they will not be much the wiser. These codes are changed quite frequently so that the enemy cannot understand them.

However, when it is necessary to keep the messages secret, we will make use of special directional or radio beams, which can be directed exactly the same as a searchlight, with the assurance that the enemy cannot eavesdrop on the message. It is to be expected that such directed beams on ultra short waves will come into general use during the next war and, as a matter of fact, practically all armies have experimented with the system and several have adopted ultra short waves for such communication.

The same reasoning holds true for airplanes. Here also, special equipment, whereby an airplane can send out a sharply focused beam wave, which cannot be intercepted by the enemy if the usual precautions are taken, will be used.

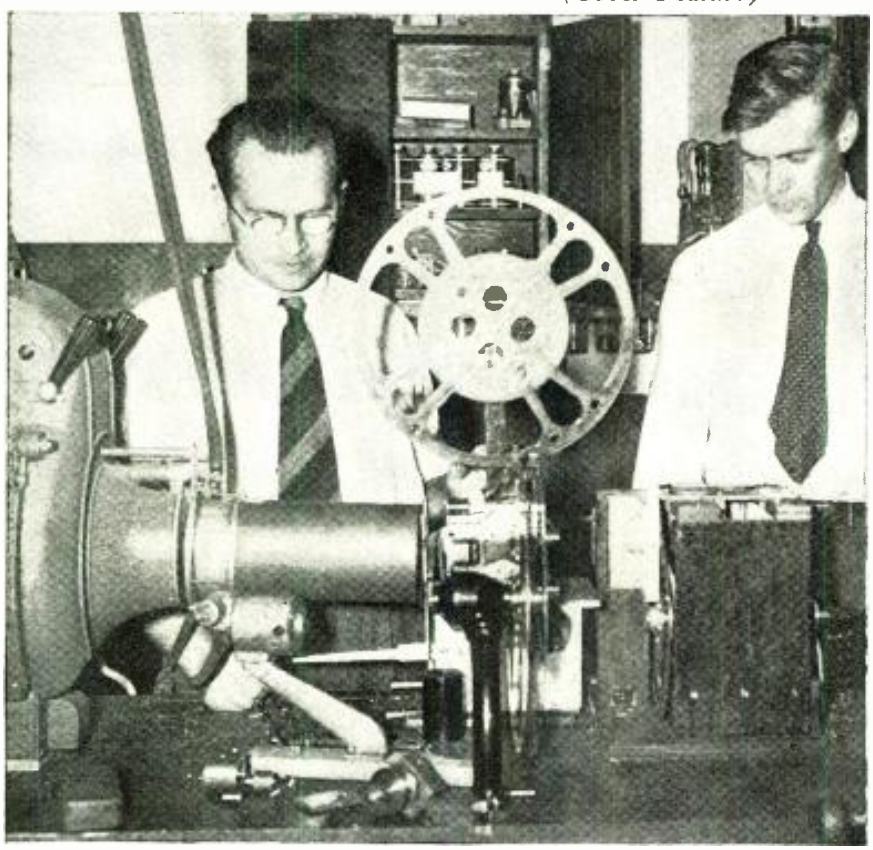
It will even be possible for outposts, where it is impossible to use telephone wires, to employ short waves for communication purposes to the rear. Short-wave sets have already been designed which can be carried on the back of any soldier. These are usually small battery operated affairs that weigh a fraction of a pound. The operator finds it easy to direct the micro wave back to his own lines, so that the enemy cannot intercept the message. This is also done by special beam-reflector work.

These ultra short waves will also be used where small mines, planted in the soil, can be hidden at strategic points, bridge approaches, etc., ammunition dumps, and wherever necessary. By a special combination impulse, the mine can be exploded at any time, although a special formation of signals are necessary before this can be accomplished. No wires are used, and the destruction can be effected especially during the retreat of troops in order to hamper the movements of the enemy.

There are, of course, hundreds of other uses of short waves for warfare purposes, many of which are secret and about which little or no publicity has, as yet, been given.

Color Television Demonstrated

(Cover Feature)



Dr. Peter C. Goldmark (left), CBS chief television engineer and inventor of color television, and J. N. Dyer, assistant chief television engineer, at the color television projector.

Television images in full colors were recently demonstrated in the laboratories of the Columbia Broadcasting System, using apparatus developed by Dr. Peter C. Goldmark, 34 year old scientist. The images were derived from Kodachrome 16 mm. movie film at the transmitter, where a color filter disk was inserted between the film and the iconoscope. This filter disk consisted of *two* sets of color filters: red, blue, green; red, blue, green. A similar disk (but naturally of much larger size) was placed in the receiver cabinet between the viewers and the end of the cathode-ray tube. These disks were operated synchronously as the image at the transmitter was sent out. The disk at the receiver is kept in synchronism by means of a framing impulse transmitted through the air, although it operates from the same power source as the receiver tubes. Surprisingly enough, the disk need have a radius no greater than the diameter of the tube, for its shaft is positioned directly at the tube. The film used was taken at 64 frames per second but it is stated that the usual 24 frame film can be used with no additional defects.

There is some question, however, as to whether or not it will be possible to get sufficient intensity of artificial light to afford *live* pickups, when at the same time generating so much heat that the performers will be even more uncomfortable than they are in the present "black-and-white television" studio.

The pictures demonstrated at Columbia Broadcasting System consisted of 343 interlaced lines. Although this is considerably fewer than used in standard black and white television operation, detail was good. However, Dr. Goldmark is working to increase the number of lines beyond the 400 point without having to exceed the 6 mc. band.

Another feature of his system is that the light impulses from the film, after passing through the color filters, are made to fall upon photo-sensitive materials, the output of which can be controlled by *separate* gain controls. This makes it possible for the program director to correct or, if desired, overcorrect, for any color desired.

The picture is completely scanned every 60th of a second instead of every 30th. The following sequences are of interest.

The odd number lines are scanned in red in 1/120th of a second. The even number lines are scanned in green in 1/120th of a second.

At this point the *whole picture has been scanned*, but *there is yet no blue in the picture*. Time thus far: 1/60th of a second.

Now the red on the odd number lines has faded and these same lines are scanned in blue in 1/120th of a second.

At this point the whole picture has been scanned *one and one-half times, but in full color only once. Time thus far: 1/40th of a second.*

Now the green on the even number lines has faded and these same lines are scanned in red in 1/120th of a second.

At this point the picture has been scanned twice but in full color only once and a third. Time thus far: 1/30th of a second.

Now the blue on the odd number lines has faded and these same lines are scanned in green in 1/120th of a second.

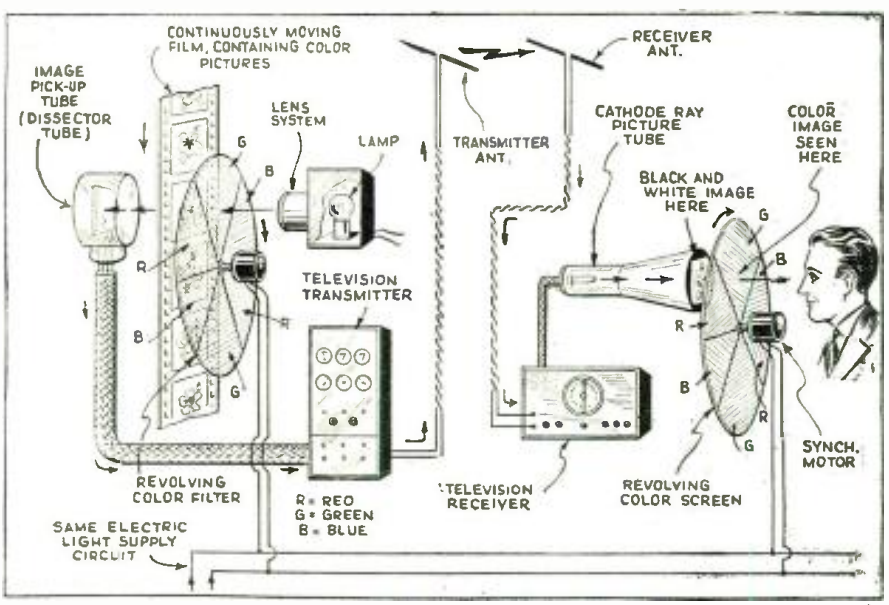
Time thus far: 5/120th of a second.

Now the red on the even number lines has faded and these same lines are scanned in blue in 1/120th of a second.

At this point the whole picture has been scanned three times and in full color twice. Elapsed time thus far: 1/20th of a second.

And now the whole progressive cycle begins again with the even number lines being scanned in red.

When there is no color disk in front of the receiver tube the picture appears as a black and white image.



This special diagram shows the principle upon which the new color television operates. The color film used at the transmitter was made on Kodachrome stock. The color images may be picked up as "black and white" pictures on standard television receivers.

New Eyes for Airplanes

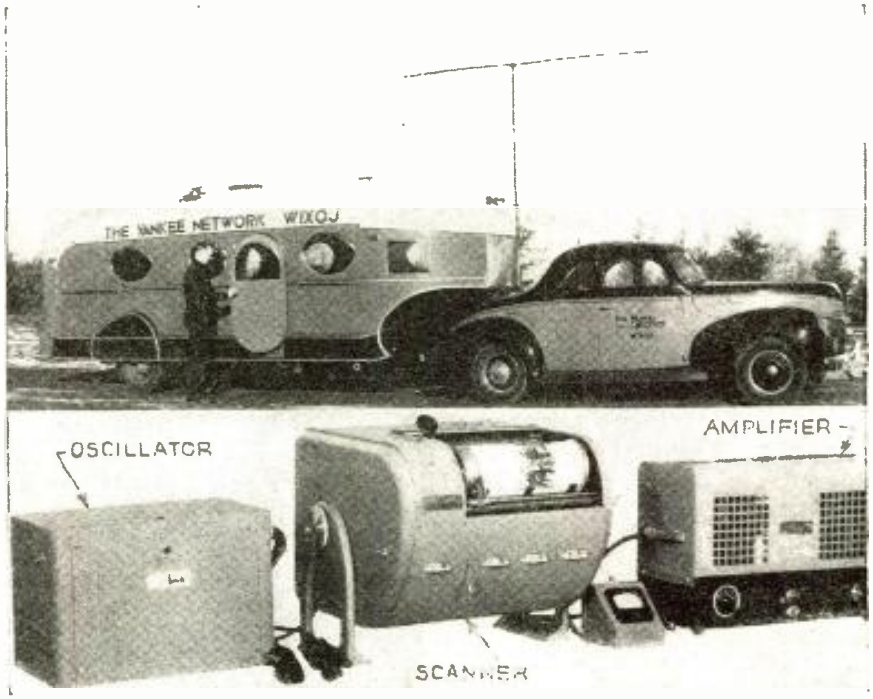
(Cover Feature)

Sketches can be transmitted from airplanes to their ground stations and vice versa by means of the new lightweight Finch facsimile transmitter-receiver. This is the device which is being added to some observation planes in the United States Air Force. It weighs but 35 lbs. and is extremely simple in operation.

Facsimile apparatus has been used by German planes almost since the beginning of the war and has recently been adopted by the British. In the United States, the receiving equipment is connected directly to the output of a radio receiver in place of a loudspeaker, while the transmitting equipment connects to the input of a transmitter in place of a microphone.

According to officials of the facsimile manufacturing company, the apparatus is self-synchronizing and can send or receive material at the rate of approximately 8 square inches per minute. The paper used is dry and images are recorded by electrochemical means. It is possible to operate this equipment on a separate channel without interfering with the plane's regular radio communications.

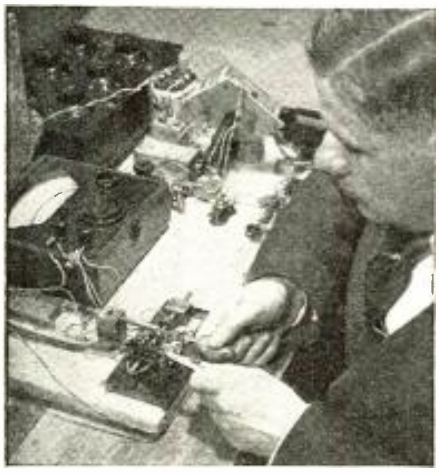
Another application, illustrated herewith, is the use of *facsimile trailers* for military purposes. The coupe contains complete facsimile equipment—including a receiver and a 1000-watt transmitter. This apparatus is shown in the insert. The trailer, which contains similar equipment but a more powerful transmitter, may be parked at any desired location and the coupe uncoupled from it. The coupe then may go out on scouting trips and flash facsimile images back to the trailer, which can promptly relay them to headquarters. This highly mobile scouting equipment can be of great value in military operations.



The newest high-speed facsimile apparatus. The car can go to the scene of an accident or other event, relay the picture to the trailer, which in turn can relay the picture back to the main station.

Magnetic Ultra-Micrometer

Described in the *Bell Laboratories Journal* is an ultra-micrometer which is able to measure the thickness of a thin coating of metal or paint on a backing material without damaging such coating. The Laboratories have devised a method of making this measurement through the use of magnetic probes when the backing material is composed of any magnetic substances.

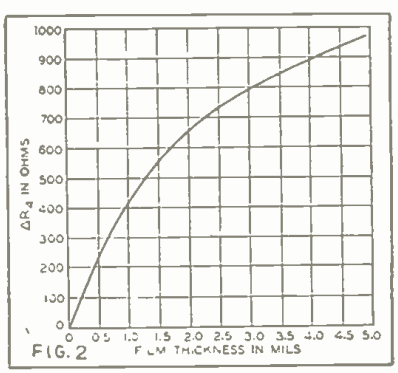


The new magnetic ultra-micrometer, which can measure the thickness of thin metallic or paint coatings.

The measurements are made by comparing two magnetic circuits which have the test specimen between them as a common part of both circuits. This is shown in Fig. 1. The non-magnetic film on one side of the specimen introduces a gap in one of the circuits (which are otherwise identical), and this causes unbalance. The thickness of the film which is to be measured is indicated by the degree of unbalance.

In Fig. 1, P1 and P2 are two magnetic probes which are wound with exciting coils C1 and C2, and exploring coils S1 and S2. C1 and C2 are connected to a constant source of 110 volt 60 cycle A.C., while S1 and S2 form a bridge circuit with resistances R3 and R4. The output of transformer T2 measures the unbalance of the bridge. This output may be changed to D.C. by means of a thermocouple, a copper-oxide rectifier or a commutator. It is read on a D.C. galvanometer or microammeter.

In use a strip of iron as thick as *the test specimen plus the non-magnetic coating* is placed between the probes. The bridge is then balanced by adjusting R4 and the test specimen is substituted for the iron strip. The unbalance of the bridge is read on the galvanometer, which has been calibrated by means of strips having surface deposits of known thickness.



Curve shows the thickness of a coating in mils in relation to change in resistance of R4.

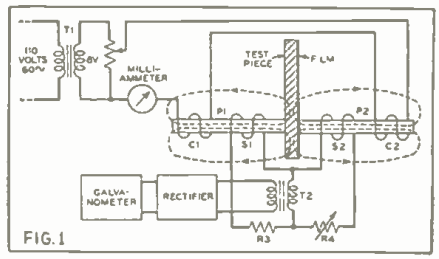
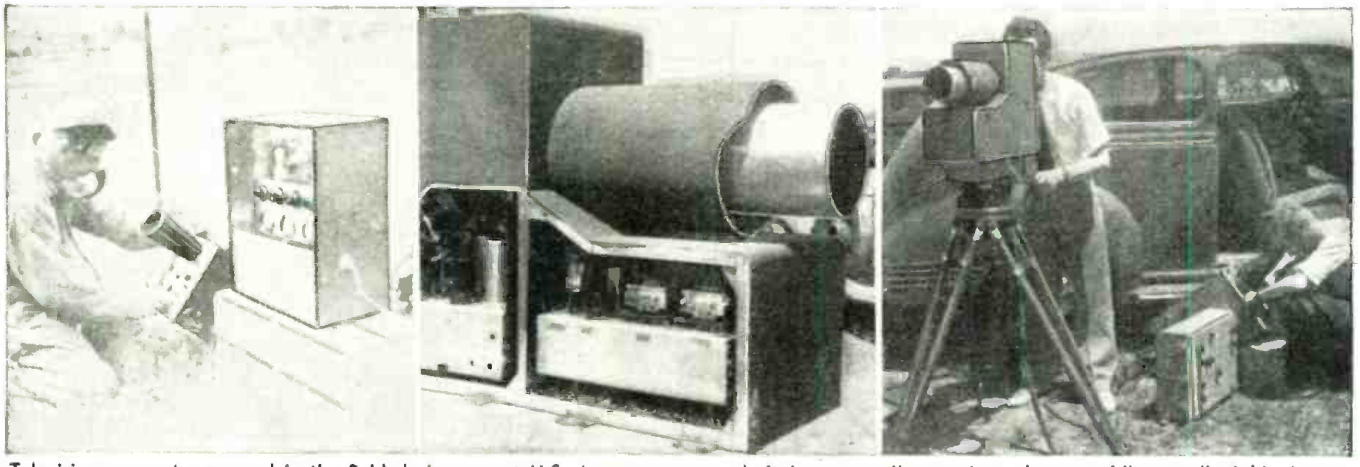


Diagram of bridge used for measuring thin films or coatings.

Another method of making the measurement is to reduce the output voltage of T2 to zero by adjusting R4 to balance the bridge with a test specimen, and then noting the change in resistance. Fig. 2 is a curve which shows how the thickness of the coating in mills is read against change in resistance R4 in ohms. The photograph shows how this compact bridge is used.



Television apparatus as used in the field during recent U.S. Army maneuvers. Left, image monitor; center—close-up of "camera"; right—image pick-up camera set up for use.

Television for Military Use

During the recent "War Games," Allen B. Du Mont Laboratories arranged with Army officials to send a fully-equipped mobile television unit together with 15 operators for the use of the "defending army."

Establishing a base on the campus of St. Lawrence University at Canton, N. Y., the television crew worked quickly to get their portable equipment into action. In short order these experts were flashing scenes of troop movements to televiewing posts at the headquarters of the "Defending Army," and a new chapter in scouting history was written.

A 50-watt transmitter was installed in the Physics Building at St. Lawrence University. The television antenna was raised to the top of one of the towers of radio station WCAD, located in that building. On the college Chapel Tower, less than 200 feet from the Physics Building, was mounted a second antenna serving as a relay link in picking up image signals transmitted by the mobile unit as it moved across "No Man's Land." These signals were sent via coaxial cable to the main transmitter for re-transmission to receivers at Second and Third Corps Headquarters.

When word was received that troops were moving in the region of Canton, the television crew went into action. A small truck, carrying the complete mobile television pickup equipment, rushed to the scene of military operations. Following close behind was an Army truck carrying a motor-generator unit, since there was no time to be lost in making contact with electrical energy. The mobile unit, powered with a 25-watt relay transmitter, was set into motion in about the time it takes a newsreelman to get his camera rolling. As the pictures were picked up by the television camera, they were instantly translated into electrical equivalents which were flashed to the relay receiver and main transmitter for re-transmission to the Second and Third Corps Headquarters.

Engineers stationed in the tower of the Chapel checked the images as they were received, and sent the signals via coaxial cable to the control room in the Physics Building. There they were finally scanned on a monitor and sent to the Army officers who watched the action with avid interest, by means of Du Mont television receivers installed at Heuvelton, DeKalb Junction and Canton. Images were clearly received according to the television experts and gave our military leaders an idea of how effective a part television can play should warfare actually visit America.

In addition to pickups from the "field of battle," television engineers set up their camera at the Message Center in Canton, from which point Army officers took part in the telecasts.

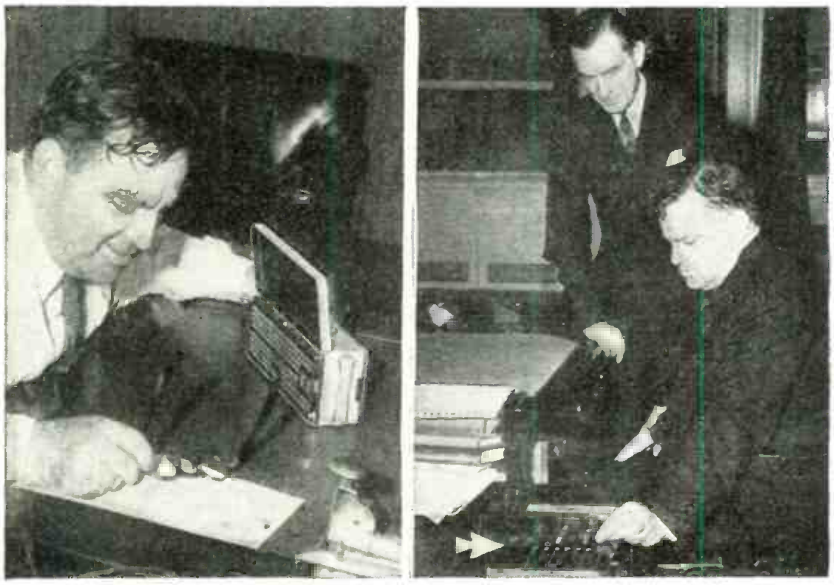
OUTLAWING INTERFERENCE

"*Diallist,*" the erudite feature writer of Great Britain's *Wireless World,* bewails the fact that no laws exist to suppress at their source causes of interference with radio reception. He says, "No government would dare to prohibit their use and if the sales of such appliances were made illegal, it would be many years before all of those now at work were worn out. It looks, then, as if we must regard radiation by apparatus of countless kinds as a necessary evil. We can't suppress it at its source, for matters have gone too far for that. We shall have to tackle the problem entirely from the other end, by endeavoring to make receivers immune from the effects of unwanted radiation. It may be that this will be accomplished by developments in anti-interference systems combined with better screening *(i.e., shielding)* of receivers. But it is also possible that frequency-modulation will show the easiest way out of the difficulty."

In the United States of America, however, steps are now being taken to eliminate one of the most prolific sources of radio interference—shortwave diathermy apparatus. According to the measures under consideration, the use of such apparatus will by no means be forbidden. Instead it is proposed to allocate a specific frequency band for the use of such medical aids.

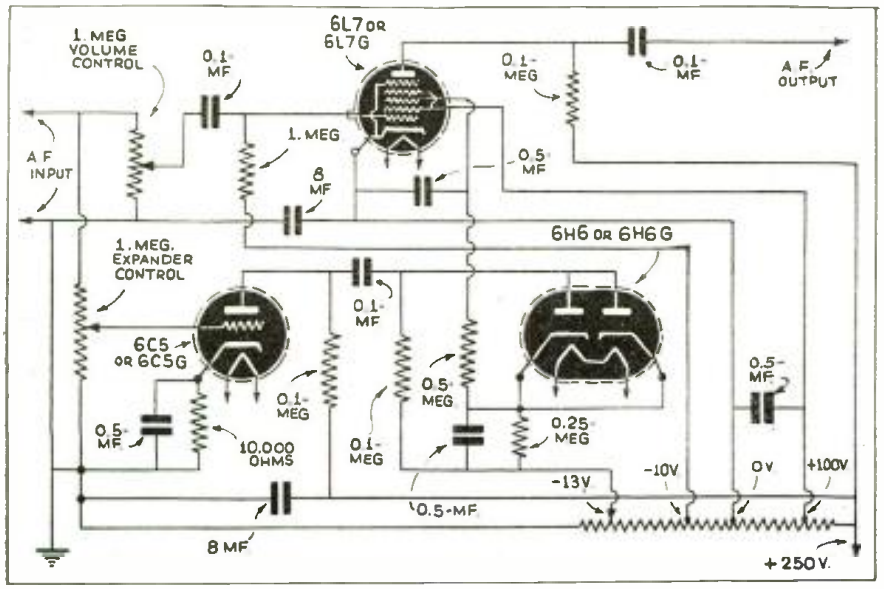
PRESS AGENTS GET TOGETHER

Two shrewd press agents got to Fiorello La Guardia, New York's scrappy little Mayor, last month. The Pilot press agent installed a portable receiver in the "Little Flower's" desk drawer, in such a way that it turns *on* and *off* automatically when the drawer is operated. The RCA press agent set up one of the new *Personal* radios on the Mayor's desk to enable him to "keep in touch with world events."



New York's Mayor La Guardia listening to RCA "personal" radio (left), and a Pilot set at right.

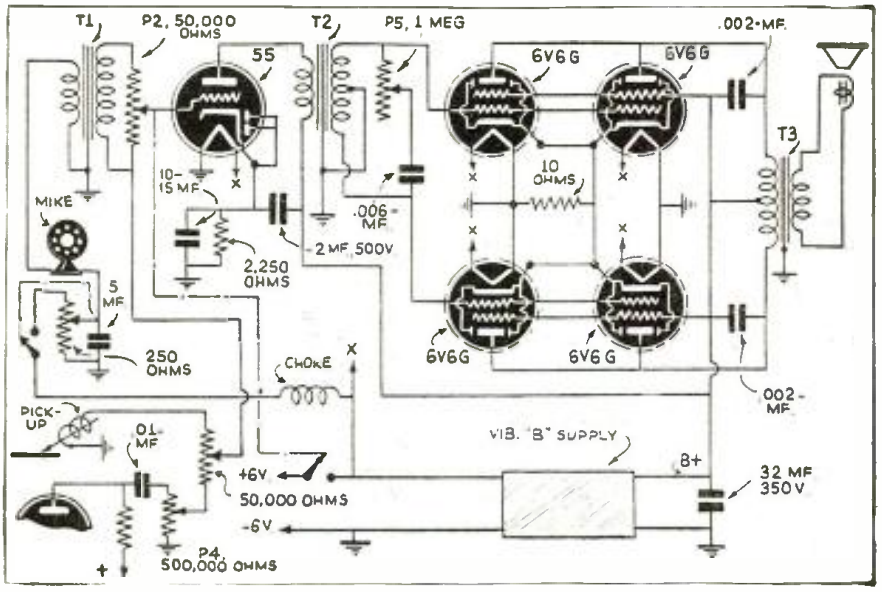
Preamplifier and Volume Expander for Pickup



● AN ingenious unit which combines the function of preamplifier and volume expander for use in connecting a pickup to a public address amplifier is described in *Radio Tecnica* of Buenos Aires. The circuit uses a mixer of the 6L7 type. The output of the pickup is connected to the No. 1 control grid through a shielded lead, and a 13 volt negative potential is applied to grid No. 3 to reduce the amplification factor of the tube. The 6H6 is connected as a simple rectifier and is connected to the plate circuit of a 6C5 through a .1 mf. condenser. According to the author, Juan C. Correa, the soft passages of a recording are made softer and the loud passages more forte. The unit may draw its filament supply from a filament transformer and its plate supply from a 250-300-volt power pack. The 15,000-ohm, 15-watt bleeder connected across the supply furnishes the proper voltages for the various stages. Incidentally, it is possible to connect a detector output in place of the crystal pickup.

Small 6-Volt Audio Amplifier

● A SMALL six volt amplifier excellent for P.A. or phono work in an automobile or truck is described in *Radio Tecnica* of Buenos Aires. Used in conjunction with a vibrator type battery eliminator, this unit is automatically biased from the six volt battery. It makes use of a 55 tube in its first or driver stage and a layout of four 6V6G's in push-pull parallel to afford ample output for loudspeaker operation. 28 watts output can be had without overloading the final stage if 285 volts are available for the plate circuits. A triple fader circuit is employed, so that the input of this amplifier may be switched from microphone to pickup or to the output of the radio receiver used in the car. As these variable resistances are not ganged, any two or all three of the inputs may be mixed. The author of the article recommends that a high quality B eliminator be used, and that the output transformer have a primary impedance of 5,000 ohms. All other values are shown in the diagram.



Reducing Losses in S-W Sets

● THE reduction of losses in shortwave receivers is discussed by O. J. Russell, writing for *Electronics and Television & Short-Wave World*. Mr. Russell points out that the input impedance of a typical tube operating at 60 mc. is approximately 5,000 ohms and that such low impedance causes considerable damping when high impedance inputs are used. A partial solution to this problem may be had by tapping the grid of the R.F. amplifier down on the tuned circuit. Thus, if the tube input impedance is 50,000 ohms and the tuned circuit of 20,000 ohms dynamic impedance, both sensitivity and selectivity are improved by connecting the grid half-way down the tuning coil. If the grid is connected further down the coil, selectivity is increased but amplification drops off.

This author recommends the use of ceramic capacitors for the shortest wave bands in order to reduce self-inductance in the by-passing capacitors. He points out that the inductance of the by-pass leads plus that of the capacitor and the capacity of the latter form a series tuned circuit.

Another point which he brings out is that the inductance of the cathode lead reduces input impedance and gain in a power stage due to a degenerated feedback. In order to avoid this effect as much as possible, the cathode-to-ground path must have a minimum inductance. This can be done, he suggests, by using the cathode pin (terminal) as the *common* grounding point for its particular stage. Figures 1, 2, and 3 show some of the ideas which this author sets forth.

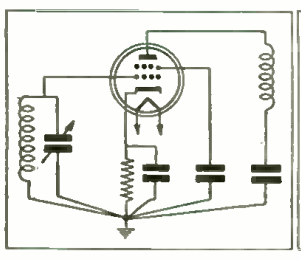


Fig. 1

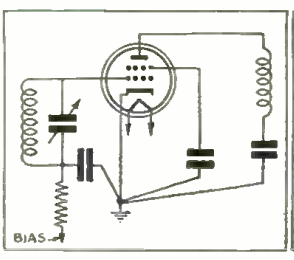


Fig. 2

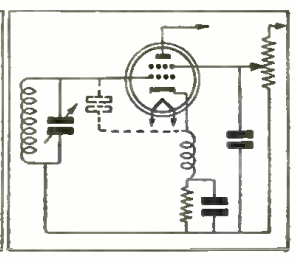


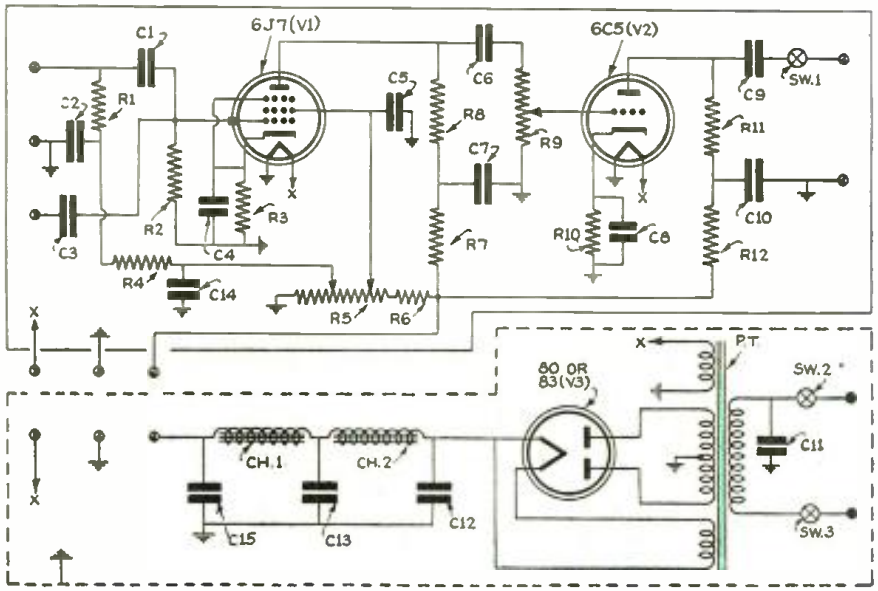
Fig. 3

High-Gain Preamplifier

● THE Argentine radio publication *Revista Telegrafica* describes a high-gain preamplifier for use with photo-electric cells and other applications. The article, written by Javier E. Poledo, LU5CK, describes a simple 2-stage amplifier which uses only inexpensive parts in addition to the power pack. The undistorted gain of this apparatus is 64 db., and it will operate with an input as low as –72 db. In addition to use with photo electric cells, it can be operated from crystal, dynamic or velocity microphones. The tubes used are a 6J7 in the first stage and a 6C5 in the last stage. The rectifier used in the power-supply can be an 80 or 83. In use, the input may be connected either directly to C1 and C2 or to C1 and C3, as the binding posts show. Transformer T1 provides 420 volts on each side of the center tap. Forty-five and fourteen henry chokes CH1 and CH2 are capable of carrying 35 ma. each.

Outside of the usual precautions of avoiding interstage coupling and of using leads as short as possible, the construction is exceedingly simple. The only two variable components are R5—a slider type resistor—and R9—a 25,000 ohm volume control. A list of the values of the various parts follows:

R1 —1 megohm
R2 —500000 ohms
R3 —1200 ohms
R4 —1 megohm
R5 —50000 ohms, 25 watts
R6 —50000 ohms, 2 watts



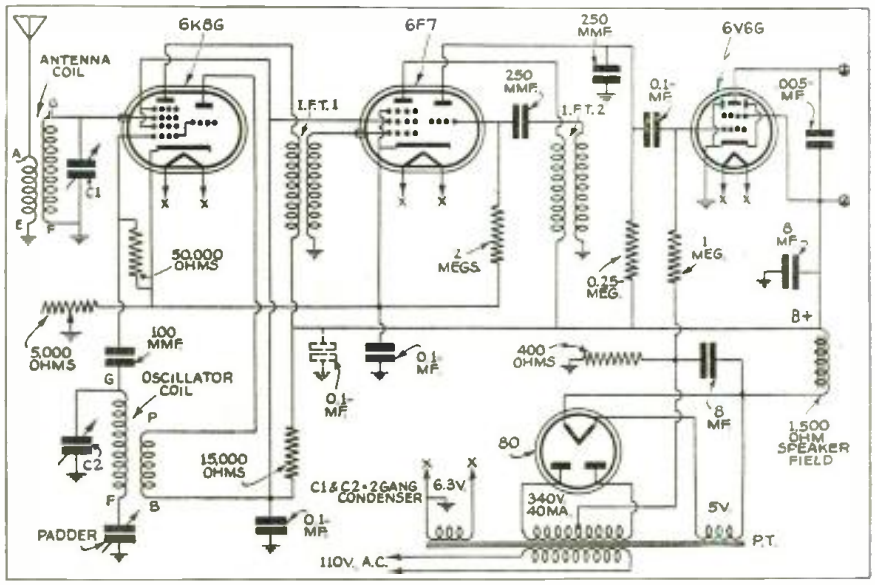
R7 —10000 ohms
R8 —90000 ohms
R9 —250000 ohms
R10—1000 ohms
R11—20000 ohms
R12—5000 ohms
C1 —0.1 μF
C2 —40 F, 450 volts
C3 —0.1 μF
C4 —40 μF, 25 volts
C5 —8 μF, 450 volts
C6 —0.1 μF
C7 —40 μF, 25 volts
C8 —40 μF, 25 volts
C9 —0.1 μF
C10—40 μF, 450 volts
C11—0.1 μF
C12, C13, C15—8 μF, 750 volts
C14—8 μF
CH. 1—45 henries
CH. 2—14 henries
P.T., 420 v. C.T.; 80 ma.
SW1 & SW2 Ganged
(Note—μF = mf.)

4-Tube Superhet

● THE 4-tube superheterodyne for broadcast reception is described in the *Australasian Radio World*. This little set makes use of a 6K8G as mixer, 6F7 as IF and second detector and 6V6G as output tube. The power-supply, designed for A.C. operation only, uses an 80 as rectifier. The author points out that this set was designed to cost an absolute minimum to construct and to out-perform any other similar set as yet used in the Antipodes. All parts are standard and easily obtained in any radio store. The major ones consist merely of an antenna coupler, an oscillator coupler, and a pair of intermediate frequency transformers.

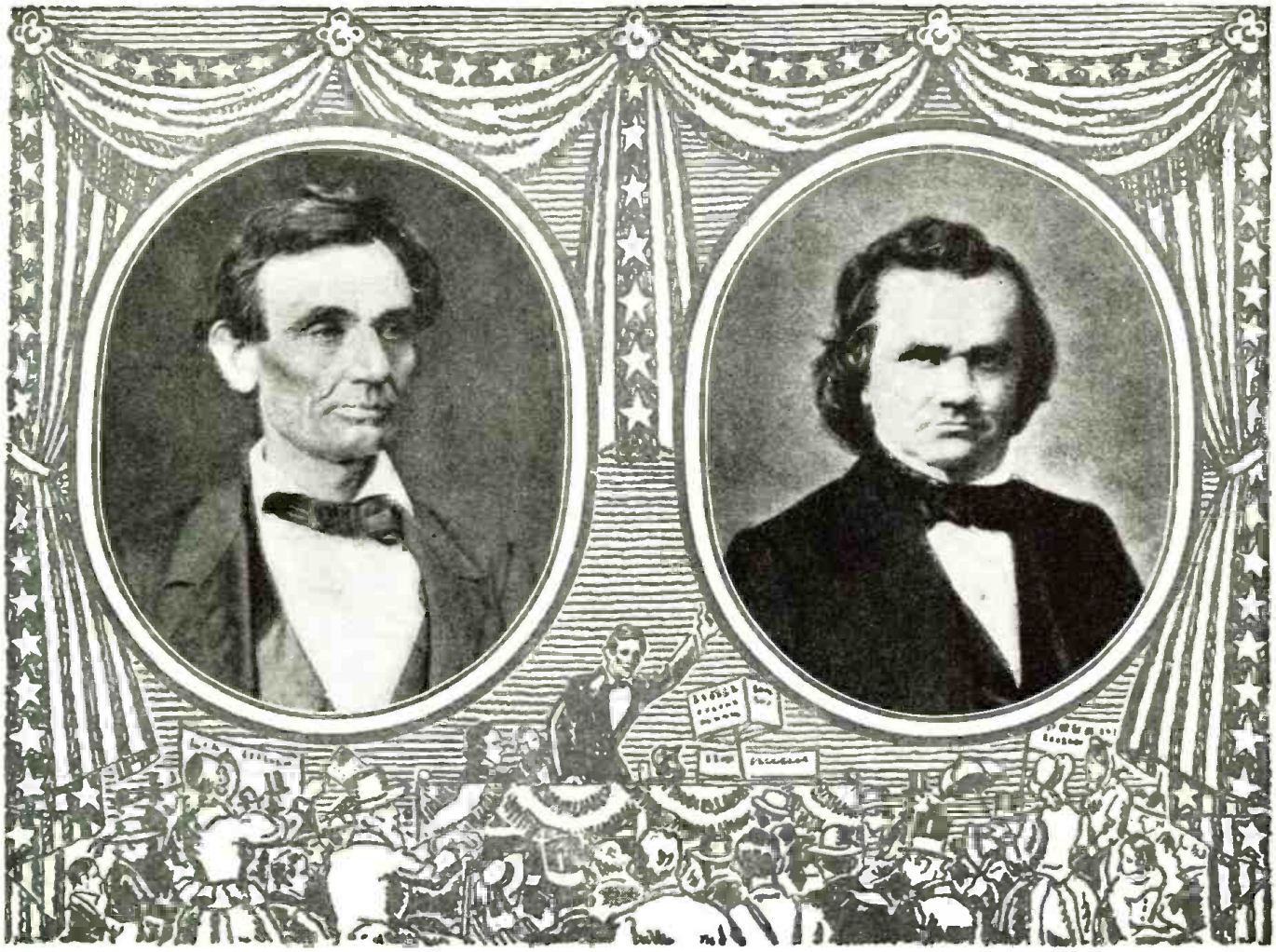
The set is laid out as compactly as possible, with the tuning condenser at the left hand side and the volume control directly below it. The power transformer is rated to supply 340 volts at 40 ma.—ample for this receiver, as the tubes are used somewhat below their maximum ratings.

An experienced constructor should build this set in one evening.



Can YOU Answer These Radio Questions?

1. Can you explain in simple language just how color television works? *(See page 390)*
2. What is the purpose of a vacuum tube in a tuning meter circuit on a receiver and how is it connected? *(See page 400)*
3. Is a tickler coil used in a simple tuned radio frequency receiver? *(See page 404)*
4. Name at least one effective method of smoothing up a regeneration control and draw the connection. *(See page 406)*
5. Can you describe a simple method for reading the current in several parts of a radio transmitter circuit, using but one meter? *(See page 407)*
6. What is the relation in physical dimensions of the radiator, the reflector and the director in an inverted doublet antenna? *(See page 410)*
7. Is it necessary to use spark suppressors on the engine of a car used to carry a mobile 2½ meter transceiver? *(See page 419)*
8. What means would you employ to measure the unbalanced condition of a capacity and resistance bridge designed for radio purposes? *(See page 423)*
9. What is a simple method of recording a facsimile picture? *(See page 426)*
10. What is the effect of connecting a parallel resonant circuit in the antenna system of a receiver? *(See page 437)*



Through Radio, All America Could Have Judged the Lincoln-Douglas Debates

IN 1858, Abraham Lincoln, then an Illinois lawyer, debated states' rights and the vital slavery question with Stephen A. Douglas. These debates have been called the most important in American history—yet only a few thousand people in Illinois were able to hear them. Other Americans were kept in ignorance until, weeks and months afterwards, the speeches were sketchily reported in the journals of the day.

Today, with the miracle of radio, statesmen are able to speak directly to millions of Americans, keeping them constantly informed on the vital issues affecting our nation. And as a result, we are the best informed people on earth.

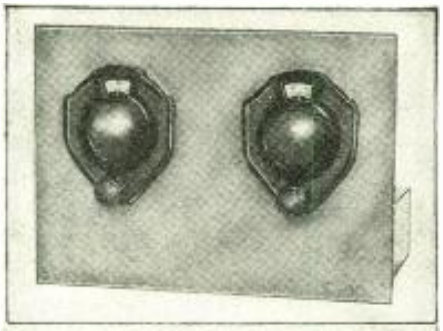
Two great networks of the National Broadcasting Company, an RCA Service, operate a total of 35 hours a day, broadcasting important news matter as well as entertainment and educational programs.

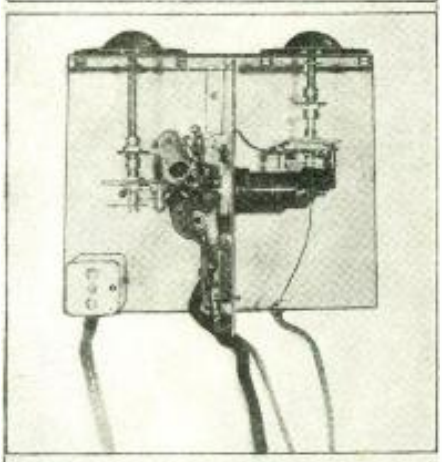
Instant communication to and from leading nations of the world is provided through R. C. A. Communications, Inc. And in RCA Laboratories, fountain-head of radio progress, engineers are continually at work pioneering new developments in radio and sound. These developments are made available to RCA licensees, so that America and the world may enjoy better radio receivers, records, transmitting apparatus and other radio and sound equipment.

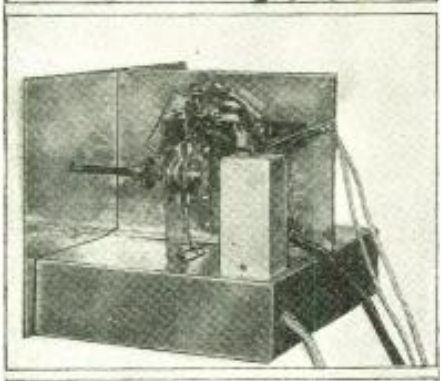
★ ★ ★ ★ RCA ★ ★ ★ ★

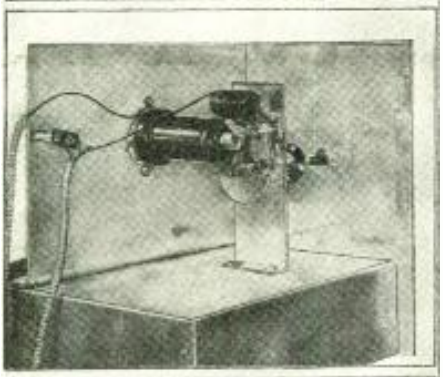
Radio Corporation of America

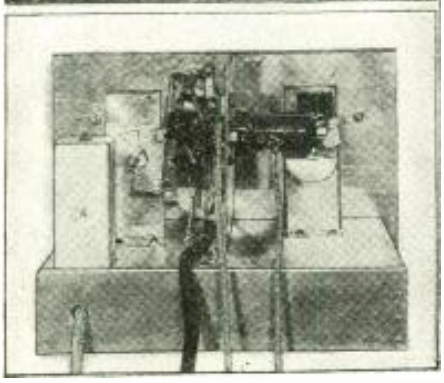
Radio City, New York
RCA Manufacturing Company, Inc.
Radiomarine Corporation of America
National Broadcasting Company
R.C.A. Communications, Inc.
RCA Laboratories
RCA Institutes, Inc.











5 AND 10 METER CONVERTER

James White

Here is a handy converter which will appeal to the short-wave fan as well as to the Ham. It uses a single 6K8 tube and the other parts may be found in the odd-parts box.

● TO make a long story short, I wanted a good converter—not the best in the world—but one that would live up to the word *good*. With this in mind and one eye directed at an almost "flat" pocketbook, I began.

First came the selection of the foundation: in view of the ease of work and price, I decided on a 7x9x2 inch electralloy chassis, and a 7x10 inch 16 gauge aluminum panel. The shield, on which is mounted the tube and majority of parts, is of the same material as the panel; the dimensions are 5x7 inches with a half-inch lip turned up for mounting.

Next came the selection of the parts to be used, the 15 mmf. variable condensers are, I believe, the cheapest available, costing 35 cents each new. The balance of the parts, with the exception of the condenser couplings and fibre shafting, can be found in the usual junk box. Just one caution here, use only a good grade low-cost tube socket—it pays in the long run.

All of the wiring around the tube socket can best be done before mounting; the same applies to both variable condensers. After this is completed, there is left only the connecting of the different units. Of course, all of the drilling is completed first. The grid section is mounted to the right, looking from the rear. Here is the tube and the complete grid-tuning section, which, by the way, consists of a variable condenser and a coil; the latter is mounted directly on the rotor and stator terminals. To the left is the oscillator section and the majority of parts.

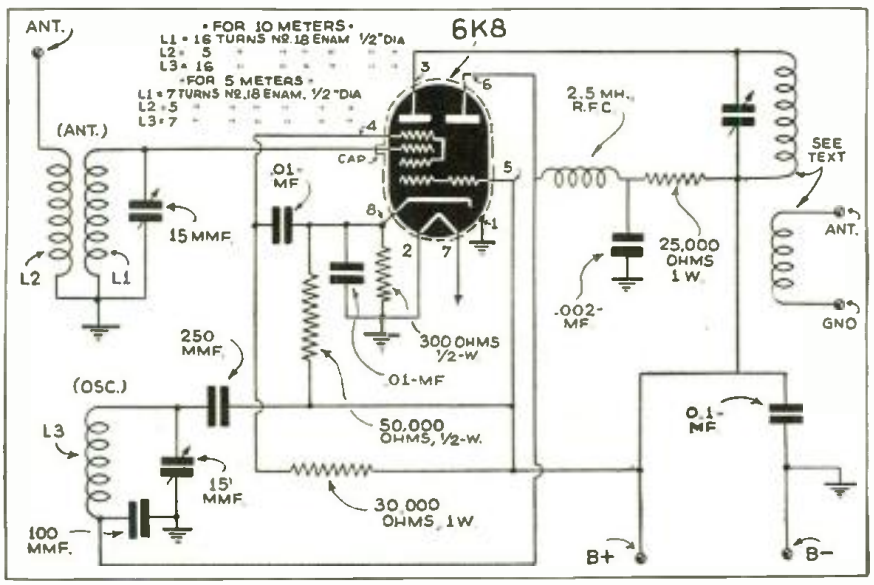
Care should be taken to get the wiring correct. The I.F. coupling unit located at one side of the shield can be constructed from any I.F. transformer, the one I used was a former 262 kc. The wooden dowel is removed and stripped of all wire; then wind on 35 turns of #30 enamel wire; over this wind another coil of approximately 15 turns. The latter is used for coupling to the receiver "antenna-ground" or doublet connections. The I.F. tuning condenser is also from the old I.F. unit, it consists of both padding condensers connected in parallel.

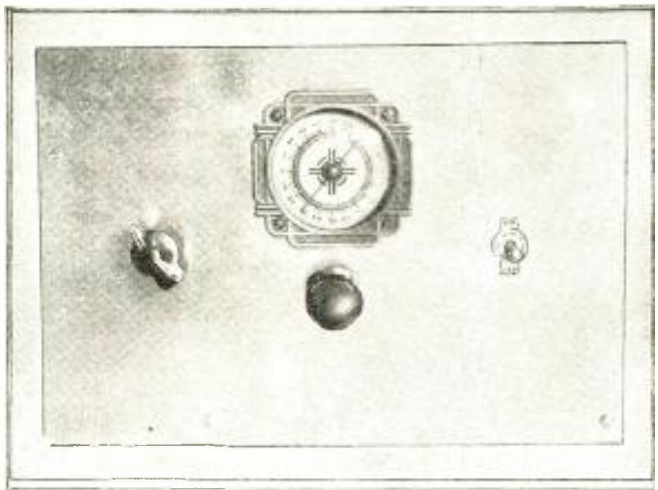
Both sets of coils will bear some experimenting—try the old cut and try method. The above values work fine in my set.

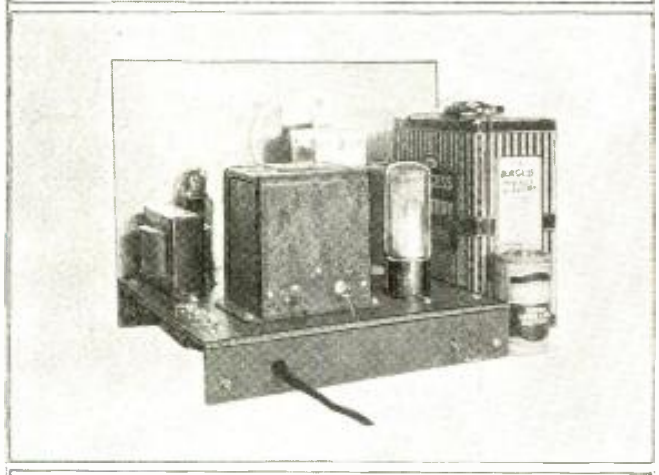
In using the converter, first connect it to a 250 volt power-supply; it is possible to use the receiver's power-supply. Connect your antenna to the converter and ground both receiver and converter to an *external* ground. I have found that this will decrease the noise picked up quite a bit. The I.F. unit is connected to the receiver's doublet or antenna ground connection. Switch both on and tune the receiver to approximately 2500 kc., and vary the I.F. condenser until the noise is the loudest. (The receiver's freq. may have to be varied.) Now get set to tune for signals. The grid circuit tunes very broadly, so all there is to do is to tune the oscillator control until the signal is picked up, and then "peak" the grid circuit.

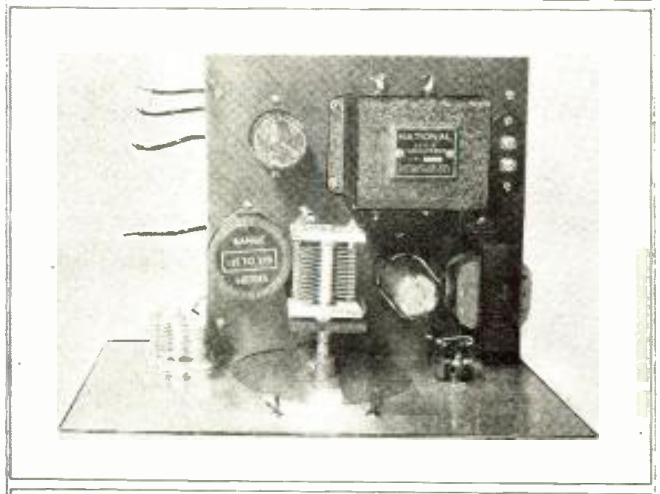
I think anyone who constructs this converter will be well pleased. I am, and I would like to hear from those who construct it; let me know what you think of it.

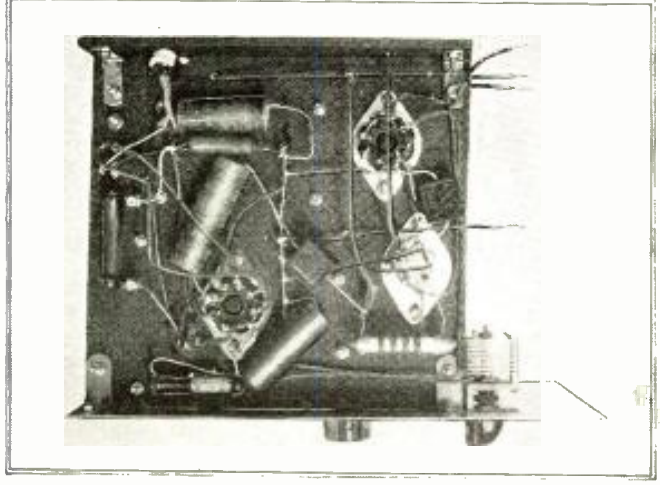
Photos at left show various views of converter; below—wiring diagram followed by author.











Two photos directly above show top and bottom views of receiver.

A "Bug-less" RECEIVER for the Beginner

William D. Hayes, W6MNU

Left—Front view of the 2-tube receiver; regen. control at left. Second picture shows rear view of receiver, with batteries.

The beginner wants a design that is simple, sure-fire, and easy to build. Mr. Hayes has provided just such a receiver in the unit here illustrated and described. The circuit is an effective one and the battery operation ensures noise-free reception on those DX signals.

●

● WHEN a simple receiver is desired, one that will be easy to build and quick to function, the usual choice is a regenerative detector working into a stage of audio. This type of set has become well established for one reason only, and that reason is that no simpler or less expensive circuit has been devised which can produce equivalent results.

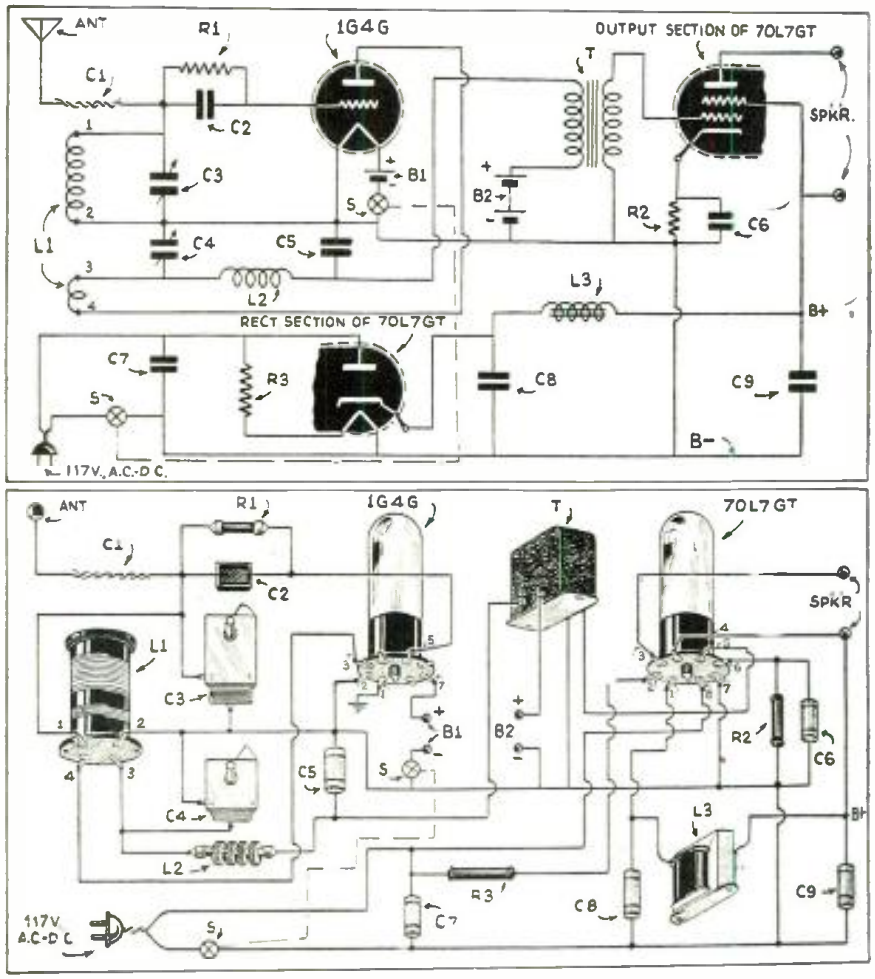
In such a simple receiver there just isn't room for many "bugs", but one "bug" that does persist in showing its ugly head on rather frequent occasions is that obnoxious pest, *tunable hum!* This difficulty arises when an A.C. operated power-supply is used to furnish plate voltage for the detector, and the power-supply feels like becoming part of the R.F. circuit over part of the tuning range of the receiver. The hum is especially troublesome on the higher frequencies, and it is probably safe to say that the majority of home-built regenerative receivers which get the detector plate voltage from an A.C. operated supply suffer from more or less tunable hum on twenty meters. There are several so-called remedies for tunable hum, but the simplest and surest cure is a "B" battery for detector plate supply.

The Detector

As might be expected from the above remarks, the receiver described in this article uses a 45-volt battery to supply detector plate voltage. The tube employed is a type 1G4G which is a medium-mu triode with a filament current requirement of only 50 ma. at 1.4 volts. In view of the fact that a 70L7GT is used as the audio amplifier and rectifier, it might well be asked why a triode of the 150 ma. heater series is not used as a detector instead of the 1G4G. This would permit the heater to be operated in series with the heater of the 70L7GT, thereby eliminating the filament battery required by the 1G4G. The objection to this scheme is that the A.C. heater would introduce a certain amount of hum.

It is a well-known fact that tubes with 6.3 volt heaters are frequently responsible for introducing *hum* in a regenerative receiver, and for this reason 2.5 volt types are preferred when the heaters are to be A.C. operated. Tubes with 12 volt heaters would be even more apt to cause hum. As a matter of fact a 12J5GT was actually tried as the detector, and while the hum introduced was not so bad as to make the receiver inoperative, it was bad enough to interfere with pleasant reception. Substitution of the 1G4G renders the receiver *absolutely hum-free,* both in and out of regeneration, over the entire tuning range! Of course if the set is to be used on a D.C. line, the 12J5GT should prove entirely satisfactory.

A single flashlight cell takes care of the filament drain very nicely, and in this type of circuit 45 volts of "B" battery is all that is desired. The filament circuit is broken by half of the D.P.S.T. toggle switch, S, when the set is turned off. No switch is required in the "B" battery circuit, since with the filament of the 1G4G cold, all load is removed.



The wiring of the "bug-less" receiver is very simple, and can be performed by even the beginner.

The antenna is coupled to the grid of the detector through condenser C_1 which is made by simply twisting a few turns of insulated wire together. For most antennas of fifty feet or more, two or three twists will be sufficient, but with very short antennas this number should be increased.

Plug-in Coils Used

The plug-in coils used are a four-prong set covering 10 to 560 meters in six ranges when tuned with a 140 mmf. condenser. Since these sets are available from a number of manufacturers at very reasonable prices, no coil winding data will be given here. Those interested in winding their own will find appropriate data in the various handbooks. Regeneration is controlled by varying C_1, and the detector enters regeneration smoothly, minus clicks or thumps.

A 1:3 audio transformer is used to couple the detector to the audio amplifier, and although the particular transformer used is more expensive than the average, it cannot be overemphasized that a good coupling transformer pays big dividends in this type of receiver, not only in the elimination of *fringe howl*, but also in the over-all effectiveness of the set.

The Audio Amplifier and Its Power-Supply

A type 70L7GT serves the dual purpose of beam-power amplifier and half-wave rectifier. This tube requires a heater current of only 150 ma., which means that the power drawn from the line is only about half what it would be if the older type 300 ma. tubes were used. Since the 70L7GT dissipates almost twice as much power in its heater as does a 6L6G, which is a much larger tube, the bulb gets quite hot during operation, and the tube should be located so as to provide for adequate ventilation. By using a line-operated power-supply for the audio amplifier, the battery economy is greatly increased over what it would be if the entire receiver were battery operated, and yet the advantages of battery supply for the detector are retained.

The output of the 70L7GT is about 1.5 watts, ample to drive a speaker, and since the output transformer is usually mounted on the speaker itself, none is included on the chassis. The set should never be turned on unless there is a D.C. path across the output terminals, because if voltage is applied to the screen of the amplifier without being simultaneously applied to the plate, the screen will have a hot time of it.

The power-supply consists of a standard half-wave rectifier circuit which permits A.C.-D.C. operation and, of course, the "B" negative should *not* be grounded. No line cord resistor or ballast tube is required, since a 300 ohm, 10 watt resistor takes care of the necessary voltage drop very nicely. Pin #2 of the 70L7GT should be connected to "B" negative and pin #7 to the 300 ohm dropping resistor in order to keep the potential difference between the amplifier-unit heater terminal (pin #2) and the am-

plifier-unit cathode terminal (pin #6) as low as possible. The 24 mf. input filter condenser maintains the output voltage at 95 or 100 under load, depending on the line voltage.

Construction

The 1/16 inch aluminum panel for the set measures 10 inches long by 7 inches high. In the interest of easy construction, the chassis is made of Masonite and is cut about 2¾" shorter than the panel in order to allow a space for the batteries. The dimensions of the chassis are 7 inches deep by 7¼ inches long by 1¼ inches high, and it is fastened to the front panel with a pair of one-inch brass-angle brackets. The tuning condenser is mounted on a Masonite bracket, the dimensions of which will depend on the type of vernier dial used. The dial should have a step-down ratio of at least 4 to 1. Mounted at the rear right-hand edge of the chassis is the output terminal strip, and the line cord and antenna lead are brought out at opposite ends of the rear drop.

Operation

Detailed information on the correct method of operating a regenerative receiver has appeared so many times, in so many different publications, that it would be a waste of space to repeat it here. Such information is universally available. It is important to remember, however, that the secret of obtaining good performance from a simple receiver lies in careful operation.

An antenna about fifty feet long will produce very satisfactory results, although wide variations in length can be compensated for by adjustment of the antenna coupling. Even with a very short antenna the sensitivity of this type of set is surprisingly good, and this fact combined with its extreme simplicity and freedom from "bugs" should recommend it to all those who need a small and inexpensive receiver.

Parts List

C1—(See text)

AEROVOX
C2—100 mmf. mica
C5—100 mmf. mica
C7—.01 mf., 400 volt paper
C8—24 mf., 150 volt electro ("Dandee")
C9—12 mf., 150 volt electro ("Dandee")

SPRAGUE
C6—25 mf., 25 volt electro ("Atoms")

IRC
R1—5 meg., ½ watt

HAMMARLUND
L1—2-winding plug-in coils (SWK-4)

NATIONAL
L2—2.5 mh. R.F. chokes (R-100)
T—1.3 audio transformer (A-100)

RCA
1—1G4G
1—70L7GT

CARDWELL
C3—140 mmf. variable ("Trim-Air")
C4—100 mmf. variable ("Trim-Air")

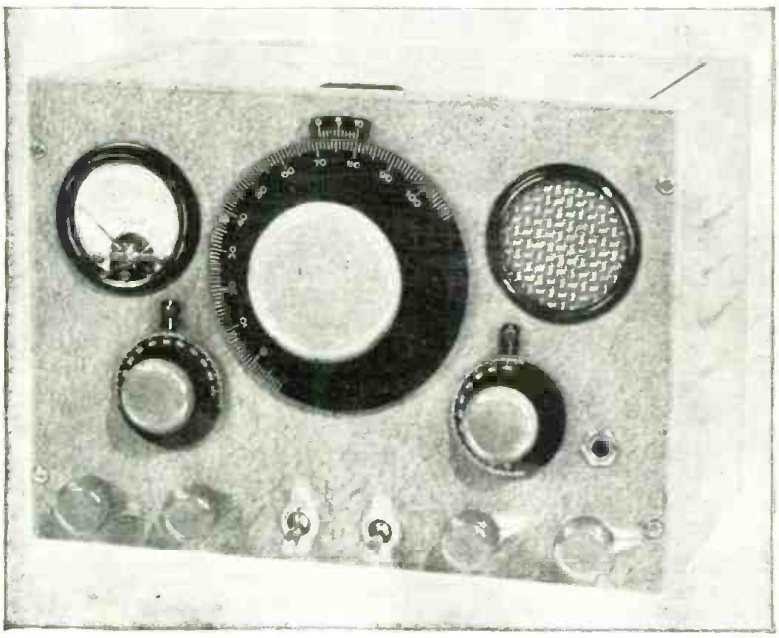
CONTINENTAL CARBON
R2—200 ohms, 1 watt

OHMITE
R3—300 ohms, 10 watts

STANCOR
L3—30 hy., 50 ma. (C-1003)
B1—1.5 volt flashlight battery (No. 950)

EVEREADY
B2—45 volt "B" battery (B-30)

ARROW
S—D.P.S.T. toggle switch



This portable receiver covers the principal short-wave bands; with proper coils the *broadcast* band may also be tuned in. It is a superhet and uses the new RCA miniature type battery tubes. It requires only one small 45 B-battery and a single 1.5 volt dry cell for the A supply, these being self-contained in the cabinet here shown. Loudspeaker and phone jack are built in, also a special tuning meter.

Left—this handsome miniature communications receiver will appeal to every Ham and short-wave fan. The batteries fit inside the cabinet; a special tuning meter is "built in."

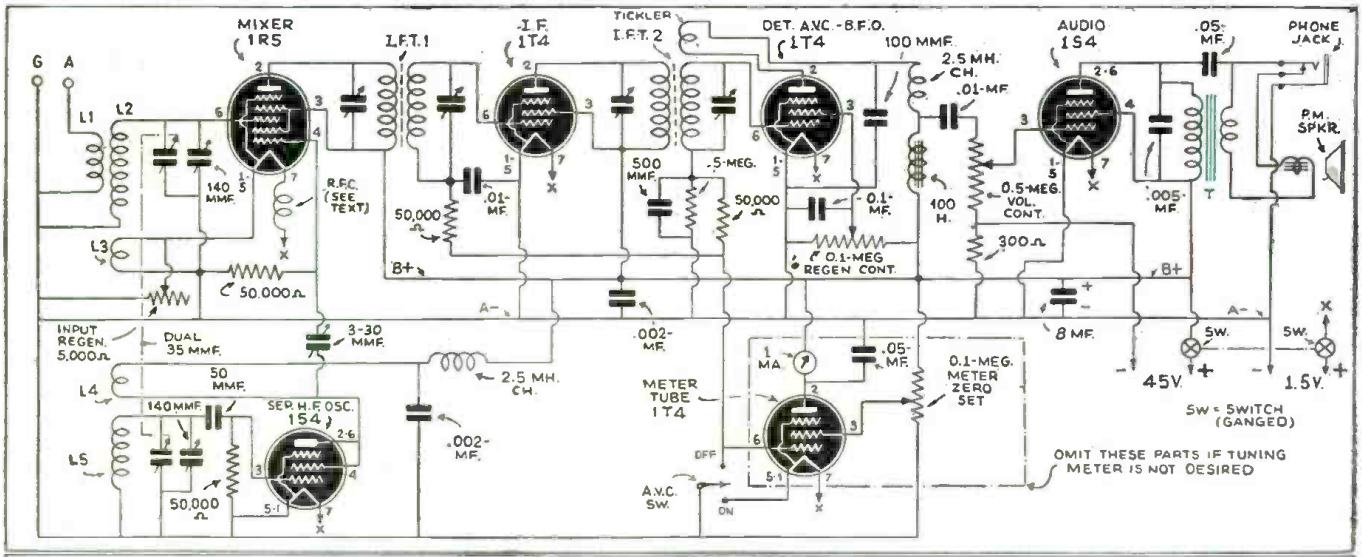
A Miniature

Communications Receiver

Howard G. McEntee, W2FHP

Hook-up for the battery type portable communications receiver, designed and built by Mr. McEntee.

● THE possibilities of a really compact short-wave receiver with self-contained power-supply have always appealed to the



writer and the advent of the new RCA miniature line has made such a receiver practical.

The fact that reasonable output may be had with only 45 volts on the plates, means that the whole power-supply may consist of only two units, a 45 volt Minimax B battery and a single dry cell for the A.

Though this receiver is essentially designed for headphone work, a tiny P.M. speaker has been included to make a complete and self-contained unit. Many signals will produce real loud-speaker volume, though of course the output cannot be called high fidelity!

Separate Oscillator Used

Six tubes are used in a slightly unusual circuit. The 1R5 mixer is driven by a *separate* 1S4 oscillator. The latter is a power output tube, but was found necessary for plenty of output on the high frequencies. During tests it was found that the 1R5 used conventionally as combined oscillator and mixer worked quite well, even on the higher frequencies, but of course input regeneration would not work out well in this case.

A conventional 1T4 I.F. stage is followed by another 1T4 as a regenerative second detector. This set-up gives very good selectivity and high gain and in addition the detector is made to produce an AVC voltage. Since the latter is small and is applied only to the I.F. tube, the actual control is of limited effectiveness, being more in the nature of overload control on strong signals.

The 1S4 output tube is coupled to the detector by a high impedance A.F. choke and the usual volume control. The output circuit is so arranged that the speaker is cut out when the phones are plugged in.

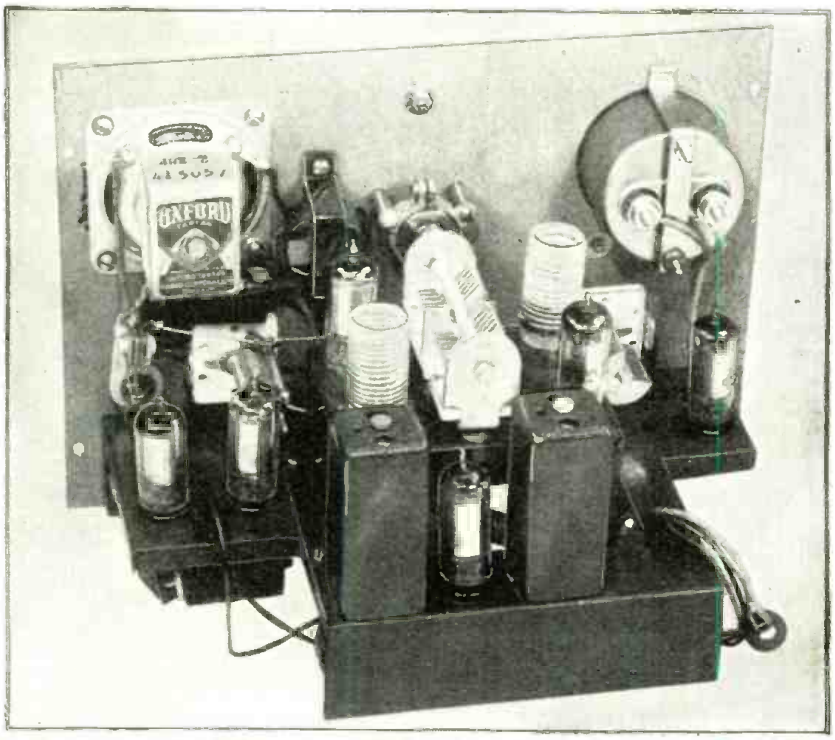
Can Be Used as "Field Strength Meter"

Since this little receiver is entirely self-contained, it was decided to equip it with a VT voltmeter circuit and use it as a highly sensitive field strength meter. This circuit may be omitted if desired, as it adds nothing to the ordinary receiver operation. However, it works very well and a strong signal will swing the meter clear across the scale. *A front panel zero adjuster is provided as an added convenience.*

Standard parts are used throughout, though many are the smallest obtainable. The chassis must be cut out at the corners to accommodate the two power supplies. Quarter inch angle strips were soldered around the cutouts to insure a solid chassis.

The two R.F. tubes and coils and the main tuning condenser are mounted above the chassis on a platform bent from a piece of 1/16" aluminum. This platform is 1⅝" high and the top is 2¼" x 3¾". The chassis proper is cut out beneath the platform so that the necessary wiring may be accomplished.

The panel is drilled first after a careful layout of parts has been made. The vernier dial drive unit mounts behind the panel and is spaced therefrom by three 9/16" bushings. The variable resistors and the two switches are a close fit and care must be exercised that they do not *short* on the chassis. The latter is held to the panel solely by the mounting nuts of the resistors and switches.



Rear view of the custom-built receiver, skillfully put together by its designer, Mr. McEntee—batteries not shown. Note loudspeaker at left and "tuning meter" at right.

Adding Tickler to I.F. Transformer

The second I.F. transformer must have a third winding added to it for a tickler. This winding is placed on the dowel between the upper winding and the dual condenser, and consists of about 50 turns of #30 D.S.C. wire. It is necessary to unsolder the terminal wires before the tickler is put on. The wire may be wound in either direction and care should be exercised to protect it where it comes out of the case.

The grid leads for the I.F. transformers are, of course, moved to the bottom of the units.

The choke in the positive leg of the V1 filament is made by winding the core of a 2.5 mh. choke with a single close-wound layer of #30 wire. The original choke winding is removed with diagonal cutters.

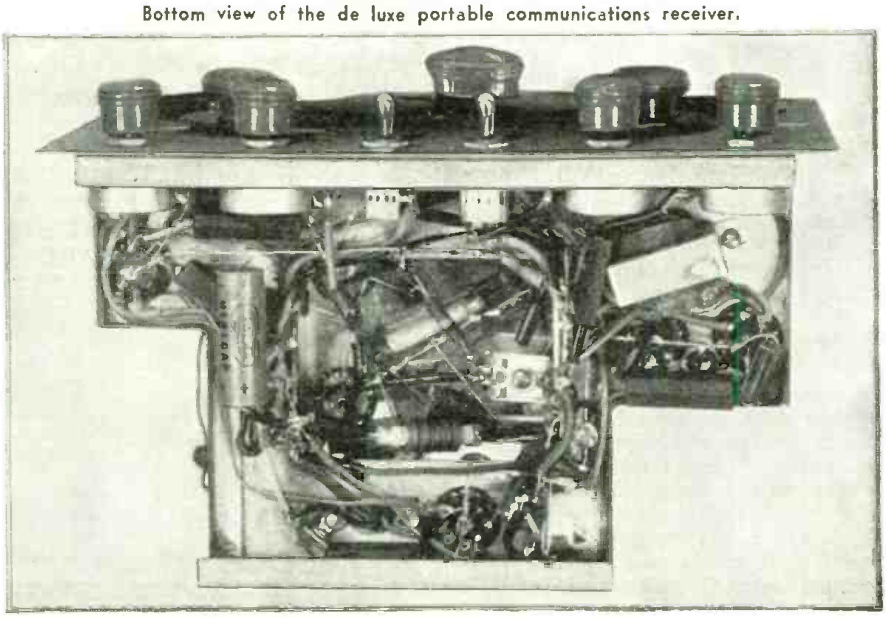
Wiring is started by making all connections beneath the platform. Ground wires and all those carrying R.F. are of #18 with lengths of spaghetti slipped over at the points necessary to prevent short-circuits.

A #14 ground buss runs from end to end and across the chassis, and *all ground connections are made to this* rather than to the chassis itself. The latter is connected into the circuit, however, by the ground side of the variable condensers.

Low-loss Coil Forms Used

The coil and tube sockets and the coil forms are of excellent high frequency insulating material called Amphenol 912. This material must be handled with care in the matter of soldering, however, due to its low melting point. The trick is simply to be

Bottom view of the de luxe portable communications receiver.



sure there is no pull on the wire being soldered, and to make certain it is tinned. Apply the solder with a hot clean iron and apply heat no longer than absolutely necessary. Then do not move the heated part for a minute or so to allow for cooling. The knack is soon attained, but caution is advisable.

The first thing to do after the set is wired and the wiring is *carefully checked* is to align the I.F. transformers with a 465 kc. signal from a service oscillator. When this has been done, check the detector regeneration control to make certain that the added tickler coil in IFT2 is properly phased. If oscillation cannot be obtained with the regeneration control full on, simply *reverse* the tickler leads.

The R.F. end is very simple to line up. Just turn the oscillator band set condenser at a desired spot and bring the detector condenser to resonance, this point being shown by an increase in noise level. The actual frequency coverage will naturally have to be found by experiment as it will vary with each set. For example, on the set shown, the 20 meter amateur band is received with both band set controls at about 20 (assuming 100 as the full capacity position). On the higher frequency bands two spots close together on the detector dial will give the increase in noise level, and the higher frequency position was found to give the best image rejection.

If regeneration cannot be obtained on any one band, increase the size of L3 a few turns.

The meter circuit is controlled by the AVC switch and it is simply necessary to set this at ON and adjust the meter to zero position (full scale reading) with the variable screen voltage control on V6. A very strong signal will make the needle go practically all the way to the left of the dial.

There is very little to do in the way of voltage checking other than to be sure that the batteries are in good condition. With AVC on, the B drain is about 15 ma., and the A current 400 ma. A voltmeter across the 300 bias resistor should read very close to 4V.

List of Parts

HAMMARLUND (Condensers and Chokes)
1—Dual 15 mmf. condenser, #HFD-15X
2—140 mmf. condensers, HF-140
3—R.F. chokes 2.5 mh., CHX
1—30 mmf. trimmer, MEX

R.C.A. (Tubes)
2—type 1S4 tubes
3—type 1T4 tubes
1—type 1R5 tube

ALADDIN
1—I.F. transformer, 465 kc., type C101M
1—I.F. transformer, 465 kc., type C100M

TRIPLETT
1—1 ma. R meter for plate circuit use, model 223

BUD (Chassis, Case & Switches)
1—Grey crackle finish case, 7" x 10" x 6" deep, #C993
1 Chassis 1½" x 5½" x 9", #CB996
1 Sheet aluminum, PA985
1 —SPDT switch, SW1118
1 —DPST switch, SW1119
1 Closed circuit jack, J1325

CROWE (Dials)
1 —4" vernier dial, #6197
2 1¾" dials, #6170
4—Knobs, #6143

AMPHENOL (Sockets & Coil Forms)
8—Coil forms, #24-5H
2—High frequency 5-prong sockets, #54-5H
4—Bakelite sockets, 7-prong, #78-7P
2—High frequency, 7-prong, #54-7P
1—Bottle liquid 912 dope, #53-2

I.R.C. (Resistors)
4—50,000 ohm ½ watt resistors, BT ½
1—.5 megohm ½ watt resistor, BT ½
1—300 ohm ½ watt resistor, BT ½
2—100,000 ohm variable resistors, D13-1[illegible]
1—500,000 ohm variable resistor, D13-133
1—5000 ohm variable resistor, D11-114

SOLAR (Fixed Condensers)
2—.01 mf. paper 200 V. Type MP
3—.05 mf. paper 200 V. Type MP
1—.1 mf. paper 200 V. Type MP
2—.002 mica, Type MW
1—.0001 mica, Type MO
1—.00005 mica, Type MO
1—.0005 mica, Type MT
1—.005 mica, Type MW
1—8 mf. 100 V electrolytic, Type M-108

AMPLIFIER CO. OF AMER. (Transf. & Plate Choke)
1—Midget output transformer, 3 ohms to 8000 ohms
1—Midget plate choke, 100 henries at 1 ma.

EVEREADY (Nat'l. Carbon Co.—Batteries)
1—45 V. B battery #482
1—1½ V. A battery, #6

OXFORD (Portable)
1—Midget speaker, #2-ZMP

MISC.
Speaker hole ring
Hookup and coil wire, etc.

COIL TABLE

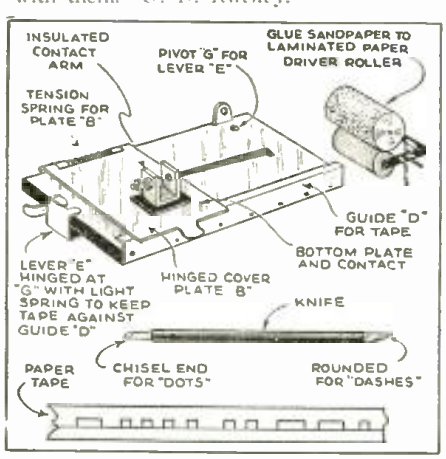
	L1	L2	L3	L4	L5
80—10		65	5	10	58
40— 8		30	4	8	26
20— 4		14	3	6	13
10— 2		4	1	4	4

All coil forms ¾" diameter, #18 bare, space-wound, 1" long used for L2, L5 on 10 and 20 M coils and #26 DSC for L1, L3, L4, 40 and 80 coils all close-wound. All coils coated with "912" dope after winding.

TAPE CODE RECORDER

● THE accompanying sketch shows some of the writer's ideas whereby it becomes fairly simple to make your own tape recorder and reproducer, for the purpose of learning the radio code.

For recording the code signals, either a pencil or pen may be used if the armature holding it moves horizontally instead of vertically. This allows the pen to trace a continuous line, insuring a continuous ink feed without blobs. The resulting dot and dash record will represent a series of humps along a line, but by running the tape through the recorder again and closing all the bases of the humps, you have a series of small characters representing dots and dashes. These can be cut out of the tape with a sharp steel blade. Next a spring brush (one made with multiple contact leaves) is arranged to make contact through the openings in the paper tape. Some of the tapes, after having been recorded, may be glued together so as to make an endless tape and the signals can then be reproduced over and over until you become thoroughly familiar with them.—*O. B. Ritchey.*



OLD RELIABLE T. R. F.

for the Beginner

L. M. Dezettel, W9SFW*

A "non-regenerative" receiver which is easy to build; it tunes the stations in without squeals—cost of construction is nominal, and it works a loudspeaker. It is *not* a superhet!

The finished 4-tube receiver (4 tubes includes rectifier).

● WHEN the beginner wants to build a receiver that is free from the usual "bugs" found in a superhet circuit and, in fact, sometimes encountered in the menial regenerative set, there is nothing like the "Old Reliable" *tuned radio frequency* circuit. There is no worry about fancy tracking systems, oscillation controls, or any other gadgets to confuse our minds.

The set we describe here is easy to construct; and if the wiring diagram is followed correctly, it is almost impossible for the set to fail to operate. This receiver operates from a line voltage of 105-125 volts A.C. Since higher plate voltages are obtained from an A.C. set than are possible from an A.C.-D.C. set, the performance obtained from this simple four-tube set compares favorably with that of many larger receivers. The parts are all standard and are selected for efficient operation, giving good selectivity and fine tone quality. It is even possible to purchase a punched and drilled chassis, eliminating any difficult metal work. The only tools required are a screwdriver, a pair of long-nosed side-cutting pliers, and a soldering iron.

A 6D6 tube is used as a screen-grid R.F. amplifier. A 6C6 tube is used as an infinite impedance detector. This type of detector actually adds considerable amplification to the signal, as well as performing its regular duty of rectifying the R.F. voltage. In addition, it does not load the coil circuit, thereby adding to the selectivity of the set. The 42 tube further amplifies the audio signal and has sufficient power to drive a speaker to considerable volume. Finally, an 80 is used to rectify the A.C. voltage in the power-supply portion.

The mounting of the parts is, of course, the first step in the operation, assuming that you have either obtained a punched and drilled chassis, or have made your own in accordance with the pictorial diagram. The speaker should be left until the last, so as to avoid damage to its cone. Here is a hint on mounting the transformer: Take off the two bottom supporting bars, mount the transformer onto the chassis, and replace the supporting bars over the same mounting screws, but under the chassis. This method mounts the transformer laminations down flush with the chassis; and when the nuts are drawn up tight, transformer hum is completely eliminated. Notice that the coils and tubes are all shielded to prevent oscillation. Don't forget to mount the tube shield bases at the same time that the sockets of the 6C6 and 6D6 tubes are assembled to the chassis.

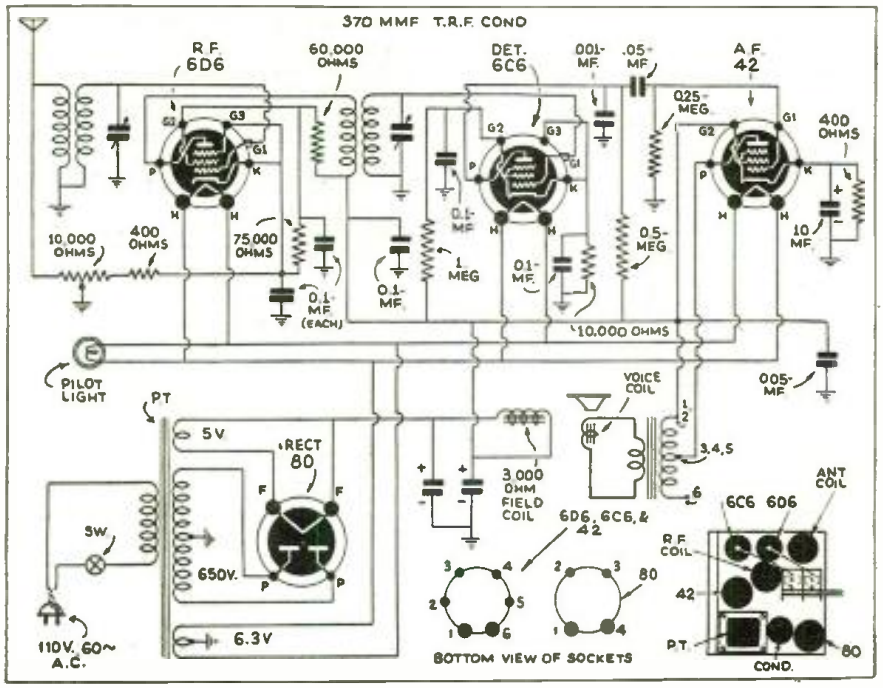
Wiring the receiver should present no difficulties if the diagram is followed carefully. Check off each wire on the diagram as connections are made, to prevent oversights. Start your wiring with the filaments of the tubes. These leads should lay flat against the chassis. Make all other connections as short and direct from one part to another as possible. All resistors and condensers are mounted by their own leads, but the entire length of the leads need not be used. Make connections direct, and cut off any excess. It goes without saying that soldering should be done carefully and with a clean tip. Touch your soldering iron to the joint to be soldered until the connection itself is hot enough to flow the solder which, incidentally, should be of a good grade of the rosin-core type. Poorly soldered connections or no solder at all is one of the biggest reasons for noisy operation in any receiver.

Be sure to watch the polarity of all filter condensers. The plus and minus signs on the condensers are clearly marked and should be followed diligently.

When the wiring has been finished, check it again very carefully. Many times this extra check will save hours of later work,

*Engineer, Allied Radio Corp.

Wiring diagram of the novel receiver, which does not employ regeneration.



and will prevent the possibility of burning out parts because of incorrect connections.

After the set is completely wired and checked and the antenna is connected, you should be able to tune in several stations. One simple adjustment is now required which, if made, will increase the selectivity and sensitivity of your set. Tune in a station at about 1400 kc., and reduce the volume until the program is barely audible. Now turn the trimmer condenser adjustment (located on the side of a tuning condenser) until maximum volume results. Thereafter, all stations will be received most efficiently, and no further adjustment of this kind is required.

If squeals are heard when tuning a station, this indicates that the set is oscillating. Oscillations result only if leads from point to point are too long. This applies particularly to all leads coming from the grid or plate of the tubes.

If all parts are mounted securely, wiring is done neatly, and the soldering is clean, your receiver should work "right off the bat."

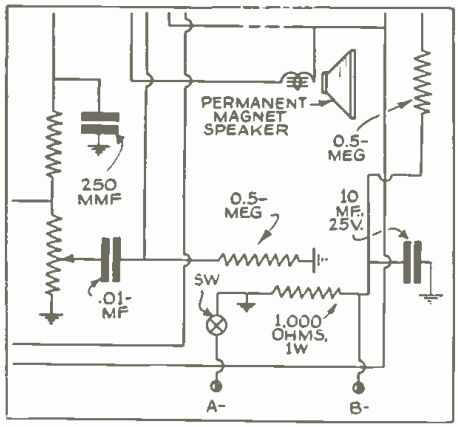
Parts List

KNIGHT
1—4 prong wafer socket
3—6 prong wafer sockets
2—Tube shields
1—Power transformer
1—8-8 mf. condenser
1—10,000 ohm control
1—Switch for above control
2—400 ohm 1 watt resistors
1—10,000 ohm ½ watt resistor
1—60,000 ohm 1 watt resistor
1—75,000 ohm 1 watt resistor
1—250,000 ohm ½ watt resistor
1—1 megohm ½ watt resistor
1—.5 megohm ½ watt resistor
1—.001 mf. mica condenser
1—.005 mf. 600 volt condenser
1—.05 mf. 600 volt condenser
5—.1 mf. 600 volt condensers
1—10 mf. 25 volt condenser
1—A.C. cord and plug
2—Grid caps
1—Stamped chassis base

MISCELLANEOUS
1—Antenna and R.F. coil
1—2-gang T.R.F. condenser

CORRECTION ON DIAGRAM

● THE bias resistor was shown incorrectly connected in the diagram for the 3-Tube Superhet by Lee Garrison, page 272 of the September issue. The correct connection of the bias resistor is in the grid circuit of the output pentode, as shown in diagram herewith.



CORRECTION

● IN the concluding half of the article entitled "High Power with the R. & T. Economy Transmitter" by Herman Yellin, page 345, October issue, the credit for the transformer and the filter chokes should have been given to the Kenyon Transformer Co. Also see page 290 of the first half of this article in the September issue.

SMOOTHING UP THAT Regeneration Control

William J. Vette

● IN the past few years the trend has been toward the superhet receiver, and the lowly regenerative set has been left to the tyro and beginner.

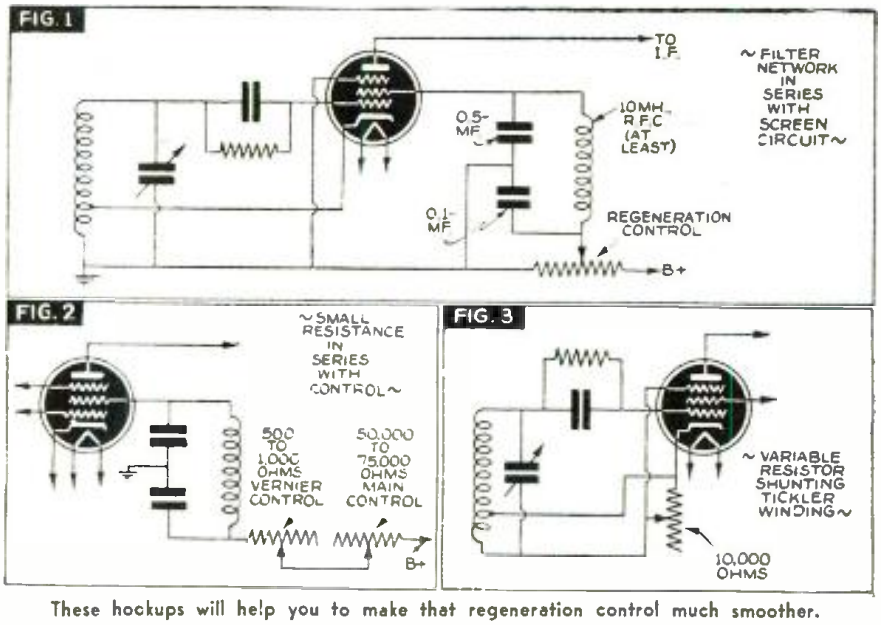
I have noticed many small superhets using regeneration in the first detector stage to give more gain and greater selectivity. I have even built a few small sets using this principle and found the results quite favorable.

When the regenerative set was in full favor, much attention was paid to the proper operation of the regeneration control. With no intermediate amplification to give the signal a big build-up, it was important that all the gain possible should be squeezed from the detector circuit, and a set which had a jumpy or erratic control of the feed-back never produced much in the way of phenomenal reception.

Now, while some attention is paid the control in sets depending entirely upon feedback for their amplification, there is usually sufficient gain, through conversion and intermediate amplification, in the smaller superhets using regeneration, that the effects of a faulty control are not readily apparent. If the regeneration is introduced in either the first detector or the R.F. stage, it is hard to tell whether the stage is oscillating or not, unless it is oscillating too much—then whistles and spurious signals are heard.

It is readily apparent that regeneration, if properly applied and smoothly controlled, will result in much improved reception, but it is also readily apparent, in some small superhets I have seen, that the regeneration adds nothing—in fact it would probably be found to be creating a loss in the circuit.

When a regenerative *first detector* is used, a rough bumpy control results in an erratic signal. Whether used in the first detector of a superhet, or in the only detector of a TRF set, regeneration, for utmost efficiency, must be under absolute control, as it is a well known fact that for peak signal strength, the detector should be kept just under the point of oscillation. A detector which jumps in or out of oscillation is worthless in a TRF set, and, while not so noticeable in a super, it is really a detriment, if peak signal strength is needed. In the first stage of a super, the selectivity suffers much if the control is too far advanced; also, both selectivity and sensitivity are lacking if the control is much below the oscillation point. Further, if the stage is oscillating strongly, a second local frequency is present, beating with the incoming signal and with the local oscillator output, creating many spurious signals; this latter condition usually results in bringing the local broadcast station down into the short wave bands, to cover up the signals you want. Also, tuning is usually quite broad under this condition.



These hookups will help you to make that regeneration control much smoother.

From all of which it should be quite apparent that for maximum results from the little regenerative super, as much attention should be paid the regeneration control as though it were a little one-tube set having only a regenerative detector. Proper attention given to this point will reward you with much greater sensitivity and selectivity, resulting in the reception of a lot of the weak stations you would undoubtedly miss otherwise.

A stunt I used to find very effective for TRF sets is illustrated in Fig. 1. This will smooth up all but the very roughest of controls, if the action is jumpy and erratic. The choke used here should be preferably of at least 10 mh. inductance; the smaller R.F. chokes will not have sufficient smoothing action. The bypass at the screen terminal of the tube should be at least .5 mf. and the one on the cold end of the choke may be as small as .1 mf. This combination acts to smooth the control in much the same manner as the filter choke and condenser network acts in the power supply.

Often the control is jumpy because the variable resistor used is of improper value. If this is so, and another one of correct resistance or taper is not at hand, much may be done toward smoothing the action by having a much smaller rheostat in series with the main one; this acts exactly as does the bandspread condenser, spreading the critical portion of the control arc over a much larger area. In operation, the main control is set to as near the critical point as possible, and the small control used as a vernier, for the actual fine control.

Oftentimes the first detector, if regenerative, is of the *electron-coupled* type. Unless the coils are wound with utmost precision, the feedback winding may be too large, and this makes for very difficult control. If this is the case, and it isn't convenient to rewind the coils, you can shunt the tickler winding with a smooth acting variable resistor of about 10,000 ohms, and, with the regeneration control set to about ¾ of its full setting, back this shunt control off until the set just goes out of oscillation; then the action of the control will be very smooth. This stunt will also enable you to determine to your own satisfaction just how much the regeneration adds to the set in the way of added sensitivity and selectivity, as the control, if cut out completely, shorts out the tickler winding. Incidentally, this shunt will probably have some effect on the tuning, so should not be used as a control. When the desired point has been found, it should not be changed unless a change is necessary with another coil.

Incidentally, these same stunts are just as valuable to use with a simple regenerative TRF set.

We Will Pay

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

℗

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

A Beginner's 2-Tube Transmitter

This high-class two-tube beginner's transmitter will appeal to every Ham beginner; data is given for operation on the 40 and 80 meter bands. It has a crystal-controlled oscillator.

Geo. W. Shuart, W2AMN*

● THE newcomer to ham radio who chooses to build his own transmitter rather than purchase a ready-made one, usually starts off with something simple. Though, all too often the beginner, in his haste to get on the air, puts together a haywire transmitter with rather disappointing results. Assuming the beginner is going to operate on two bands (80-40 meters) and the desired power output is in the neighborhood of 100 watts, we believe the outfit described in this article is just about ideal. Such a rig can be built cheaply and need not be complicated.

Looking over our manufacturer's tube list, the 812 variety seems to be the best buy from the standpoint of economy. Since this tube only requires some 5 or 6 watts driving power for around 100 watts output, a single 807 crystal oscillator should do the trick nicely. Using the 807 in a tritet oscillator doubler circuit permits full output on two bands with one crystal. This transmitter works on 80 and 40 meters with no provision for adding other bands, although 20-meter operation can be had with some sacrifice in output, if the final is used as a doubler. In this case, the tube should not be loaded as heavily as when operated as a straight amplifier.

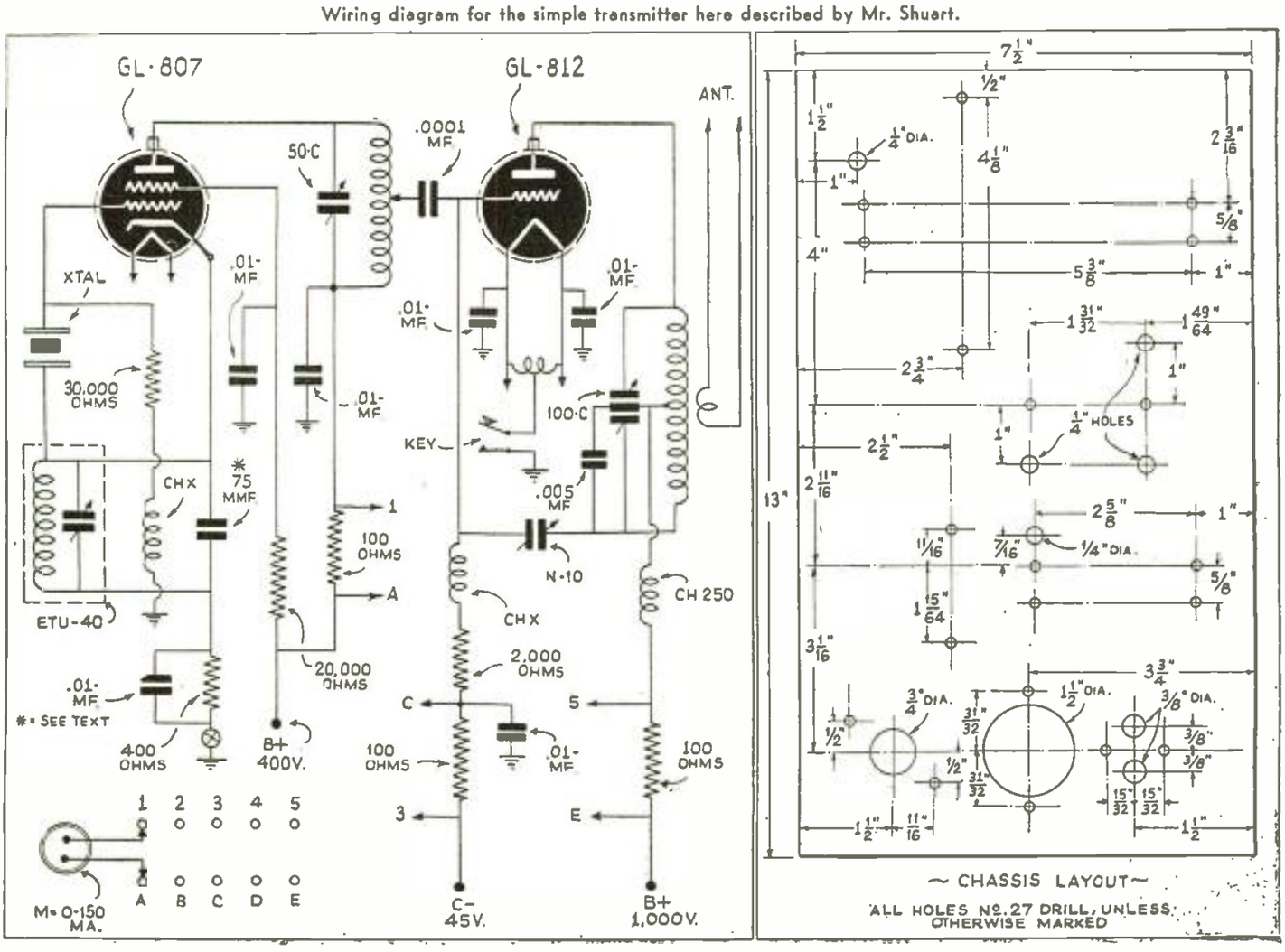
The entire R.F. portion of this transmitter is mounted on a 7½" x 13" x 2½" steel chassis which was given a coat of gray lacquer after all drilling was completed. This treatment provides a much neater appearance and eliminates finger stains which would appear on the unpainted chassis.

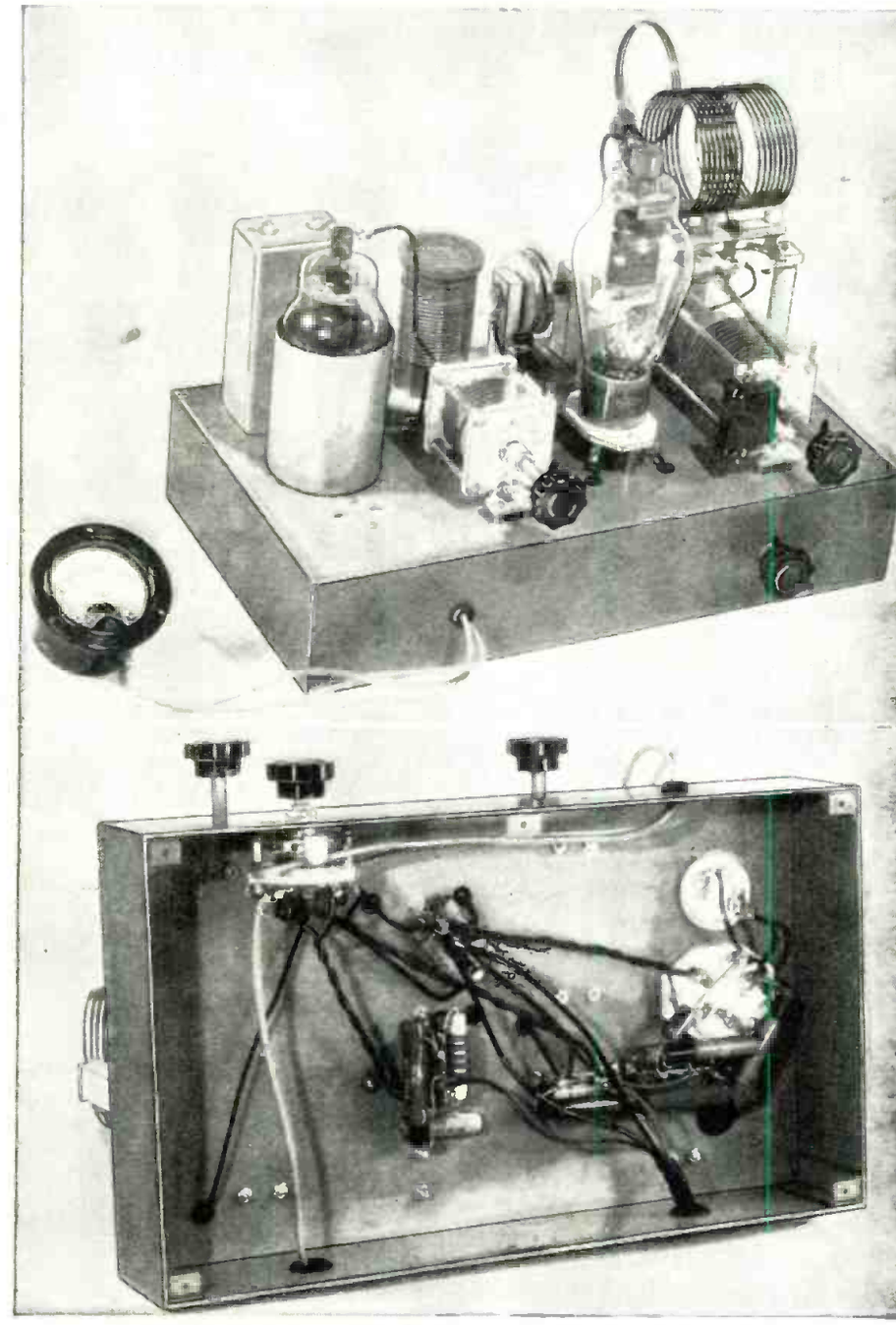
The cathode circuit of the 807 employs a 40-meter shielded coil and condenser assembly. This unit does not have sufficient range to tune to a suitable frequency in order to provide proper crystal operation. Therefore, it is necessary to add a small fixed capacitor of 75 mmf. In the plate circuit of the oscillator, we have a plug-in coil because here we change from 80 to 40 meters when doubling.

When the oscillator is operated straight through on 80 meters, the cathode tuned circuit is not *shorted* out as is usually the case. Using a well shielded tube, the 807 instead of the 6L6, and the addition of external shielding, reduces coupling to the point where the crystal does not oscillate with the coil shorted. This rather thorough shielding also reduces crystal current. During a test run of over a half-hour, there were no signs of crystal heating with the plate circuit tuned to either 80 or 40 meters and no adjustment of the cathode circuit

*Hammarlund Mfg. Co., Inc., New York City.

Wiring diagram for the simple transmitter here described by Mr. Shuart.





Front and bottom views of the handsomely built beginner's transmitter.

was necessary. The two condensers in the tuning unit were set at maximum capacity and perfect results were obtained. With other crystals, however, some adjustment may be necessary. Though, when once adjusted for 40-meter operation no further tuning should be required.

The 812 amplifier is extremely simple and uses the split coil condenser arrangement in order to obtain neutralizing voltage. Both stages use a new type of variable condenser having an insulated rotor allowing much more compact construction and adding considerably to the economy of cost.

Metering is accomplished with a single 0 to 150 milliammeter. It will be noted that each circuit to be metered has a 100 ohm 2 watt resistor in series with it. The meter is switched across these resistors. Though they are in parallel with the meter, the error caused is a small fraction of a milliampere and the drop in circuit voltage is also relatively small. The advantage of this system is that a standard meter can be used very nicely without requiring special shunts.

In wiring the transmitter, ordinary #16 push-back wire is used and enough terminal strips are employed to make a neat and simplified wiring job. The wiring diagram, coil data, and drilling plan should complete the constructional information. Getting the rig on the air is just about as simple as building it. Apply voltages to the oscillator and adjust the cathode condenser for maximum plate current of the 807. Then, adjust the plate condenser of this same stage for the minimum plate current. Neutralizing is next. With filament voltages applied to the 812 with no plate voltage, open the neutralizing condenser all the way. Then, with the meter switched to the amplifier grid circuit, rotate the plate condenser and a decided change in plate and grid current will be noticed. Swing the plate condenser back and forth, at the same time closing the station of the neutralizing condenser. The fluctuation in grid current will gradually become smaller and smaller until it disap-

be approximately 76 times the diameter of the wire used in the transmission line. If you use No. 14 wire the spacing will be 4.7 inches. (The 5" Johnson insulator will serve the purpose.)

Since the transmission line is non-resonant the length of the line may be quite long, but should be as short as possible.

If you plan on using low power it is advisable to use this simple method of feeding the beam for in other types of feed systems the energy is almost lost before it reaches the radiating element. There is approximately 3-8 db. loss/100 feet if you use twisted wire cables on 30 mc. (See table on Pg. 430 of *Radio Handbook*, Pub. by Radio Ltd.—1940.)

To the average ham, the two most important questions in his mind are: Will the antenna get DX, and how much will it cost me?

I have prepared an approximate price list of the various components needed in the construction of the beam.

3—10 ft. lengths of ¾" metal conduit (thin wall) @	$ .72
2—10 ft. lengths of ½" metal conduit (thin wall) @.	.52
6—Conduit couplings for ¾" @	.12
1—7 ft. length 1½" water pipe. (Threaded in center.) per foot	.14
1—Pipe tee for 1½" water pipe	.33
2—7 ft. lengths of 1½" pipe for vertical support per foot	.14
1—Car bearing for rotatable base	.50
Delta match system: wire and insulators	.75
Total approx.	$9.00

The antenna can actually be constructed for less than ten dollars. It will prove to be worth ten times its value when you use it on 10 meters the first day the band is good.

The next and last problem is that of *tuning the antenna:* this is very simple if the antenna has been cut to the exact frequency of the transmitter. We may utilize the equations that I presented in the beginning of the manuscript.

We must first assemble the antenna and put it on its mast, the next step is to adjust the delta match until we get the maximum amount of energy in the array. A field strength meter is the best indicator for tuning, this should be placed about twenty-five feet from the radiating surface of the beam.

After the antenna seems to be "loading up" properly, we will then adjust the telescoping tubes in the end of each element.

It is best that we first make sure that the total length of the radiating element (radiator) is exact for the frequency of the transmitter. Then proceed to adjust the ends of the reflector, about an inch at a time, until the field strength meter indicates a maximum value. The director is the next element to tune, and the same procedure is followed until each element is tuned to its "peak."

If you can locate some other ham, within a radius of 3 to 5 miles, with a good receiver and an R meter, you can retune the antenna and have him give you a good signal check. It is then a good idea to rotate the antenna a full 180 degrees for a comparison of front to back ratio; the antenna should be tuned until the signal is maximum in one position; the back ratio will be almost zero if the antenna is properly tuned.

When listening to an incoming station you can rotate the antenna around until his signal is loudest, then leave the antenna in that position and call him.

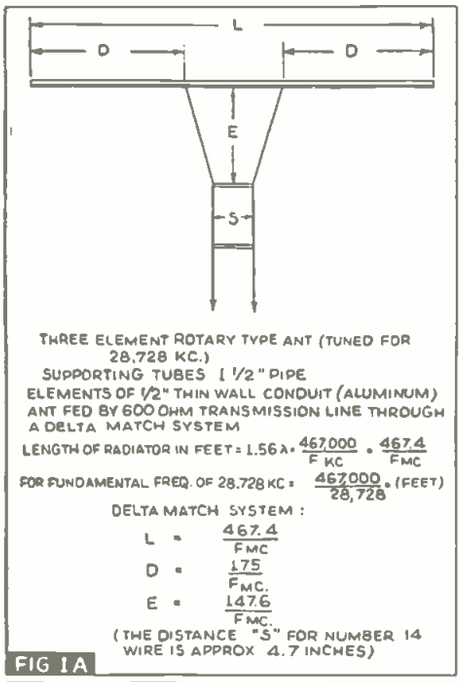
If any further details on construction or tuning of the array are desired, I will be glad to answer any and all of the readers' letters.

(Enclose a self-addressed and stamped envelope.)

Good DX with your new antenna and if you hear me on 10 meter phone, give me a call!

(Send all inquiries to the author in care of this magazine.—Editor)

Diagrams below show how receiver was converted for 10 meter reception; also details of new 10 meter Bent Array.



THREE ELEMENT ROTARY TYPE ANT (TUNED FOR 28,728 KC.)
SUPPORTING TUBES 1 1/2" PIPE
ELEMENTS OF 1/2" THIN WALL CONDUIT (ALUMINUM)
ANT FED BY 600 OHM TRANSMISSION LINE THROUGH A DELTA MATCH SYSTEM

LENGTH OF RADIATOR IN FEET = $1.56\lambda = \frac{467,000}{F\ KC} = \frac{467.4}{F\ MC}$

FOR FUNDAMENTAL FREQ. OF 28.728 KC = $\frac{467,000}{28,728}$ (FEET)

DELTA MATCH SYSTEM:

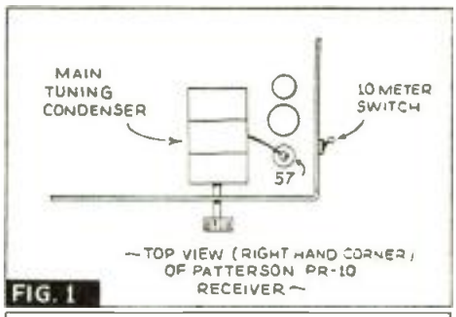
$L = \frac{467.4}{F\ MC}$

$D = \frac{175}{F\ MC.}$

$E = \frac{147.6}{F\ MC.}$

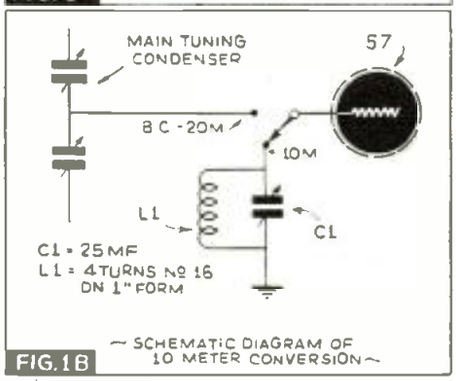
(THE DISTANCE "S" FOR NUMBER 14 WIRE IS APPROX 4.7 INCHES)

FIG 1A



—TOP VIEW (RIGHT HAND CORNER) OF PATTERSON PR-10 RECEIVER—

FIG. 1



— SCHEMATIC DIAGRAM OF 10 METER CONVERSION—

FIG. 1B

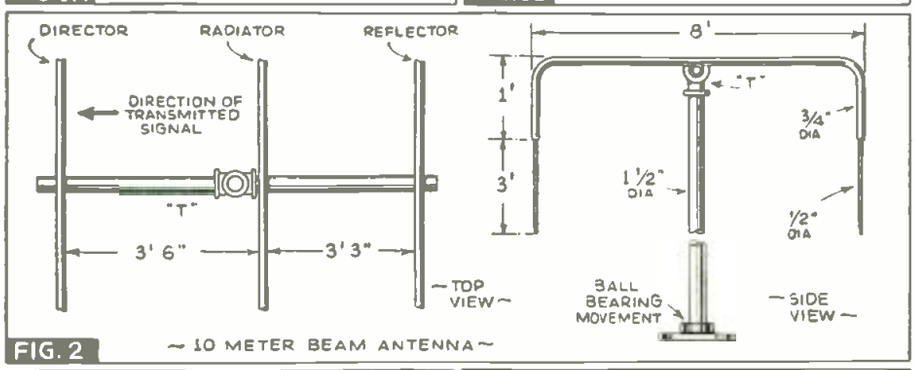
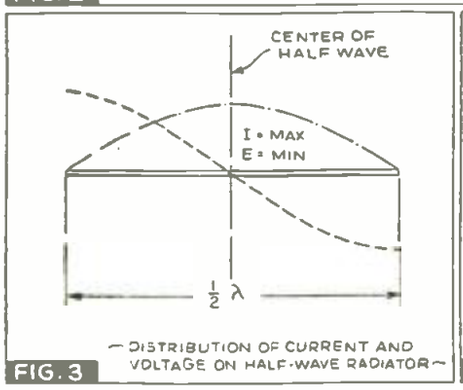
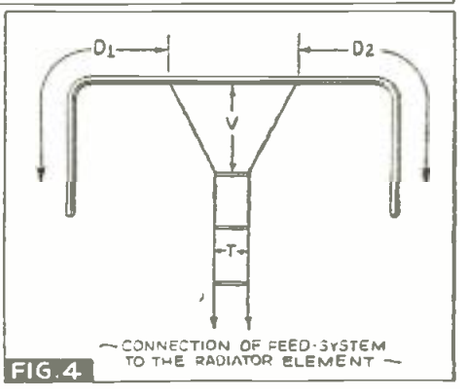


FIG. 2 — 10 METER BEAM ANTENNA—



— DISTRIBUTION OF CURRENT AND VOLTAGE ON HALF-WAVE RADIATOR—

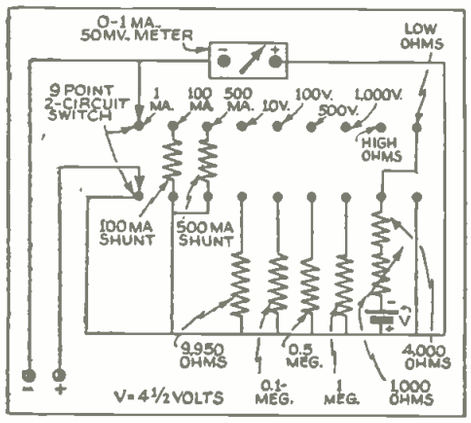
FIG. 3



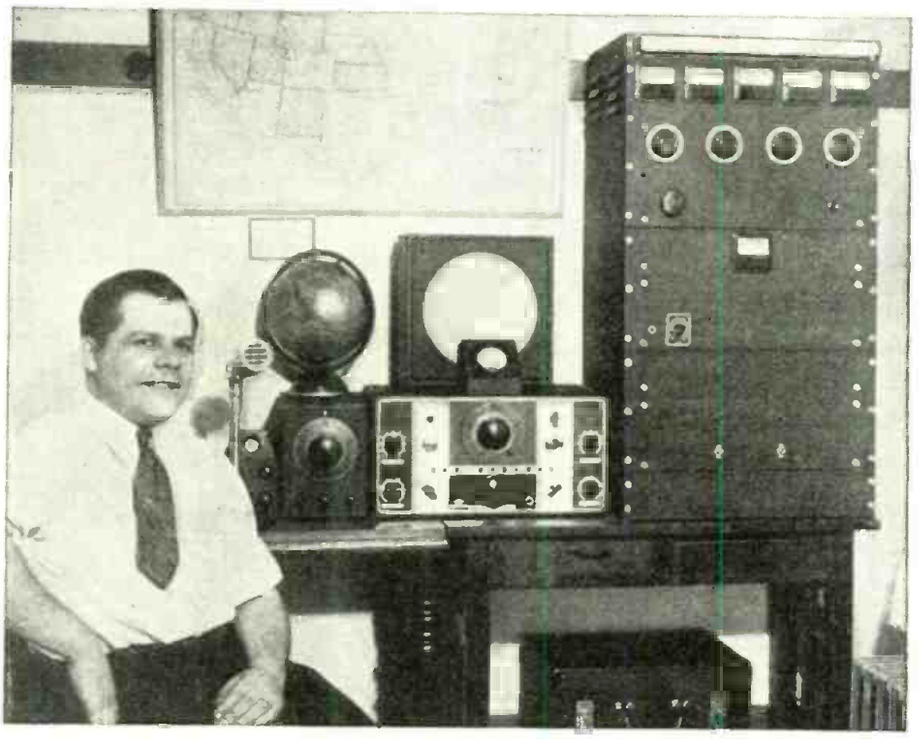
— CONNECTION OF FEED-SYSTEM TO THE RADIATOR ELEMENT —

FIG. 4

CORRECTION



● IN the article entitled an "Economical Volt-Ohm Milliammeter," by John T. Wilcox, in the September issue of the magazine, an error was made in the diagram and the correct wiring diagram is shown above. We are sorry if this caused our readers any inconvenience.



"Honor" Plaque Awarded

To Edward Trybus, W9WPZ

For Best HAM Station Photo

Editor:

Herewith a picture of my ham shack, which I would like to enter in your monthly "Ham Station Photo Contest."

The transmitter is home-built, using a 6L6 xtal osc. on 28,624 or 29,464 kc. in the ten meter band; T-20 buffer T-55 in final, running 150 watts input. Using an Electro-Voice No. 620 dynamic mike—6C6-76-P.P. 76's-P.P. 6A3's-TZ 20's class B.

The antenna is a vertical "Johnson Q." Receiver is a National NC-100X and a pre-selector, using a 1851. Use scope to check modulation percentage.

The transmitter was recently built and many F.B. contacts have been made on 160 and 10 meter fone.

EDWARD TRYBUS, W9WPZ.

●

Here is the new "Award of Honor" Plaque which measures 5" x 7" in size. It is handsomely executed in colors on metal, and is framed, ready to hang on the wall. The name of the winner will be suitably inscribed.

●

Note These Important Rules

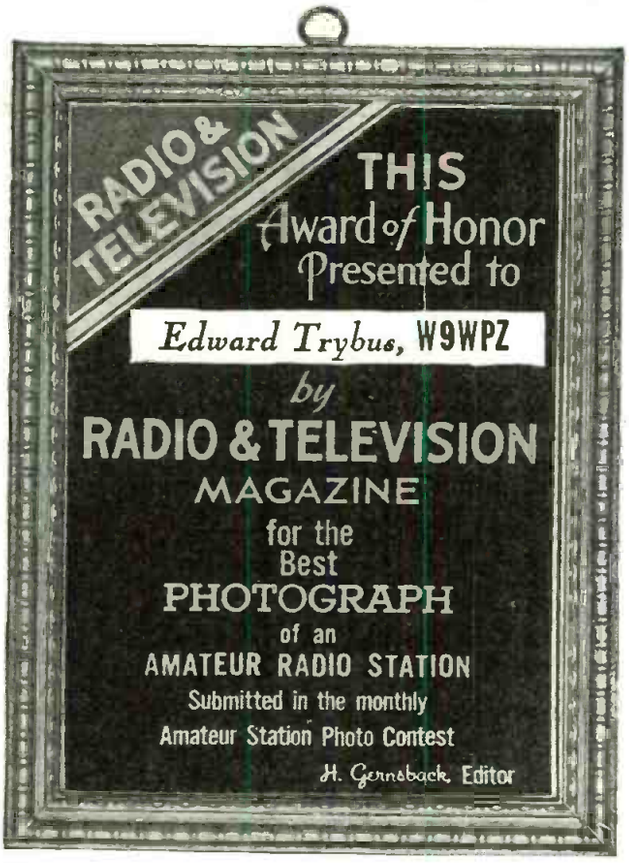
Attach a brief description not longer than 300 words, describing the general line-up of the apparatus employed, the size, type and number of tubes, the type of circuit used, name of commercial transmitter—if not home-made, watts rating of the station, whether for c.w. or phone or both, etc., also name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

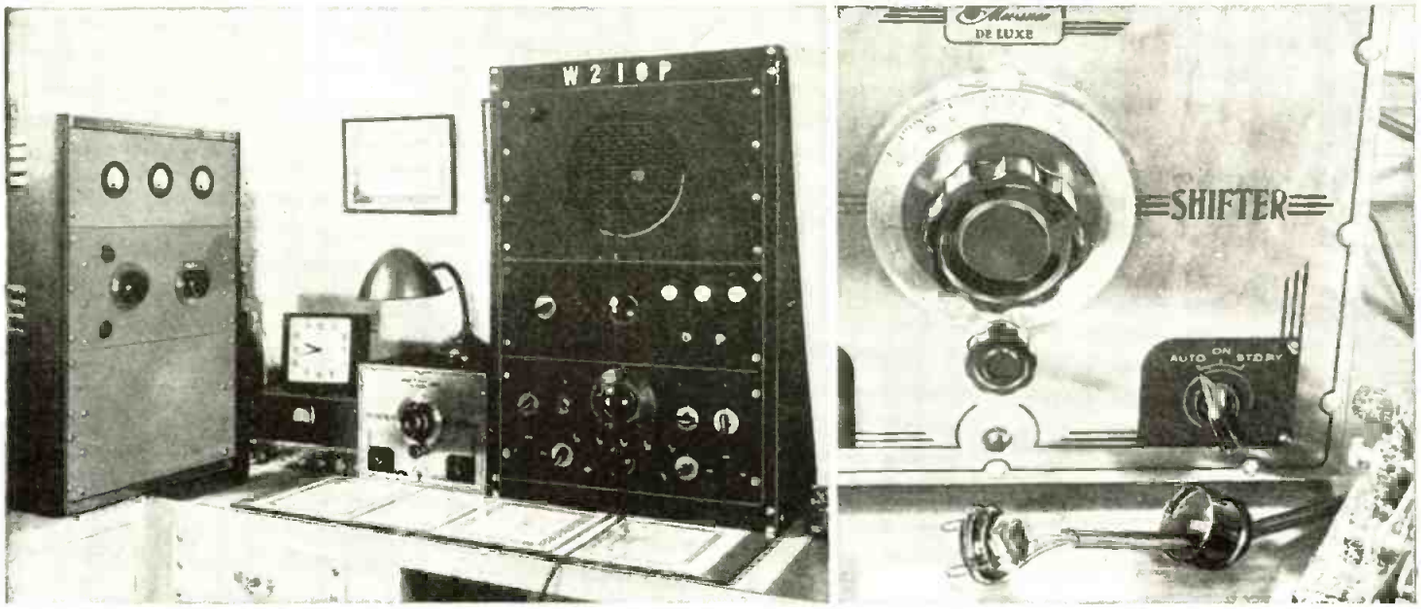
State briefly the number of continents worked, the total number of stations logged or contacted, and other features of general interest. Mention the type of aerial system and what type of break-in relay system, if any.

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

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

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





Left—The Contest Special "at home". Note the controls mounted in the rack with the receiver. The simplicity and beauty of the rig is apparent. ECO on one hand; "break-in" keying; the perfect set-up for good operating. Right—The ECO connector as explained in the text. Ordinary mike cable is used for the line, and a 5-prong plug for the container.

The 814 "Contest Special" Transmitter

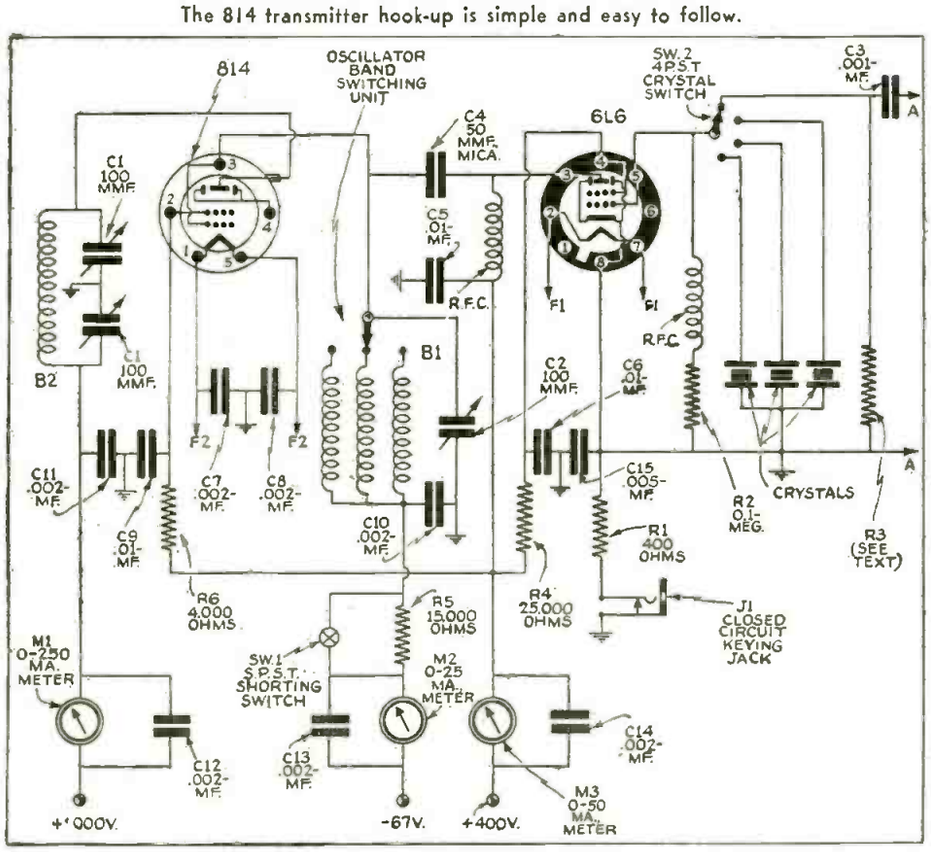
Larry LeKashman, W21OP*

● NEW restrictions on amateur radio have limited communication among amateurs to the United States and her possessions. Obviously under these circumstances high power construction is not practical. Rag chewing, traffic handling, and contests will probably by far exceed other current activities. 100 to 150 watts would do a fine job for any of the aforementioned classifications of hamming, and with this in mind we dug up this "Contest Special."

The *transmitter* described has actually been tried under operating conditions. Operating conditions may mean a bulb tied to the antenna posts or real honest to goodness QSO's. In this instance the latter case fills the bill, for this transmitter with one or two changes was used to set the National Sweepstakes contest record of over 100,000 points in the 1939 contest. This represents over 650 contacts in every state of the Union and most of our possessions in 39 hours. It has served equally well as a driver for a pair of hundredths; for consistent traffic schedules; and for general operating. As a compromise between high and low power it has proven an excellent mean; it is extremely versatile in operation and requires no expensive or tricky band-switching mechanism. For appearance it runs second to no "rig" and watt for dollar, it is very economical.

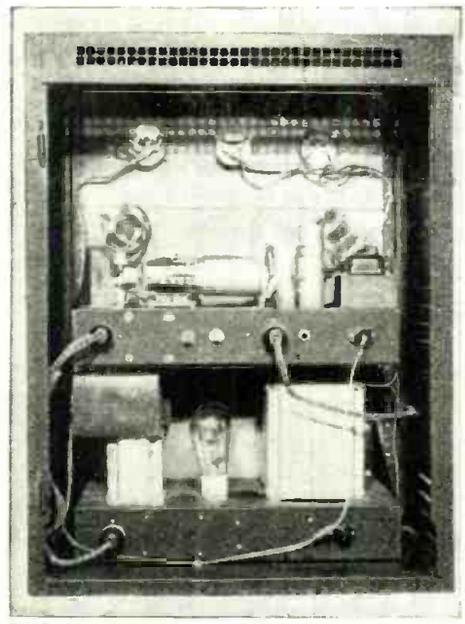
*Peerless Radio Distributors.

The 814 transmitter hook-up is simple and easy to follow.



The RF lineup consists of a band-switching crystal-switching 6L6GX driving an 814. Input may be run over 200 watts with no danger to the tubes. Plug-in coils were used in the PA, since band-switching of any rated stage larger than 100 watts is not economical. Incidentally the part list included at the end of this article really means something, because many a manufacturer's equipment fell short of the continuous demands made by this rig.

Power-supply requirements for the 814 and 6L6 were completely handled by two supplies. No circuits are given since they are quite fundamental; however, part arrangement and component rating may be obtained from the photographs and parts list. It was found that for best operating results the 814 screen supply should be independent of the plate supply. The 6L6 plate supply was tapped for the screen voltage, the only difficulty being that it was possible to apply screen voltage without 814 plate voltage. This source of trouble was overcome by using *inter-locking* switches. No switches are included on the



Back view of the transmitter: Notice how the control leads terminate in a socket at the side of the cabinet, making it a simple operation to plug in switches or relays. The jack is for cathode keying or keying the oscillator B minus.

front of the rig, since all controls are brought out through the Amphenol plugs to the control panel. The filaments are turned on by one switch; 6L6 B minus and the 814 primary by a second switch. Burgess A60's supply bias to make complete *break-in* possible.

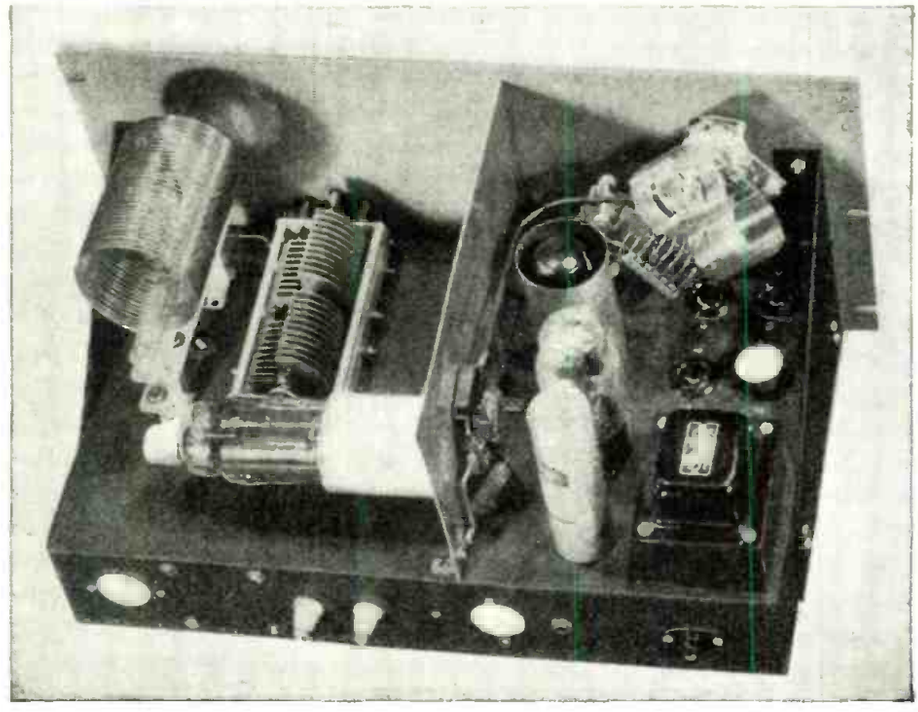
Construction of the contest special is not difficult, in fact its simplicity is one of its high points. The 814 will operate with maximum efficiency on its side, keeping the filament on a level plane of course, and the short leads make this type mounting practical. For those who feel that an RK39, or 807, because of plate leads on top, would make better oscillators, let us summarize our experience with these tubes. Despite the additional length of the 6L6 plate lead, it performs much better as an oscillator because the 807 and RK39 are too well shielded and require higher operating voltages. During contest work the 6L6 was not used as an oscillator, but as a buffer. This change is performed by switching the crystal selector to the ECO plug. Since the 814 requires so little grid drive, the 6L6 tuning is not critical and if adjusted to the center of the operating band it will provide ample excitation over all adjacent frequencies.

In the circuit diagram "A" goes directly to the output of the ECO. R3 is nothing more than a resistor cut in the circuit to raise the bias of the 6L6 from that of an oscillator to that of a buffer. Photograph 4 shows how this was accomplished in the contest special. Both C3 and R3 are housed directly in the ECO coupler.

The 814 performs remarkably well as a doubler, a resistor to aid it in this function being included right in the circuit. At this point many will wonder why we did not drive the 814 directly from the ECO. As a matter of fact it was done this way for some time. When it became obvious that a separate screen supply would be required there seemed no reason why the 6L6 shouldn't be added. It was necessary to tune the 814 grid when driving it directly from the ECO. This meant two tuned circuits all together. Adding the capacity-coupled 6L6 meant no more tuned circuits and gave the additional use of a crystal oscillator-buffer. While the 6L6 was not intended for doubling, by changing the circuit to a tri-tet you can also use the stage for doubling. The 6L6 also proved a wise step when the 814 was placed on phone since it offered another stage of isolation. When using the *Signal Shifter* this did not present any serious problem since they have a built-in buffer. However, all ECO's do not measure up to this standard.

Antennas are less of a problem when the amplifier is single ended, although you've got to watch for harmonics. During the SS, doublets, beams, and long wires all performed with fine results. This particular part of getting your station on the air

The 814 Contest Special—from the top. A 6L6GX was substituted for the 6L6 with better results.



is more a matter of personal taste and convenience, than advice. The three meters used constantly monitor the 6L6 plate; 814 grid; and 814 plate. The 814 grid is important to watch, since it is extremely easy to overdrive and seriously damage.

The 814 was not used on phone for any length of time. However, it performed very well and R9 reports were commonplace over the U.S. on 20 and 75 meter phone. On CW little more need be said for its performance. Despite the relatively high cost of the 814 it is questionable if a better performing, or easier handling rig could be built for the same cost. Figure out the component cost of this transmitter, as compared with two and three buffer rigs, and you'll fully appreciate the possibilities of beam-power tubes for medium and high-power amplifiers.

Parts List—814 Transmitter

I.R.C.
R1—400 ohms BT2
R2—100.000 ohms BT2
R3—See text
R4—25.000 ohms 10 Type AB
R5—15,000 ohms 10 Type AB
R6—4,000 ohms 10 Type AB

BUD
B1—OCS 1 Band-switching unit

NATIONAL
RFC—R100U
2—0 Type Dials

TRIPLETT
M1—0-250 ma. Type 2"
M2—0-25 ma. Type 2"
M3—0-50 ma. Type 2"

R.C.A.
1—814
1—83V

JAMES MILLEN MFG. CO.
2—37001
1—36001

PAR-METAL CO.
1—DL 2613
1—G 3602
1—G 3604
1—G 3606
2—B 4526
2—SB 78

CARDWELL CO.
C1—100 mmf. variable MT 100 GD
C2—100 mmf. variable ZR 100 AS

CORNELL-DUBILIER
C3—.001 mf. mica 4-12010
C4—.00005 mf. mica 4-24050
C5, C6, C9—.01 paper DT 6S1
C7, C8, C11—.002 mf. mica 4-52020
C10—.002 mf. mica 4-12020
C12, C13, C14—.002 mf. mica 4-12020
C15—.005 mica 4-12050
1—TLA 6040
1—TQ 15020

COTO
B2—BTVL Coils; C1 6BTLM Base

HYTRON
1—6L6GX

TAYLOR TUBES, INC.
2—866JR

STANCOR
1—C2303
1—A6335

UNITED TRANSFORMER CORP.
1—S47
1—S57
1—S33

BIRNBACH
2—423 B
2—458

AMPHENOL
2—RSS4
2—RSS5
2—PM4
1—PM5
1—RSS8
6—RCP5

MISCELLANEOUS
J1—Closed-circuit keying jack
S1—SPST shorting switch
S2—4PST crystal-ECO switch

RADIO TELEGRAPH APPARATUS *Manufactured by*

WORLD'S CHAMPION RADIO TELEGRAPHER

• *The Amazing* OSCILLATONE

- More than 10,000 oscillators built for operators during the past four years and one improvement after another has finally culminated in a genuine masterpiece.
- Beautiful plastic cabinet developed by the same artist who designed the "Super Stream-speed."
- AC-DC operation.
- Complete with built-in reproducer.
- Toggle switch gives choice of low or high volume.
- Choice of 600 or 1000 cycle note.

Truly an outstanding piece of equipment that belongs on every operator's desk.

MODEL No. S700 — NET TO THE OPERATOR **$5.95** MINUS TUBE Uses 117N7GT

OSCILLAFONE MODEL No. CR-700 @ $2.85 net to the operator. An exceptionally fine quality speaker designed expressly for key-clickless dots and dashes. Housed in this same pretty plastic cabinet.

AC-DC AUDIO OSCILLATOR

MODEL No. A-700
Net to Operator **$2.85**
Minus Tube
Uses 117N7GT

An oscillator fully as good as my amazingly good Oscillatone, except smaller housing because no speaker. Electronically keyed which means limitless speed and clean keying. Uses 110 to 120 volts, either AC or DC. Connect jumper wire across two rear terminals for speaker volume. Terminals: 2 right for key; 2 left for headphones. Please don't be misled by this absurdly low price. You cannot buy a better audio oscillator for any amount of money.

Battery Powered AUDIO OSCILLATOR

MODEL No. B-700
Net to Operator **$1.80**
Minus Tube & Batteries
Uses 1Q5GT

Same pretty plastic cabinet as Model A-700. A remarkably good audio oscillator giving a beautiful clear 1000 cycle note. Uses 1½ volt for A battery and 22½ volts or 45 volts B battery depending upon volume desired. Terminals: 2 right for key; 2 left for phones or speaker. Rear terminals, left to right: B plus, B minus; A plus. A minus. Here is really an exceptionally fine piece of battery operated equipment. No more headaches from squawky buzzers.

AUTOMATIC EQUIPMENT for TRANSMITTING and RECEIVING

Write for separate sheet describing Mac's astounding device which automatically keys local oscillator or another transmitter on the incoming signal. It is positively amazing! RETRANSMITTER, Model No. 1400 $60.00 net to operator complete, nothing else to buy.

MAC RECORDER

A commercial quality radio telegraph signal recorder capable of speeds in excess of 200 wpm. Sold only as complete unit with RECORDER DRIVING UNIT which is a signal leveler, noise suppressor and static eliminator. Separate folder available.

MODEL No. R-900 **$29.50**
Driver, RD-900 **$29.50**

MAC AUTO

Four years of constantly building and improving automatic radio-telegraph transmitters, has resulted in this fine piece of commercial quality apparatus. Uses the new 117N7GT and 117Z6GT type tubes and the RCA 923 photo-tube. Good for 200 wpm. Uses ordinary commercial inked slip. Separate folder available.

MODEL No. PCT811A **$29.50**

TAPE PULLER

Probably no one has devoted the time, energy and money that Mac has to develop a real high quality commercial type tape puller at a reasonable price. Powerful AC-DC motor with rheostat speed control. Built-in take up reel. Separate folder available.

MODEL No. CTP1300 **$29.50**

T. R. McElroy

MAC

100 BROOKLINE AVENUE **BOSTON, MASS.**

RADIO TELEGRAPH APPARATUS *Manufactured by*

WORLD'S CHAMPION RADIO TELEGRAPHER

NEW SUPER STREAM-SPEED

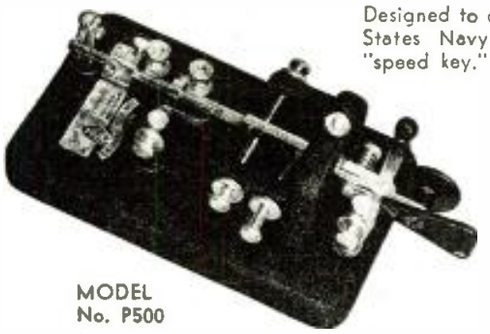
S-600-PC *Platinum Contacts* $11.85
S-600-SC *Silver Contacts* 9.50

Into this gorgeous speed key has gone Mac's 30 years operating experience supplemented by the finest engineering ability in the radio-telegraph industry . . . with their combined efforts coordinated under the styling genius of one of America's outstanding design artists. See it! Handle it! You'll have to own it!

Combining beauty and utility in a most striking fashion, this radically new, semi-automatic key is the last word in operating ease. Fast, rhythmical Morse is a real pleasure with this key.

- Streamlined base of special dense alloy. Wt. 4 lbs.
- Tear-drop shaped base makes it immovable on table.
- Heavily chromed with bluish tinge to prevent glare.
- Stainless steel coil springs and bearings.
- Beryllium copper mainspring and U spring.
- Bronze bearing screws.
- Bronze alloy pigtail.
- Bakelite insulation throughout.
- Molded plastic dot paddle and dash button.

PROFESSIONAL MODEL, MAC KEY



MODEL No. P500
$7.50
NET TO THE OPERATOR

Designed to conform with United States Navy specifications for "speed key." It is just what its name implies: A fine Professional Operator's model Mac Key. Base 3¾" x 6½" x ¾" thickness. Beautifully black wrinkled over Parkerized base casting. Carefully designed super-structure, similarly finished. Chromed parts, circuit closer, bakelite insulation, 3/16" silver contacts. A key that will thrill any radio or telegraph operator.

AMATEUR MODEL, SPEED KEY

A speed key of this quality is available at this ridiculously low price only because Mac has written off all original production costs, such as patterns, jigs, dies tools etc., resulting from tremendous volume of the old style Standard and DeLuxe Mac Key over the past five years. Nearly ten thousand of these excellent speed keys have been sold. Black wrinkled base, nickel-plated parts, no circuit closer. Here is a good speed key for the man who must watch costs, but wants a real operator's instrument.

MODEL No. A400
$5.95 NET TO THE OPERATOR

DELUXE MODEL, STREAMKEY

MODELS BB-300, or BS-300, price
$2.85
NET TO THE OPERATOR

Beautiful tear-drop streamlined base with same extra heavy, bluish tinged chrome finish used on the Super Streamspeed. All parts similarly chromed. Finely balanced and attractive key lever. Huge 3/16" contacts especially designed for these keys. There is a "feel" to these streamlined keys that'll thrill any operator! Choice of ball bearings balanced lever, model BB-300; or bronze bearing screws, model BS-300. Same price.

PROFESSIONAL MODEL, STREAMKEY

NET TO THE OPERATOR $1.80

Same key as Deluxe Model, but with black wrinkled base. Choice of ball bearings balanced lever, Model BB-200; or bronze bearing screws, Model BS-200, same price.

AMATEUR STREAM KEY

Price, net to Operator
A-100 @ $1.00
S-100 @ $1.35

Choice of either grey or black plastic. Cadmium parts. Here is a truly fine hand key at a ridiculously low price.
A100 minus switch & speed key lip.
S100 with switch & speed key lip.

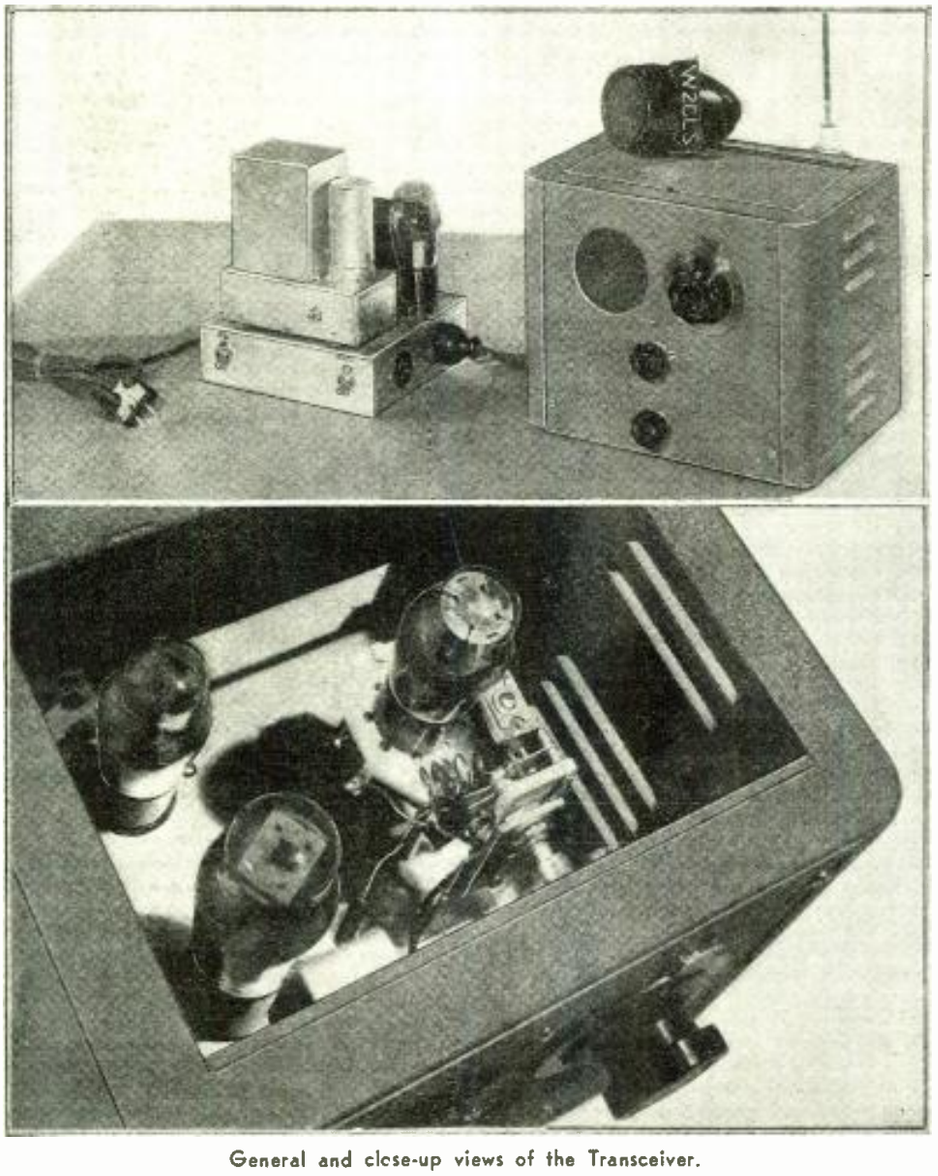
T. R. McElroy

MAC

100 BROOKLINE AVENUE **BOSTON, MASS.**

A 6 and 110 Volt 2½ Meter Transceiver

John T. Wilcox, W2CLS*



General and close-up views of the Transceiver.

● THE 2½ meter band is an excellent band for interesting "contacts" and with the band rapidly becoming more populated, it is not difficult to make a contact in most city or suburban areas.

The height of the antenna on a 2½ meter transmitter is important, and this is one of the reasons the transceiver about to be described has provisions for 6 volt car operation, in addition to 110 volts A.C. It really is interesting to try out different locations with the outfit, and many more contacts can be made from high or clear locations through the use of a 6 volt Vibrapack.

Transceivers should be designed with the thought that the same circuit is to be used for transmitting and receiving, and that only a low plate voltage and high grid resistor on the *receive* position will keep down the radiation from the outfit when receiving. Along this same line antenna coupling is important; too tight, it usually kills the receiver position and still does not offer tight enough coupling for the transmitter to "load" properly. Through considerable testing, cutting and trying of coils, condensers, etc., a fair compromise was arrived at and it will be necessary to adhere to these few important points when building this outfit. All grounds on the tuned circuit must be brought to one point close to this circuit, the condenser C4 must be very close or exactly at the center tap point it bypasses on the coil. The two .0005 mf. condensers connected to the filament of the 6J5G tube must be located directly under the tube base with *very short leads*. If all these points are followed out and the layout is adhered to, the receiver will super-regenerate with low plate voltage and the 5 megohm grid resistor specified, and allow a fairly tight antenna coupling. This will strengthen the signal in the *transmit* position.

The tuning condenser is mounted on a bracket and insulated from it by a small piece of mycalex or other suitable H.F. insulator.

The tank coil must be made up fairly exact and it may be necessary to pull it out, or compress it, in order to obtain proper coverage of the band. The condenser specified will give good band coverage, but if more is considered desirable the rotor blades may be bent out from the stator to effect greater band-spread.

The coil L1 was wound 5 turns of No. 16 bare copper wire, 7/16 inch inside diameter, spaced over 1 inch in the original set. As previously mentioned, it may be necessary to pull this out (separate the turns more) or compress it some to get the band correctly located on the dial.

To obtain smooth super-regeneration over the entire band, it may be necessary to spread the coil slightly more on the grid or plate side, depending on how close to center the coil is tapped. The R.F. choke consists of 20 turns of No. 30 D.S.C. wire, wound on ¼ inch inside diameter (close-wound).

The receiver performs in excellent fashion and will give good speaker volume on the small P.M. speaker. The antenna should be an adjustable whip type and although not critical it should be adjusted to correct length to give best results, especially on receiving. Best results will most likely be had when it is set about 4 feet high, as there is the few inches of lead to the antenna jack to consider as part of the antenna.

The oscillator in the *transmit* position will draw about 18 to 20 ma. and at 275 to 300 volts the audio power of the 6F6G will modulate fully the 5 to 6 watts input to the 6J5G.

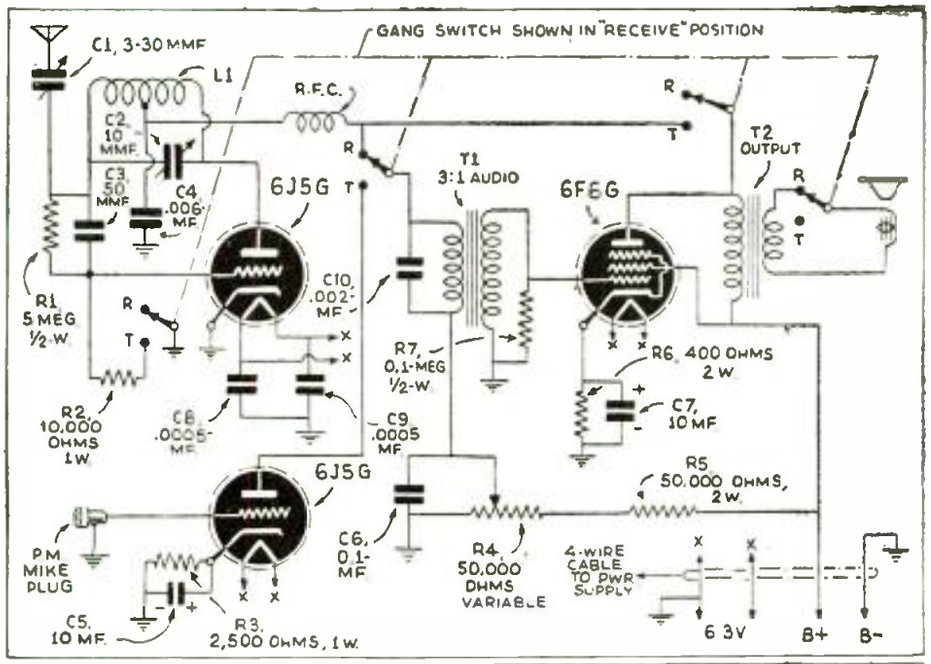
The extra 6J5G is used as a speech amplifier in the *transmit* position and eliminates the necessity of shouting into the microphone. The mike used was made from a small 2½" P.M. speaker with a "voice-coil to grid" transformer mounted in the same case. This type of mike eliminates the use of batteries and the rig will always be ready for use, and requires only A.C. power or a 6 volt storage battery.

A 4-pole double-throw switch changes the "rig" from *transmit* to *receive* position.

The R7 resistor used across the secondary of the audio transformer is needed to stop *fringe howl*.

The power-pack circuit is rather simple and the same filter system is used for both A.C. and battery operation. While the outfit can be used for portable mobile work, the writer only used it when parked at some good location, setting the outfit on the hood or roof of the car.

*Technical Consultant, Radio Wire Television, Inc.



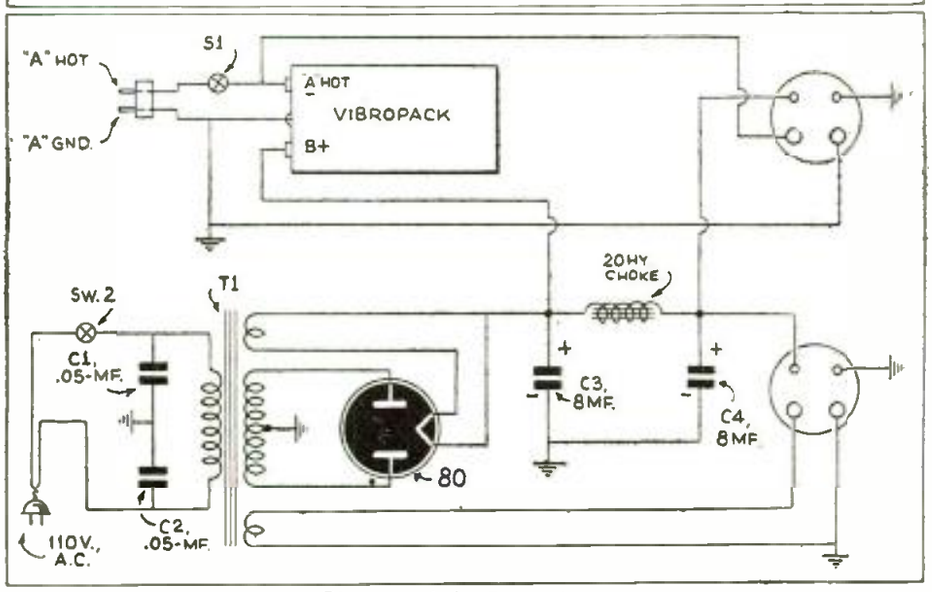


Diagram of the Transceiver.

In mobile operation severe fading will no doubt occur in many locations. If it is desired to operate *mobile*, an antenna can be rigged up on the car and fed with a single wire transmission line, tapped off approximately 7 to 10 inches from center. It will also be necessary to tap the antenna coupling condenser down about one turn from the end of the tank coil.

Ignition noise should be no problem on this type of receiver; on the writer's car the ignition did not interfere and no suppressors of any kind were used. In the short time the outfit has been in use the number of contacts effected and the fine reports received have been very gratifying.

Parts List—2½ Meter Transceiver

HAMMARLUND
1—HFA1OB condenser
1—Octal socket
1—MEX trimmer
1—FC coupling

TRUTEST
1—K19273 output transformer
1—K1619 audio transformer
1—K1458 power transformer
1—K1578 filter choke

LAFAYETTE
1—K19268 3½" PM speaker

CROWE
1—No. 298 Vernier dial
2—Knobs

PARMET
1—No. CA 200 cabinet
2—7x7x2 inch chassis

AEROVOX
2—.05 mf. 600 v. condensers
2—8 mf. 450 v. condensers
1—No. 1467 .006 mf. mica condenser
1—No. 1467 .002 mf. mica condenser
2—No. 1467 .0005 mf. mica condensers
1—No. 1469 .00005 mf. mica condenser
2—10 mf. 50 v. condensers
1—.1 mf. 400 v. condenser

MALLORY
1—V.P. 552 Vibrapack

YAXLEY
1—No. 1312L switch

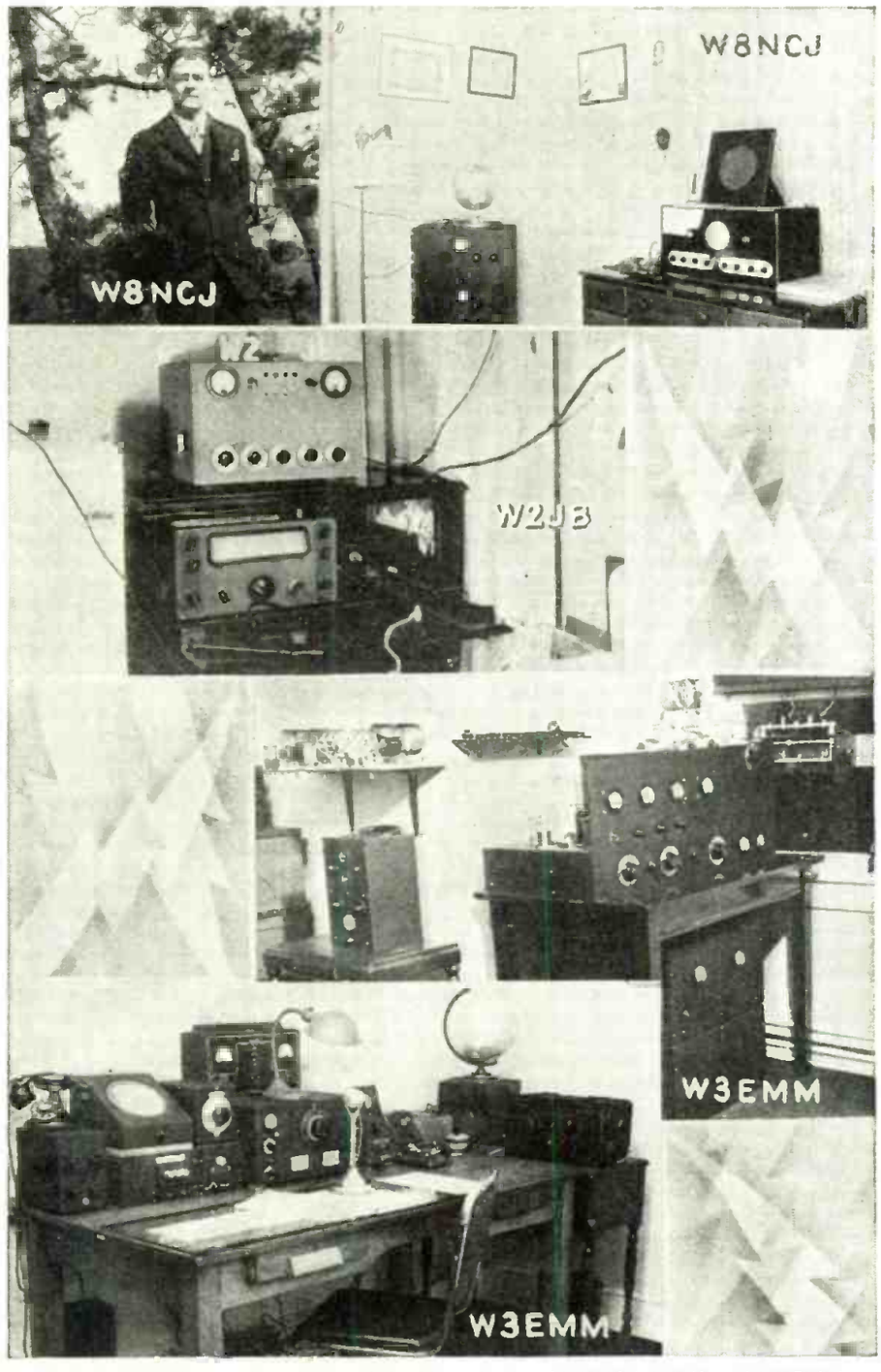
I.R.C.
1—No. 11-123 50,000 ohm control
1—50,000 ohm 2 W resistor
1—400 ohm 2 W resistor
1—2,500 ohm 1 W resistor
1—10,000 ohm 1 W resistor
1—5 megohm ½ W resistor
1—100,000 ohm ½ W resistor

AMPHENOL
3—4 prong sockets
2—8 prong sockets

MISCELLANEOUS
1—Cord connector—female
1—4-prong plug—male
1—Line cord and plug
1—Jack type stand-off insulator
1—Mike plug, chassis type—male
1—Feed-thru bushing
1—R.F. choke (see text)
Accessories:
1—P.M. mike (see text)
1—60" adjustable auto-whip antenna
Necessary wire, hardware, etc.
2—S.P. toggle switches

"CQ"

Larry LeKashman, W2IOP



Here are some interesting photos of the Ham shacks of W8NCJ, W2JB and W3EMM.

● ESTABLISHED and under way. CQ turns up the gain and starts off the first regular column. Publication deadlines make it impossible to record your reaction to the opening announcement, so until next month you'll have to copy this fist.

Amateur radio has produced another "first." The honor goes to Bill Still, W2GJR, a Jamaica, New York resident. Bill has a *televisian* set in his automobile! Not one of those NBC five ton trucks—the entire outfit is behind the dash, the center panel housing the screen. As far as we know W2GJR has produced the first instrument of its kind, and it is a long step forward toward making television really practical. Among the novel features is a relay which turns the set off automatically when the car starts, to prevent any undue distraction from driving. Just as soon as it can be arranged we will give you some photographs and technical data, in the meantime hats off to W2GJR!

W5EGA out in Oklahoma City has quite a reputation as a "rag-chewer"

de luxe! Knowing Hal as we do, it wasn't long before we got some inside dope on his family. One thing we learned, aside from the fact that he has no eligible sisters, is worth passing along to our tennis-minded friends.

Hal's mother has been Oklahoma women's tennis champ for many years and teamed up with his brother they won the Oklahoma City doubles championship. That explains where W5EGA got that swing. Anyway, he is an excellent source of tennis information if you're really serious about the game.

Something else that is really different. W2JB's set up as illustrated. Don't let the fact that the rig is between the kitchen wall and the refrigerator discourage you because it is capable of handling 800 watts! Completely contained in that one box the rig contains such unusual features as a variable link which enables you to run 40 r 800 watts by a mere swing. The line-up is a 6F6-PP 6L6's and PP HK54's. As Ben puts it—the rig is "hamproof," being completely equipped with safety switches throughout. Whenever the HK54's run too hot, Ben opens that nearby door and dishes out some ice cubes. W2JB likes his super-compact rig mighty fine, but out of his 86 countries *worked*, 79 were done with a lone 807, which for New York City is mighty fine.

With our tongue in our cheek we criticize our contemporary radio column competitor in the newsweekly, *Time*. Our complaint is that they give radio a very haphazard treatment and generally write down our finer points. The abuse that the radio industry takes through their technical errors has given us a good case of the horrors. Their most recent departure from convention was the description they gave of WABC's new "475 foot transmitter." Quite a long line even for the BC bands. Their blanket statement that only the strongest signals could be heard through the steel of New York skyscrapers is also somewhat misleading. There are two DX Century Clubbers in Manhattan, both in steel skyscrapers. Besides—there are numerous holders of WAC certificates—if you don't believe me, ask W2HHF, W2HUQ, W2GVX, W2JXH, W2HMD, and lots of others. Anyway, we are glad to award a pink ticket for *Time* magazine.

Incidentally our reason for getting so hopped up about *Time* is that back a few months when *Fortune*, a related publication, printed their *All-American* issue, they listed the outstanding American hobbies. Smack down to those with only 15,000 bona-fide enthusiasts went *Fortune* and *never a once did they mention Ham radio* with over 55,000 licensed amateurs.

Contrary to popular belief, new hams are getting on the air faster than ever. While most of us with our "inside" information can hazard a guess as to the future status of amateur radio, the only people who really know are the FCC commissioners and their close associates. Common sense indicates the amateurs will not be disturbed by anything short of war. But one way or another don't pay too much attention to "confidential" dope floating around amateur circles.

'Tain't worth repeating, but I'm out of your reach. FCC order number 674 will

insist that all licensed amateurs obey the Ohms law.

The San Antonio Radio Club turns out a nifty sheet under the *nom-de-plume* "Gutter Dope." Unfortunately, as in so many similar publications, the editors are having a bit of trouble obtaining material. W5's down there might pitch in and lend a hand. Meetings are held at the Gunter Hotel at 8 p.m. Fridays. Lifted from their column is the following gossip from Texas. W5BLE is said to be on with grid-modulated 211's. W5FAR is teaching swimming at St. Mary's University. W5FGV lives practically under W5FGQ's three element rotary and yet they have never met. W5AJW is fooling with radio-controlled airplanes. W5AXI has stumbled on a new kind of modulation defined as a cross between FM and AM, to be known as PM. W5EIS keeps too busy with YL's to bother with amateur radio. W5OR and W5PF have recently joined the ranks of the benedicts. Among the familiar calls mentioned are such active boys as W5HDK, W5JC, W5FGQ, and W5HHL. We'll be hearing more from all of them in future issues of the column.

The Queens Radio Association (QRA) celebrated its second anniversary with a club dinner. The Tom Felineys (National Television Corp.) recently supplied the industry with a new expert. Out Hollywood way Bob Larson of 618 North June Street wants to swap QSL's with SWL's. I offered him 1000 choice cards from my collection for HL.

The New Zealand DX Radio Association is continuing publication of their journal *Tune In.* Of interest to many amateurs who might not be aware of this particular phase of our hobby is the *broadcast* band listening done throughout the world. Some day we hope to run an inside story on the things they hear, but sufficient to say, just about every station in the U.S.A. has been reported heard at one time or another in N.Z.

New Zealand SWL's report 10 meter conditions very poor; 20 spotty; and 40 excellent. One morsel they make note of is ZP2AA on 14 mc. phone. Well some day— Some of the best W's reported on 20 were W7GVA; W9BEU; W9NQI; W7FLD; W8OQF; W7HIQ; W6QUU; W6PXP; W5IDZ; W1AXA; W8OCA; W1KMY; W2LFN; W5IEP; W9THS; W6MWQ; and W6QAP.

Bemoaning the loss of the *S.S. Niagara,* the gang make note of the fact that numerous QSL's headed for the states went down with her when she hit a mine.

As you should know by now Cuba is back to the CM prefix. The DASH reports that German amateurs are being relicensed and are expected to carry on strictly in the usual manner, *in spite of the war!* The WIA has made application for the reissuance of licenses throughout Australia for frequencies above 112 mc. with power limits of 25 watts. South Africans will be relicensed after individual approval by the Government board, consisting of Communications, Military and Civil authorities.

Not in the amateur category, but perhaps of interest to our readers: The BBC has short-wave programs for United States listeners, available by writing to the British Broadcasting Corporation, 620 Fifth Avenue, New York City.

There are lots of amateurs still building and rebuilding. W2MUO has just arranged a big deal with one of the locals and will soon be sporting a pair of 100TH's. Fred's rig will be a Meissner Signal Shifter—6L6-814-PP100TH's. W2KUP is putting PP HK54's on 112 mc. W21CX, slowly, but surely is assembling his 250TH's. W2KIK is QRT, having joined the Army. W2GWE will sell his four 250TH's at a good price—married life keeps him QRL. W2LJM, W2MXB, W2IOP, and W2MVJ are all in the process of building new gear. W2MDU is lining up the phone gear. W2MYK finally broke down and started to rebuild without any "haywire." Fritz is the man of many calls having held NY2AE; W6HSV; 9LA; etc.

Don't forget, gang, that next month it'll be your column. Your remarks and ideas; your comments and suggestions. Let's hear from everyone and if you have any good photos around, ship them in. Until the next QSO 73.—L.L.

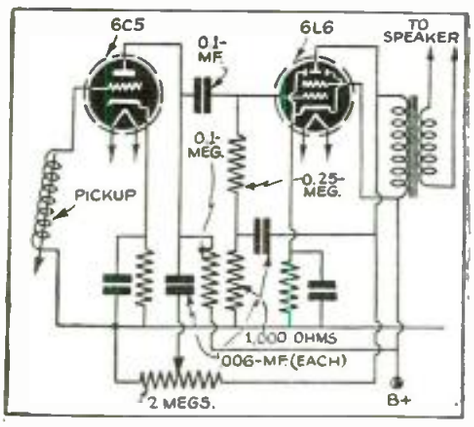
Degenerative Feed-Back

I just bought the current number of R. & T. and looking through its pages with a hungry gleam in my eyes for new circuits —boy, was I surprised! If all forthcoming issues are equally as good, then you will have achieved your goal, because this new make-up contains just about everything in radio, down to the beginner.

I am buying R. & T. at the newsstands.

The circuit which I relate to is a method varying the amount of degenerative feedback with a 2 megohm tone control; this method achieves one or more things. You can run the control at mid-position for high tones. At one end of control you can reduce highs and lows; at the other end of control degenerative feed-back comes into play, boosting the lower frequencies. I do have a very slight amount of feed-back within the power stage itself. I am using this method of tone control in my own amplifier; the high resistance in the tone control keeps it from being burned up. This tone control really works.

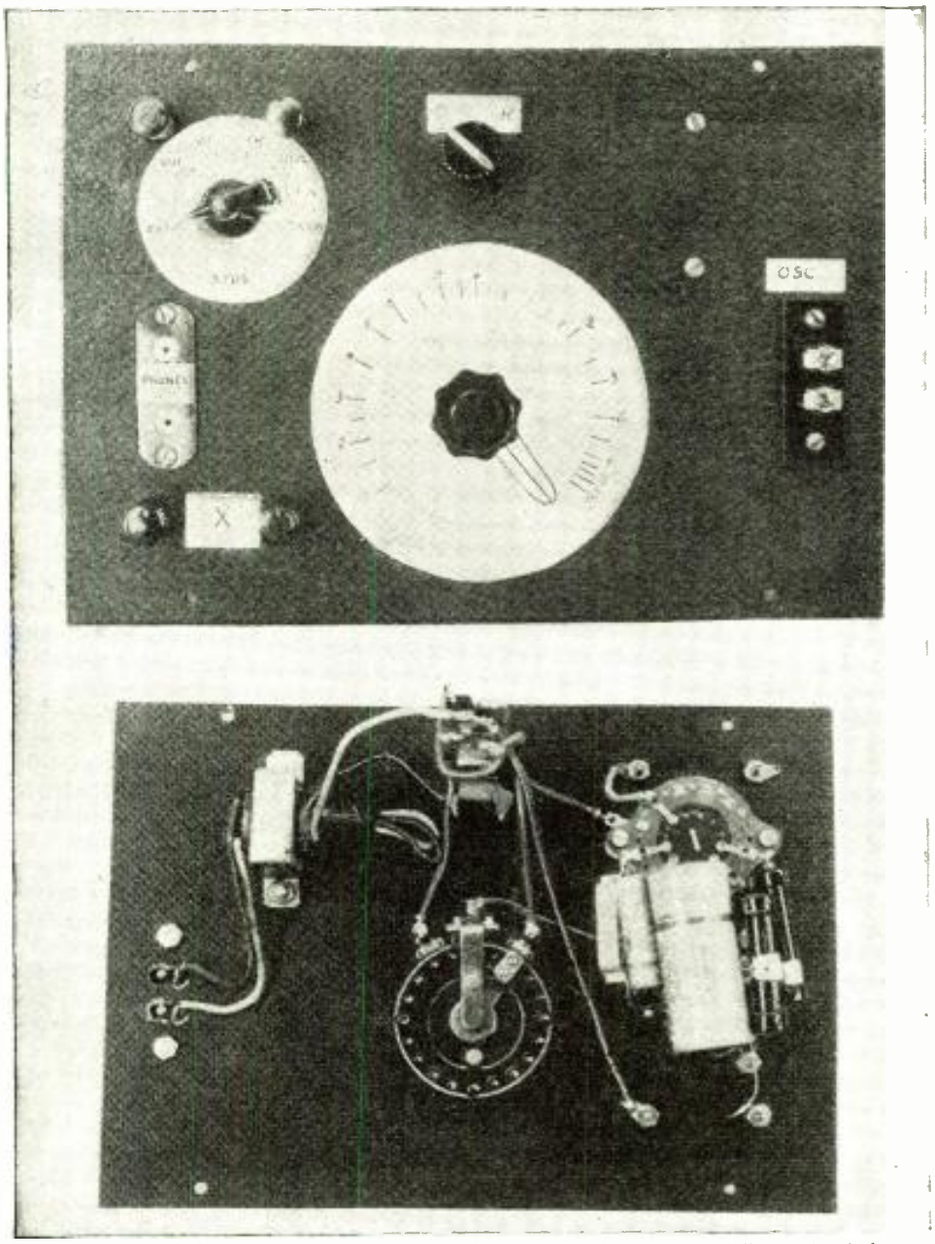
M. IANNONE,
Pittsburgh, Pa.



A Direct-Reading

Resistance & Capacity Bridge

Lawrence Fleming, W3HQP



Two views of the resistance and capacity bridge, showing the specially made dials.

● THE bridge to be described will measure resistance from 1 ohm to 1 megohm and capacity from about .001 mf. to 10. mf. The accuracy is on the order of 10%. The dial scale is home made and it is direct-reading. Once the dial is set at the point where the audio oscillator note disappears in the headphones, the scale reading gives the answer directly, without any further figuring—as easily as with a commercially built bridge.

Circuits

Fig. 1 shows the circuit. It is set up to measure resistance and capacity only. There are several reasons for leaving out provisions for inductance measurements. In the first place, the inductances usually used in radio work are either very small—R.F. and I.F. coils on the order of 10 to several hundred microhenries—or they are very large—audio transformers and chokes of quite a few henries. In the case of R.F. coils, their reactance (or more strictly, impedance) at the audio frequency used for measuring is very small. It is so small that the stray inductance and capacity of the bridge circuit is enough to make the null point indefinite and spoil the accuracy. In the case of audio transformers and chokes, and with R.F. coils also, their D.C. resistance is fairly sizeable compared with their reactance. This introduces phasing difficulties which make necessary an extra control on the bridge to obtain proper balance. This extra complication is hardly worth the trouble in any but laboratory work, since R.F. coils can usually be measured better by finding the frequency they tune to with a known condenser, and since there is seldom much need to know the inductance of an audio choke or transformer with any exactness.

The lower limit of capacity that can be measured depends on the stray capacity to ground of the parts and wiring of the bridge circuit. This limit is usually about .001 mf. It can be extended downward by careful shielding and by adding an extra control, known as a Wagner ground, for balancing out the stray capacity. However, nobody wants to twiddle several knobs just to find how many mikes a condenser has, so we will leave out the extra controls. Anyway there is a method of getting approximate measurements of capacities down to about 100 mmf. with the bridge just as it is, without the trimmings. This method will be described later.

The circuit of Fig. 1 is, then, a simple bridge in its primitive state. Three built-in standards of resistance and three of capacity are provided—10, 1000, and 100,000 ohms and .001, .01, and 1 mf. They are shown as R1 to R3 and C1 to C3, and are selected by a single gang tap switch SW1. In addition, one of the points on the tap switch goes to a pair of terminals for hooking on any other standard which may be desired. P is the main potentiometer with which the balance is found, and its pointer travels over the home-made direct-reading scale which will be described presently. Incidentally, P must be the linear taper, wire-wound type, and the larger its physical size the more accurate it is likely to be.

SW2 is a reversing switch. The impedance of a condenser is inversely proportional to its capacity, while the impedance of a resistor is directly proportional, of course, to its resistance. Hence the potentiometer scale would read backwards on capacity measurements if it were connected so as to read resistance correctly. To get around this, therefore, we hook up the reversing switch so we can "turn over" the potentiometer when we want to change from resistance to capacity measurements, and vice versa.

Standards

For the 10 and 1000 ohm standards R1 and R2, ordinary wire-wound 5 or 10 watt resistors are accurate enough. For the 100,000 ohm R3, a Continental Carbon Multiplier resistor is inexpensive and satisfactory. High grade mica (.001) and paper (.01 and 1 mf.) condensers make fairly good capacitance standards. If the condensers closest to their rated value can be selected from a batch by means of a dealer's or serviceman's condenser tester, so much the better.

Audio Power

Many experimenters, like the writer, have a test oscillator which will put out 50 milli-

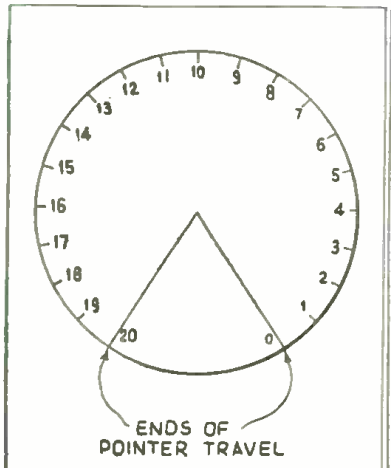


FIG. 4

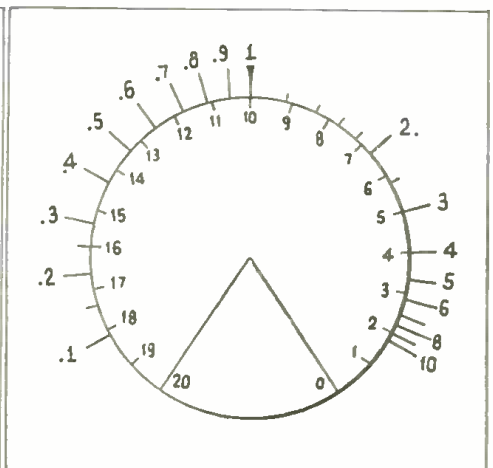


FIG. 5

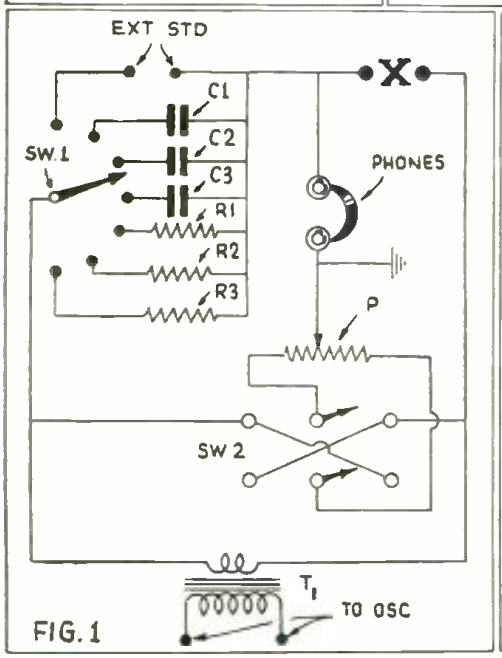


FIG. 1

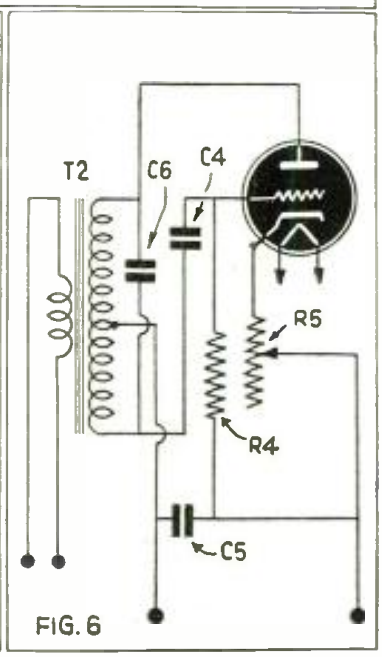


FIG. 6

Drawings above show details of special dials, which are easily made—and diagram of bridge connections.

watts or so of good wave form audio at some frequency between 400 and 2000 cycles. For this reason no oscillator was built into the bridge. A code practice oscillator will not usually give good results because its output is rich in harmonics. The better the wave form, the better the results. The oscillator frequency does not affect the readings obtained. The frequency should be selected for the ease with which it can be heard in the phones.

The reason for including the coupling transformer T1 in the circuit is largely to help balance the stray capacity to ground of the two sides of the bridge. It also steps down the impedance of the oscillator to make it match more closely the bridge impedance (which is roughly equal to the resistance of the potentiometer P), in order to get a healthy oscillator signal into the phones. The requirements for the transformer are not critical. A plate-to-line transformer will do, or a carbon mike transformer with the low impedance side toward the bridge. The writer uses an old line-to-grid unit rescued from the junk box. If the oscillator employed has a built-in output transformer, none is necessary at T1.

As for potentiometer P, its resistance can be anywhere between, say, 200 and 5000 ohms. The resistance has no effect on the calibration of the instrument. The only requirement is that it be linear—no taper—and that it be wire-wound for permanent calibration. The writer uses an ancient Yaxley "air-cooled" 400 ohm unit.

The Layout

Fig. 2 is a photograph of the panel, and Fig. 3 the back. The main potentiometer P is in the center of the panel, with the large knob and scale. Immediately above it is the reversing switch SW2. The range switch SW1, with the resistors and condensers grouped around it, can be seen in the upper right-hand corner in Fig. 3. The mechanical layout has no particular effect on the performance of the outfit, and should be arranged for convenience. The panel is Masonite, crackle-finished, 7"x10".

Scale Layout

Now for the main part of the job, drawing up the scale. This has to be an individual job for each model of potentiometer, because the total arc of shaft travel varies somewhat between different makes.

The knob used is a medium-sized "transmitter" knob. A strip of celluloid is cemented with Duco cement to the inside face of the knob to make a pointer about 2" long. Scratch a line along the center of the pointer out to the tip. Now cut out a piece of stiff paper about 5" in diameter, and cut a 1" hole in the center. Mount the potentiometer on the panel and temporarily fasten the paper in place on the panel, with the 1" hole centered around the shaft. Fasten the knob in place, and rotate it to the extremes of its travel, making a pencil mark at the two positions of the pointer. Now remove the paper and draw on it a circle having a radius equal to the pointer radius, carefully centered at the point where the shaft goes through. Take a pair of dividers and divide the arc of the pointer travel along this circle into half, then divide each half into two parts; then divide each of these quarters into five equal parts. Number each of these divisions lightly in pencil from 0 to 20, on the inside of the circle. By now the scale should look like Fig. 4.

Now we come to the final marking. On the outside of the circle, opposite the number 10, mark 1 in ink. At 6.66, mark 2, and so on throughout the arc, locating the ink numbers according to Table I.

TABLE I

Ink number (n)	*Location on pencil calibration (a)*
0.1	18.2
.15	17.4
.2	16.6
.25	16.
.3	15.4
.4	14.3
.5	13.3
.6	12.5
.7	11.75
.8	11.1
.9	10.5
1.	10.
1.2	9.1
1.4	8.3
1.6	7.7
1.8	7.2
2.	6.6
2.5	5.7
3	5.
4	4.
5	3.33
6	2.8
7	2.5
8	2.2
9	2.0
10	1.8

The relation between the numbers in the two columns is:

$$a = \frac{20}{n+1}$$

The scale should now look like Fig. 5.

Erase the pencil markings on the inside of the circle, and the thing is done.

Don't cement the scale directly to a crackle-finished panel. The black finish may soak through the paper in spots. Back it up first with another piece of paper. On the one the writer built, the soaking-through process took several months, but succeeded in making a complete mess of the scale. Rubber cement was used in that case.

Since the numbers are closer together near the ends of the scale than at the middle, it might seem at first glance that it is less accurate at the ends. If accuracy is taken as meaning the amount of ohms or mf. per unit of scale length, that is true. But if we take accuracy as meaning the *percentage* change per unit length, then the scale is fairly uniformly accurate throughout.

Operation

Each graduation on the scale gives the ratio at that particular point between the left-hand and the right-hand portions of the potentiometer winding. This is identical with the ratio between the unknown and the standard resistor or condenser. Here is an example. Connect up the oscillator and the headphones and turn the range switch to, say 1000 ohms. Now connect a resistor of, say 3000 ohms across the "unknown" posts (marked "X"), and listen to the oscillator note as you turn the potentiometer knob. The oscillator note will fade out as the pointer passes 3 on the scale. The ratio between the unknown and the standard is 3; 3 x 1000 is 3000 ohms.

Incidentally, the null may occur in this first trial at around 0.33, in the left-hand half of the scale. If it does, flip the reversing switch and mark with an "R" the position at which the scale reads correctly for resistance measurements. Mark the other position "C".

It will be noticed that the null point becomes broader as higher resistances and smaller capacities are measured. The practical limits are around .00025 mf. and 2 megohms. Also, hum pickup and hand capacity become noticeable in these ranges. The ground to the arm of the potentiometer shown in Fig. 1 becomes important here. If a good ground is not handy, touching the phone terminal which connects to the arm of P will help considerably.

A way to measure small capacities is to balance the bridge with the .001 mf. standard cut in and with an .001 mf. condenser connected across the "X" terminals. Then add the small condensers (on the order of 100 mmf.) across the one already in circuit and rebalance the bridge. The difference between the two readings gives the value of the small capacity.

The bridge is not intended for measuring electrolytics, but good results can often be obtained if the condenser is first hooked across a source of D.C. at its rated voltage for a short time, then immediately put on the bridge.

Oscillators

If no oscillator is available, one can be easily built. The circuit of Fig. 6 is an example. It is largely self-explanatory. The tube can be any medium-mu triode. R5 provides bias and also some inverse feedback which helps to improve the wave form. T2 is a push-pull output transformer with a secondary impedance of 30 to 500 ohms or so. A midget speaker output transformer with the secondary replaced by 300 turns of No. 32 wire will do. The primary impedance should be rather low. A low L/C ratio gives good wave form in audio oscillators as well as in R.F. work. C6 will have to be selected by trial to give the best-sounding note. It will run somewhere between .005 and .05 mf.

Parts List

C1—.001 mf. mica condenser
C2, C4—.01 mf. paper
C3—1.0 mf. paper
C5—.1 mf. paper (may be omitted)
C6—See text
R1—10 ohm wire wound resistor
R2—1000 ohm wire-wound resistor
R3—100,000 ohm precision carbon resistor
R4—250,000 ohm carbon resistor
R5—10,000 ohm volume control
P—3000 ohm linear wire-wound potentiometer
T1—10,000 ohm plate to 500 ohm line transformer
T2—P-P output transformer, 500 ohm sec.
Note—T1 not necessary if T2 is used.

Send Your Own Facsimile Pictures

Carl Helber

● WITH the simple device shown it is possible to send printed material by the action of electrical impulses. This article describes the *transmitting* scanner only. The scanner was built as an aid to testing a home-made facsimile printer, which was built about six months ago.

The outfit is capable of sending only black and white material, with no discrimination for intermediate shades. Only simple tools are required to build the scanner and the parts are very inexpensive; in fact, many of them may be found in the average experimenter's odd-parts box.

The first step in the construction is the making of a suitable drum for holding the material to be scanned. For this purpose a piece of bakelite tubing 2¼" in diameter and 5½" long should be procured. A groove is cut in the surface of the drum in order to accommodate a clamp made of a tin strip 5½" long and ½" wide. Two hacksaw cuts are used to start the grooves and then the material between the cuts is removed with a narrow chisel. At either end of the clamping strip is a ⅛" hole to accommodate the clamping screws. Next two disks of ½" wood are turned out on a grinding head or wood lathe. The discs should fit snugly into the ends of the drum. A ¼" iron rod is used as the shaft for turning the drum. The shaft can be attached to the drum discs by means of a small radio knob, in the manner shown in the drawing.

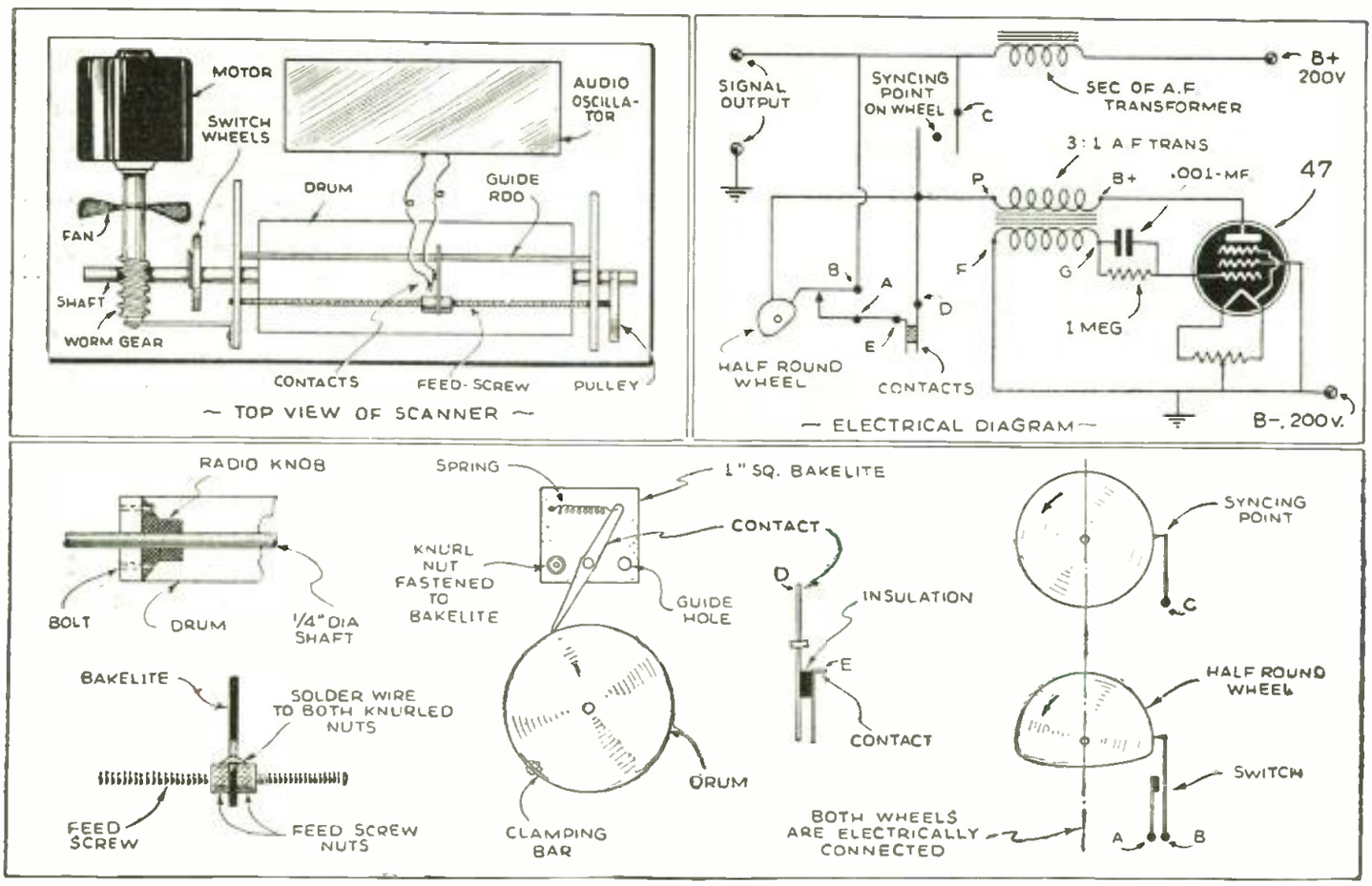
Two pieces of ⅛" masonite 4x3" are then cut to serve as supports for the shaft. Two small angles are used to fasten the supports to the base, which is made of a piece of wood 10¼"x6"x⅞" thick. The drum is separated from its supports by several small washers. The picture or drawing to be transmitted must be in the form of a strip, which is 6¾" long and any width up to 4¾". The screws of the clamping strip are loosened and the ends of the paper slipped under the strip. Tightening the screws completes the mounting of the material to be sent.

The material to be scanned must be prepared by putting a layer of graphite on the black parts with a very soft pencil. The material is scanned by two metal contacts, mounted in such a way that they pass over the material to be scanned. Wherever the contacts pass over the graphite, a circuit is completed which operates an audio oscillator. The audio signal is amplified and fed to the facsimile *printer*. The contacts are made of small strips of galvanized iron (or spring brass) about 26 gauge and are mounted as shown in the diagram. Of course the two contacts are insulated from each other, but they should be as close together as possible. A spring is attached to the contacts in order to keep them in contact with the paper in case of any irregularities which may occur in the drum.

A piece of ⅛" thick bakelite about 1" square is used to support the contacts. Two ⅛" holes are drilled in the strip about ⅝" apart. One hole is used to guide the bakelite, while the other is attached to a feed-screw by means of two knurled nuts as shown in the drawing. The feed-screw is a 6½" length of ⅛" rod, threaded about 6" with a 6-32 die. The feed-screw and guide-rod are mounted just above the drum. On the threaded end of the feed-screw is mounted a masonite pulley 2¼" in diameter. A rubber band is used to connect this pulley to a small pulley on the drum shaft. The small pulley is conveniently made by slipping a piece of rubber tubing over the end of the drum shaft.

This arrangement should provide about 150 scanning lines to the inch. The width of the scanned material is about 2¾". With

Below—diagrams showing arrangement of Mr. Helber's facsimile apparatus.



these constants the facsimile index is 412. The reason that the scanning width is only 2¾" instead of 3⅜", is that the drum revolves at a slower rate than the rate at which the printer arm travels. The commercial Finch recorders have an index of about 400; therefore, the scanner and printer will work together very nicely, provided that the scanning and printing rates are very nearly the same.

On the end of the drum shaft opposite the pulley arrangement are mounted the gear drive and a switching system. The gears have a ratio of 40:1 but 36:1 will work about as well, depending upon the speed of the motor. The latter ratio (36:1) was suggested because the gears from a toy "Erector" set can be used. The worm gear is connected to an induction motor from an electric fan by means of a small piece of rubber tubing. The motor should have a speed of about 2400 R.P.M. if a 40:1 gear ratio is used or 2100 R.P.M. if a 36:1 gear ratio is used. The author used a ratio of 40:1 and obtained a drum speed of 59 R.P.M. which was very suitable. Again the most convenient method of connecting the large toothed-gear to the drum shaft, is by means of a radio knob. Incidentally, the motor should be cooled by a small fan mounted on the shaft.

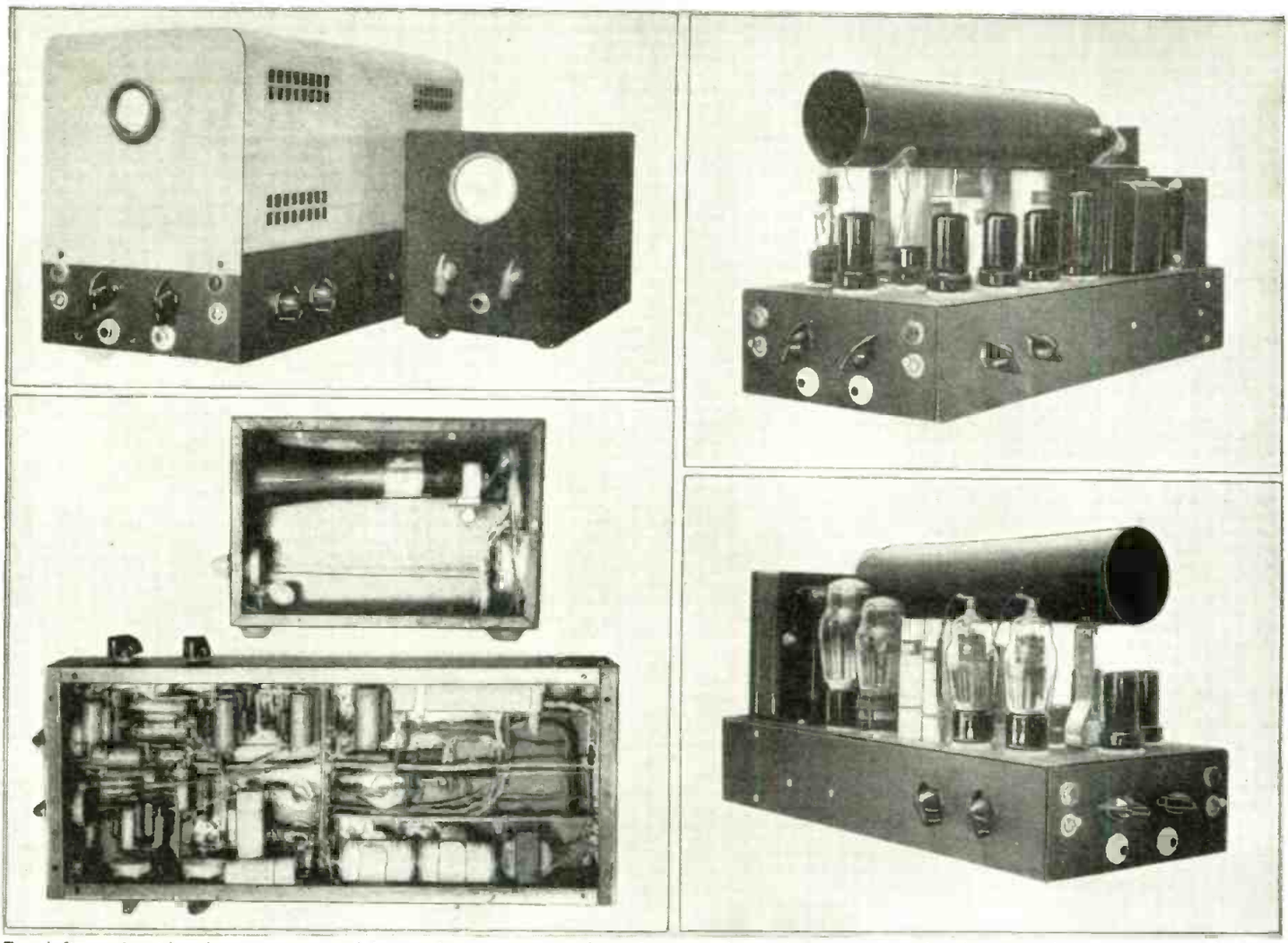
Next to the gear arrangement is mounted a switching arrangement which automatically sends out a synchronizing impulse just before each scanning line starts. The synchronizing impulse is of greater amplitude than the picture impulses, but is of the same frequency. The switch is constructed so that impulses from the drums are sent only for one-half of each revolution. The contact is then broken and the switch is in a position to receive the synchronizing impulse. The synch. impulse is produced by a protruding pin on the switch wheel. The switch wheel was taken from an old radio dial and is made of brass.

The electrical circuit is that of a simple audio oscillator, using a 47 for producing oscillations. After trying several oscillators it was found that by connecting the screen to the cathode, the plate current could be cut to the very low value necessary for reducing the voltage drop across the graphite coated material. About 200 volts on the plate is sufficient to produce enough output to drive a 6L6 to satisfactory printing output. The synch. contact should be adjusted so as to close just before each scanning line starts. The switch should be positioned in such a manner that the clamping strip passes the contacts on the return stroke of the printer.

A slight bit of linear distortion occurs, because the lines are scanned at constant speed, but reproduced at a slightly varying speed. The distortion is hardly noticeable, however. I find the scanner almost indispensable when testing out my home-made printer. Tests are run on Sunday mornings just before W1IK's 1:30 a.m. facsimile program. In this way I can tell that the printer is functioning properly. (My receiving station is located at Cleveland, Ohio.) I hope to give more details on facsimile soon.

Example of facsimile picture reproduced by the apparatus described.

Another article on
"FACSIMILE"
will appear soon—
Watch for it!



Top left—main videophone camera and its monitor—camera at left of picture. Lower left—a view under the deck of the camera and looking inside the monitor (smaller apparatus). Top and bottom views at right show videophone camera, with cover removed; iconoscope tube shield is shown in place.

The R. & T. Videophone

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

This extremely flexible unit can be used as:
Two-Way Television Telephone
One-Way Television Telephone
Modulator Unit in Amateur Radio Television
Television Service Engineer's Video Signal Generator
Television Camera for Demonstrations
Classroom Demonstration Unit

● DESCRIBED in this and next month's article you have "in the flesh" one of the simplest and cheapest Television camera units yet designed for the home constructor, the experimenter, the teacher and the amateur. It makes use of the new RCA Radiotron 1847 amateur Iconoscope.

The authors show how to make this unit into a two-way *television-telephone,* carrying the picture and voice both ways. How many men have dreamed of doing this! This was made possible, of course, by the "ham" ike—the unit was designed to make use, as economically as possible, of this tube. The use of the RCA 902 cathode ray tube to view the picture is dictated by economy, as the same power-supply is then used for both ikes and also both picture tubes. The use of a 906 or larger C-R tube would necessitate a separate power-supply for them and the addition of sweep amplifiers to the present sweep oscillators in order to cover the larger area.

The design is such that either camera can be used with either "monitor." When the nearer monitor is plugged into its camera it is possible to make camera adjustments. When the camera is fully adjusted the nearer monitor is plugged out and the distant one plugged in. The operator is thus assured that he is sending out a good picture.

Two designs are described. In one the use of the device as a *two-way television telephone* is uppermost in mind; in this one the second camera has no built-in power-supply at all. The one camera supplies all sweeps, video amplifiers, etc., for both cameras and both monitors. In the second design its use as a one-way unit OR as a MODULATOR FOR HAM TELEVISION is considered more important. The power-supply used in this design is smaller and somewhat cheaper; it is called upon to supply only one camera and one monitor. For utmost flexibility it is desirable to make both units like the latter. In this case the constructor will be able to use either camera completely independent of the other. For maximum economy, however, where two-way television telephone service is desired, the first unit is the one to build.

The tentative amateur television standard was adopted. This is 120 lines per picture, 30 pictures per second. This was done with the use of the unit as a modulator for amateur television, later, in mind. The 120 lines

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per picture is about the resolution limit possible with the ham ike.

The camera unit containing the power-supply for the complete television telephone system, also contains the video amplifiers which must follow its ike, a blanking and synchronizing impulse tube and the sweep (saw-tooth) oscillators. The other camera in this set-up contains the ike and its videos. The controls provided on the first camera are: Horizontal Sweep Frequency (number of lines per second); Vertical Sweep Frequency (number of frames per second); Focus and Beam Current of the ike; Gain of the Video Amplifier (picture contrast); and blanking level control.

On the monitors, which contain only the cathode-ray viewing tube and its bleeder (besides the plug), are mounted the focus and brilliance controls of the picture-viewing tube, and a jack for a pair of phones (when apparatus is used as a one-way televisionphone). On the camera is mounted a pair of jacks, one for mike and one for phones (phone jack used for two-way videophone operation). The other camera contains an ike and its video amplifiers, a filament transformer, focus and beam current controls for the ike, and a video gain control.

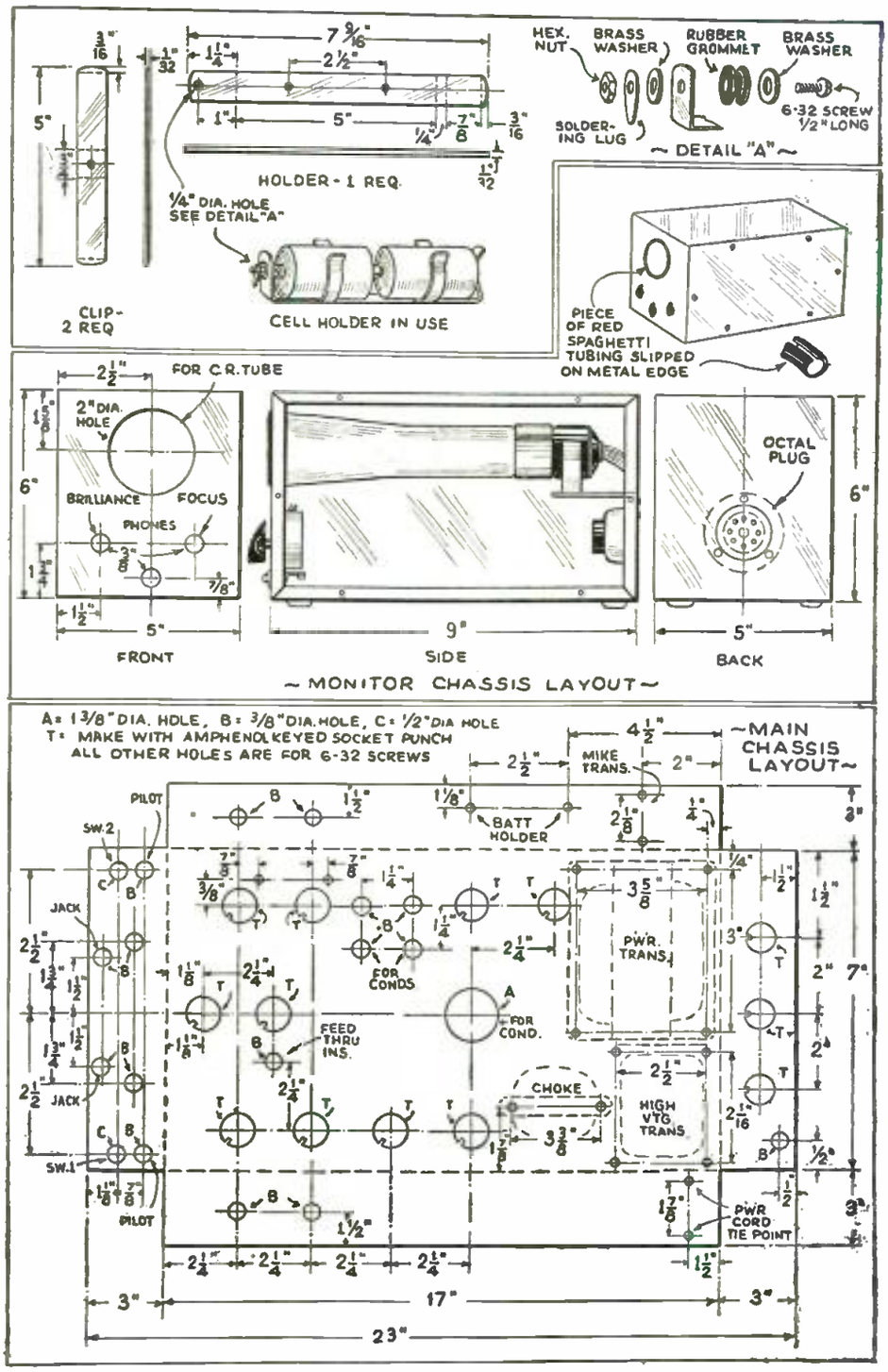
When use of each unit independently is foremost in the mind of the constructor—or if it is intended to build only one camera and monitor (for either one-way televideophone OR as modulator for ham xmtr) the units will each contain the following. In the camera: power-supply for camera and one monitor complete—this includes a high voltage supply for the ike and the C-R tube and a low voltage one for the video amplifiers and the sweep oscillators. The camera will also contain the bleeder for the ike, the video amplifiers, the sweep oscillators, the blanking and synchronizing tube, the six controls mentioned above and the ike. The monitor will contain a bleeder, plug, jack, and the two controls for the viewing tube. The camera of course has the mike jack and the plug for the cable going to the monitor.

The photographs which accompany this article show the BIG camera and one of the monitors. This is the camera designed for two-way videophone operation and containing the larger power-supply. Note the relatively small size of the unit, also the bare simplicity of the monitor unit. In this two-way unit the other camera will be very empty; the other monitor just like the one shown.

We are accompanying this write-up with full chassis drilling layout and with all mechanical construction details. The sketches will enable the ambitious constructor to get started without any delay. By the time the next article appears he can be ready to mount parts and wire the unit he has elected to construct.

In the meantime final tests and improvements are being made on the videophone units at the laboratories of the Television Club at the Brooklyn Technical High School to assure the constructor that he is going to have a completely "de-bugged" outfit which will work well—first crack!

At the present moment we are employing five video amplifier stages—four using 6AC7 tubes and one a 6AG7. We are endeavoring to improve the *gain*, without im-



Drawings above show detail of cell holder; monitor chassis layout (center) and lower view—main chassis layout.

pairing the response of the videos, in an effort to do with three stages in place of five. Five are a little fussy to keep stable and without tendency to oscillate. However, should they prove absolutely necessary, following our plans will assure good results.

We have endeavored to build the camera unit upon the smallest possible chassis, so that it may not be clumsy and so that it can later be mounted upon a regular heavy wooden camera tripod for out of doors use. The experimenter may therefore employ a larger chassis. In this case it is suggested that the space between the power-supply and the rest of the unit be increased and that additional separation be provided between the sweep oscillators and the videos. This enlargement will require less careful routing of wiring in the unit. With care in routing of leads, it is not necessary to make the unit any larger than we have. Naturally the experimenter will so route his wires as to: avoid regenerative feedback in the videos; hum pick-up by wiring of the low-level stages, etc. The specific precautions will be listed in the next article. By the way, a suggested change which would make the camera lighter would be to build its power-supply as a separate unit, and to put a cable between the camera and the power-supply. The authors felt, however, that better a heavy camera in one unit, than to have to "portage" two units!

The drilling dimensions given correspond to the parts used by the authors. These parts will be listed completely in the coming article, so the constructor will be able to get exactly the same parts to fit his drilling.

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★ Spare socket included on front panel for any future tubes.
★ Tests by the well-established emission method for tube quality, directly read on the GOOD ? BAD scale of the meter.
★ Jewel protected neon.
★ Tests shorts and leakages up to 2 megohms in all tubes.
★ Tests leakages and shorts in all elements AGAINST all elements in all tubes.
★ Tests BOTH plates in rectifiers.
★ Tests individual sections such as diodes, triodes, pentodes, etc., in multi-purpose tubes.
★ Latest type voltage regulator.
★ Features an attractive etched aluminum panel.
★ Works on 90 to 125 volts 60 cycles A.C.

Model 1240 comes complete with instructions and tabular data for every known type of receiving tube. Shipping weight 12 pounds. Size 6" x 7½" x 10¾". Our Net Price..... **$11.85**

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THE NEW CHANNEL-ANALYZER

FOLLOWS THE SIGNAL FROM ANTENNA TO SPEAKER OF ANY SET

The well-established and authentic SIGNAL TRACING METHOD of locating the very circuit in which there is trouble, and the very component that causes the trouble, is now for the first time available at a price any radio serviceman can afford.

THE CHANNEL-ANALYZER WILL

★ Follow the signal from antenna to speaker through all stages of any receiver ever made.
★ Instantly track down exact cause of intermittent operation.
★ Measure both Automatic-Volume-Control and Automatic-Frequency-Control, voltages and circuits without appreciably loading the circuit, using built-in highly sensitive Vacuum-Tube Voltmeter.
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★ Track down and locate cause of distortion in R.F., I.F., and A.F. amplifier.
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★ Locate leaky condensers and all high-resistance shorts, also show opens.
★ Measure exact frequencies, amount of drift and comparative output of oscillators in superhets.
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WITH FIVE STEPS OF SINE-WAVE AUDIO

SPECIFICATIONS:

1. Combination R.F. and A.F. Signal Generator. R.F.—100 K.C. to 90 Megacycles. A.F.—200 to 7500 cycles; Sine-Wave. — WITH OUTPUT OF OVER 1 VOLT. All direct reading, all by front panel switch manipulation.
2. R.F. and A.F. output independently obtainable, alone or with A.F. (any frequency) modulating R.F.
3. Latest design full-range attenuator used for controlling either the pure or modulated R.F.
4. Accuracy is within 1% on I.F. and broadcast bands; 2% on higher frequencies.
5. Giant dial etched directly on front panel, using a new mechanically perfected drive for perfect vernier control.
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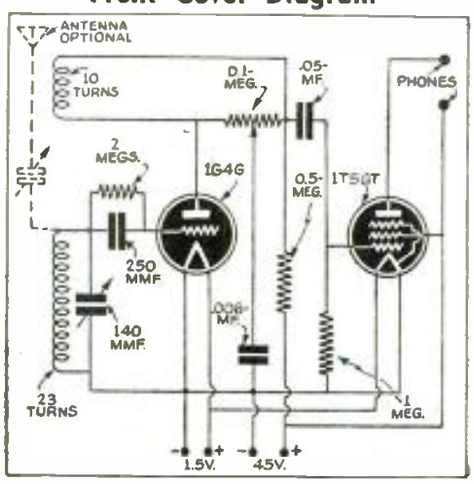
This is a new department. If you have a new Hook-Up, send it along; a pencil diagram will do. Be sure to include a brief description.

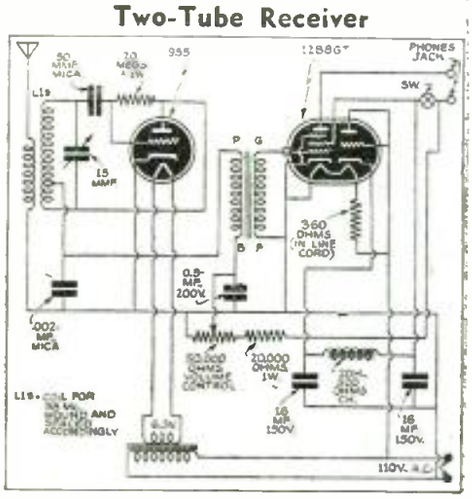
All diagrams and descriptions accepted and published will be paid for at regular space rates. Diagrams may be for receivers, adapters, amplifiers, etc. Send them to Hook-Up Editor, RADIO & TELEVISION, 20 Vesey St., New York City.

Front Cover Diagram

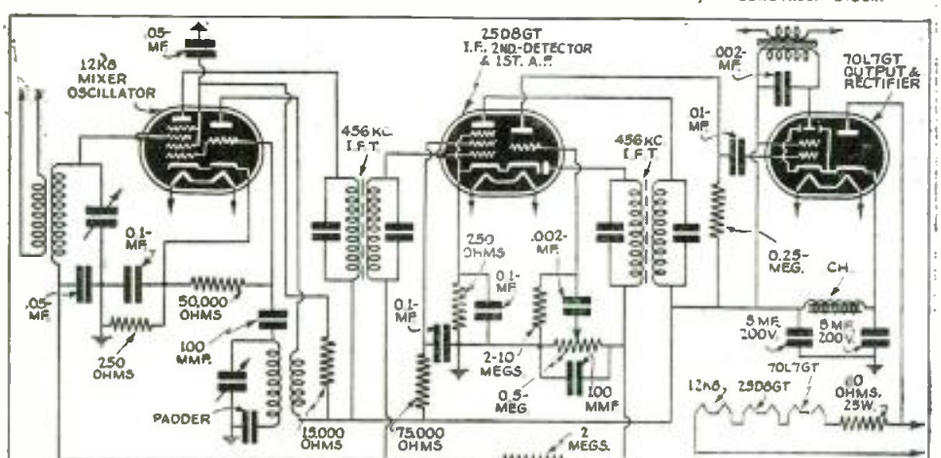


Here is a simple yet effective two-tube receiver hook-up, contributed by Wayne Johnson, 6300 Broadway Terrace, Oakland, California. Mr. Johnson built this receiver in a cigar box and it did great work at a Boy Scout's Camporee, at Oakland. This receiver is battery operated.

Two-Tube Receiver

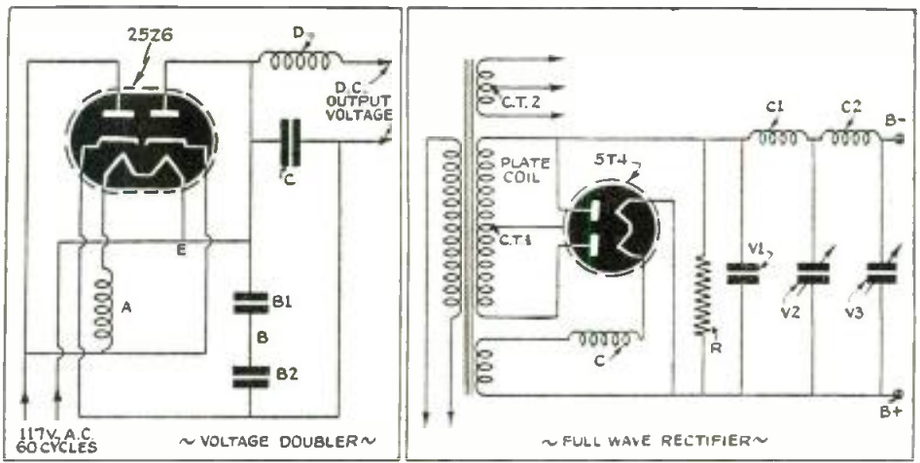


The diagram above shows a novel two-tube receiver hook-up contributed by C. Barby. He states that strong earphone volume is obtained and that no antenna is necessary for local work. It is best to keep the 12 B8 tube in a separate box, with the choke and electrolytic condenser block.



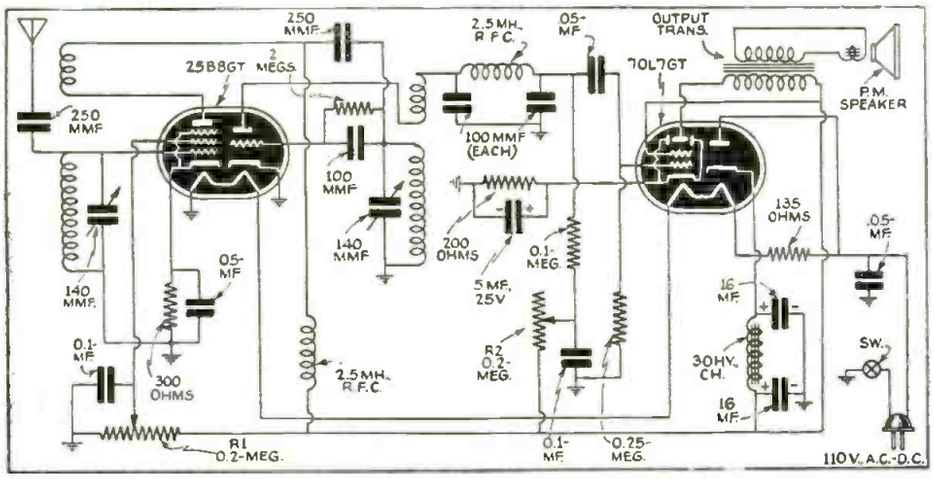
A 110 volt A.C. or D.C. three-tube receiver submitted by Charles Maneri, 51 E. Houston Street, New York City. The output transformer is shown just above the 70L7 tube. The condensers may be either 200 or 400 volt type. The resistors are ½ watt, except heater ballast unit, which is 25 watt. Cap. of padder depends on coils used.

WHAT'S WRONG WITH THIS DIAGRAM?

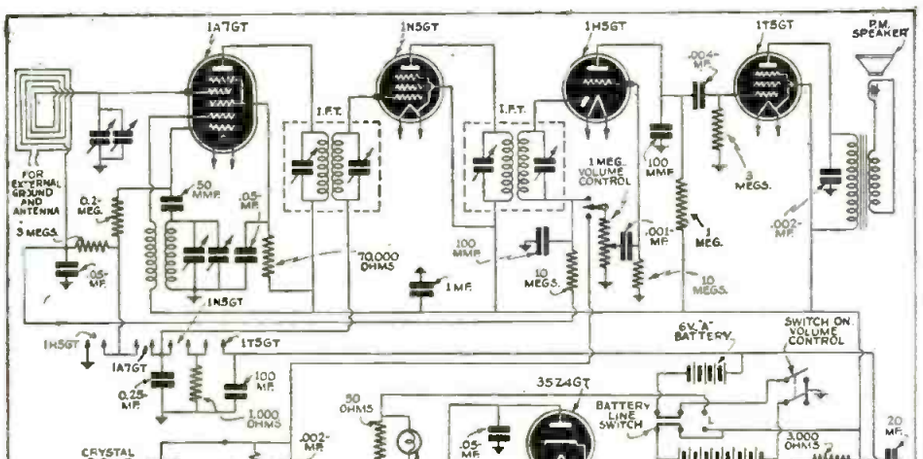


Be honest with yourself and study the diagrams above for at least 3 minutes before turning to the answers on page 441.

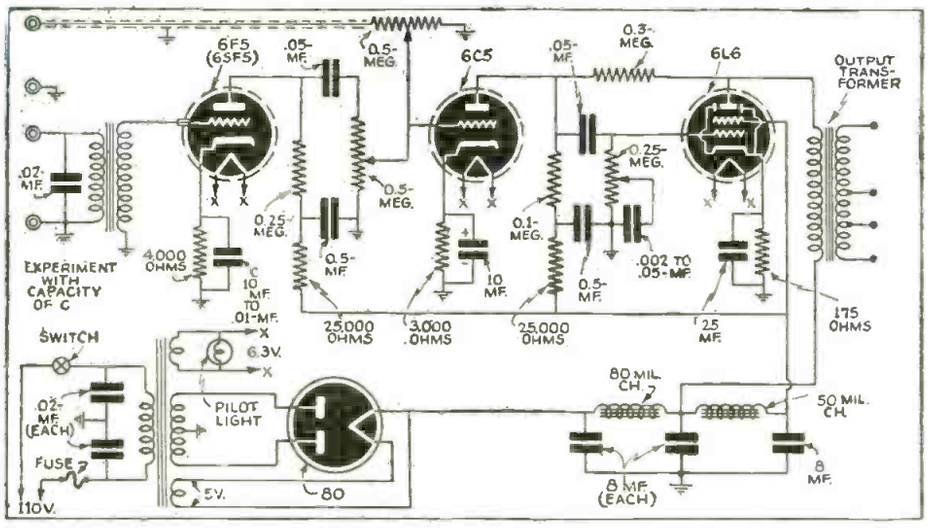
to the Radio Experimenter



All-wave set with a regenerative R.F. amplifier contributed by Harold Mills, Jr., 1803 Harrisburg Road, Canton, Ohio. This circuit gives high sensitivity and selectivity according to Mr. Mills and has great DX properties. R1 is the regen. or gain control for the R.F. stage; R2 is the regen. control for the detector. Tuning condensers may be ganged or tuned separately; use trimmers if ganged. Plug-in coils are used to cover short-wave and B.C. bands.



The diagram above shows hookup of G.E. Co., 3 in 1 portable radio and phonograph combination, which should be of interest to every experimenter and set-builder. A loop antenna is used for radio reception. The set operates on 110 volts A.C. or D.C. A crystal pick-up is used in this circuit.



This 6-8 watt audio amplifier contributed by John R. Kinch of Garson Mines, Ontario, Canada, is an interesting hookup. It will be found useful for amplifying the input from phonograph pickups, and will find many other applications in radio experimenting. It may also be used for recording radio programs.

Edited by Herman Yellin, W2AJL

3-Tube Battery Receiver

Please show a diagram for a battery-operated 3-tube receiver covering the frequency range of 100-700 kc. for airplane use. —L. Horner, Newark, Delaware.

A. The receiver shown makes use of a pair of two-winding coils, 2 sets of which will be needed. One set of coils should be used to cover the 100 to 250 kc. range, and the other set to cover the remainder. Note that the second tuning coil is in the plate circuit of the first 6K7 tube, in order to increase the selectivity. Regeneration is controlled by means of the 50,000 ohm potentiometer in the detector screen-grid circuit.

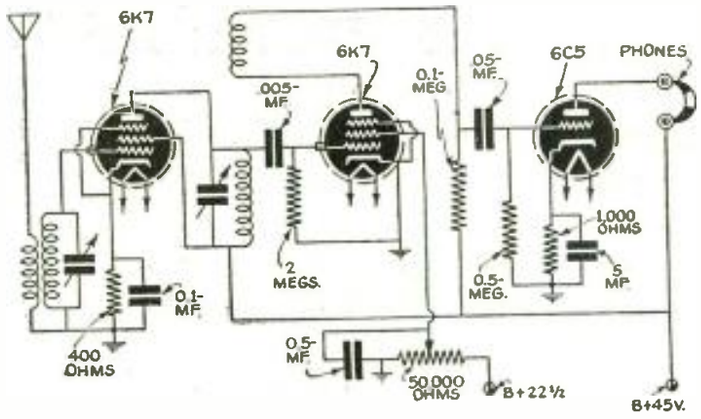
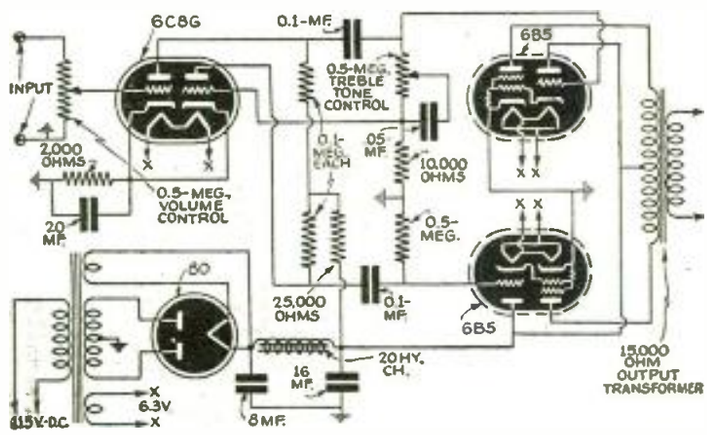


Diagram for a three-tube receiver operating on batteries. (No. 1234)

Phonograph Amplifier

I would like to build a phonograph amplifier using a high impedance pickup and a 6C8G as 1st A.F. and phase inverter, with 2-6B5's in the output.—C. Harrison, Millburn, N. J.

A. The diagram shows such an amplifier and has the power-supply included. The output transformer has an impedance of 15,000 ohms and its secondary impedance should match the particular loud-speaker used. A tapped secondary will increase the flexibility, inasmuch as any speaker can be used.



This amplifier will be found very useful in connection with phonograph pickups; the loudspeaker is connected to the output transformer shown at the right. (No. 1235)

2-Tube Regenerative Receiver

Please give a diagram of a two-tube regenerative receiver using a 6J7 and a 6C5G.—J. Kriebel, Moylan, Pa.

A. The diagram herewith shown uses tapped plug-in coils. The 100 mmf. condenser is the band-setting condenser while the 20 mmf. unit serves as a tuning condenser. Quite effective band-spread is obtained in this manner. A little experimentation may be necessary to locate the cathode tap at a point where oscillation will be smoothest.

160 meters—60 turns #24 D.S.C. on 1½" diam. form; cathode tap 2 turns from ground end.

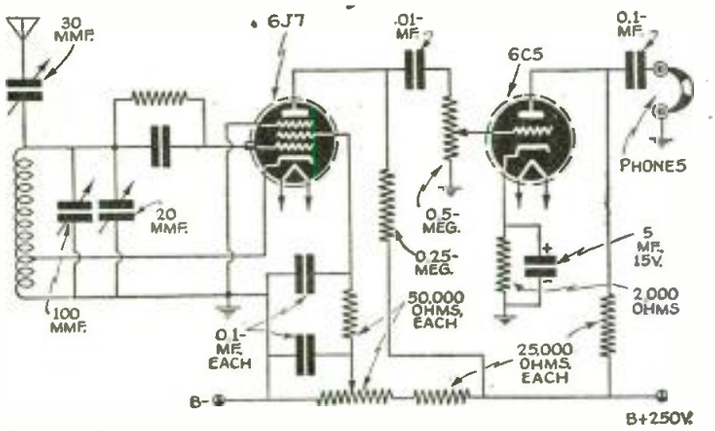
80 meters—35 turns #22 D.S.C. on 1½" form; tap 1½ turns from end.

40 meters—20 turns #22 D.S.C. space wound to 1⅝"; tap 1½ turns from end.

20 meters—10 turns #22 D.S.C. space wound to 1½"; tap 1 turn up.

10 meters—5 turns #18 wire, space wound to 1½"; tapped at 1 turn from ground end.

(All coils wound on 1½" diameter forms.)

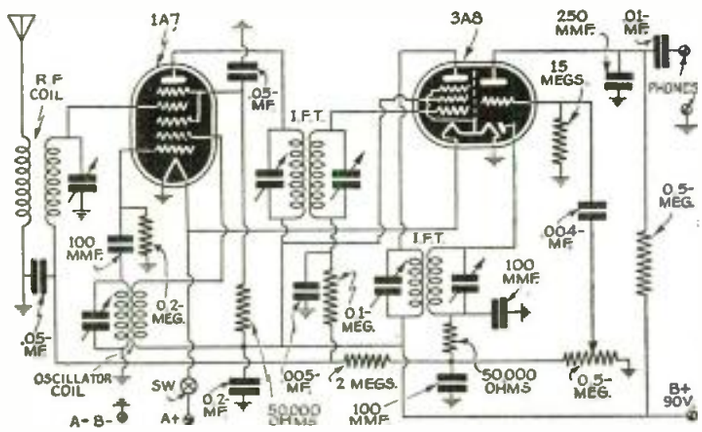


A two-tube regenerative receiver, suitable for use with headphones. (No. 1236)

Battery Superhet

I want a diagram for a compact battery superhet.—H. Gursh, Brooklyn, N. Y.

A. A small two-tube superhet is shown here. On strong local stations it is possible to operate a small loudspeaker, but for consistent loudspeaker operation it would be advisable to incorporate another stage of audio. The R.F. coil can be replaced with a loop, although the coil and outside antenna will give better results. Incidentally, the 3A8 tube has two filaments, allowing for operation on either 1.4 volts or 3 volts. In this receiver the two filaments should be connected in parallel.



Here is a battery superhet which will appeal to the experimenter. (No. 1237)

Oscillator Coil Data

Can you give me data for building the oscillator coil used in the midget Phono oscillator shown in the July issue?—F. L. Frailer, Baltimore, Md.

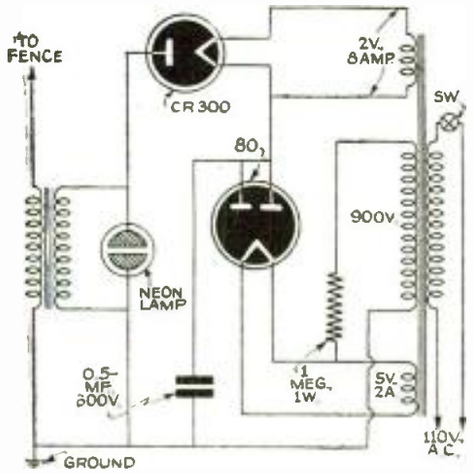
A. A coil suitable for use in any phono oscillator requiring a two-winding coil can be constructed as follows: The grid coil consists of 110 turns of No. 30 enameled wire, wound on a 1" diameter form. Over this winding place a layer of waxed paper and wind on about 45 turns for the tickler winding. Try reversing the leads to the tickler if the unit refuses to oscillate.

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

Electric Fence Shocker

? *Can I use a high voltage transformer connected to a fence to keep cattle away from the fence?—A. Zott, Chicago, Ill.*

A. A continuous flow of high voltage should not be applied to a fence, as the high voltage may prove fatal. "Fence controllers," a diagram of which is shown, supply only a few brief pulses of high voltage per minute to the fence. The D.C. voltage charges the condenser, which is discharged through the primary of the output transformer by the special CR300 Cetron tube. A comparatively high voltage is thereby induced in the secondary of this transformer, which is connected to the fence; the other side of the transformer must be connected to a good ground. With the 1 megohm resistor shown, about 55 discharges per minute are produced. A 2 megohm resistor will produce about 28 per minute. The output transformer has a secondary to primary ratio of about 15.



A simple circuit arrangement for electrically charging a fence. (No. 1238)

Coil Data

? *Would you please give me the data for winding a coil to operate between 200 and 400 kc. using a 350 mmf. tuning condenser.—L. Behrman, Phoenix, Ariz.*

A. The simplest coil for you to wind would be a single-layer coil on a 2 inch diameter form. Use 270 turns of #30 enameled wire which will take up 3 inches. With your tuning condenser, the frequency range will be somewhat greater than the 200 kc.

Transmitter Data

? *I would like to use a 6.3 volt tube instead of the "59" used in the 160 meter transmitter described in the July issue. Also what kind of mike transformer and modulation choke should I use?—J. Scale, Longview, Texas.*

A. A 6L6G tube should perform quite well in this transmitter. Change the grid-leak to a 10,000 ohm unit. Incidentally, the diagram shows the 59 filament connected directly to 6.3 volts. This was an error—the filament should have been shown connected through a 2 ohm series resistor to the 6.3 volts. Although Mr. Lester used an output transformer as a mike transformer, a regular mike transformer of the type used in *transceivers* can be used to better advantage. The modulation choke can be a 20 henry, 75 milliampere filter choke.

Veri Cards From SW Stations

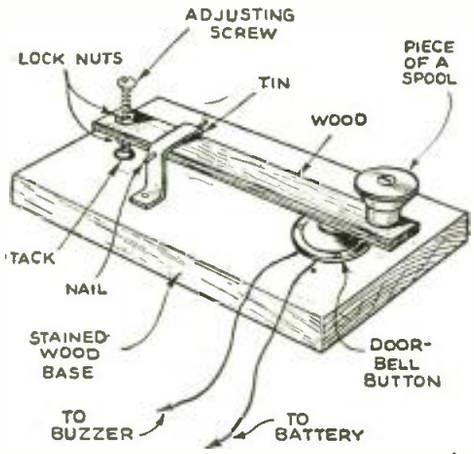
? *How can I get verification cards from American and foreign short-wave radio stations?—G. McConnell, Titusville, Fla.*

A. Most short-wave broadcast stations are always delighted to receive reports on their signals and will send verification cards to the listener. However, always give the station as much information as possible about the program, in order to establish proof of your reception. Note the artists' names and the names of the selections played with the exact times and date. Indicate the time zone on which your time is based, such as Eastern Standard or Pacific Standard time. Give the station a complete report on how they were received, signal strength, quality of modulation and whether any fading was noticed. Since some stations will not send you a "veri" unless postage is enclosed, it is a good policy to send a stamp with your report to the station. Foreign stations should be sent an International Postal Reply Coupon (obtain at your Post Office: cost 9 cents).

The Cover Kink
First Prize Winner

Simple Key

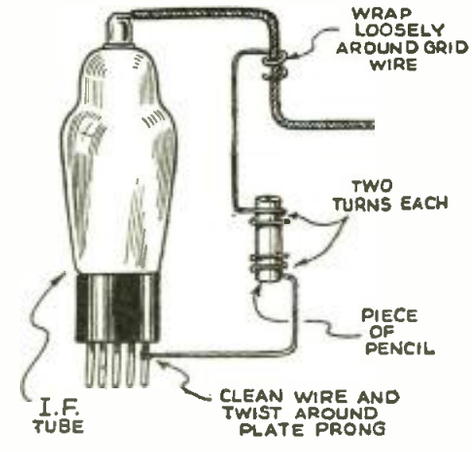
Here is a simple key for beginners. The doorbell button serves two purposes, first to make the contact, and second to eliminate the necessity of having a spring and its hard-to-make adjustments. The button may have to be pushed in too far; for this reason the adjusting screw is necessary. To keep the screw from digging into the wood, thus losing its adjustment, a tack is driven into the base underneath it. The button is made from a piece of a sewing spool. When the base and lever are stained, this makes a neat key for code practice.—*Edward Earnshaw.*



Tuning In CW

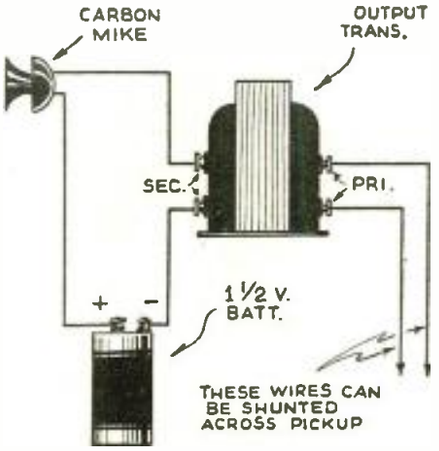
A minute capacity feed-back in the I.F. circuit of a superheterodyne receiver will make CW signals readable. While some CW signals are readable on a superhet due to the CW signal beating against the side-band of a modulated wave; all will be readable by this simple arrangement.

A small piece of hookup wire and a short piece of pencil are all the parts necessary. The insulation from the hookup wire is scraped back about a half-inch, and the wire is twisted around the plate prong of the I.F. tube. The other end of the wire is twisted two turns, around a piece of pencil. Another piece of hookup wire is wrapped, two turns around the other end of the piece of pencil, and its free end twisted two turns around the grid cap wire of the same tube. The turns are spaced depending on the tone of the signal desired. The insulated wire is simply untwisted from the grid wire for phone reception.—*J. F. Byrnes.*



Connecting Mike to Phono-Oscillator

Here's a hint to those who wish to connect a mike (carbon type) to a phonograph



oscillator, without having to buy a mike transformer. In many oscillators there is no arrangement provided for connecting a mike (carbon), but this can be easily done.

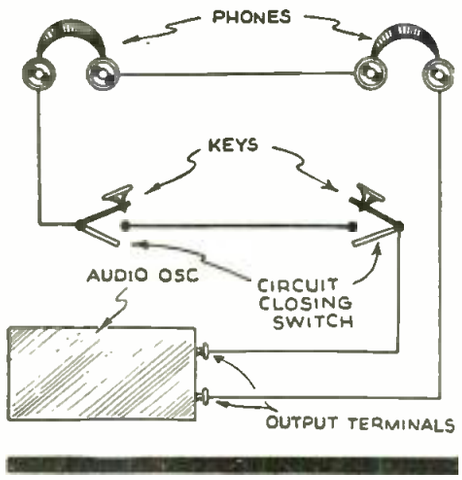
Secure an old output transformer, 1½ volt battery and microphone from the junk box and connect as shown in the diagram.—*Lloyd Miles.*

Two-Way Code Unit

Many code learners, having but one practice set, and who wish to work two-way, are at a loss for the proper method of connection.Perhaps the simplest system is that used by the commercial telegraph lines. This system uses but one practice set, enables the sending operator to hear his own "fist," and requires but two wires between stations.

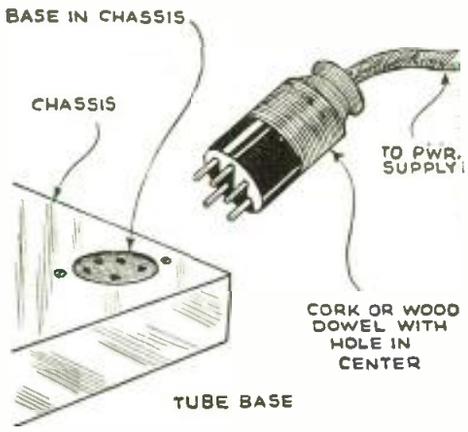
As seen in the diagram, all components are connected in series. The only requirement is that each key be equipped with a circuit-closing switch. The receiving operator keeps his key closed and vice versa.

Buzzer type sets may be used in place of the audio oscillator with equal results.—*C. C. Erhardt, W2HNJ.*



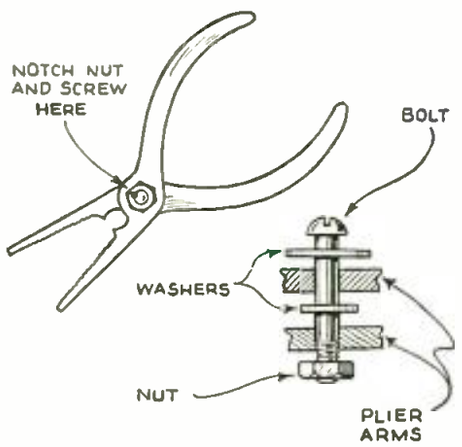
Emergency Plug

I recently made an experimental short-wave receiver and decided to make a plug-in arrangement for the power-supply. I devised this simple gadget from an old tube base, and a spare socket; the number of prongs on the plug and holes in this socket, depending on the number of leads needed for the circuit.—*Willard Etling.*



Repairing Pliers

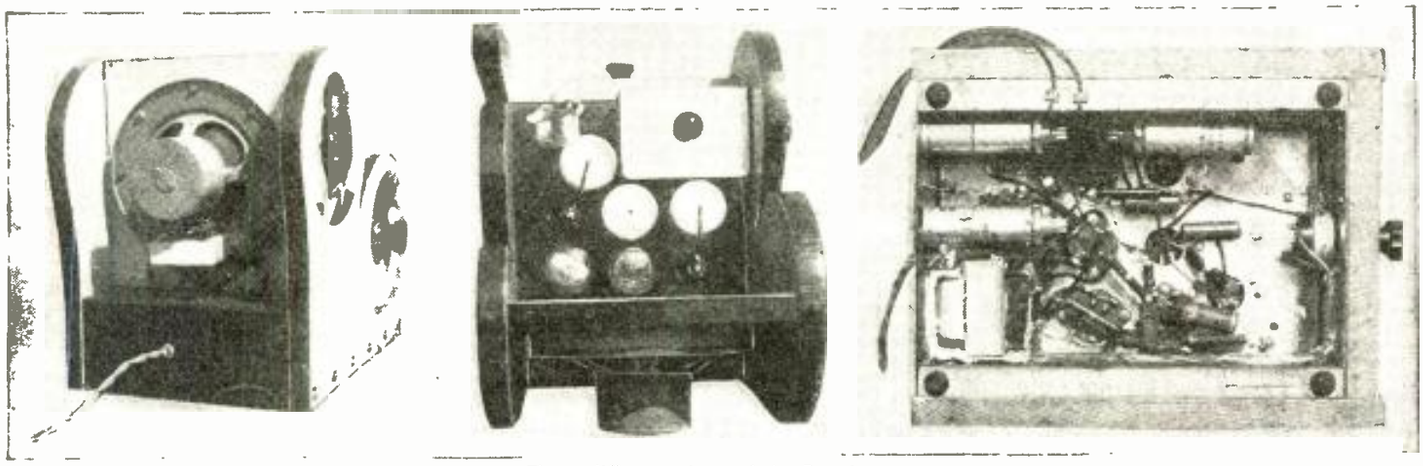
Frequently pliers become loose, jaws do not meet evenly and the tool has to be discarded. To save it, try one of these methods: First, file down the head and punch out the rivet. Clean the inner surfaces and smear on some vaseline; replace the rivet with a nut, a spring washer, and a heavy screw or bolt. (A number of these pliers have a circular depression around the bolt hole of the rubbing faces just large enough to take a common size washer.) However, the tension of the



spring washer is soon lessened by eating into the soft metal, or by the turning of the components. If you prefer a permanent tight fit, assemble as before, omitting the spring washer. With the punch, notch the screw and nut at a point where they meet. In either case, you have a better tool than you bought.—*Conrad Chittick.*

RADIO KINKS

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



Three different views of the Receiver.

The BOUDOIR TRF 4

Ralph W. Martin

● IN the May 1939 issue of RADIO & TELEVISION, page 29, there was published a description of the "Bauer" TRF Four. The writer has experimented considerably with this circuit, and added some improvements, which seem to be worth passing along.

This improvement, which the enclosed diagram will readily reveal, consists of the incorporation of an additional tuned circuit at the antenna. By thus placing a parallel resonant circuit in the antenna circuit, a higher signal current is transferred to the grid of the first tube (6K7), thus increasing the gain in volume over what can be obtained by the usual antenna coupling shown in the Bauer circuit. This addition gives the circuit two complete band-pass tuners. Then there is the improvement in selectivity obtained by the addition of another tuned circuit. The only additional part required on the chassis is another unit in the tank condenser, i.e., the condenser must be four-gang instead of three-gang.

Coils No. 2 and 3 are the same as were described in the Bauer article referred to, but coil No. 1 must be specially constructed. It requires a longer coil form in order to accommodate the two windings and still allow a loose coupling. The important item is the construction of the adjustable form on which the primary is wound. It is desirable that the primary and secondary forms should have nearly the same diameter, so that when each is wound with the same number of turns, their respective inductances will be practically the same. This point was practically met by making the primary coil form of several turns of good bond paper, firmly glued together so as to form a thin stiff cylinder, and having a diameter just large enough to allow it to slide over the secondary coil. No. 34 enamelled wire was used, and the finished coils were then covered with a turn or so of scotch tissue, which is excellent for preventing injury to the wire and preventing the spooling from becoming dislocated or jumbled.

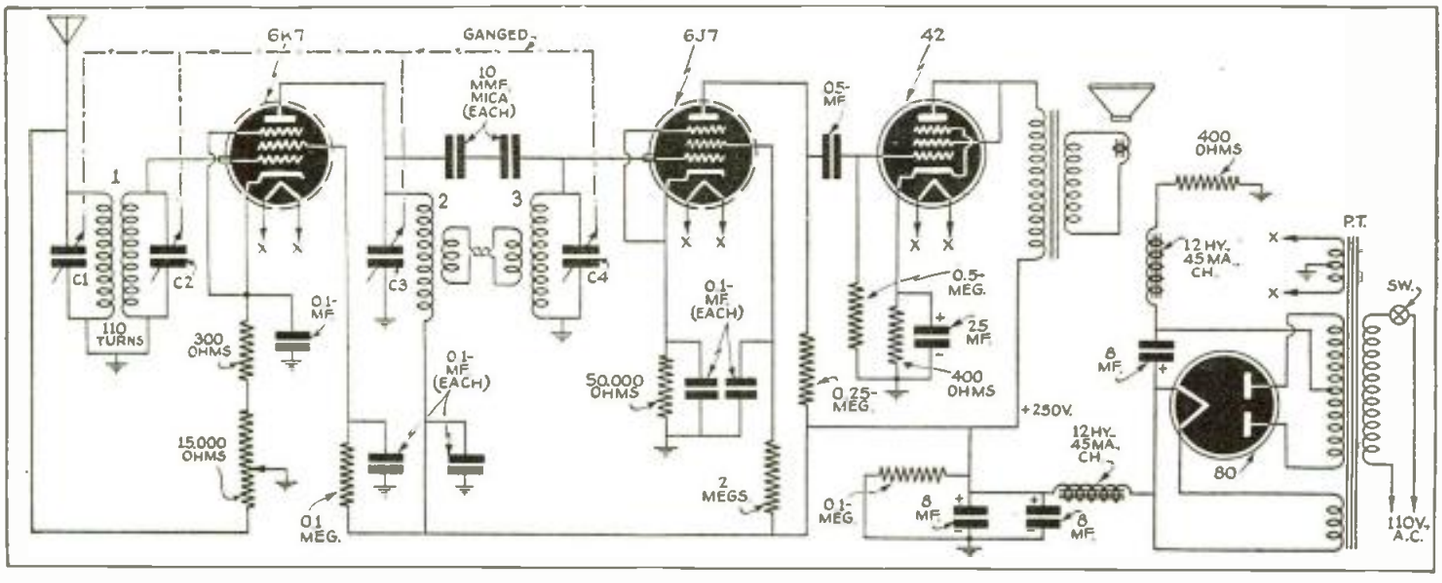
In the "Bauer" circuit as previously published, a small condenser marked "c" on Mr. Bauer's diagram, was described as a home-made gadget made up of two hooks or loops of insulated wire. The writer found this arrangement to be dangerous, for the insulation nearly burned through, and a *short* in the B circuit was narrowly averted. It was then found that two mica condensers of .00001 mf. capacity each, and connected in series, serve the purpose just as well, and are perfectly safe.

Another weak point of this circuit in its present form, is that tuning condenser C3 must block 250 volts of D.C. An accidental touch with a screwdriver, or a small particle of metal getting between the plates would again short the B circuit and do plenty of damage. For this and other reasons, the tank condenser should have its stators and rotors insulated from one another and also from the chassis.

Such a type of tuning condenser was recently mentioned in one of the technical publications, but, so far as we know, is not yet available on the market. Because of the above danger, the tank condenser has been covered with a hood. (See photos.)

We believe there are possibilities of developing this circuit even further. The securing of the new type of tank condenser just mentioned might open up new channels. Such a type of tuning condenser is, in fact, necessary for the successful operation of the circuit herein-described.

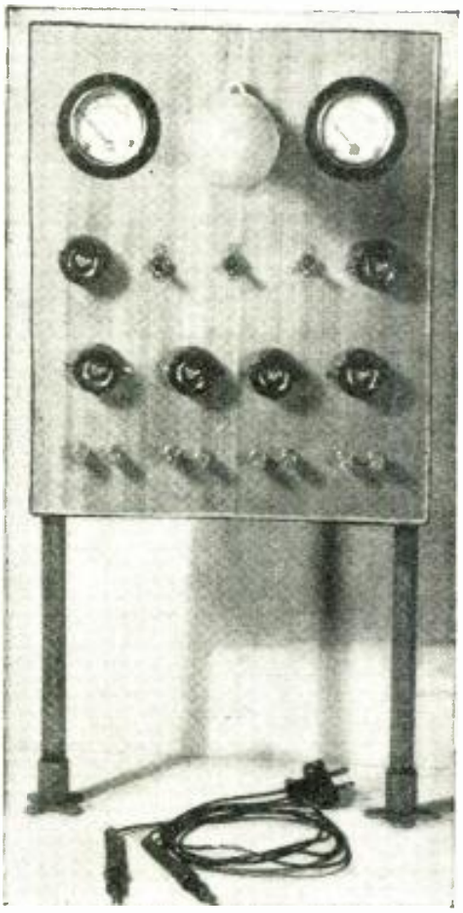
Wiring diagram of TRF receiver.



Switchboard for the "Lab" and Shop

Raymond B. Wailes

Here is a handy test switchboard for the home shop and laboratory. One can add as many switches and other controls as he may find necessary—but the simpler such test boards are, the more efficient and useful.



Above—test switchboard with meters and test lamp. The terminals at the bottom of the board are for the attachment of the test cords. The better the quality of the test meters, the more accurate the results obtainable.

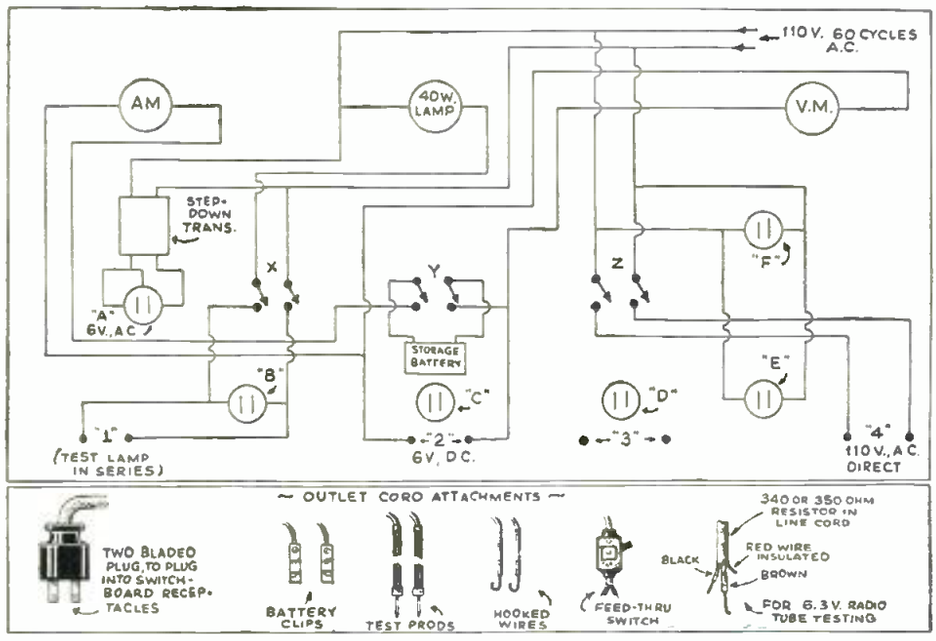
● HERE is a switchboard for the shop or home laboratory which will meet with more than mediocre approval, owing to its flexibility in adapting itself to the particular line of work employed in the shop or "lab."

The panel is of half-inch wood, twelve inches wide and fifteen inches from top to bottom of panel. The panel is mounted by means of pipe clamps on the back, to two three-eighths inch diameter galvanized pipe, twenty-two inches long, fitted at their lower threaded ends with three-eighth inch floor flanges.

Three double-pole double-throw (D.P.D.T.) switches, X, Y, Z, of the toggle type, with inch long threaded stems are used for controls. Four pairs of large sized binding posts 1, 2, 3, 4, are mounted in a row along the bottom of the board. Six moulded 110 volt standard female receptacles, A, B, C, D, E, F, are mounted also on the board, along with a 40 watt lamp mounted in a porcelain socket at the top central portion of the board. A D.C. voltmeter 0-6 volts and an 0-30 amp. D.C. ammeter is also mounted on the board.

You will find that the connections as given will afford you practically all the conveniences needed for ordinary testing and shop work. These connections are as follows: Outside 110 volt current is led to the primary side of a stepdown transformer mounted on the back of the panel. The 6 volt secondary of this transformer is connected directly to the receptacle-socket A. The current is fed out of the receptacles A, B, C, D, E, and F by a two-pronged plug attached to the end of a pair of flexible duplex wires. A pair of long handled test prongs each fitted with a single strand of flexible lamp cord, or better, test-instrument cord, and connecting to a common two-bladed plug makes another useful adjunct to obtain the desired current from the switchboard. The 6 volt A.C. current from the transformer can be used in testing toy trains, small lamps, motors, bells, radio tubes, etc. The primary of the stepdown transformer is left continually "on the line" directly connected to it.

The 40 watt lamp is connected in series with the D.P.D.T. switch X. When the switch is thrown down, plug receptacle B and binding posts 1 become "hot," *with a lamp in series with them.* This is useful in testing for open-circuits, grounds on armatures, etc. With test prongs on 1 or in receptacle B, the lamp lights if the prongs are connected across a completed circuit (one which is not open). D.P.D.T. switch Y connects directly across a 6 volt storage battery located under the bench on which the switchboard is mounted. When the switch is thrown down, this 6 volts D.C. is fed to binding posts 2, with the ammeter in series with them and the voltmeter shunted across them. This is useful in electroplating or for utilization of heaterless types of radio tube operation. External current from an outside source can also be fed back to the panel, through wires, to utilize the voltmeter on the panel. Receptacle-socket E and F are "hot" at all times, being connected to the 110 volt "mains." These are useful in operating an electric soldering iron, the iron being plugged into E or F. Switch Z puts 110 volt current directly to binding posts 4. Receptacles C and D, and binding posts 3 are held in reserve or can be utilized by the experimenter to suit his own particular conditions or hook-ups.



Circuit-diagram for the switchboard, which provides tests for continuity, "opens" and "shorts."

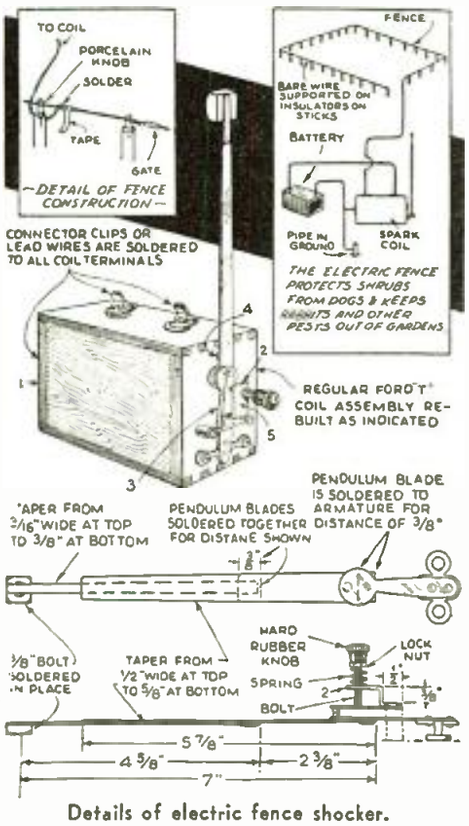
ELECTRICAL ARTICLES WANTED!

● IF you enjoy this department be sure to send us a description of your favorite piece of electrical apparatus. We want articles on simple electric motors and methods of using them, electric meter test set-ups, high frequency furnaces, home-made battery chargers, home-made measuring instruments and bridges, etc. All articles accepted and published will be paid for at regular space rates. Be sure the photos are sharp and clear.—*The Editors*

AN ELECTRIC CATTLE FENCE

● TO keep stray dogs away from flowers and shrubbery, an electric fence consisting only of a single wire supported on sticks fitted with insulators is now being extensively used. Farmers are also using the single wire electric fence to keep cattle and other animals within a given enclosure. An ordinary one-half inch spark coil such as the ignition type may be used for the purpose of charging the wire. It is usually fitted with an extended arm on the vibrator, with a weight fastened on the outer end of this arm. The high voltage terminal of the spark coil is fastened to the wire mounted on porcelain insulators nailed to the tops of the sticks, the wire being placed at a height of 8" to 12" above the ground usually. One wire from the spark coil (the usual *ground* wire of ignition type coils) is connected to a piece of galvanized iron pipe driven into moist earth.

The spark coil takes only a small current and a set of dry batteries may be used in a pinch, but a storage battery will last much longer. A step-down transformer may also be experimented with, but batteries usually give best results unless a specially devised transformer arrangement is provided. Removable sections in the electric fence may be provided at gates, etc.—*Data courtesy LeJay Mfg. Co.*

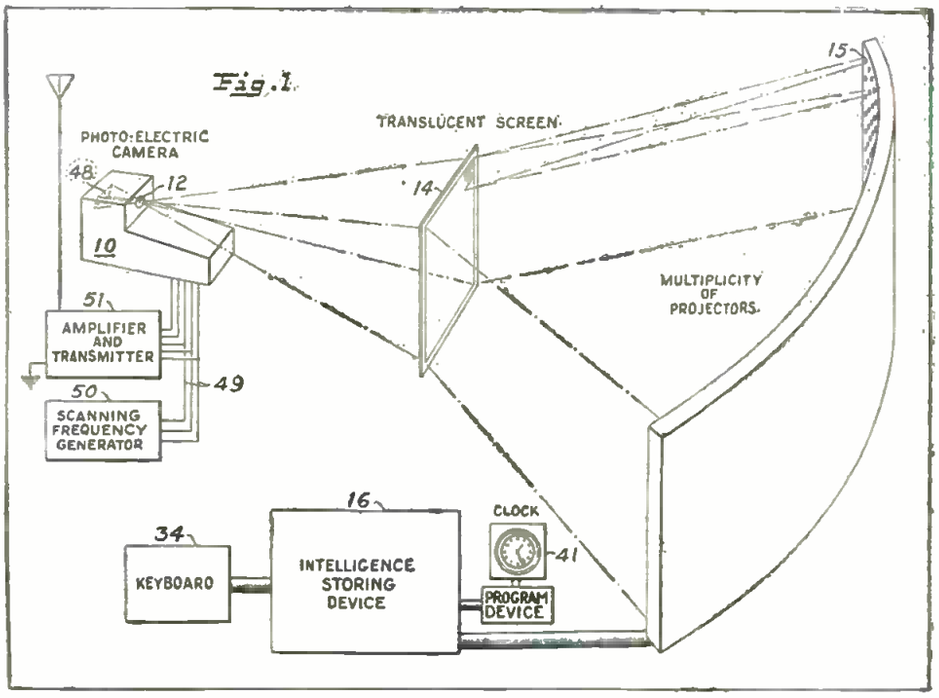


Details of electric fence shocker.

Digest of Recent Radio Patents

MULTIPLEX TELEVISION

● RALPH W. BUMSTEAD of Westfield, N. J., is the recipient of this elaborate patent, No. 2,207,716 on a multiplex television system. We recommend that every student of television technique obtain a copy of this patent, as it contains so much unusual material, especially means for superimposing a number of images on the television screen. This patent covers the multiplex transmission and reception of images over a single channel of communication. Other objects are to provide a device for the broadcast of news and other items, and has particular reference to the transmission and reception of "stock quotations," game scores, and word pictures having any desired news significance. When used for reproducing stock market prices, etc., the patent describes a method for utilizing a "storing" mechanism, in which the transmissions may be tabularly set up on a quotation board. A television screen is provided on which may be projected different patterns, representing interwoven images of the characters used to display the quotations. Through a novel arrangement of control circuits, the operator of this system can cause stock review figures to be flashed on the screen at the receiver, and any other desired stock quotations can be *selectively* flashed on the screen, at any desired interval. In this way the information which can be flashed on the receiver screen can be made very complete.

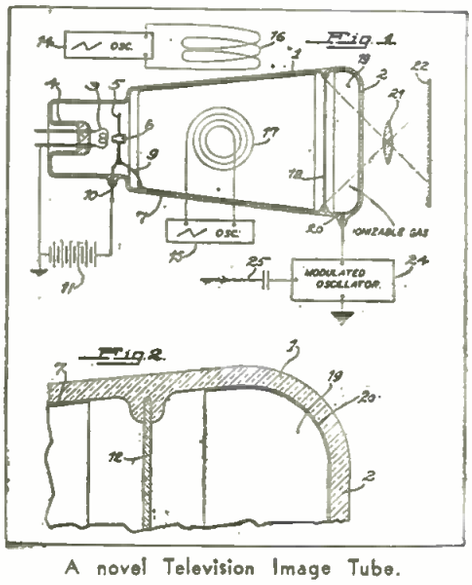


Multiple images can be superimposed on the screen of this televisor.

TELEVISION IMAGE TUBE

(Front Cover)

● PHILO T. FARNSWORTH, well known television inventor, has just received patent No. 2,213,070 for a clever television image tube, in which the picture is formed in a luminous gas, contained in a pocket or chamber at one end of the tube. The image formed in the luminous gas layer is then preferably projected onto a viewing screen in enlarged form, through a suitable optical system. The cathode beam is projected against a diaphragm or *dielectric barrier*, which is parallel to the transparent window at the end of the tube. This barrier may be made of thin glass or quartz. The scanning beam is moved across the "gun" side of the diaphragm, by means of scanning oscillators in the usual manner, and the space between this diaphragm and the transparent window is preferably filled with an ionizable gas. As the cathode beam moves across the gun side of the screen, spots of varying luminosity (being modulated by the television signals, representing the varying degrees of light and shade) on the *front* or *gas side* of the screen become visible, and in this way serve to form the complete picture or image. This action occurs through the emission of secondary electrons on the impact of the cathode beam against the diaphragm.



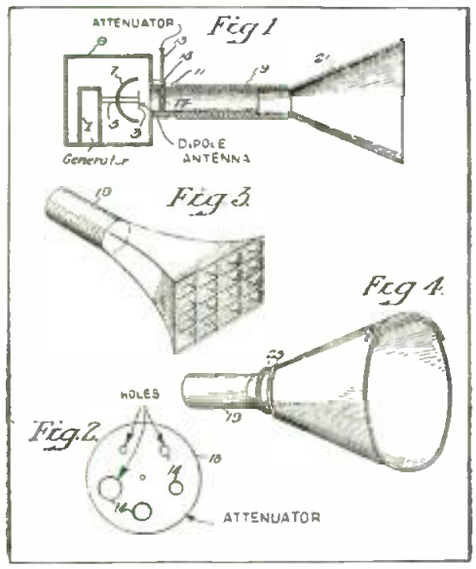
A novel Television Image Tube.

CAPACITIVE R.F. VOLTAGE DIVIDER

● THIS patent, No. 2,205,866, covers a scheme for an adjustable capacitive voltage-measuring device, suitable for measuring R.F. voltages over a wide frequency range. It comprises an input circuit and an output circuit, together with a first and a second variable capacitor, each having a group of rotor and stator plates suitably arranged.

ULTRA SHORTWAVE DIRECTOR

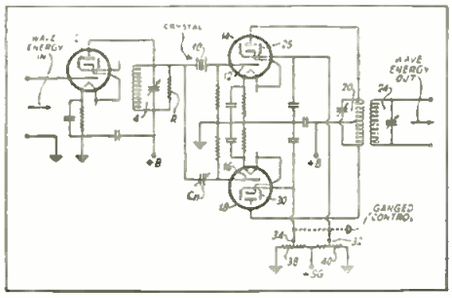
● THIS patent covers an ultra shortwave attenuator and directive apparatus. One form of attenuator is shown in Fig. 2, and comprise a disk that has several openings in it. The length of the metallic sleeve or tube 19 can be varied, by sliding the outer sleeve back and forth. The flared portion of the metallic horn tends to direct or "beam" the energy radiated from the dipole antenna. If the wavelength is short, with respect to the diameter of the flared portion, a sharply formed beam may be radiated. In some instances it is advantageous to sectionalize the flared portion of the attenuator, to more sharply beam the wave and such a design is shown in Fig. 3. In a like manner the flare may be adjacent by increasing or decreasing its larger diameter as indicated by Fig. 4. The corrugated portion 23 at the base of the flare, offers sufficient flexibility to permit such adjustment. The patent also covers a method of measuring the quality of the radiated wave, by means of a small dipole antenna and a thermocouple, together with a suitable indicating apparatus. This patent is No. 2,206,683 and was issued to Irving Wolff and assigned to RCA.



A horn-type short-wave director.

CRYSTAL FILTER

● MURRAY G. CROSBY of Riverhead, N. Y., has obtained patent No. 2,205,847 (assigned to RCA) which has to do with a comprehensive means of neutralizing a crystal filter. As the diagram shows, the crystal feeds into a push-pull circuit arrangement, controlled by a dual potentiometer. Signal energy from the crystal 10 is fed to the grid 12, and the neutralizing energy from the condenser CN is fed to the grid 16 of a second coupling tube. The plate circuits of the two coupling tubes are connected in push-pull through the transformer primary 20, so that the neutralizing energy supplied by tube 18 will properly buck the



energy reaching 20, through the capacity of the crystal holder. The filtered wave energy may be supplied from 20 to any utilization circuit by means of the secondary coupling coil 24.

RADIO AUTOGRAPH

● THIS interesting patent has been granted to Clarence H. Kehn of Chicago, Illinois, and bears No. 2,205,531. This patent covers a telautographic system of transmitting writing, drawings, etc., by radio means. One of the objects of the invention is the provision of radio sending and receiving sets, actuated by a radio broadcasting station, by a plurality of definite audio frequencies, and a provision for varying the intensity of these frequencies. The patent covers also the arrangement of the special receiving circuits for converting the modulated audio frequencies into mechanical movement, by means of solenoids attached to a set of levers, which in turn actuate a pen, pencil or other movable stylus.

At the transmitter a series of audio frequency oscillators are connected to a set of impedance matching transformers, the secondaries of which are joined to a constant impedance network. As the stylus at the transmitter is moved, the attached levers will vary the intensity of the oscillators and thereby cause a plurality of different frequencies and of varying intensities to be broadcast. The corresponding varying currents picked up by the receiving set will cause the solenoids to exert a stronger or weaker pull on the (iron) cores attached to the reproducing stylus. This is a counterpart of the wire type telautograph.

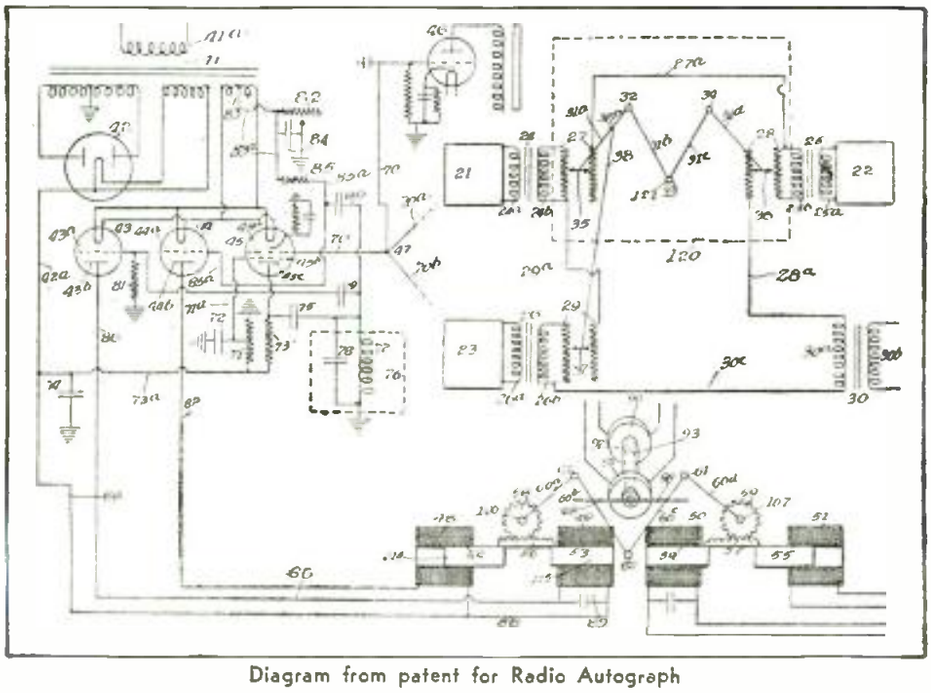


Diagram from patent for Radio Autograph

Answers to Puzzle Diagram on Page 432

Voltage Doubler Circuit

1. A should be indicated as a resistance, not a choke coil or inductance.
2. Point E in the circuit should be joined to Point B and not B1.
3. Condenser C should connect on the right-hand side of the choke coil D.
4. Choke coil D should have been shown with an iron core.

Full-Wave Rectifier Circuit

1. The center top of the high voltage plate winding CT1, should be *grounded.*
2. Lead No. 1 should be connected to the center-top of the plate coil.
3. The R.F. choke C, if used, should be inserted in the circuit at X and not at the point shown.
4. The voltage divider R is incorrectly connected and should be placed across the output terminals of the filter, to the right of the condensers.
5. The chokes C1 and C2 should have been indicated with iron cores, and not with air cores as shown in the diagram.
6. The condensers V2 and V3 should have been indicated as fixed condensers, not the variable type, as the arrows indicate.

New Apparatus of Interest to All

New RCA Victrola Series

● A COMPLETE new series of console and table model RCA Victrolas embodying many important advances which improve tone quality and performance to a degree never before achieved, has been announced. A principal feature of the series is advanced cabinet styling.

Greatly increased power output (push pull amplification), improved circuits, larger and better loudspeakers, automatic tone compensation, and a "Tone Guard" which cancels out virtually all the extraneous noises of mechanical operation which is present in all phonographs, are among the more important improvements introduced in the new instruments. Automatic tone compensation and the "Tone Guard" now make it possible to reproduce records faithfully—at low volume—without hearing objectionable noises or distortion of the tonal range. A home recording mechanism utilizing a special chassis is incorporated in three of the models.

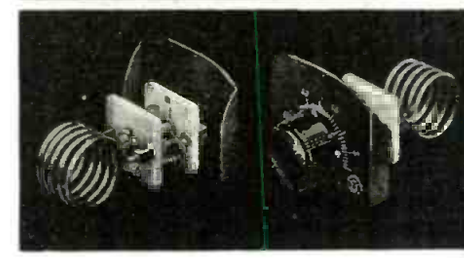
The new instruments include three luxuriously-appointed console grand models in the "De luxe" series, four instruments in the "Anniversary" series (including two with home recording), four consoles in the "Master" series (including one with home recording), and two table models. There is also a new automatic record changing Victrola attachment that converts any radio into an automatic phonograph.

It is important to point out that the home recording facilities built into three of the new models are not a kit or an attachment. This mechanism includes a chassis designed especially for home recording.

The "Tone Guard" is a system of welled grooves built into the edge of the Victrola compartment in such a way that the lid closes over it. The slots trap and cancel out unwanted extraneous noises, guarding the tone emitted by the loudspeaker. A molded cover of specially treated material acoustically seals the mechanism beneath the motor board.

The instruments also use new 12- and 15-inch loudspeakers which utilize a new principle of cone suspension to provide response over a wider audio range than ever before. Not only is bass range improved, but changes in treble response have increased musical brilliance and reduced surface noise. Oversized turntable motors are also important contributors to higher fidelity of reproduction.

In the "Anniversary" series, Model V-205 includes the Tone Guard feature, one of the elements contributing to vastly improved tone quality at low volume. This 9-tube instrument has such features as 12-watts push-pull output, three-point bass and continuous treble tone control, and the new supersensitive loudspeaker. A divided top lid conceals the record mechanism, while the instrument panel is located in the front, concealed by a gracefully curved door. Model VHR-207 (see photo) is similar in appearance to the V-205, with the home recorder feature.



New James Millen Products

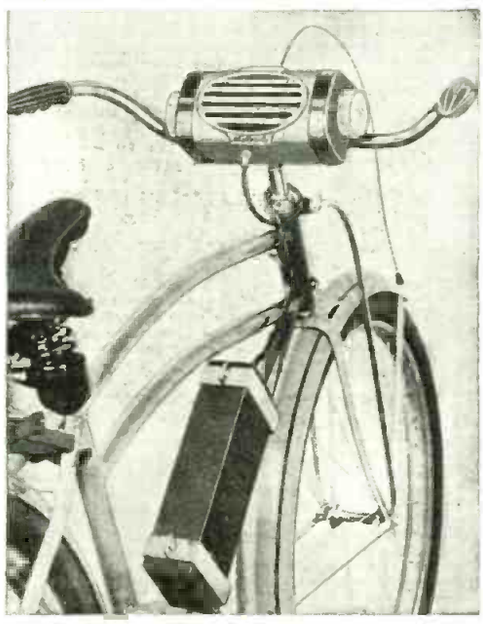
● TWO of the new radio products brought out by the James Millen Mfg. Co. are shown herewith. Top cut shows precision crystal secondary frequency-standard. This frequency-standard housed in a substantial metal cabinet, with control panel containing the necessary switches, is capable of being adjusted to WWV, or similar primary standard, and putting out uniformly accurate calibrating signals with 10, 100, and 1,000 kc. intervals. This frequency-standard uses the new G.E. Co. 1,000 kc. crystal, having a frequency temperature coefficient of less than one cycle. The crystal is sealed in helium in a standard metal tube envelope. The self-contained A.C. power-supply is fitted with a VR150-30 voltage regulator tube. In addition to the oscillator, multivibrators, and amplifier, a built-in detector with phone jack and gain control in the panel is incorporated. The tubes required for this secondary frequency-standard are: VR150-30; 6K8; 2—6SC7; 6V6; 6L7; 5W4. The size of the cabinet is 9 x 9½ x 10½ inches.

The second and smaller illustration herewith shows the new Midget Frequency Meters. These meters come in several different frequency ranges, and they are very handy for the Ham, as well as the commercial operator, as they can be installed in any small nook about the transmitter, such as in the corner of a shield compartment, a corner of the chassis, coil, cans, etc. They are useful for checking harmonics, parasitics, and for use in oscillator-doublers, tank tuning, and many other applications. They are supplied in sets of four, in handy protective cases, or they may be purchased individually if so desired. They come in the following ranges: 2.8 to 9.7 mc.; 9 to 28 mc.; 26 to 65 mc.; and 50 to 140 mc.

Bicycle Radio Receiver

● HERE'S the latest—a bicycle radio receiver, self-powered with batteries, and it works a loudspeaker. The Motorola Bike Radio is compact and light in weight.

The set uses 3 tubes—two triple purpose and one power tube in superheterodyne circuits. Features: Automatic volume control; permeability tuning of antenna and oscillator circuit and 4" permanent magnet dynamic speaker. Size 8" wide, 4¼" high, 3¼" deep; low battery drain; uses "A" and "B" batteries which come in special pack easily mounted to frame, size 10¾" x 4¼" x 2⅛". Set brightly finished in red with blue trim baked



enamel. Large tuning and volume knobs are provided. Set mounts on handle bars with rubber shock-proof mounting. Comes complete with aerial, batteries and mounting accessories.

New Timer for Radio Boxing Fans

● THE Tork Clock Company announces a new *radio fight timer* which shows all exact timing details of boxing bouts on the air. This specially decorated Fight Timer is self-starting, synchronous motor operated after plugging it in an A.C. circuit. A hand switch is tripped at the gong for the first round and thereafter until the end of the contest it shows the split-second time of every round and rest period. Fans know exactly when the bell would save their favorite boxer and precisely how the count is progressing against the man that's down. If you now enjoy boxing by radio, this timer will add greatly to your interest and pleasure.

It is made in two sizes. The 6" size, called the Television Model, is for private use on television or radio receivers, and the 14" square Wall Type is for semi-public use in club rooms, etc.

Marine Radiophone for Small Craft

● A NEW and extremely compact 25-watt marine radiophone for use on small commercial and pleasure boats is announced by Hallicrafters, Inc. It provides for 2-way communication with other boats, land telephone and Coast Guard stations.

Any one of five crystal-controlled transmitting frequencies is instantly selected by a rotary switch on the panel. Another switch gives an instant choice of five corresponding receiving frequencies plus an extra weather report channel. All transmitter and receiver circuits are internally pretuned.

The transmitter and 7-tube superheterodyne receiver are inclosed in a single compact cabinet de-

signed either for table or bulkhead mounting. The power supply is a separate unit and connects to the main unit by plug and cable. Power is drawn from the boat's battery but by interchanging one plug provision is made for operation from any 110-volt A.C. line.

Removal of the handset from its hook automatically switches the receiver output from the built-in loudspeaker to the handset. A "push-to-talk" button on the handset performs all *transmit-receive* switching operations during actual communication. The panel meter and its switch provide a continuous check on transmitter operation and modulation.

The receiver includes a stage of tuned preselection, quiet AVC and numerous other refinements.

Non-Inductive Power Wire-Wound Resistors

● A COMPLETE line of commercially non-inductive power wire-wound resistors, from 10 to 200 watts and with any type of mounting, has been announced by the International Resistance Co.

The degree to which inductance is reduced is well illustrated in the Type DG 1000-watt unit of 80 ohms resistance. With standard winding the inductance is 76 microhenries, whereas, with the Ayrton-Perry winding this is reduced to 0.3 microhenry.

Features include climate-proof coating. Resistance Data Bulletins IV and IV-A will gladly be sent upon request.

Marine Radio Interference Filter

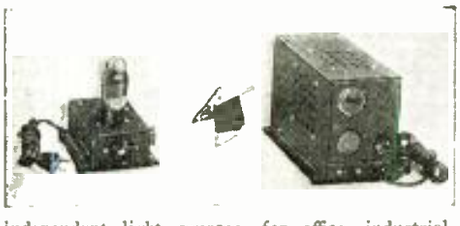
● THESE new Miller duo-lateral wound chokes use two No. 1 B&S gauge special conductors in parallel for each of the two main chokes. They are rated at 200 amperes, 250 volts, with 30 ampere shunt field filter. The No. 1 cables are made up of 520 strands of No. 28 bare copper wire, the whole covered with a double cotton serving and a special insulating varnish.

All condensers in the filter—there are four 2-mf. non-inductive paper condensers—are provided with fuse protection to avoid failure of the equipment in the event of condenser failure (a remote possibility, as the condensers are tested to 1440 volts A.C.).

The net weight of the filter is 141 pounds. The dimensions are 18 inches long, 16 inches wide and 10 inches high.

Eby Photo-Electric Units and Alarms

● CIRCUITS and advanced engineering features, with all component parts having wide safety factors, insure continuous operation of the new Eby line of photo-electric units and alarms. Eight numbers from a Beginner's Unit to a Burglar Alarm with intermediate units, self-contained or



independent light sources, for office, industrial, and commercial applications are included.

The new improved type of the EBY Electric Eye is standard equipment on all models. The 'Beginner's' and 'Heavy Duty' units are illustrated. Built to operate on 110 to 120 volts A.C. 50 to 60 cycles. D.C. models will be available shortly.

Airplane Radio

● THE Piper Aircraft Corporation and the RCA Manufacturing Company have completed arrangements for the installation of two-way RCA radio equipment in the famed two-place Piper Coupe at the former Company's Lockhaven, Pa. factory. Transmitting and receiving equipment and a new type of antenna reel system are supplied.

The coupes may also be purchased with factory-installed radio receivers alone, or with a receiver equipped with a radio range filter which enables the pilot to listen to range signals, voice broadcasts, or both together.

The complete two-way equipment includes the AVR-15A receiver, Model AVT-15A 7½-watt transmitter, and Model AVA-41 Antenna Reel System. All three units have CAA type certification. The range is over 100 miles under ordinary conditions, satisfying CAA requirements for instrument flight.

The equipment is installed complete with headphones, microphones, etc., and includes shielding of electrical wiring and complete bonding of the plane.

The AVT-15A transmitter is an extremely lightweight unit incorporating the power supply and transmitter in one case. The power supply is arranged to operate the receiver as well, further reducing overall equipment weight.

The receiver is tunable over the radio range and weather broadcast band of 200 to 410 kc. and has a separate traffic control channel. A switch is provided for instant change over to the traffic control frequency of 278 kc. This feature is of great importance when approaching an airport with the receiver tuned to the radio range station. Selection of either radio range or traffic control is accomplished by flipping a switch on the control panel.

New W8KPX Receiver

● THIS new receiver designed by the Sigmon Radio Supply Co. uses nine of the latest type Loktal tubes. It has an ultra high gain R.F. stage, a high gain 1600 kc. I.F. circuit, an automatic

noise eliminator, and covers 5, 10 and 20 meter reception—a 3-band receiver with excellent sensitivity and selectivity. It is available in "kit" form. Illustrated folder giving constructional details and prices is available on request.

QSL Card Album

● THIS new Gordon QSL card album comes complete with your call letters on it. Your QSL cards become more valuable as the years go on. You can now keep your cards in this album, where they will always be clean, perfectly legible and safe from loss or damage.

The book is bound in red Morocco grained covers, embossed in gold. Has 50 gray cover-stock pages; album expands for 50 more sheets. One side of page holds 4 cards. Pages are loose-leaf, yet firmly held under compression. Stubs between sheets prevent bulging.

2 New Transformers

● THE Kenyon Transformer Co. has just announced the addition of two new types to their line of *Telescopic Shielded Humbucking Transformers* as follows:

TYPE P204, has a primary of 500/333/250/200/125/50 ohms and secondary of 50,000 ohms (single class A grid). Frequency response plus or minus 1 DB 30 to 20,000 cycles. Shielding, 90 DB.

TYPE P205 has a primary the same as P204 and a secondary of 100,000 ohms to P. P. grids. Frequency response is plus or minus 1 DB 30 to 20,000 cycles. Shielding, 90 DB.

The transformers in this group are *annealed after complete construction* to remove all bending and shearing strains brought about during manufacture. This extra process assures maximum permeability of the electromagnetic shields.

F-M Transmitter

● "SYNCHRONIZED FREQUENCY MODULATION" is the term selected by Western Electric Company to describe its new line of *FM transmitters*, the first unit of which was announced recently. Synchronized frequency-modulation is a radio wave generating system, developed by Bell Telephone Laboratories, in which the *average* or carrier frequency of the FM carrier wave is locked in step with the vibrations of a precision quartz oscillator. The carrier drift is thus confined to extremely close limits, an achievement which removes one of the final obstacles to FM broadcasting as a commercial reality.

The new line of transmitters exhibit a carrier stability matching that of the best amplitude-modulated units currently in use on the longer broadcast wave lengths. Attention is called to the importance of carrier stability as a factor in high-quality transmission and reception; the newly-developed system limits carrier drift to within .0025 percent—at least four times better than the present requirement of the Federal Communications Commission of .01 percent.

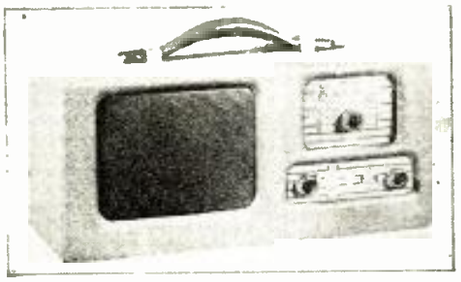
No "B" Battery in This 4-Way Portable

● THIS novel and unusual portable works on 110 volts A.C. or D.C.; "self-powered" on 5 flashlight batteries; or it may be operated in car or boat on 6 volt storage battery.

In addition, the Setchell Carlson Portable "66" uses a three-gang tuning condenser and a tuned R.F. stage, giving sensitivity and selectivity so necessary when used in remote vacation areas.

The elimination of "B" batteries cuts the cost of operation. The use of standard flashlight cells for its self-contained power-supply offers a convenience to the vacationer when in need of replacements.

Features: For the car—6 to 8 volts. For home use—110 volts A.C. or D.C. For outings—self-contained batteries. (No "B" batteries are required: Set uses 5 or 10 No. 2 flashlight batteries.



(Over twice the service with 10.1) Drain approximately same as flashlight. Three-gang tuning condenser. Tuned R.F. stage (giving greater sensitivity-selectivity). Band coverage—540 kc. to 1750 kc. Concealed loop antenna. 5" P.M. dynamic speaker. Disappearing clips for simple car installation. Enclosed 6- to 8-volt cord for connection to car battery. Enclosed cord for 110 volt A.C. or D.C. operation. Convenient voltage selector switch. Finished in two-tone Pig Grain Leatherette. Five tubes: 1-1N5, 1-1A7, 1-3A8, 1-1T5, 1-35Z5. Size: 13" x 6" x 5¾". Weight with five batteries: 9½ pounds.

New F.M.-A.M.-Phono Combination

● INTRODUCED as an outstanding item of the new Lafayette 1941 receiver line is the Model FM-13 *three-way* combination for reception of both frequency and amplitude modulated broadcasting, and reproduction of records.

The 9-tube dual tuner provides a tuning range of 550 to 1600 kc. for standard broadcasts, and of 40 to 50 megacycles for F.M. reception. The tube line-up is: 6SK7 r.f. amplifier, 6SA7 converter, 6SK7 A.M. i.f. amplifier, two 1853 F.M. i.f. amplifiers, 6SJ7 limiter, 6H6 F.M. detector, 6R7 A.M. detector and audio, 80 rectifier.

The audio system is on a separate chassis and employs a 5Y4G rectifier and two 6C8G's driving a pair of 6L6G's. Rated at 20 watts output, the response of this amplifier is substantially flat from 30 to 15,000 c.p.s. Properly balanced dual speakers, automatic bass-compensation as a built-in feature, and separate manual controls for bass and treble equalization result in impressively realistic and natural reproduction.

The automatic phono unit not only changes but mixes records, playing any combination of 10" and 12" records up to ten. The pick-up is one of the tangent-arm type for minimum record wear.

General Electric Co.

● TWO new bulletins on G.E. "frequency modulation" broadcast transmitters have just been received. One bulletin describes a 250-watt transmitter and the second bulletin a 1000-watt transmitter.

New RCA Inductive-Output Amplifier—No. 825

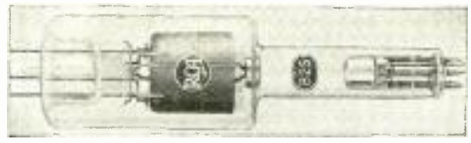
● THE RCA-825 is a multi-electrode vacuum tube of a new type in which the electron stream is inductively coupled to the output circuit. It is designed for use as a power amplifier *at frequencies above 300 megacycles,* and in such use is capable of handling power outputs up to 35 watts depending on the bandwidth and type of service. The 825 is also well suited for use as an oscillator and harmonic generator in the same way as tubes of more conventional design. Because of its high transconductance and its adaptability to tank circuits having low effective capacitance: the 825 is especially suited for wideband services, such as *television* and *frequency* modulation.

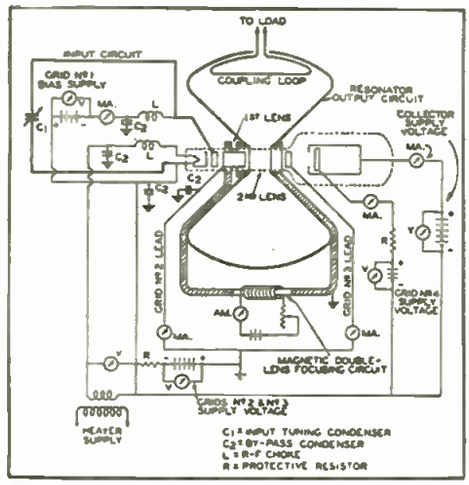
Tentative Characteristics and Ratings

Heater Voltage (A.C. or D.C.)	6.3	Volts
Heater Current	0.75	Ampere
Transconductance for plate current of 50 ma.	5500	Micromhos
Direct Interelectrode Capacitances:		
Grid No. 1 to Grid No. 2	1.7 max.	uuf
Grid No. 1 to Cathode	3.4	uuf
Grid No. 2 to Cathode	0.9	uuf
Terminal Mounting	Special	
As R-F Power Amplifier and Oscillator—Class C Telegraphy		
Key—down conditions per tube without modulation # #		
D-C Collector Voltage	2000 *max.*	Volts
D-C Grid No. 4 Voltage	1500 *max.*	Volts
D-C Grid No. 3 Voltage	3600 *max.*	Volts
D-C Grid No. 2 Voltage	3600 *max.*	Volts
D-C Grid No. 1 Voltage	−100 *max.*	Volts
D-C Collector Current	50 *max.*	Milliamperes
D-C Grid No. 1 Current	2.5 *max.*	Milliamperes
Collector Input	100 *max.*	Watts
Grid No. 4 Input	7 *max.*	Watts
Grid No. 3 Input	5 *max.*	Watts
Grid No. 2 Input	7 *max.*	Watts
Collector Dissipation	50 *max.*	Watts
Grid No. 1 Dissipation	0.15 *max.*	Watt
Typical Operation: **		
D-C Collector Voltage	1500	Volts
D-C Grid No. 4 Voltage	800	Volts
D-C Grid No. 3 Voltage	3600	Volts
D-C Grid No. 2 Voltage	3600	Volts
D-C Grid No. 1 Voltage:		
From a fixed supply of	−40	Volts
From a cathode resistor of (approx.)	800	Ohms
From a grid resistor of	18000	Ohms
Peak R-F Grid Voltage	45	Volts
D-C Collector Current	45	Milliamperes
D-C Grid No. 4 Current	2	Milliamperes
D-C Grid No. 3 Current	0.5	Milliampere
D-C Grid No. 2 Current	1	Milliampere
D-C Grid No. 1 Current (Approx.)	2.3	Milliamperes
D-C Grid No. 1 Dissipation (Approx.)	0.1	Watt
Power Output (Approx.)	35	Watts

Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

** The focusing electromagnet is a double magnetic lens operated at approximately 1000 ampere turns.





Appearance and method of using the new 825 tube.

The electron stream is focused into a beam by the combined effects of magnetic and electric fields. While it is possible to focus the electron stream by means of an intense uniform magnetic field in the direction of the beam as shown in Fig. 1, it is preferable to make use of the double-magnetic lens system shown in Fig. 2. The latter arrangement localizes the magnetic field in the regions where it is most needed, and consequently makes the energy required to establish the requisite field considerably less than for the uniform magnetic field. Because of the low magnetomotive force required to energize the lenses, a permanent magnet may be used for this purpose.

Because of the very close spacing between cathode and grid No. 1, a high ratio of transconductance to input capacitance is obtained. This feature together with the fact that this tube is especially suitable for use with tank circuits having low effective capacitance makes the 825 particularly useful in wideband services. Furthermore, the close cathode-grid No. 1 spacing satisfies the high-frequency requirement of minimum electron transit time which is important if excessive input loading and loss of transconductance are to be avoided at ultra-high frequencies.

Grid No. 2 which accelerates and focuses the electron beam, is so designed and positioned as to obtain a low grid No. 2 current and at the same time to maintain the input capacitance at low value.

When an inductive-output tube is to be used as an oscillator, some of the energy from the output circuit must be fed back to the input circuit by means of a transmission line. This line should preferably be tapped on the input circuit so as to prevent the occurrence of standing waves. The length of the line should also be adjustable to permit compensation of the phase shift in the transconductance of the tube. In this way, since the feedback coupling through the tube is negligible, optimum phase relations for the oscillating circuit may be obtained with resultant high efficiency.

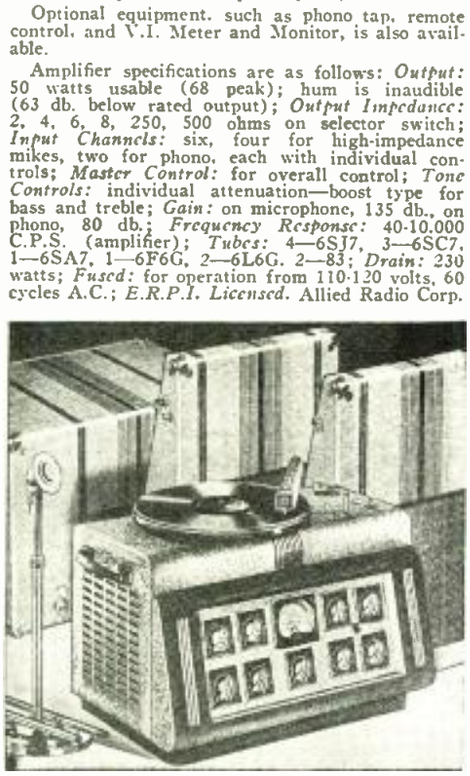
In an inductive-output tube, the power input is equal to the product of the collector voltage and the d-c collector current, exactly as is the case in conventional tubes. The power dissipated at the collector is the difference between the power input to the collector and the power which is taken from the electron stream by the loaded tank circuit.

50 Watt De Luxe Master P.A. System

● THE complete de Luxe P.A. Knight System is designed for use in Broadcast Stations, Recording Studios, Schools, Rentals, Rinks, Labs, Choirs, Orchestras, Legislatures, Theaters, Night Clubs, etc. Outstanding features include: dual tone equalizers, inverse feedback, lighted control panel, power driver, 6 input channels, electronic mixing, master control, speaker selector, beam power output, universal output, silencer jacks, fuse-protected "safused" speakers, headphone jacks, etc.

Optional equipment, such as phono tap, remote control, and V.I. Meter and Monitor, is also available.

Amplifier specifications are as follows: *Output:* 50 watts usable (68 peak); hum is inaudible (63 db. below rated output); *Output Impedance:* 2, 4, 6, 8, 250, 500 ohms on selector switch; *Input Channels:* six, four for high-impedance mikes, two for phono, each with individual controls; *Master Control:* for overall control; *Tone Controls:* individual attenuation—boost type for bass and treble; *Gain:* on microphone, 135 db., on phono, 80 db.; *Frequency Response:* 40-10,000 C.P.S. (amplifier); *Tubes:* 4—6SJ7, 3—6SC7, 1—6SA7, 1—6F6G, 2—6L6G, 2—83; *Drain:* 230 watts; *Fused:* for operation from 110-120 volts, 60 cycles A.C.; *E.R.P.I. Licensed.* Allied Radio Corp.



Browning Frequency Monitor

● THE Browning Laboratories has recently announced a new precision amateur frequency monitor, Type M3, covering the six amateur bands from 160 meters to 2½ meters. The monitor is so designed that the amateur bands are completely band-spread over 240 degrees on a 5½" laboratory dial. 100 and 1000 Kc. oscillators are used as secondary standards and may readily be adjusted to one part in a million against the Bureau of Standards Station, WWV. These secondary standards allow accurate checking of dial calibration in the amateur bands. The dial is direct reading and requires no counting of beats to determine the frequency of exciters, transmitters or received frequencies. Zero beat is indicated visually by the cathode ray tuning indicator and aurally in phones. This apparatus may also be used as a visual deviation meter.

New Atom Type Condensers

● PACING the rapidly growing popularity of condensers with "feet" for vertical mounting soldered directly to the chassis, or for bending the "feet" through chassis holes, the Sprague Products Company has introduced a line of Atom-type midget dry electrolytics, known as Type LM.

LM Condensers are enclosed in a sturdy cardboard tube, with inner seal moisture protection and are well potted with a high melting point wax. All have separate positive and negative leads which come out at the same end. Durable metal mounting feet make it easy to solder to the underside of a chassis under crowded conditions or for vertical mounting on top of the chassis. These feet may either be soldered directly to the chassis, or inserted through chassis holes and bent over for fastening. The result is a rigid, good-looking installation made with a minimum of effort and in the shortest possible time—even in the most crowded of modern midget receivers.

"Pick-up" Pressure Scale

● UNIVERSAL Microphone Co., Inglewood, is now distributing its new weight scale for servicemen, recorders and others who need to quickly determine the weight on pickups or cutting heads. The tiny instrument is small and lightweight, but extraordinarily accurate.

It reads in ounces and has a hook for speedy connections, and enables the holder to see the weight on the needle or stylus. Besides use with servicemen and recorders, the advent of home recording has made such a precision instrument necessary because manufacturers now recommend a certain weight limitation. It will be available through dealer and jobber channels.

Contact and Attenuator Service Kit

● A NEW kit for cleaning noisy attenuators, tuners, all-wave switches, variable contacts, etc. The kit consists of special contact cleaner and special corrosion resistant lubricant. One can easily clean noisy controls and frequently clear the trouble without dismantling the chassis or control unit.

Consolidated Wire & Assoc. Corps.

● A WIDE variety of new products have just been announced by Consolidated Wire & Assoc. Corporations. Of interest to servicemen, experimenters, and amateurs alike, these new additions include:

Two items of particular interest for use in replacement work on small radios—miniature dry-electric condensers in etched foil tubular, etched foil waxed carton and midget plain foil waxed-carton types: as well as a new series of midget double-tuned I.F. transformers. A complete line of radio cements and solvents. A variety of phono and record accessories—including plain steel or brass-plated high-fidelity needles. Paints, varnishes and lacquers—including brush-on wrinkle finishes.

Ceramic Trimmer Capacitor

● THIS new capacitor has fixed plate bonded to the ceramic base, eliminating the usual variable air film. The variable plate rotates on a ground ceramic surface. Unit is equally stable at all capacity adjustments. Provides negative temperature compensation of .0006 MMF/MMF/°C. Power factor less than 0.1%. Capacity change with humidity or temperature cycling less than 0.5%. Available capacity ranges 2 mmf to 6 mmf, 3 mmf to 12 mmf, 7 mmf to 30 mmf, 60 mmf to 75 mmf. Manufactured by Centralab.

New Catalogs

New Sprague Bulletins

● THE new 1940-41 condenser catalog from The Sprague Products Co., is a handsomely printed affair; the special illustrations and clearly printed tables give specifications and prices of the various Sprague condenser units. Among the popular items found in this new catalog are a complete line of atom condensers, tubular types, can and cardboard electrolytics, also paper and mica condensers of all sizes. The tel-ohmike condenser and resistor analyzer is listed and described, including the new de luxe tel-ohmike. New test instruments of very reasonable cost and a capacity indicator are listed and described; also a new line of high voltage television condensers.

New Transmitter Guide

● A NEW edition of the Transmitter Guide has just been released by the Thordarson Electric Mfg. Co. A wide selection of transmitters is presented, ranging from 20 to 1000 watts, in addition to a Portable and Emergency unit and two Band-Switch Exciter units.

Complete building and operating instructions are furnished, including over 100 illustrations to help build high quality transmitters of modern design. This new guide contains many new circuits and ideas on ham transmitter equipment and technical articles covering Class B Output Calculations, Driver Transformer Ratios, Matching Class C Loads to Modulators and other information of vital importance to the amateur.

Available at 15 cents, postpaid, from the Thordarson Electric Mfg. Co., or from the Service Dept. of RADIO & TELEVISION, 20 Vesey St., New York, N. Y.

Universal Microphone

● UNIVERSAL Microphone Co., of Inglewood, Cal., has issued its new microphone catalog. The publication announces increased sensitivity of all its models. Main items have been changed from −53 to 48, with other models in proportion. This company has also started to distribute its new KD model dynamic microphone to fill what it believes is a long-felt need in the price range. KD will be a running mate for the KO model crystal microphone.

James Millen Mfg. Co.

● THE new 1940-41 catalog of the James Millen Mfg. Co. has been received and a number of new and interesting items for shortwave set-builders and Hams are illustrated and described. Among the new apparatus we note a long awaited Precision Crystal Secondary Frequency Standard. Another item interesting to radio amateurs is the Midget Frequency Meter, available in a number of different ranges. Other useful apparatus of high quality are I.F. transformers of all types, including those for F.M. receivers; hash filters, wave traps, safety relays, many types of connectors and sockets, coil forms, stand-off insulators, R.F. chokes, transmitting coils and condensers, dials, scales, etc.

Meissner Vibrator Guide

● THE Meissner Manufacturing Co. has recently brought out a complete new guide on vibrator replacement units. All types of vibrator units are listed, for automobile and household set replacements. An elaborate buffer replacement chart is included and also a section on buffer condensers and their functions.

New Aerovox Catalog

● THE new 1939-40 catalog listing the Aerovox condensers, resistors, and test instruments is a very complete one, as every imaginable type of condenser is described and listed therein, including both wet and dry electrolytics, filter and analyzer condensers, mica and oil-filled types, television condensers, etc. The resistors listed include the wire-wound, lacquer-coated and insulated molded carbon types, etc. Among the test instruments we find a capacity-resistance bridge and an inductance-capacitance checker, etc.

Marine Radiotelephones

● TWO new catalogs have just been released by Hallicrafters, Inc. One of the beautifully printed catalogs describes portable radiotelephone sets for use on yachts, cruisers, etc., and includes in the line a radio-compass location finder. Another one of the booklets describes Fishermen's radio telephone sets, which are built to government specifications. These marine sets are of great practical value and can be used for many other purposes than on shipboard.

COMMERCIAL NOTICES 10¢ A WORD

Under this heading only advertisements of a commercial nature are accepted. Remittance of 10c per word should accompany all orders. Copy should reach us not later than the 10th of the month for the second following month's issue.

AGENTS WANTED

300% PROFIT SELLING GOLD Leaf Letters for Store Windows; Free samples. Metallic Co., 446 North Clark Chicago.

CODE MACHINES

AYERS ALL ELECTRIC CODE Practice Machines. Low monthly rental. 50,000 words practice tapes. World's Champion code machine designed by T. R. McElroy, World Champion telegrapher. Write N. C. Ayers, 711 Boylston St., Boston, Mass. Dept. C.

DIATHERMY MACHINES

DIATHERMY, SHORT-WAVE Therapy, and ultra short-wave therapy machines custom-built by radio engineer at considerable saving over commercial machines: 6 meters, 16 meters or any other frequency specified can be furnished. Machines substantially built with high patient safety factor, 250-300 watts output. Neat professional appearance. Automatic safety time switches. All necessary pads and electrodes. For sale only to physicians hospitals, and sanatoriums. Prices from $195.00 to $300.00. Not for sale to the general public. Write for further information giving your own specifications and requirements. Allan Stuart, P.O. Box 56, Teaneck, N. J.

INSTRUCTION

$15.00 STEAM ENGINEERING Course—8 vols. $4.50; Radio and Electrical text-book bargains—act list. Life of Napoleon. 3 de luxe volumes $3.00. $10.00; New Cyclopedia of Science. 1300 pp. $4.50; Hopkins' "Experimental Science." 2 vols. $3.50. Harry Ackerson, Box 322, Ramsey, N. J.

MOTORS

RECONDITIONED MOTORS, 1/50 HP, AC-DC, Nickel $1.50; 1/30 HP, black $2.50. Fully guaranteed. F.O.B. New York. Wonderful value limited quantity. Act Promptly! Gold Shield Products, Dept. 114, 350 Greenwich St., New York City.

PATENT ATTORNEYS

INVENTORS — PROTECT YOUR rights before disclosing your invention to anyone. Form "Evidence of Conception"; "Schedule of Government and Attorneys' Fees" and instructions sent free. Lancaster, Allwine & Rommel, 436 Bowen Building, Washington, D. C.

QSL—CARDS—SWL

SWLS—QSLS. COLORFUL, Economical. W9KXL, 819 Wyandotte, Kansas City, Mo.

TELEVISION

TELEVISION—MOTORS, DISKS, Tubes. Arthur Pohl, 2304 Scotten, Detroit, Mich.

FOR SALE (NON COMMERCIAL) 3¢ A WORD

Under this heading we accept advertisements only when goods are offered for sale without profit. Remittance of 3c per word should accompany all orders. Copy should reach us not later than the 10th of the month for the second following month's issue.

DON'T BUY A RECEIVER UNTIL you get my free list of reconditioned, guaranteed Receivers! Practically all models at money saving prices. Trade-ins. Time Payments. Send for list. W2AVA, 12 West Broadway, New York.

RECONDITIONED GUARANTEED receivers cheap. Free trial, terms. Hallicrafters, Nationals, Hammarlund, Howards, RMEs, and all other makes and models at lowest prices. Write for free list. W9ARA, Butler, Missouri.

LOOK! A $50.00 SUPREME 535 oscilloscope, scarcely used, with 2 inch screen, I need money, make an offer. Louis Geiger, Chatfield, Minn.

ISSUES 1 TO 54 OF POPULAR Educators and 6 band, 6 tube receiver covering 9 to around 600 meters. Will trade if good offer in a good ham receiver is obtained. Alfred Nieini, 20—3rd St., S.E., Chisholm, Minn.

BARTER AND EXCHANGE — 1¢ A WORD

NO ADVERTISEMENT TO EXCEED 35 WORDS, INCLUDING NAME AND ADDRESS

Space in this department is intended solely for the benefit of our readers, who wish to BUY or EXCHANGE anything in the Radio, Television and Photographic fields for Radio, Photographic and other merchandise; therefore we charge only 1c a word. Each word in a name and address is counted. Remittance should accompany order.

Only one advertisement can be accepted from any reader in any one issue.

We cannot accept responsibility for any statements made by the readers.

All dealings MUST be above board. Remember you are using the U. S. mail in all these transactions and therefore you are bound by the U. S. Postal Laws. Describe anything you offer accurately and without exaggeration. Treat your fellow men the way you wish to be treated.

We welcome suggestions that will help to make this department interesting and helpful to our readers.

Copy should reach us not later than the 10th of the month for the second following month's issue.

TRADE AUTO, MIDGET OR FLOOR model radios, new or used, for cameras or equipment. Fred Harvey, 4533 Sheridan Road, Chicago, Ill.

WILL EXCHANGE NEW RADIO receiving and transmitting parts, tubes, receivers, Rider's Manuals, etc., for old U. S. stamps. Major Fred Luther Kline, Kent, Ohio.

HAVE AN ELKHART SAXOPHONE, 160 meter phone xmitter, Electric guitar, New Superior Oscillator, Supreme tube tester, and radio parts. Want: High voltage transformer or power supply, xmitting tubes, elective pickup or phono player. Harry Parker, Sylva, N. C.

TRADE AUTO RADIO, RECORD player, mikes, camera, projector, enlarger, books, others. Want photo goods, accordion, concertina, or? Swap lists. M. Edstein, 2953 Ruckle, Indianapolis, Ind.

WANTED GENEMOTOR, A.C. GENerator or Vibra pack capable of powering medium size portable transmitter. Have meters, oscilloscope or cash. Eric Pohle, 122 Fifth Street, Saddle River, N. J.

WILL TRADE: 2—807's, MICROscope, printing press 4 x 6 with type good for printing "q s l" cards for television tubes and equipment. Wm. Ussler, Jr., 856 W. Allen Lane, Phila., Pa.

WILL SWAP BALDWIN TYPE G fones in good condition. ARRL Antenna Book, McElroy "100 Str. Key" and cash for Brush x'tal fones, Instructograph jr. Bob Hammond, 208 W. Lincoln Ave., McDonald, Pa.

HAVE EXCELLENT RECORD player in solid walnut cabinet. Also 8-tube, all-wave, Airline Radio in console cabinet. Both in perfect condition. Make best trade offer. D. J. Gilmore, 146 Hawthorne St., Belmont, N. C.

WANTED: COMPLETE N. R. I. course, 1938—'39 with Advanced Course in Servicing, less instrument. Will pay cash. Charles DeSimone, 262 North 6th St., Brooklyn, N. Y.

TRADE STRONG BROWN KRAFT envelopes, all sizes for mailing manuscripts, or photographs to editors; printer's ink, several colors. Want parts, R. T. I. course, back copies or? W. Hargett, 3646 Kosciusko, St. Louis, Mo.

HAVE WESTERN NEW 276A'S (300 watts out), 30-10,000 cycle mike, Interstage transformers and telephone handsets. Want good turntable, crystal pickup, high voltage power transformer, ten volt filament transformer. Joseph Dalton, 410 Belgrove Drive, Arlington, N. J.

WILL TRADE RADIO PARTS, RAdio magazines, meters, test equipment, etc., for anything of value, at any time, describe yours fully. Roby, 6303 Kenwood, Chicago.

HAVE RADIO EQUIPMENT AND other items to trade for Stancor 110 c.m. xmitter. Answer all letters, Vernon Robertson, 1710—5th Ave., So., Columbus, Miss.

WHAT HAVE YOU? WILL ACCEPT anything of value. Have meters, tubes, checkers, transformers, relays, receiving transmitting equipment, portables, camera equipment, speakers, amplifiers, converters, dynamotors, transceivers, recording barometer, telescope. Will correspond. Royal, 315 S. Western, Chicago.

HAVE 242A, 211E, 210'S, 281'S, 250's, 59's, 6L7's, 2A6, 80 and 160 crystals and holders, UP1016 transformer, other junk. Trade offer? Buck, 1644 Anthony Ave., N. Y. C.

HAVE KEYSTONE 16 M.M. PROjector and movie camera to match. Swap for transmitter, parts or a good receiver. John Lawler, 19 Plesant Street, South Hadley Falls, Mass.

TRADE: 250W TRANSMITTER parts, rack, mike, meters, 211D, 261A tubes, amplifier; want: SX17, SX18, Howard 460 or other good allwaver, with crystal. Logan, 1149 W. Chicago Ave., Chicago, Ill.

WANT: ACE DO-ALL ULTRA MODel or Howard 436, Candler Junior Course, typewriting course. Have: 40 lessons Lincoln Aviation Course, mandolin, Yale phonograph, Winchester 97 shotgun, 6 Volt soldering iron, Delta Lite, etc. Charlie Stiles, 816 Platte, Alliance, Nebr.

HAVE AMPLIFIERS, TUBES, speakers, pickups, new and used. Want set of Rider's manuals or what volumes have you? L. Juergens, 107 Cherry Street, Mankato, Minnesota.

TRADE: $125.00 U. E. I. REFRIGeration course for N. R. I. radio course, typewriter or rifle. J. De Marco, 417 Elton St., Brooklyn, N. Y.

TELEPLEX, TAPES AND KEY, amount $60.00 in exchange for a good camera preferably Leica, Perfex, developing tanks, etc. Nat Goldstein, 155 Wyona St., Brooklyn, N. Y.

EXCHANGE—24 NEW UNUSED symphonic records and Session electric clock for Sky Buddy S19R or Stevens No. 57 or Savage No. 7 rifle. Schoonover, Oakland, N. J.

WANTED: TEST OSCILLATOR, multimeter, condenser checker, analyzer, tube checker, vibrator tester, oscilloscope, manuals, tools, etc. Also want ham transmitter and parts; have $100.00 cash. Note for balance. Walter Wichner, W9ACT, Sioux Falls, S. D.

TRADE: 6L6 CW TRANSMITTER, code oscillator, PA system, 5 meter transceiver, 600 volt transformer, 400 volt supply, crystal pickup—need enlarger, typewriter, Hawaiian guitar, plate camera, drill—or? Stanley, 2748 Meade, Detroit.

TRADE: MILLION MODEL TM tube and condenser tester, Underwood typewriter—just reconditioned, N.R.T.I. Radio and Television course, Gilbert Electric Eye, for? Harold Wintheiser, LeCenter, Minn.

SWL EXCHANGE

This department is for the benefit of all short wave listeners who wish to exchange SWL cards. Remittance of 1c a word for each word in the name and address should accompany order.

UNITED STATES

O. BARNESON, 2838 Moss St., Los Angeles.

O. BENINCASA, 122 Pearson St., Santa Rosa, Calif.

C. R. DUCY (W3XW4), 517 N. Franklin St., Philadelphia, Pa.

VERNON LEE GIBBS, R.F.D. No. 5, Lexington, Kentucky.

BOB LARSON, 618 North June Street, Hollywood, California.

JAMES LEE, 90 N. Crossmon St., Alexandria Bay, New York.

MERT MEADE, W9KXL, 819 Wyandotte, Kansas City, Mo.

DON T. MEISEL, 221 West 26th St., Sioux Falls, So. Dak.

JACK SEALE, 510 Idylwood Drive, Longview, Texas.

LEE ROY TALLANT, R.F.D. No. 3, Lincoln Highway, Irwin, Penna.

GEORGE TURKEY, 1020 Fourth St., S. W., Massillon, Ohio

FREE CATALOGS and INFORMATION

By carefully reading the advertising columns, you will find many offers to furnish literature containing valuable technical information that will help you in your work. Use this list freely.

Firm	Business	Offer	No.	Cost	Adv. Page
ABC Radio Laboratories	Set Mfr.	Information		Free	401
Allied Engineering Institute	Kit Mfr.	Circulars		Free	402
Allied Radio Corp.	Mail Order	1941 Fall Radio Catalog		Free	399
American Radio Institute	Radio School	Booklet		Free	412
Amperite Co.	Parts Mfr.	Replacement Chart	"S"	Free	412
Arrow Radio, Inc.	Mail Order	Information		Free	422
Audel, Theo., & Co.	Book Publisher	Information		Free	405
Ayers, Automatic Code Machines	Code Machines	Information		Free	420
Bliley Electric Co.	Parts Mfr.	Circular	D-2	Free	408
		Engineering Bulletin	E-6	10c	
		Bulletin	E-7	Free	
		Circular	A-7	Free	
Bud Radio, Inc.	Parts Mfr.	Catalog		Free	398
Burstein-Applebee Co.	Mail Order	1941 Catalog	57	Free	401
Candler System Co.	Code Course	1940 Book of Facts		Free	408
Cannon, C. F., Co.	Parts Mfr.	Folder	T-17	Free	412
Chartered Institute of American Inventors	Patent Attorneys	Information		Free	441
Crowell, Thomas Y., Co.	Book Publisher	Information		Free	415
Dodge's Institute	Radio School	Catalog		Free	405
Goldentone Radio Co.	Set Mfr.	1941 Bargain Catalog		Free	414
Gold Shield Products	Mail Order	Catalog		Free	422, 427, 433, 435
Hallicrafters, Inc.	Set Mfr.	Literature		Free	B.C.
Hammarlund Mfg. Co.	Set & Parts Mfr.	"40" Catalog		Free	421
Harrison Radio Co.	Mail Order	Information—List		Free	412
Harvey Radio Company	Mail Order	Information		Free	398
Henry Radio Shop	Mail Order	Information		Free	408
Howard Radio Co.	Set Mfr.	Information		Free	387
Instructograph Company	Code Machine	Information		Free	419
International Resistance Co.	Parts Mfr.	Catalog	45	Free	409
Lafayette Radio Corp.	Mail Order	196-Page Catalog	82	Free	403
Lancaster, Allwine & Rommel	Patent Attorneys	Booklet		Free	441
McElroy, T. R.	Code Machines	Catalog		Free	416, 417
Mass. Radio School	Radio School	60-Page Catalog		Free	405
Midget Radio Co.	Set Mfr.	Information		Free	420
Midwest Radio Corp.	Set Mfr.	Catalog		Free	427
Millen, J., Mfg. Co., Inc.	Parts Mfr.	1940 Catalog		Free	415
National Company, Inc.	Set & Parts Mfr.	Catalog		Free	I.F.C.
National Radio Institute	Radio School	64-Page Book		Free	398
National Schools	Radio School	Catalog		Free	405
National Union Radio Corp.	Parts Mfr.	Information		Free	401
Nelson Co.	Used Courses	72-Page Catalog		Free	420
New York Y.M.C.A. Schools	Trade School	Booklet		Free	405
Olson Mfg. Co.	Set Mfr.	Bulletin	RT-11	Free	425
Par-Metal Products Corp.	Parts Mfr.	Catalog	40	Free	414
Radio Corp. of America	Radio & Television	Literature		Free	395
Radiocrafters	Parts Mfr.	Catalog		20c	425
Radio Design Co.	Test Equipment	Information		Free	420
RCA Institutes, Inc.	Radio School	Catalog		Free	405
RCA Manufacturing Co., Inc.	Set & Parts Mfr.	Information		Free	I.B.C.
Scott, E. H., Radio Laboratories, Inc.	Set Mfr.	Literature		Free	425
Sigmon Radio Supply Co.	Kit Mfr.-Dealer	Illustrated Folder		Free	399
Sprayberry Acad. of Radio	Radio School	52-Page Book		Free	405
Sun Radio Co.	Mail Order	24-page Illus. Booklet		Free	419
		Test Equipment Bulletin		Free	
Superior Instruments Co.	Test Equipment	Catalog		Free	431
Supreme Publications	Publishers	Information		Free	420, 422
Teleplex Co.	Code Machine	Folder	S-11	Free	414
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What Do YOU Think?

A VOICE FROM THE ARGENTINE!

Editor,

I've read the last issue of RADIO & TELEVISION and I want to address to the Editors my congratulations for this magazine—the best and most complete I've seen in years. All its departments are so interesting that I read them from beginning to end. I believe that there never was a radio magazine edited which covered all the radio specialties like R. & T.

In reference to the Editor's offer I would like to receive the complete World's Short Wave Station List, but I have no U. S. stamps; so, I hope you will make an exception this time and send me the list.

I'm studying C. & E. Engineering in the *University of Buenos Aires.*

I'll be very grateful to you if you announce to R. & T. readers my desire to exchange pictures and radio magazines. If they do so, I'll send them the best Argentine radio magazines and guides.

They can address their letters in Spanish or English.

73 and I hope to hear from you soon.

Sincerely,
JOSE L. TEPPER, B. S.
Treinta y Trés 1467,
Buenos Aires, Argentina, S. A.

LIKES R. & T. CONSTRUCTION ARTICLES

Editor,

Received my current number of R. & T. and would like to compliment you on it. Glad to see the photo section discontinued. Your new departments are O.K. The "puzzle diagram" is an excellent idea and adds to the improvement of your magazine.

Your construction articles appeal to me very much. Several sets were made from R. & T. and all were good receivers.

I like to see the amateur-SWL question debated in the "Readers' Letters" section.

For the SWL who would like to exchange cards, just let them send me their card and mine will be mailed them the same day. I QSL 100% to anyone, anywhere!

Keep up the good work on your "FB" magazine and all will be O.K.

GEORGE TURKEY,
1020 Fourth St., S.W.,
Massillon, Ohio.

ALWAYS GETS "NEW" INFORMATION

Editor,

I have been a reader of your "FB" magazine for about two years. Every time I read your mag. I gain some *new* information. The rig here is a Sky Buddy S-19R receiver with a 40 foot doublet north and south. DX here is 48 countries with 20 verified and V. A. C. I hope to become a ham soon and your mag. has helped me a great deal. I QSL 100% here to both cards and letters and would like to correspond with SWL's throughout the world. Lots of luck and all the best to RADIO & TELEVISION and all its readers.

"CHARLIE" ROGERS,
Box 76,
Delevan, New York.

(Turn to page 448)

NOW READY FOR DELIVERY!

With $1.00 subscription to RADIO & TELEVISION

FREE TO YOU! — *1940-41 Radio-Television Reference Annual*

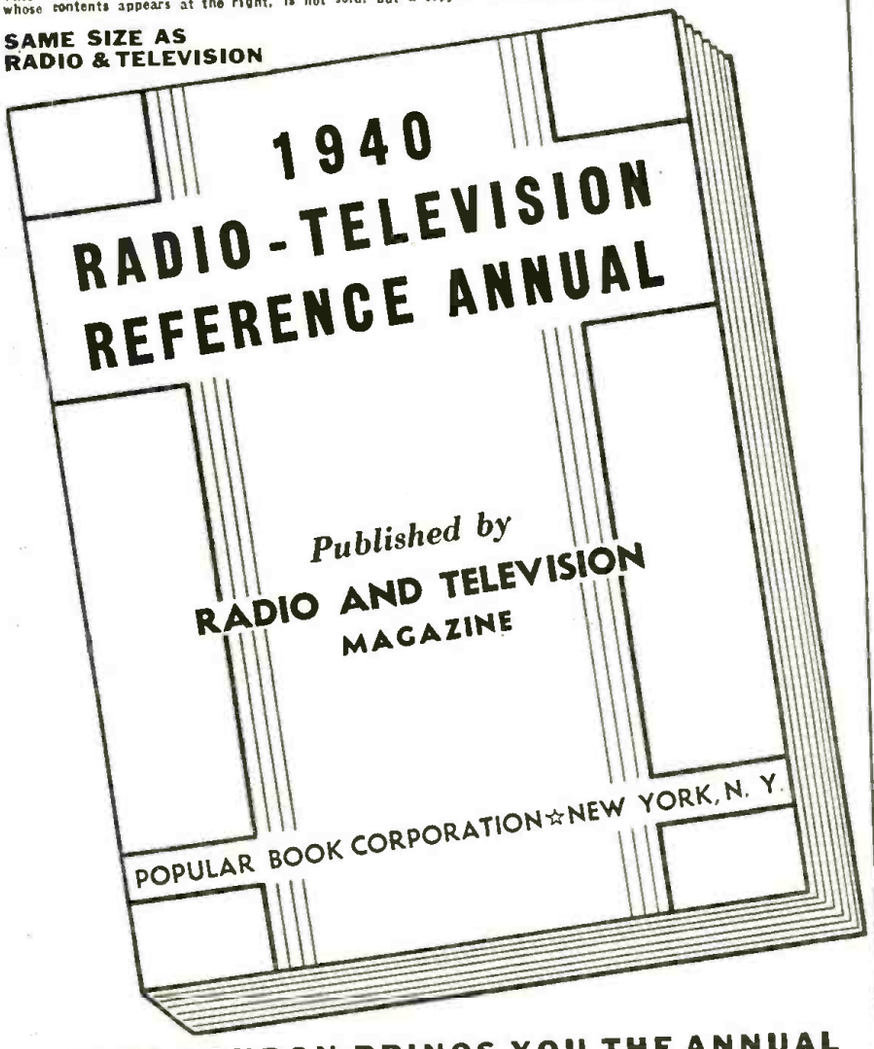
WITH our compliments, we want to send a copy of the 1940 RADIO-TELEVISION REFERENCE ANNUAL to you FREE, if you will simply take advantage of RADIO & TELEVISION magazine's special subscription offer NOW. This offer is being made for a limited time only.

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

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

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

SAME SIZE AS RADIO & TELEVISION



Read the summary of contents in this FREE BOOK!

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

BEGINNER'S SIMPLE INEXPENSIVE CONSTRUCTION ARTICLES

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

MORE ADVANCED SET CONSTRUCTION

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

THE SERVICEMEN'S SECTION

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

TEST INSTRUMENTS

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

PUBLIC ADDRESS AND AMPLIFIERS

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

"HAM" SECTION

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

TELEVISION

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

MISCELLANEOUS

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

USEFUL KINKS, CIRCUITS AND WRINKLES

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

(approximately)

45 ARTICLES

(approximately)

170 ILLUSTRATIONS

68 BIG PAGES

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

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

R. & T. 5-TUBE SET WORKS WELL

Editor,

I have been reading your very FB magazine for eight months now and I want to tell you I think it is the best yet. I have just finished building the "5-tube Broadcast Receiver" described in July RADIO & TELEVISION. This set is one "peach" of an asset. I hope you will continue to have *hookups* of this kind in your excellent magazine. I will also QSL and exchange cards with anyone in the world. Here's hoping you keep up the good work. So long and 73 to R. & T. and its readers.

JOE SWINGLE, JR.,
105 S. Wycombe Ave.,
Lansdowne, Pa.

MORE HELP FOR SWL's

Editor,

I am writing in behalf of the *Short Wave Listeners' Registry* which has recently been formed by the *Kansas City Short Wave Club.*

Our main purpose is to operate a bureau of records for SWL's which, if given wholehearted support by the SWL's, will be able to perform most of the services mentioned by various DXers in your *Readers' Letters* column.

Our first endeavor is to register all the short wave listeners and issue them identification letters. This should tend to reduce the confusion of so many QSL cards reading W2SWL, W9SWL, etc. (write for registering information).

We believe that one of the causes for non-answered QSL's is the fact that there is so much similarity between most of the SWL's cards. Imagine your wall well filled with cards; but half of them with the *same* call letter!

In your July issue you published a very FB article by Mr. Kierski of the *International Round Table*, describing the need of a "Clearing House" for SWL's, to keep lists of *non-verifying* stations.

We realize that there are hundreds of amateurs that, although they would like to, cannot verify due to many good reasons. For instance, many Hams get as many as 150 cards per week. The cost of the cards and the postage will average about two cents apiece. Altogether it would cost about three dollars per week to verify the reports received. That is too much for the average amateur.

If it is our fortune to have this "Long Rave" in your R9 plus magazine it will serve to inform a large number of the Hams and SWL's that, thanks to your *Readers' Column*, a clearing house has been formed.

If all the non-verifying Hams and any SWL's with non-verifying lists will drop a card and give us the call letters, we will have a list ready to send out shortly.

To obtain these lists, send us your name and address with five cents in stamps (not cash) to cover costs of printing and postage. A new list will be published every two months.

BILL MCGRANNAHAN,
S.W.L.R.,
6712 Kenwood,
Kansas City, Mo.

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.)

Amateur TELEVISION Marches On!

"Mrs." W9KNU is televised during a test of her husband's equipment

W9KNU
Goes on the Air with Outstanding Success

Almost before the ink was dry on the final QST article on practical television for the amateur, came word from Robert Thompson (W9KNU) that he had essentially duplicated the RCA system and had transmitted pictures successfully over a distance of about a mile. Arrangements are now being made for further tests between the W9KNU shack in Mt. Carmel, Illinois and Princeton, Indiana, an airline distance of almost nine miles!

Save for a few modifications dictated by available components, personal preferences and "studio" considerations, Mr. Thompson's transmitting equipment follows closely the experimental outfit made by RCA engineers* to illustrate the possibilities of the new RCA-1847 Iconoscope in Amateur Television. The receiver used was constructed from a commercially available kit with the r-f section revamped for the 112 Mc band and the sweep circuits altered to accommodate the 30-frame, 120 line picture. A high tripod was made at what Mr. Thompson claims was an "all time low cash outlay of 5c." A suitable lens was made with two magnifying glasses, retailing for $1.25 each. Throughout the entire equipment, costs were modest, construction not too difficult and results of a type to give a new thrill to the radio pioneer who is looking for something new and different.

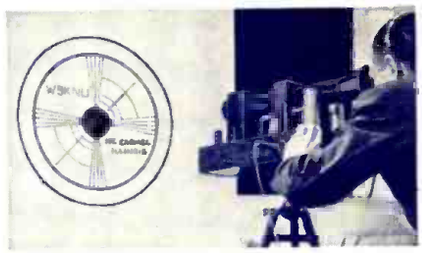
Congratulations, W9KNU!

*See the three construction articles in QST for May, June and July 1940. Reprint booklet including data on the 1847 Iconoscope may be obtained from RCA Power Tube distributors or Commercial Engineering Section, RCA Manufacturing Co., Inc., Harrison, N. J.

RCA-1847
Amateur Iconoscope

Meet "Mini-ike"... The "heart" of the Amateur Television transmitter ... and made available for amateur and experimental use at an unheard of low price for a tube of its quality and capabilities. 7⅝" long with a 2" face on which images are focussed for televising.

RCA-1847 Amateur net $24.50



Mr. Thompson finds the bold black and white pattern shown here an aid to focussing. Containing his call letters and address, this pattern can also serve for CQ's.

RCA

Transmitting Tubes

PROVED IN RADIO'S MOST EXACTING APPLICATIONS

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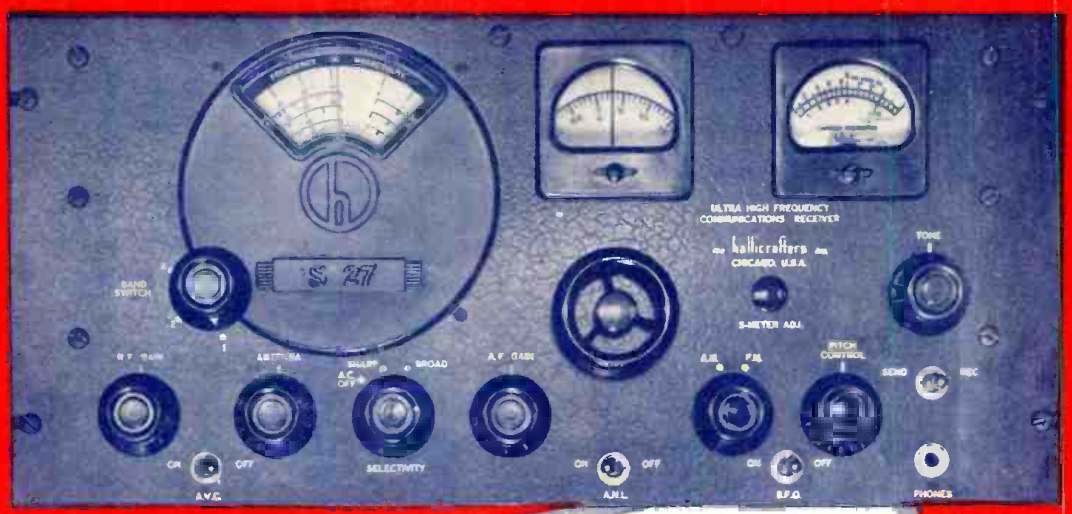

Super Efficiency!

IN TWO NEW HALLICRAFTER RECEIVERS

BOTH designed to government specifications. Model S-27 (above) is the first general coverage UHF receiver providing reception of both Amplitude and Frequency modulated signals. (27 to 145 Megacycle coverage). ¶ The new Model SX-28 (below) is a 15 Tube general purpose communication receiver incorporating the latest technical advances. Each sells for less than two hundred dollars.

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