# RADIO NEWS

DECEMBER
1940
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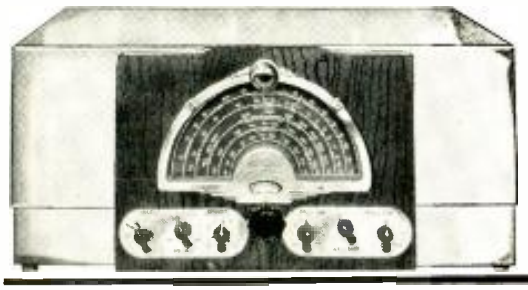

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R.F. stage, 2 I. F. stages, 9 tubes, noise limiter, bandspread.

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Professional 12" recorder, 15 watt audio public address, 25.00 mike and stand. Perfect recordings.

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AC-DC battery operation, self-charging unit built in. Self-contained antenna, electrical bandspread.... **59.50**

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## SARGENT WAC 44

Two stages, pre-selection, frequency monitor, permanent alignment from panel.....

Regular Price **139.50**

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# DAVEGA

**AMATEUR DIVISION—63 CORTLANDT ST., N. Y., N. Y.**

**★ World's Largest Radio Dealer . . . Established 1879**


BY THE EDITOR

FEW of us reading radio magazines, whether this one or any other catering to the technical and trade divisions, realize how many dollars are being spent on National Defense in the matter of radio. We see figures from time to time and they total tremendous sums. Spent this month, according to our Washington Correspondent, was in excess of $8,000,000. Spent last month, was in excess of $9,000,000. Expected to be spent before the end of the year, is $20,000,000, and most of this for units which will have to be delivered before the end of the year. Never in the history of radio has there been such a boom in buying. In line with this boom, a number of our readers have written in requesting information as to where they might obtain employment. There will always be a hiatus between employer and employee and very often good employees find it difficult to obtain employment, while employers are at the same time looking for good employees. Such a condition was indicated in one of the Sunday issues of the *Chicago Tribune* which showed a Philadelphia firm looking for no less than four radio engineers. It may well be imagined how serious the shortage of radio engineers can be when a Philadelphia firm will advertise in a Chicago paper.

Our suggestion to those readers who have been unable to find employment is to write a letter explaining their qualifications in full, to each and every radio manufacturer they know of, or concerning which they can find any information in this and other radio magazines. We are quite sure by doing this they will be able to find employment.

* * *

BY the time that this reaches you, the Registration under the Conscription Bill will already have been completed and some 16,000,000 men will have numbers. A great number of you who signed registrations indicating some knowledge of radio may expect to hear further from Uncle Sam on this subject. Radio*men* are still in demand by the Government although the ranks of the paid radio *operators* are being rapidly filled. Nevertheless it is planned to continue the training of radio operators because it has been shown in the present war that there is no such thing as "too many radiomen."

Radio schools, too, are booming from Coast to Coast and from Canada to the Rio Grande. A great number of evening trade schools teaching radio leading toward amateur licenses and servicemen training are in operation every night of the week. A number of high schools, which heretofore thought of radio as a "kid's" pastime, have in-

(*Continued on page* 42)

☆ RADIO NEWS ☆

Trade-Mark Registered

Including Articles on POPULAR TELEVISION

*The Magazine for the radio amateur experimenter, serviceman & dealer*

VOL. 24, NO. 6

# Contents for December, 1940

## FEATURES



*Cover picture by United States Signal Corps:*
*One of the new converted cavalry units—a radioized commander's armored car.*

## DEPARTMENTS





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# Bill Harrison, (W2AVA) Says: "I Can Honestly Recommend Hallicrafters Communications Receivers"

## New 1941 Super Skyrider • Model SX-28

New 1941 Super Skyrider, Model SX-28. 15 tubes—6 bands—550 kc. to 43 mc.—Frequency range Band 1—540 to 1650 kc.—Band 2—1.5 to 3.2 mc.—Band 3—3.0 to 6.2 mc.—Band 4—5.5 to 12.0 mc.—Band 5—11.0 to 32.0 mc.—Band 6—21.0 to 43.0 mc.—Micrometer scale tuning inertia controlled—Calibrated band spread inertia controlled—Tone and AC ON-OFF—Beat Frequency Oscillator—AF Gain—RF Gain—6 position band switch—Antenna trimmer—6 position selectivity control—Crystal phasing—Adjustable noise limiter—Send-Receive Switch—AVC-BFO Switch—Push-pull high fidelity, audio output—6 step wide range variable selectivity—Band pass audio filter—Wide angle "S" meter—Phone jack—80 / 40 / 20 / 10 meter amateur bands calibrated—Dimensions 20½" x 14½" x 9½". Model SX-28 with crystal and tubes, less speaker, $159.50. Hallicrafters-Jensen bass reflex enclosure, including 12" speaker, 30" x 16" x 22½", Model R12, $29.50. Same as above with 8" speaker, enclosure 23½" x 10¼" x 17½", Model R8, $19.50.

## The Skyrider Defiant SX-24

Every advanced feature of the entire Hallicrafters line is incorporated in this unit. 9 tubes. 4 bands. 545 kc. to 43.5 mc. Frequency meter tuning on 10/20/40/80 meter amateur bands. Controls include RF gain, selectivity, crystal phasing, audio gain, pitch control, main tuning control, bandspread tuning control, A.N.L. switch. 110 volt 50-60 cycle AC. For 110 volt AC operation from 6 volt DC use No. 301 Electronic Converter. Model SX-24 complete with tubes and crystal. $69.50. Model SX-24 with tubes, crystal and 10" PM23 Dynamic Speaker. $81.50. Extra for Univ. 110-250 volts, 25-60 cycles, $5.00.

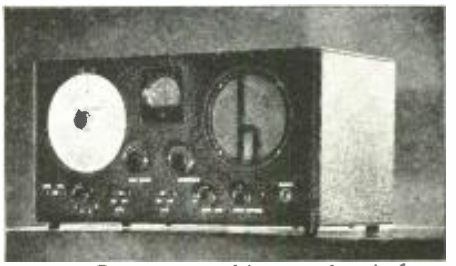
## The Super Defiant SX-25

Deluxe Model 12 tubes. 2 stages of preselection. 4 bands. 540 kc. to 42 mc. Separate calibrated bandspread dial for the 10/20/40/80 meter bands. Automatic noise limiter. Oscillator compensation for frequency stability. "S" meter calibrated in "S" and "DB" units. 10" heavy duty PM dynamic speaker in matching metal cabinet. 110 volt 50-60 cycle AC operation. DC operation socket provided for battery or vibrapack. Model SX-25 complete with speaker, crystal and tubes. $99.50. Extra for Univ. 110-250 volts 25-60 cycles $5.00.

## The Sky Champion S-20R

Gives you a quality of performance never before available at this price. 9 tubes. Complete coverage 545 kc. to 44 mc. Inertia tuning. Separate electrical bandspread. Beat frequency oscillator. Battery-vibrapack DC operation socket. Dimensions 18½" x 8½" x 9⅜". Model S-20R, $49.50. Extra for Univ. 110-250 volts, 25-60 cycles, $5.00. SM-20R carrier level meter $10.

## The Sky Buddy



Model S-19R is an amateur receiver in every respect. Covers everything on the air from 44 mc. to 545 kc., including the 10/20/40/80 meter amateur bands. Employs same electrical bandspread system used in higher priced Hallicrafter Models. 6 tubes. Built-in speaker. For operation on 110 volts 50-60 cycles AC. For operation on 110 volt AC from 6 volt DC use No. 301 Electronic Converter. Dimensions 17½" x 8½" x 8½". Model S-19R including tubes and speaker, $29.50. Extra for Univ. 110-250 volts, 25-60 cycles, $5.

Authorized factory distributor of *all* amateur receivers.

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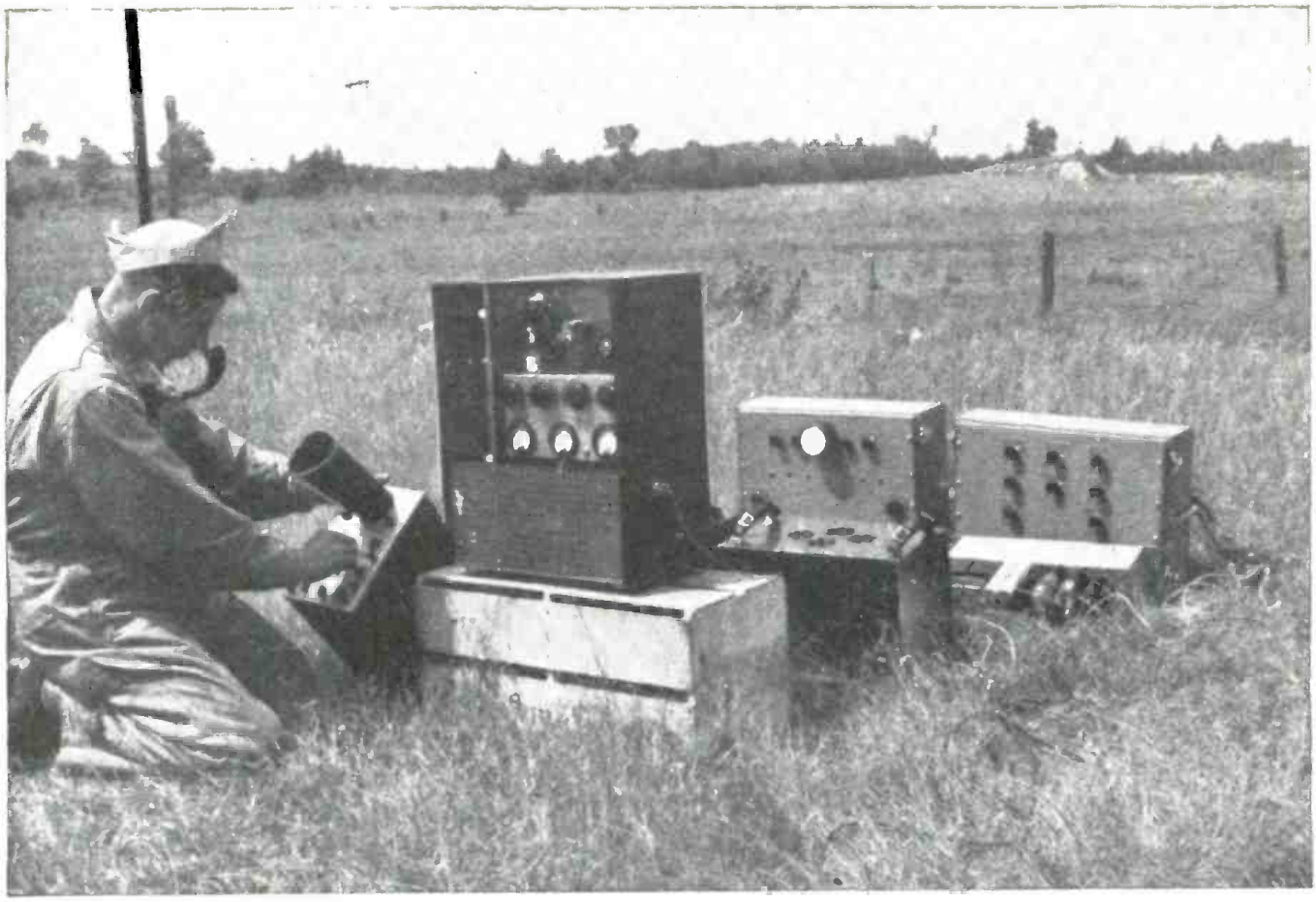


This soldier is viewing the actual scenes of a "battle" taking place several miles away. Note the chest-phone for quick relaying of information to the proper centers.

# Blitzkrieg Television

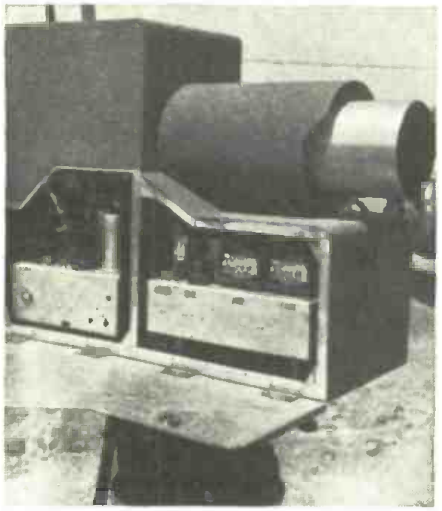
by AUSTIN C. LESCARBOURA
Croton-on-Hudson, New York

**The rapidity with which information can be passed along is the measure of the Army's success in any engagement. Television makes information available *while* it happens.**

FOR the first time in our military history, commanders saw as well as heard the reports of scattered scouts, instantly, fully, clearly, during the giant maneuvers of the U. S. Army recently held in northern New York State. Television donned khaki, took the field at a moment's notice, and proved that such visual means of communication can play an important role in the defense of our nation. Indeed, offensive "Blitzkrieg" now meets defensive "Blitzkrieg" as lightning-fast scouting neutralizes the all-important surprise element of the lightning-fast attack. Once again military science strikes a balance between attack and defense.

Quick to recognize the vast military significance of television, Allen B. Du Mont, one of America's leading television pioneers and head of his own company manufacturing television receivers and transmitting equipment, arranged with Army officials to send a full-equipped mobile television unit to the scene of the gigantic maneuvers. A base was established on the campus of St. Lawrence University at Canton, N. Y., and the television crew of fifteen men lost no time in getting their mobile and stationary equipment into action. Soon these television experts were flashing scenes of troop movements of the invading "Blacks" to televiewing posts at the headquarters of the "Defending Army," with a network of FM transmitters and receivers handling the accompanying verbal reports and coordinating the ultra-modern scouting activities. [*Note the use of FM.*—Ed.]

The main television transmitter, a 50-watt job operating on 51¼ megacycles, was installed in the Physics Building at the University. The television antenna was raised to the top of one of the towers of radio station WCAD located in that building. Some 200 feet away, on the college Chapel Tower, a second antenna was placed, serving as the relay link in picking up the 158 megacycle image signals transmitted by the mobile unit out in the field. The video signals thus picked up were sent via 300 feet of coaxial cable to the main transmitter for re-



**The Iconoscope camera used in the Army maneuvers. All power came from batteries and portable generators.**

transmission to receivers at Second and Third Corps Headquarters. The Du Mont flexible synchronizing system whereby the receiver sweeps are controlled from the transmitting end, was used, with a repetitive rate of 30 pictures per second as against the usual 60, made possible by the Du Mont "memory screen."

Television scouting falls right in with the mechanization of the modern army. A small truck carried the complete mobile television pickup equipment, followed by an Army truck carrying a gasoline-driven generator for the necessary power supply on the battlefield. The 25-watt mobile transmitter flashed its television report to the relay receiver located in the Chapel Tower at St. Lawrence University, for relaying and retransmission as already stated.

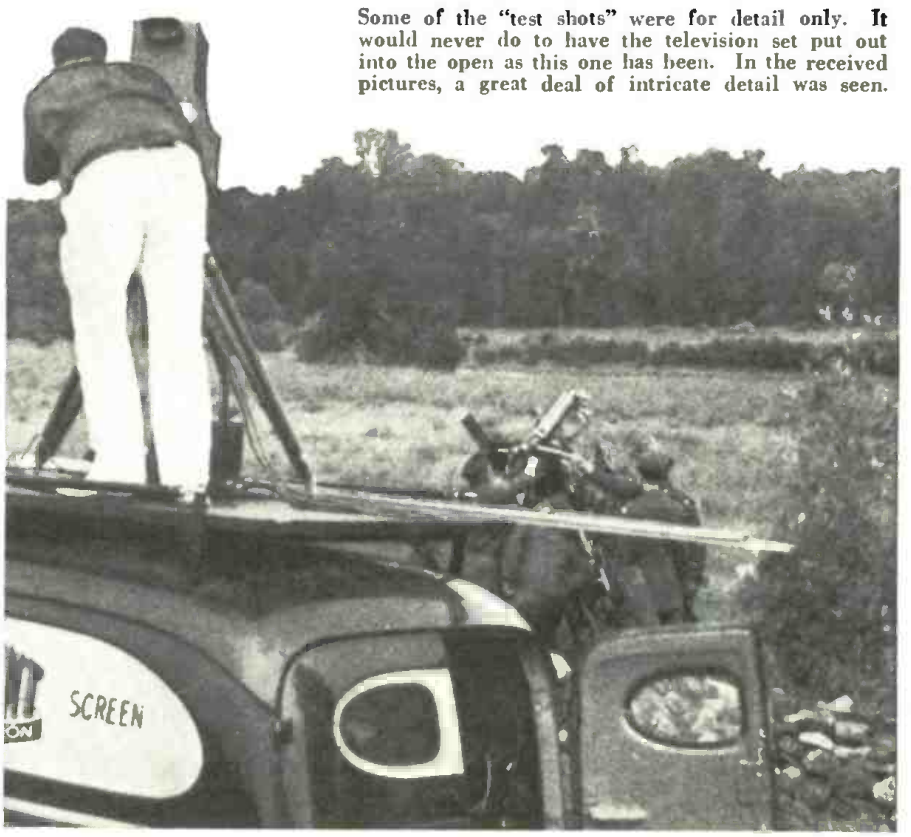
Engineers stationed in the Chapel Tower checked the images as they were received, and relayed them by coaxial cable to the main transmitter in the nearby Physics Building. There they were again monitored and then sent out to the Army officers who watched the action with avid interest, on receivers installed at Huevelton and DeKalb Junction, and also in Canton.

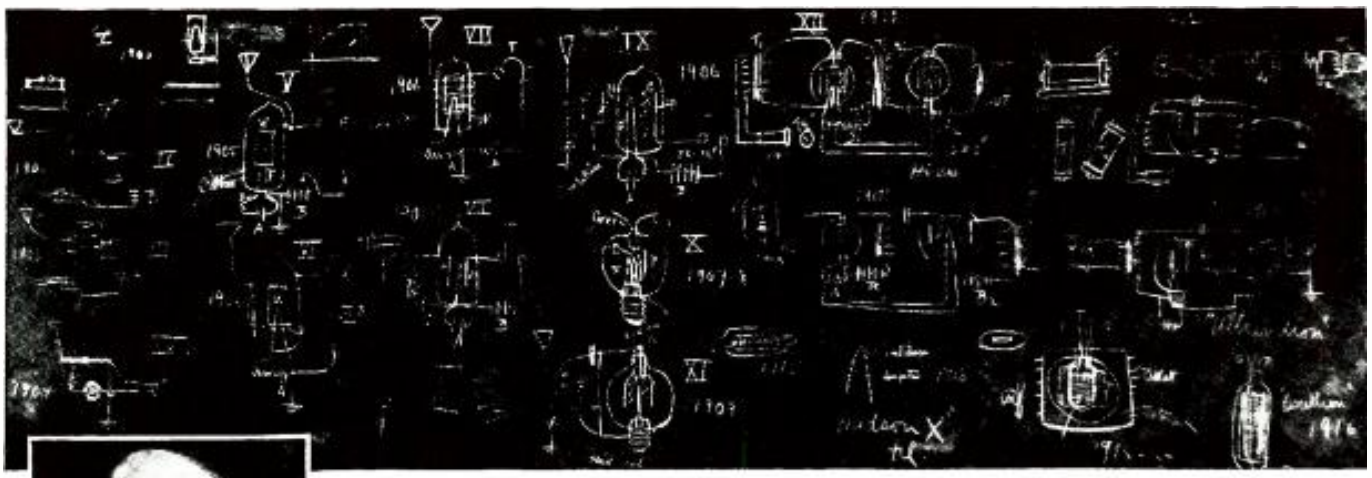
Working under the most difficult conditions of actual military action, the video boys gained invaluable experience in setting up and operating their television mobile and stationary equipment. The crew admittedly were relatively "green" at this sort of thing, and the mobile equipment hardly had its paint dry when it was rushed into battle, so to speak. Nevertheless, the simplicity of the mobile and stationary units enabled quick setups and operation, while an FM intercommunication system, also brought along, enabled the highest degree of coordination among the scattered television operators. Speaking of this FM equipment, the men kept in touch with each other and with the main transmitting quarters, at distances up to 25 miles. The FM equipment was used even in fast-moving cars dashing about the field, maintaining necessary contact all the while. By patching in on the Army telephone lines, all points in the communication network were reached.

(*Continued on page* 51)

**In spite of its bulky size and shape, this shows that the iconoscope could not only be camouflaged, but could operate successfully from deep shadows. In war times the sign painted on the back, naturally, would not be used; and the paint would be broken up with the now-familiar blotches to foil detection.**

Some of the "test shots" were for detail only. It would never do to have the television set put out into the open as this one has been. In the received pictures, a great deal of intricate detail was seen.





The appearance of the blackboard after Dr. de Forest had finished his lecture. Many of the circuits will be readily recognized by the old timers who actually used them.

Dr. Lee de Forest

# The History of the RADIO TUBE 1900-1916

by LEE DE FOREST

**Dr. de Forest reviews his early adventures during his development of the vacuum tube.**

THE evolution of the radio, or "audion" tube as it was known, is a very interesting story and a story that is not at all well known. Most radio men assume that it was accomplished through a fling of inspiration. But this is not true. It came about through hard work.

In 1900, forty years ago, I entered into the development of wireless telegraphy, and knowing at that time what Marconi had been using, there were many unnecessary complications. I didn't have a clue but I went to the library in Chicago at night and finally came across an observation which a German physicist had recorded, and that gave me an idea of what could be developed into a wircless detector. I worked in my room at night and spent my days in the Western Electric Telephone laboratory. In my room was a little spark coil with which I generated my electrical waves. One night, when I made this coil spark, I noticed the light of the Welchbach gas burner on the wall dimmed my percentably. It occurred to me that I had actually made a great discovery, that the electric waves were acting upon the incandescent gases surrounding the gas mantle.

In 1903, I had a chance to get into laboratory work and investigate the gas detector as I called it. I used the Bunscn burner in these experiments and proved that heated gases were actually responsive to electric waves.

By 1905 I had advanced to the point where I was using a carbon filament to heat the attenuated gases in a glass tube. In connection with this bulb, I used, as I had always used in my gas flame experiments, a telephone receiver with a B battery connected between the plate and the filament in the bulb. The device was not a rectifier, but a genuine relay detector whereby the electric waves produced marked changes in the battery current which was flowing through the tube.

In 1906 I removed the antenna connection from the plate electrode and connected it to a simple piece of tin foil wrapped around the cylindrical tube. This proved to be a great improvement over my preceding arrangement. I next placed this controlled electrode within the tube in the form of another plate on the opposite side of the filament from the first plate. This third electrode within the tube was a marked improvement, and I decided that I could still further improve the device if I worked it between the filament and the anode electrode.

At this time I had in mind a telephone repeater or relay and took out a broad patent on the three electrode tube thus used.

In addition to the filament battery and the plate or B battery, I used a C battery in a series with the controlled electrode. My patent was that I used this battery to bias "negatively," the controlled electrode, but I did not claim this arrangement in my patent. As a result of this omission on the part of my patent attorney, Mr. Lowenstein later secured a patent on the negative grid bias which for years was a controlling patent in radio litigation. The negatively charged controlled electrode was of much more value when the audion was used as a telephone relay than as a wireless detector. From my earliest experiments I continued to use a blocking condenser in a series within the controlled electrode.

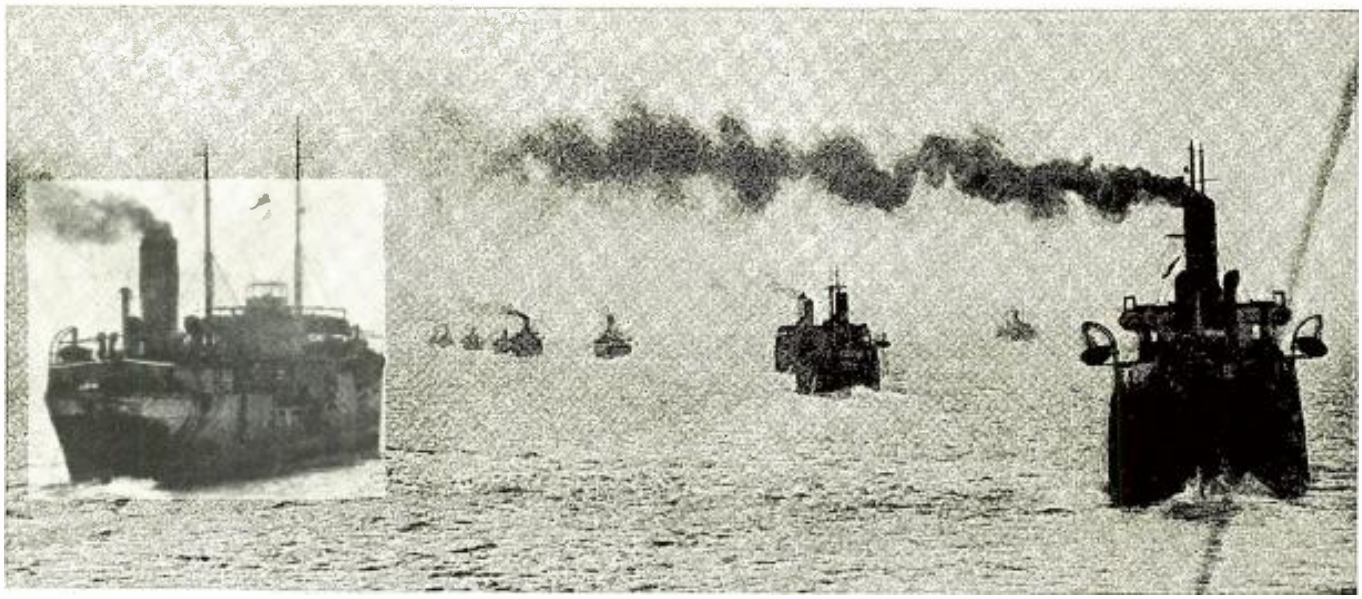
Although my first tubes were quite low vacuum, they were nevertheless quite gaseous, and permitted me to use only 22 volts on the plate. Gradually I began to exhaust my tube to a higher vacuum so that I could apply higher potentials to the plate thereby increasing the power which could be used.

In 1908 I changed from the cylindrical to the spherical type of tube. In 1907-8 I began to use two filaments in parallel. One of these was a spare. The free end of the filament was brought out of the bulb and when the first filament burned out the second one could be used simply by winding a spare wire around the base of the bulb. In 1906 the name "Audion" was applied to the device by my assistant, Mr. Babcock.

In 1909 in order to increase the conductivity of the tube and to enable the use of larger energy we used two plates and two grids usually connected in parallel. We called these "double audions" and sold them at a higher price than those using the single plate and grid.

In 1909 I first used the grid-leak for when I began to get a really high vacuum I found that the audion would block provided a good condensor was used in the grid connection. To avoid this, I used a high-resistance grid-leak. Our panels were of hard rubber in

(*Continued on page* 55)



A typical convoy scene such as the author describes, and in which he took part. ACME

# BREAKING the BLOCKADE

## As told to JERRY COLDBY

Van Nuys, California

***Being a radio operator on board ship going through the submarine fields is no picnic, as one can see by reading this true story.***

OCTOBER 21: There goes that French station at Toulon giving German U-boat positions . . . Number one at lat. 48.45N, long. 09.40W at 6:32 a.m., Number two at lat. 45.00N, long. 10.00W at 12:15 p.m., and Number three at lat. 50.53N, 14.16W at 1:39 p.m. And that's all! Lord, help the unfortunate boats that were responsible for those bearings, taken from their S.O.S. positions when they met with the enemy raiders. But I can relax now . . . we've just taken aboard the LeHavre pilot. He looked like the Messiah come to lead us to a safe haven. Was I glad . . . for the first time in three weeks I was able to lean back and rest. I remembered the day we left Galveston to make this hazardous trip.

Y'see, when the Neutrality Law went into effect in the United States, radio operating jobs were scarcer than hen's teeth. So when I received the call to make a voyage to LeHavre, France, I galloped aboard an old iron barge in double time without giving a moment's thought to the cargo, its destination, my quarters or the radio apparatus I was to be in charge of. I had a job and that was all that mattered.

The ship had been laid up since 1937 so you can imagine how the radio shack and the equipment looked when I put my suitcase down after the ship's articles were signed. Dust and dirt all over the place; brightwork rusty; batteries down without any spares aboard; just a nice mess to clean up.

The cargo we were carrying was cotton which had been loaded on board and stowed away by the time I had cleaned around a bit and tested my receiver and transmitter. I found I would need a few spare parts, but had no time to leave and get them as we were sailing on the tide in a few hours.

I wasn't the only one having trouble with equipment. I heard the engine-room men cussing a blue streak as they tried to get steam up for the cast-off. Even the cook was having his difficulties. The old cast iron coal stove wouldn't give half enough heat for baking or cooking purposes.

And so we sailed! We left Pier No. 35, Galveston, at 11:30 p.m. on September 30th. Slowly we rode out about four miles circling around while I checked the Direction Finder. It was all out of whack and it took until 4:30 a.m. for me to get it calibrated. It might have been accomplished sooner, but trouble began with my transmitter because of voltage surges which constantly varied from 80 to as high as 160 volts. Finally, with my reports transmitted, we pointed the ship out into the Gulf.

At this early date in the "Second World War," Germany's U-Boats were doing tremendous damage to shipping in the North Sea in spite of everything the British and French warships could do. They were sinking as many as ten to fifteen vessels a week and didn't seem to be particular whether the foundered ships belonged to neutral or belligerent nations. Neither were their torpedoes when they kissed the side of a boat. It was just swish . . . smack . . . bingo . . . and that was that. A few boat loads of survivors, huge waves, and a splotch of oil on the water.

And we were bound for LeHavre, right through guarded waters, with a full cargo of cotton, which I soon learned was contraband, and according to International Law, reason enough for us to be legally sunk, with or without inspection!

Our course was set to travel along the regular shipping lanes and the skipper ordered all lights to be on at night, with searchlights flooding the American flags which were painted on the sides and deck. Such faith!

October 12: The air is very quiet. Nobody using radios for fear of being picked up by U-Boats or raiders. I packed a few things together just in case it would be necessary to leave the ship on short notice.

October 13: The sea is calm and we're making good speed. Routine duties are being performed by the crew —scraping and cleaning and painting ship. A few birds stowed away on the boat at Galveston and they became very tame. One of them visited the radio shack every day until I finally taught it to perch on my shoulder. Everything was so peaceful, but I was afraid it wouldn't last.

October 14: I heard the French tanker, *Emile Miguet,* was torpedoed. The msg said they didn't stop fast enough when the U-boat signalled for them to heave to. So they sent a shell right into the bridge, which killed the skipper and second mate. No more signals from her.

I did not know this then, but in the next few days quickly learned that when a ship opened up to send any messages referring to U-boats being sighted or coming up on them, the en-

(*Continued on page* 56)

# AS I SEE IT!

**by JOHN F. RIDER**

*Dean of the Servicemen*

***Take time to think, it will pay you.***

### Think

IT IS really interesting to note how facts presented during the period that a man is studying show up later. We have had occasion during the recent hectic days to observe the workings of the minds of many radio servicemen who, being somewhat better qualified than others, have been preparing to take examinations of various kinds with the hope that their services might prove useful in connection with the defense program.

One of the strangest things is how man develops the erroneous impression of the significance of snap judgment. It is said of certain people, as an example of their executive ability, that they know what they want—that they know the answers to many things and when called upon, are able to make an instantaneous decision. It is a marvelous faculty to be able to make a rapid and definite decision, but—and it's an important but—it is also vital that the man be right, not always, at least most of the time. However, many very learned and capable people do not make such rapid decisions; instead they ponder for a few minutes, sometimes much longer, depending upon the import of the situation—and nobody considers it any reflection upon their ability.

Of course when we speak about things important, the term is relative. What is important to one man, may be very insignificant to another—it all depends upon the viewpoint and what the consequences may be as the result of the answer. No one can say that answering questions for an examination are not important, especially when the reason for taking the examination is the effort to elevate a position. Yet, the number of snap answers to oral examinations which have proved to be wrong is surprising to say the least.


*"It'd be a swell business, Maw, ef we had any electricity, wouldn't ut?"*

Invariably the men know better. The fault is that they do not think before they speak or before they put their ideas down on paper. They try to recall what the teacher said, all the time forgetting that the subject of radio is replete with situations where a general answer is incorrect. And the strangest thing of all is that these situations occur in the simplest of cases—nothing complicated, nothing elaborate—the easiest of cases. To illustrate the case in point, here is one example. The question calls for three possible sources of hum developed in a multi-waveband receiver when the receiver is switched from the broadcast band to the next highest short-wave band. Every answer mentioned the filter condensers in the power supply, when obviously the filter condensers must be okay if the hum does not exist on the broadcast band, but develops only when the receiver is switched to the short-wave band. If the condensers were bad, then the hum would be noted on the broadcast band, as well as the short wave band.

This example is not intended as a lesson in theory but rather as an example of the snap judgment dictated by the fact that most people when they speak about hum recall that the foremost source is the power supply and in the power supply, the filter condensers. The teacher said filter condensers and filter condensers it is. The fact that the manner in which the question is worded definitely eliminates the filter condensers in the power supply, is ignored completely—only because the man does not see what he is looking at—does not *think* about what is asked.

This is but one case in point and a glaring one because of its simplicity. There are many others in every branch of the servicing field—for that matter in all functions and operations of mankind, but we are concerned with the serviceman. It appears in the daily dealings with customers and calls for many explanations and apologies to clear a situation needlessly created. It appears in the daily activity in the service shop and results in the unnecessary expenditure of much time and the acceleration of the follow-up effort so as to make up for the time and effort needlessly lost.

Snap judgment is fine, but to think a little will be found much better in the long run. Many a major concern in this nation has one-word signs spread all over its establishment and the five letters spell T-H-I-N-K.

John F. Rider

### Amidst Bombs

A FEW days ago we received our copy of *"The Wireless Engineer,"* a British technical journal. We took it home with us for leisurely perusal, and, as is the custom, also bought our favorite evening paper. After dinner was completed and Janet told us all about her activities in school that day, (she is in 3B), we read the paper and then went to work upon the magazine.

What struck us as most peculiar, more than ever before, was the fact that the magazine was just like the previous issues. The newspaper said that London had been bombed again the night before as it had been night and nights and nights before that—yet that magazine showed no variation—no weakness—no decline in the excellent editorial supervision. Being a paper devoted to radio research, it contained the usual articles of that nature; the usual run of references of periodicals published in different parts of the world; advertisements selling precision apparatus, sockets, solder, transformers—everything as it was before.

Were it not for the fact that we knew a war was on, that bombings were nightly parties, we never could tell it by looking at that magazine. If people can work with the calmness, the diligence, the painstaking effort displayed in this publication and go through sleepless nights in bomb shelters—they must have guts and it'll take an awful lot to weaken their morale and beat them down. Somehow or other, we feel that the "isle" and its people will be there for a long time to come.

### Those Old Magazines

WE have during the past three or four months been making an effort to get our radio library into shape. Fortunately we have made it a practice during our association with the radio industry, which rounded out twenty years when 1940 rolled in, to maintain our subscription to the various radio papers here and abroad, which have been published during that time. Even if we say it ourselves, it makes quite a bunch.

For a long time they were lying around on shelves and as is the usual consequence of such filing, many were torn and some few were lost. However, one day we decided to bind them

(*Continued on page* 63)

The Recording Console. Along the back: (Left to Right) FM tuner, amplifier with clock, and AM tuner.

# Build Your Own Recording Studio

by OLIVER READ, W9ETI
Technical Editor

**The second article of the series describes the design of the amplifier, and a complete description of the tuners.**

IN the first article of this series, we laid out the initial plans for constructing a complete recording console. This console was made entirely of wood and possesses sufficient sturdiness to support equipment having considerable weight. This equipment will be discussed in full in this and future articles covering the subject of professional recording. The serious minded recordist will do well to follow the instructions as set forth as these are made from results which have been had from actual service and application.

The first article, which appeared in the September, 1940, issue of RADIO NEWS, stated the requirements needed for good recording. This included a brief description of the various component units which are needed in order to intelligently apply certain principles which are necessary in order to make good records. This included photographs showing the actual construction of the console, which includes compartments for housing both uncut and finished discs. At that time, only one of the two tables was illustrated. We have added another 16" transcription table manufactured by *Speak-O-Phone,* and this has been placed in the left-hand opening provided for on the console.

The most important unit in the entire assembly is the amplifier proper, which may be seen illustrated directly in the center of the control panel. The complete circuit for this is also shown in Fig. 1. An amplifier, in order to do a professional job, must possess certain characteristics not ordinarily found in the general line of amplifier equipment.

First, it must be absolutely humless in operation. In this connection, we refer to the schematic diagram and to the loss pad which is placed across the secondary of the output transformer and which feeds the cutting heads. This network places a fixed loss of 10 decibels in the circuit at all times. In other words, should a slight amount of hum be present in the amplifier when all gain controls are wide open, this will keep the hum level down to a point where it will not be fed to the cutters. This would also be true of any extraneous noise, such as tube hiss, that might be encountered in the amplifier.

Second, sufficient inputs must be provided so that all types of sound sources may be fed into the amplifier and, in turn, recorded on the disc. Provision has been made for two high impedance microphones such as the Shure Model 55-C and, in addition, another channel is provided for a low impedance microphone of the dynamic type. This channel is used wherever long lines must be used between the microphone and the input to the amplifier. Gain is controlled by means of a variable T-pad, which is placed at the input to the mike-to-grid transformer.

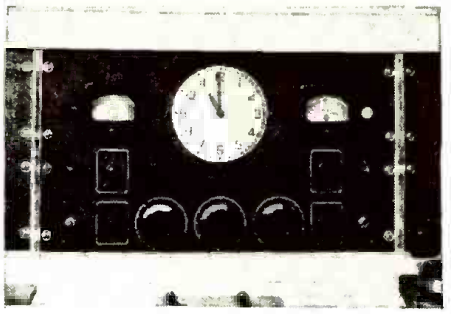
Each of the three microphone channels may be used independently, or they may be mixed where more than one is required at a time. A selector switch is provided so that various inputs may be chosen at will.

Other inputs include one for the FM tuner, the AM tuner and the two pick-ups.

Third, provision must be allowed for the selecting of either one pick-up or the other from each of the two turntables, so as to permit making copies of records, which is technically referred to as "dubbing." One of the pick-ups—namely, the one on the *Presto* table—is of the high grade magnetic type, *Audak 37E.* The other —on the *Speak-O-Phone* table—is a high grade crystal pick-up. This is used in either one of two ways. Either to play "constant amplitude," or, by changing the network, to play "constant velocity." This network is needed only when playing commercial type records and where a constant velocity is required at frequencies lower than approximately 250 cycles.

Fourth, some form of equalization is required when cutting at transcription speed of 33⅓ r.p.m. This is accomplished most efficiently by means of the network illustrated in the 6C5 cathode circuit of the third stage. With it we may either *boost* the highs or lows at will or do just the reverse—namely, to *attenuate* either the highs or lows. We also may obtain other effects with this network. One of these would be to boost the high frequencies and to attenuate the low frequencies, or vice versa. This entire network is most flexible and with it we may introduce correction to the circuit for various applications that require treatment. A technical discussion on this theory

The author is using the microscope to determine the depth of the cut. This is very important if the recording is to be a good one.



The amplifier panel. The clock is a valuable asset in timing broadcasts.

will appear in the next article, soon.

Fifth, sufficient output must be provided from any recording amplifier in order to modulate the cutting head properly. Note that it is not simply a matter of applying power to the head, but that this power be absolutely free of harmonic distortion and that it be available with extremely good regulation. The best possible type of tube for use in a recording amplifier is a low mu triode, such as the 2A3. By using fixed bias to the output stage, it is possible to reduce the distortion to a very low value. Likewise, by properly adjusting the individual bias to each of the 2A3's, we are able to reduce further any possible distortion. For this reason a switch has been included in conjunction with a milliammeter so that each plate current may be read independently, and the bias adjusted so that the current reading will be the same on each tube.

Sixth, two output sources must be provided so that we may monitor the amplifier at the same time that cutting takes place. This is accomplished by connecting another T-pad in the line to the p.m. speaker used for the monitor. This permits accurate level adjustments to be made without disturbing the impedance of the line. The other secondary feeds the two cutters as indicated on the diagram. These may also be selected by means of a switch in a similar manner to that used when selecting the pick-ups. A decibel meter connects directly across the cutter line for an accurate indication of cutting level. This is provided with calibrated series resistors so that a maximum indication of 36 d.b. may be indicated.

Seventh, the power supply for the amplifier should be located some distance from the amplifier-proper to further prevent any induced hum from getting into the equipment. This may be seen in the illustration contained in the first article. This supply includes a heavy duty plate and filament transformer and a highly efficient filtering system. All of the component parts have a rating far in excess of that actually required, as an insurance against breakdown. Bias to the 2A3's is made possible by the inclusion of a separate rectifier and filter system. An ample supply of outlets is provided on the 115 volt 60 cycle line for plugging in all of the various units that are located in the console.

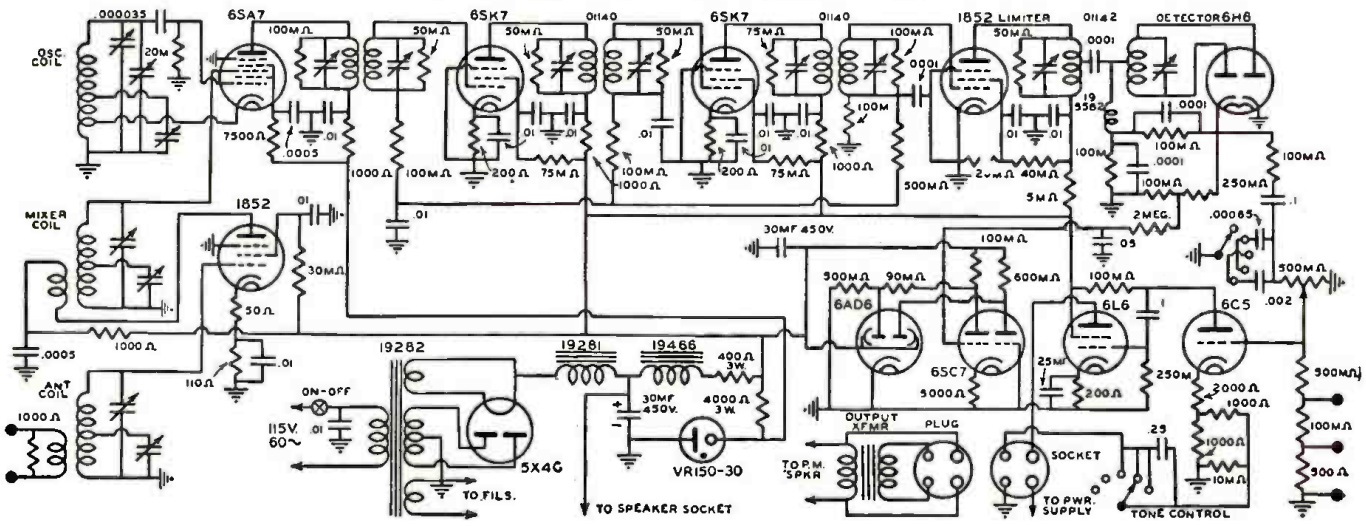
Eighth, a synchronous clock is mounted directly on the center panel of the amplifier where it may be easily read during the process of recording. This item is almost indispensable for proper timing of a program when making 16" transcription discs. A second hand must be used in this connection.

### High Fidelity AM Tuner

In order to receive programs for recording purposes with a minimum amount of distortion and with maximum fidelity, it is necessary to incorporate a tuner such as the *Meissner High Fidelity Tuner*. This is of the band-pass T.R.F. type and is designed for the reception of local transmissions, only. The overall sensitivity is kept to a minimum and the r.f. circuits are designed so that they will pass a maximum band width without actually spreading to adjacent panels. A very short antenna is sufficient for picking up local transmissions, at least in the Chicago area, and it is well to keep this as short as possible.

A power supply is included on the tuner chassis so that it will operate as an independent unit. Two output channels are provided, one of which

Circuit diagram of the FM tuner (by Meissner).



The extra playback and recording table will prove useful in "dubbing" and duplicating.

The main recording table with the cutting head in action. The playback head and arm can be seen in the back.

is used for connection to a pair of phones for monitoring purposes. The other channel is connected to the amplifier by means of a shielded cable and terminates at the input marked "AM Tuner." *There must be no audible hum from the tuner* itself or this would be amplified and passed to the cutting mechanism where a very unsatisfactory recording would be made. A tuning eye was added to the tuner, which enhanced its value for our own application.

Any tuner possessing the characteristics as stated, may be used and preferably should be of the T.R.F. variety. We have also heard many excellent tuners built around superhet circuits. But these, as a rule, were limited to one stage of I.F. The inclusion of another stage of I.F. would sharpen the signal and would not be suitable for maximum fidelity unless some provision were made in the I.F. transformers to adjust them for broad band characteristics.

### The FM Tuner

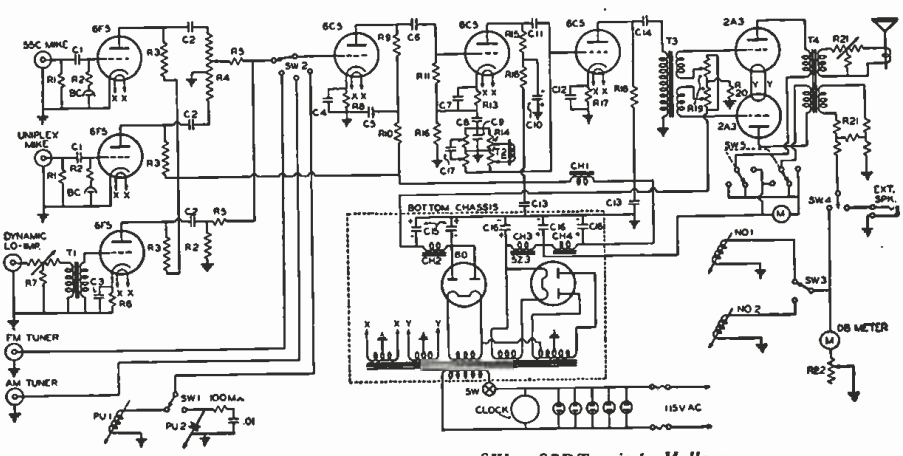
This unit is illustrated to the left facing the console, directly back of the *Speak-O-Phone* table. At the present time, there is only one FM transmitter located in the Chicago area. We have cut several records from transmissions from this station, with good success. This tuner is similar to that of the AM tuner in general design, although, of course, it is designed only for the reception of frequency modulated signals on the high frequency bands. This tuner is mounted on a standard 12¼" x 19" steel panel and mounts into the sloping compartment built into the console. It operates independently of the amplifier and contains its own power supply. Connection is made to the amplifier by means of a shielded cable and this terminates at the input marked "FM Tuner."

Either one of the tuners may be selected, only one being required at a time. The complete procedure used in cutting high fidelity recordings with this tuner in conjunction with a "constant amplitude" cutting head will be described in the next article.

### Shielding

Due to the fact that so many cables are required, it is imperative that proper shielding be made to isolate the independent circuits. This is particularly true with the cables coming from the two pick-ups to the selector switch and also the cables coming from the microphone amplifier stages. The switch SW2 should be entirely enclosed within a shield and this should be thoroughly grounded. In fact, all of the leads connecting to the switch assembly should be completely shielded from their source to prevent any hum pickup.

The output lines do not have to be shielded inasmuch as these are of low impedance and are not subject to pick-up from the line. A good ground con-




*$R_1$—2 megohms, ¼ w. IRC*
*$R_2$—2 megohms, ¼ w. IRC*
*$R_3$—100,000 ohms, ½ w. IRC*
*$R_4$—Dual .5 meg. pot. Mallory*
*$R_5$—.5 meg., ½ w. IRC*
*$R_6$—3,000 ohms, ½ w. IRC*
*$R_7$—30 ohm T Pad. Tech. Labs.*
*$R_8$—2,000 ohms, ½ w. IRC*
*$R_9$—25,000 ohms, ½ w. IRC*
*$R_{10}$—50,000 ohms, 1 w. IRC*
*$R_{11}$—250,000 ohms, ½ w. IRC*
*$R_{12}$—20,000 ohms, ½ w. IRC*
*$R_{13}$—1,000 ohms, ½ w. IRC*
*$R_{14}$—Dual Tone Control, Thordarson R1068*
*$R_{15}$—20,000 ohms, 1 w. IRC*
*$R_{16}$—50,000 ohms, 1 w. IRC*
*$R_{17}$—1,000 ohms, ½ w. IRC*
*$R_{18}$—50,000 ohms, ½ w. IRC*
*$R_{19}$—3,000 ohms pot. Mallory*
*$R_{20}$—3,500 ohms, 10 w. Mallory*
*$R_{21}$—10 db. loss pad for 500 ohm line*
*$R_{22}$—Multiplier for Decibel meter "obtainable from manufacturer"*
*M—Standard-speed Decibel Meter. Simpson*
*$SW_1$—SPDT Lever switch. Centralab 1452*
*$SW_2$—SP-4 position. Mallory 3215J*
*$SW_3$—SPDT switch. Centralab 1452*
*$SW_4$—SPDT switch. Mallory*
*$SW_5$—DP-3 position. Mallory 3222J*
*$C_1$—.1 mf. 400 v. paper. Sprague*
*$C_2$—.1 mf. 600 v. paper. Sprague*
*$C_3$—10 mf. 25 v. electro. Solar*
*$C_4$—20 mf. 25 v. electro. Solar*
*$C_5$—8 mf. 450 v. electro. Solar*
*$C_6$—.1 mf. 400 v. paper. Sprague*
*$C_7$—10 mf. 25 v. electro. Solar*
*$C_8$—.5 mf. 400 v. paper. Sprague*
*$C_9$—.002 mf. 400 v. paper, Sprague*
*$C_{10}$—8 mf. 450 v. electro. Solar*
*$C_{11}$—.1 mf. 400 v. paper. Sprague*
*$C_{12}$—10 mf. 25 v. electro. Solar*
*$C_{13}$—8-8 mf. 450 v. electro. Solar*
*$C_{14}$—.25 mf. 600 v. paper. Sprague*
*$C_{15}$—10-10 mf. 150 v. electro. Solar*
*$C_{16}$—8 mf. 600 v. electro. Solar*
*$C_{17}$—.03 mf. 400 v. paper. Sprague*
*$T_1$—Lo-Impedance mike-to-grid. Thordarson 15A68*
*$T_2$—Plate and Fil. trans. Thordarson T-14R05*
*$T_3$—Push-pull input. Thordarson T-90A04*
*$T_4$—Push-pull output. Thordarson T-90S13*
*$CH_1$—Filter choke. Thordarson T-67C46*
*$CH_2$—Filter choke. Thordarson T-18C92*
*$CH_3$—Filter choke. Thordarson T-15C54*
*$CH_4$—Filter choke. Thordarson T-67C46*

nection must be made to all units, including the clock. The leads on this clock are also shielded and grounded.

The two turn-table assemblies should also be grounded and soldering lug terminals are usually provided on most models for this purpose.

### The Use of Dual Turn-tables

If we are to enter into the recording field professionally, we will be required to use *two* separate turn-table assemblies. Standard transcription discs are 16" in diameter and standard equipment will permit cutting 15 minutes duration on one side of each disc. Therefore, we may see that in order to record a *continuous* program that might last up to an hour that provision must be made to change very quickly from one table to another without interruptions.

Referring to the diagram, we see that if we locate the switches SW1 and SW3 where they may be thrown simultaneously, that it will be possible to make copies of records without any break. Likewise, if the selector switch SW2 is being used on the AM tuner position, we need only throw SW3 to transfer the audio from one cutting head to the other. Another switch, SW4, is used in playing back records on an external speaker. This speaker is mounted in a very large baffle and is capable of reproducing all frequencies coming from the amplifier. Complete constructional details of such a speaker assembly appeared in the February, 1940, issue of RADIO NEWS.

### Selecting the Recording Tables

High quality recording requires the use of high-grade equipment throughout. The turn-tables must possess certain characteristics that are not found in the conventional portable variety. They must have extra heavy tables, preferably rim driven, for maximum steadiness and torque. The tables illustrated were selected as they both possess these features. The *Speak-O-Phone* table on the left is the newest addition to the author's recording assembly. It is designed for operation either at a standard speed of 78 r.p.m. or at the transcription speed of 33⅓ r.p.m. Changeover from one speed to another is accomplished by means of a cam lever and individual rubber drive pulleys. A particularly nice feature of this table is the fact that provision has been made on this lever so that the drive wheels may be left floating when not engaged in the work of driving the rim of the table. This prevents any "flats" from developing on the rubber wheel. The reason for avoiding the so-called flats is obvious. If the rubber tire were permitted to bear pressure on the rim, when at rest, it would not remain absolutely round for any length of time but would soon develop one of these "flats" and the result would be an uneven turn-table speed. This would create "wows" on the record.

The feed-screw on this and on the other table is of the over-head screw type. We personally favor this type of drive for the accurate cutting of grooves as it has been found to be the most fool-proof. The feed-screw itself is machined very accurately so that there will be no burrs or imperfections to jar the cutting head as it slides across the guard rails in a horizontal plane. We might mention, in passing, that it is necessary to keep this feed-

(*Continued on page* 60)


**by ALFRED TOOMBS**
Special Washington Correspondent for RADIO NEWS

### President Confirms *R.N.* Scoop!

ON September 24, the President of the United States confirmed a scoop published in this column over two months ago and formed the Defense Communications Board. By Executive Order signed that day, the Board, composed of the Chairman of the Federal Communications Commission, the Chief Signal Officer of the Army, the Director of Naval Communications, the Assistant Secretary of State in charge of the Division of International Communications, the Assistant Secretary of the Treasury in charge of the Coast Guard, came into being.

According to the Executive Order, the function of the Board shall be, with the requirements of national defense as a primary consideration, to determine, coordinate, and prepare plans for the national defense, which plans will enunciate for and during any national emergency—

*a.* The needs of the armed forces of the United States, of other governmental agencies, of industry, and of other civilian activities for radio, wire and cable communication facilities of all kinds.

*b.* The allocation of such portions of governmental and non-governmental radio, wire, and cable facilities as may be required to meet the needs of other governmental agencies, of industry, and of other civilian activities.

*c.* The measures of control, the agencies to exercise this control, and the principles under which such control will be exercised over non-military communications to meet defense requirements.

The newly named five-man Defense Communications Board sailed into its work within a short time after the above long-delayed announcement of its membership had come out of the White House. On the surface, all was serene, but behind the scenes a hot battle was brewing.

The two military service members of the Board—Major General Mauborgne, chief of the Army Signal Corps, and Admiral Noyes, Director of Naval Communications—marched in loaded for bear. Their guns were trained on mild-mannered but astute Chairman Fly of the Federal Communications Commission. Mr. Fly is the Chairman of the Defense Board, but if he had any ideas that he was going to run the show, the hardboiled Service Men set him straight.

The purpose of the Defense Board is to make plans for coordination of all of the vast American Communications Systems. This includes plans for a radio blackout in case of air-raids, broadcasts to warn civilian population, commandeering of equipment for military communications, and the strict control of all communications personnel.

General Mauborgne and Admiral Noyes have in mind measures more drastic than liberal Chairman Fly believes necessary. The Service Men believe that they will have to take over much of the F.C.C. power which has been carefully nurtured by Mr. Fly. In private conversation, the two agreed to campaign together to establish their power over the civilian. The other two members of the Board, representatives of the State and Treasury departments, are staying neutral.

It is interesting to note that the White House order is careful to point out that the new Board has no power of censorship over radio or commercial wires and is merely acting as a planning body; but in war, it will be quickly replaced by a group having absolute power to shut down, or use as they see fit, every communication facility we have.

### This Defense Buying

ALTHOUGH stated in this column last month that it was believed, and indications seemed to show, that radio purchases for National Defense will eventually exceed a total of two billion dollars, the exact amount of money to be spent during 1941 on radio is a closely guarded secret. The best information available indicates that in excess of $20,000,000 worth of radio equipment has been ordered so far. Almost all of this must be delivered within the year. Inside information indicates that these orders are only a drop in the bucket. A secret long-range purchasing program has been drawn up which calls for the purchasing of several times as much equipment as has been ordered. However, this will not be needed until thousands of planes and tanks start rolling off the factory lines in about two years. When millions of dollars of orders yet to come are placed, the radio manufacturing industry will enjoy a tremendous boom. Inasmuch as the equipment is being specified mostly for tanks, planes, and mechanized forces, there is not any use in ordering it until they are built. When the army reaches its peak of men and machines in a couple of years, then radio orders will flow. There is no longer any distinction between "regular military channels" and "defense" radio purchases. Army and Navy officers are buying all the military radio, merely making their orders bigger to include the bigger fighting forces.

Some of the orders placed since last month include Rauland Corporation of Chicago, for transmitting equipment — $454,415.00; Bendix Corporation, Baltimore, radio compasses—$673,906.00; Central Telegraph Corporation, Newark, N. J., for radio transmitting equipment—$543,753.00; General Electric Corporation, Schenectady, N. Y., for transmitting equipment—$5,297,775.00; The Rauland Corporation, Chicago, receiving and transmitting equipment—$372,596.00; Bendix Corporation, Baltimore, radio equipment—$9,353.00; Barlow Engineering Company, New York, for panels—$69,192.00; Radio Receptor Company, New York, for rectifier power equipment—$25,355.00; Siems Spokane & Co. & Associates, Navy Contracts for work in Alaska—for radio facilities in Dutch Harbor, $27,450.00; Lingren & Swinerton & Associates—Navy contract for work in Canal Zone (for receiving radio station at Balboa)—$585,000.00; for extended radio facilities, same company (at Gatun), $241,200.00. The orders mentioned above total $8,299,995.00.

The report in last month's column that General Electric had turned down a radio order because it was too filled up to take it on has been denied by authoritative sources of that firm. General Electric claims to be able to take on any and all radio orders on which they bid. Similarly, a bottle-neck in the matter of sockets was denied by the president of the American Phenolic Corporation who stated that he had literally thousands of sockets on his shelves ready for distribution to whomsoever would require them for the completion of Government contracts. Further investigation into the socket bottle-neck reveals that probably the situation is one of "traffic" in that the sockets are available at the source but might have found difficulty in reaching the final recipient. This bottle-neck is being rapidly cleared up and, at this writing, seems to have disappeared entirely.

No other bottle-necks have developed in the industry. They say the only threat is the shortage of tool and die makers. The Defense Commission is very optimistic about the radio industry. The question of priorities under which manufacturers have agreed to give priority to military articles before the Government will sign a contract, has not even come up. This indicates that the Defense Commission believes the Industry can turn out military radio without any interference to or from normal commercial products. Some radio manufacturers are using idle floor space for the production of munitions. Stewart-Warner, of Chicago, for instance, is reportedly making machine gun parts.

### Transmitting Equipment Bill

THE Bill which would require the registration of all transmitting equipment and mostly aimed at the amateur is still in the Legal Division of the Federal Communications Commission. No one seems to know quite why it is being held up. It will be transmitted to Congress probably by the White House, and a member of the House or Senate Interstate Commerce Committee will probably introduce it. The bill will require all amateurs to register each and every piece of their transmitting equipment. Not only will the bill make available to the proper Governmental forces the type and number of radio transmitters in existence, on the shelves of the amateur shacks, and in actual operation, but it will also enable the Army to know just how much equipment it may have access to should the occasion arise.

### No Subversive Amateur Activity

THERE has been no evidence of any subversive work by hams. Some have acted indiscreetly, not knowing they were doing anything wrong; but there has been absolutely nothing to indicate that a single ham is "off reservation." Early in the Spring, however, a number of "subversive" transmitters were discovered operating in the amateur bands. The operators of these subversive groups were not licensed amateurs.

Chairman Fly, in a letter directed to this column, dated October 10, said: "It has recently come to the attention of the Commission, through correspondence with certain amateur radio operators, that violations of the Commission Order No. 72 (prohibiting contacts with foreign sta-

(*Continued on page* 48)

# External Noise Silencer

by L. M. DEZETTEL
Engineer, Allied Radio Corp.
Chicago, Illinois

**With the addition of this unit to your superheterodyne receiver, you can bring it up to 1941 standard. A good unit for the s.w.l.**

NEARLY all of the communication types of receivers on the market today incorporate a "noise limiter" circuit. This has become common practice in receiver design because of the operators appreciation for a means to read through some of the previously unreadable signals.

Notice, however, that we speak here of a "noise *limiter*." This means that noise is *limited* to a certain value—that value generally being the peak value of the modulated wave, or in the case of c. w., the carrier peak. But up to the signal peak and equal to it, you still have the noise impulses.

The circuit described in this article is a "noise *silencer*." This circuit not only chops off the noise peaks above a certain value, but actually takes that chopped off portion, and uses it in such a manner that the rest of the noise is also eliminated. Thus, then, we have true "noise *silencing*." The circuit is a little more complicated than the "noise limiter" type but is much more effective.

Previous silencers were designed only for use with superheterodynes employing 2 stages of I.F. amplification. The present unit, however, will operate satisfactorily with any Superhet, whether it has one or two stages of I.F.

Let's look into the action of a "noise silencer" very briefly. The "noise silencer" unit is connected into the radio set in the last I.F. stage, and, thus, the 6L7 in the "noise silencer" unit replaces the tube previously employed at this stage in the radio receiver. The control grids of both the 6L7 and the 6J7 are tied together in the "noise silencer" circuit.

When a noise greater in amplitude than the incoming signal enters the circuit, it is amplified by the 6J7 and rectified by the 6H6. This rectified voltage is developed across the .1 megohm resistor and fed back to the 6L7 through the injector grid. This puts a negative bias on the 6L7 temporarily, making it inoperative and thereby killing the noise. The incoming signal also is blocked out, but, since most noise impulses last for only approximately 1/1000 of a second, the ear does not detect this interval of silence. The amount of rectified voltage fed to the injector grid of the 6L7 depends on the amplitude of the signal and the noise peaks, and the setting of potentiometer R1.

Assembly and wiring of the unit is really quite simple, especially since a formed and punched chassis is available. Notice the use of an a.c.-d.c. type line cord for filament supply.

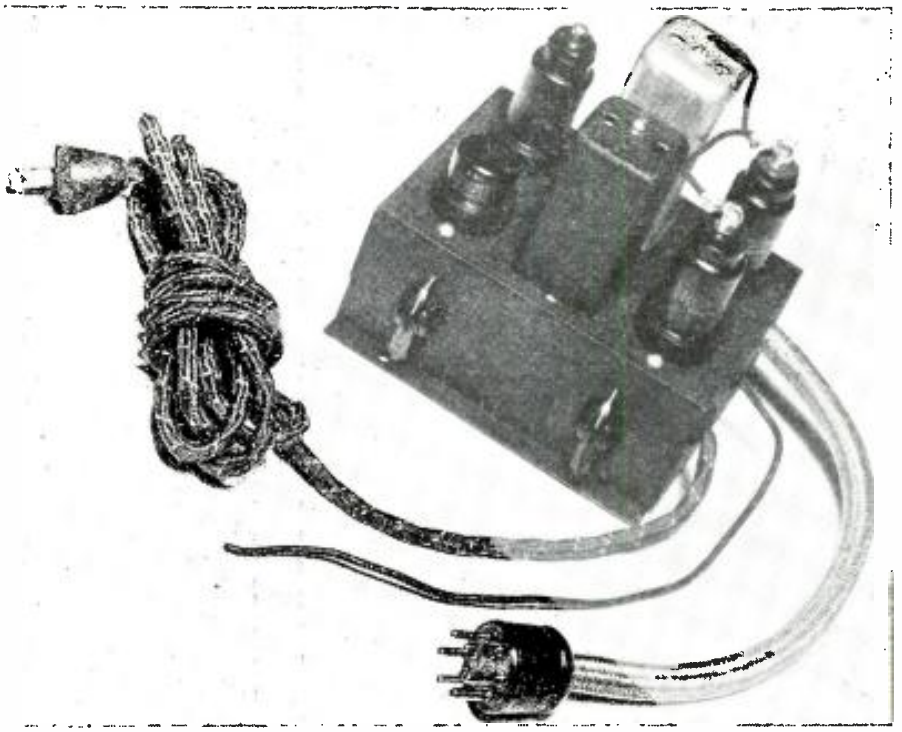
"B" voltage is taken from a suitable source in the receiver such as the screen grid terminal of the output tube.

It is important to keep leads as short as possible. This is especially true of the shielded lead used for the plug. Notice, too, that the plug used must correspond in number of prongs with the tube it replaces (octal or 6 prong).

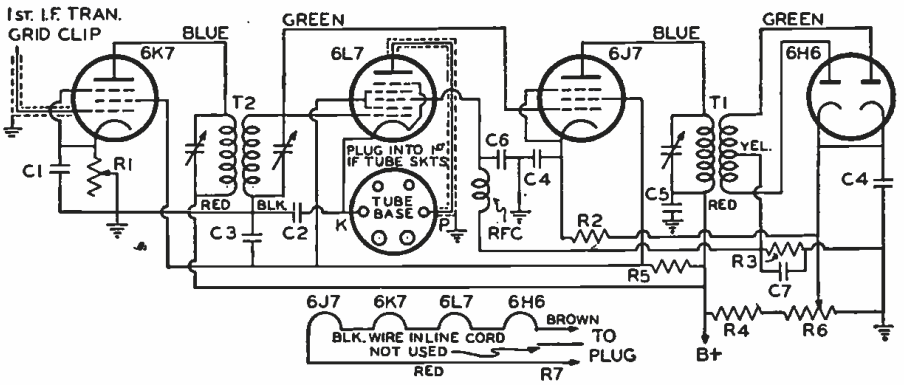
After the unit has been completely wired, it is ready for alignment and test. Plug in the line cord of the Silencer and allow the tubes to warm up. An output meter and oscillator, if available, should be used for aligning. Even without these units, however, the unit can be tuned fairly well by ear.

Because of the shielded leads from the receiver to the silencer unit, the plate circuit trimmer of the last I.F. transformer in receiver and the grid

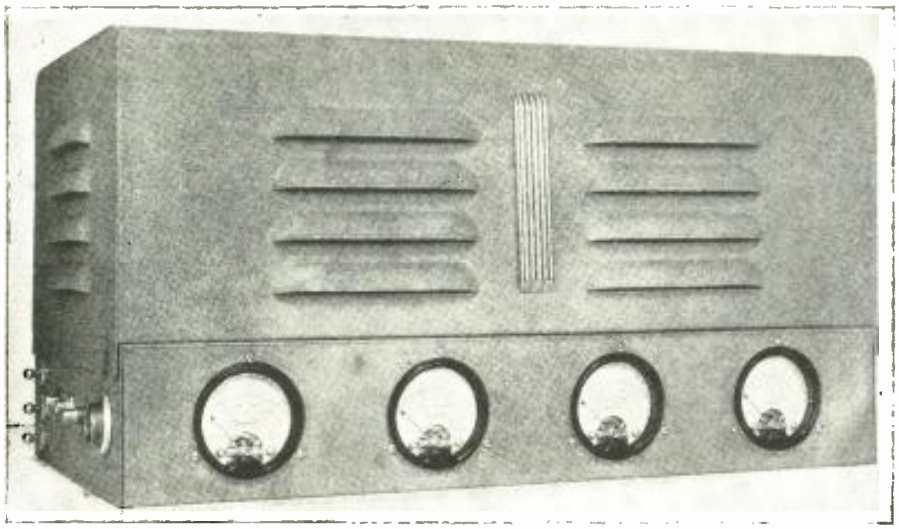
(*Continued on page* 52)



The completed unit will look something like this.




*$C_1$, $C_2$, $C_3$, $C_4$—.1 mf. 200 v. paper. Knight*
*$C_5$—.1 mf. 400 v. paper. Knight*
*$C_6$—.0001 mf. mica. Knight*
*$C_7$—.00005 mf. mica. Knight*
*$R_1$, $R_6$—5,000 ohm pots. Knight*
*$R_2$—350 ohms, ½ w. Knight*
*$R_3$—100,000 ohms, ½ w. Knight*
*$R_4$—300,000 ohms, 1 w. Knight*
*$R_5$—15,000 ohms, 1 w. Knight*
*$R_7$—290 ohm line cord. Ohmite*
*$T_1$—Special I.F. Trans. Allied A5693*
*$T_2$—Special I.F. Trans. Allied A5840*



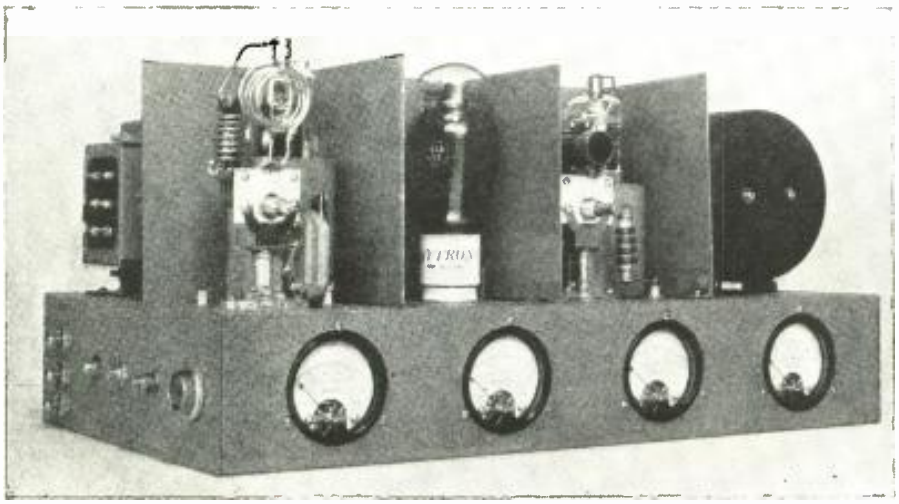
Front view of the experimental FM-AM 56MC transmitter. Every circuit needed to operate safely is metered; the panel switches are duplicated.

# AN EXPERIMENTAL FM-AM MOBILE TRANSMITTER

by KARL A. KOPETZKY, W9QEA
Managing Editor, RADIO NEWS

**Following the lead suggested by the Army, the author designed a transmitter which brings the advantage of FM to mobile work.**

Note the extremes to which the shielding has been carried out in the laying out of the component parts. This shielding is very important.



ALTHOUGH elsewhere in this issue appears the statement that the Signal Corps believes that Frequency Modulation has been somewhat oversold, the author is still mindful of the statement made to him by one of the Army officers of the Signal Corps that Frequency Modulation would eventually find its way into mechanized military radio. The same officer bemoaned the fact that the amateurs were doing little or nothing at that time, to develop this new phase of radio. To a certain extent, he was right, because very few articles on the construction of experimental frequency Modulated *mobile* transmitters and receivers have appeared any place.

After reading and digesting so much of contemporary literature pertinent to the subject and locatable, it was decided to attempt to build an experimental version of a Frequency Modulated-Amplitude Modulated transmitter for *mobile* amateur use. F. C. C. regulations dictated that this transmitter operate in the 5 Meter band, and good voice modulation indicated that the swing be not greater than 50 kcs. The unit illustrated above is the result of the experimentation, and it would be unfair to continue without giving due credit Crosby of *RCA* and a number of writers in *"QST"* who, unwittingly, have contributed much to the development of this unit.

In view of the fact that there are a comparatively few Frequency Modulated broadcast receivers in the homes, and practically no Frequency Modulated ham receivers capable of operating in the 5 Meter band in the hands of amateurs, it was determined that Amplitude Modulation should be made available at the transmitter source. Not only would this enable the experimenter-amateur to test the relative signal strength of Frequency Modulation versus Amplitude Modulation from one given location, but it would also enable him to establish many contacts with amateurs owning Amplitude Modulated receivers which would otherwise have been lost.

In a recent publicity release from *General Electric,* it was indicated that the comparative signal strength for a given antenna and with certain transmitter power merited as much gain as 33-to-one in favor of the Frequency Modulation. Since the transmitter in question has a carrier power of approximately 35 watts, this would be equivalent *in Frequency Modulation terms,* to a 1155 watt, AM station. The amateurs have not yet taken cognizance of the fact that Frequency Modulation ratios to Amplitude Modulation power are so great that the 1 kilowatt FM allowed to amateurs is equivalent to the average 33 kilowatt AM station.

This power, expressed in terms of Amplitude Modulation is almost that which might be used by WMAQ, Chicago, or WEAF, in New York. As soon as this fact becomes more generally known, it is to be expected that many more Frequency Modulated transmitters and receivers will make their appearance in the amateur ranks. Of course, the figure of 33 to 1 is by no means conservative. It is rather an experimental figure arrived at for a given condition at a given location; however, tests with the Maywood police, using Frequency Modulation, and other Government instrumentalities as

well as the Alaskan Air Service, presently also using Frequency Modulation, indicates that the coverage of Frequency Modulation far exceeds the fondest imaginations of any Amplitude Modulation coverage.

### Power Source

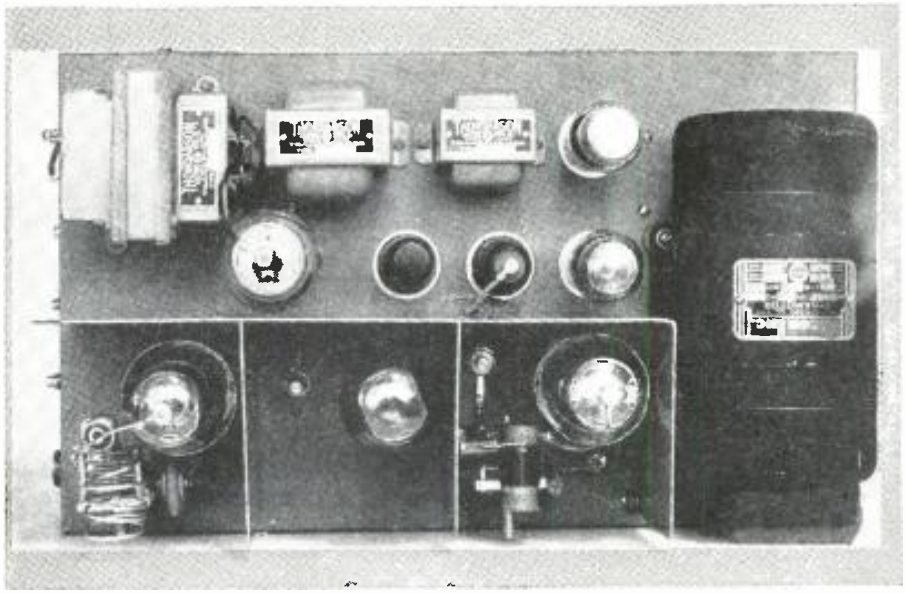
In considering the local source of power, the unit being a mobile rig, batteries will have to be used, and these will have to be storage batteries. To operate the tubes at their respective and proper voltages would place an extraordinary high drain on a six volt storage battery and so the system was designed around the usual 12 volt system such as appears in marine and aviation installations.

The total drain under full operating conditions with the carrier on, fully modulated, either FM, or AM, is approximately 15 amperes from the 12 volt source. While it is true that under the FM condition the transmitter is switched to cut off several tubes, namely those which supply the audio for Amplitude Modulation, it is equally true that in cutting off these tubes the power on the final amplifier is accordingly raised so that the difference between FM and AM from a power input source is negligible and remains at 15 amperes.

Since screen grid tubes were used, it became necessary that if the plate current and voltage of any one set of tubes, especially those used only for AM, was to be disconnected, that the screens would also have to be disconnected from their power source. This would cause a complicated system of switches and, in order to avoid this it was decided to cut off the filaments of those tubes which normally operate under AM conditions. With the filaments cut off, and unlit, the plates and screens, while having on them a plate potential would nevertheless not draw any current, and the tubes would not be damaged. The change-over switch, then, incorporated as a part of a relay, cuts off the filaments of those tubes which are only used during AM operation. Another part of the change-over system incorporates a relay switching the reactance modulating tube from a reactance modulated position, as used in FM, to straight audio amplifier as used in AM.

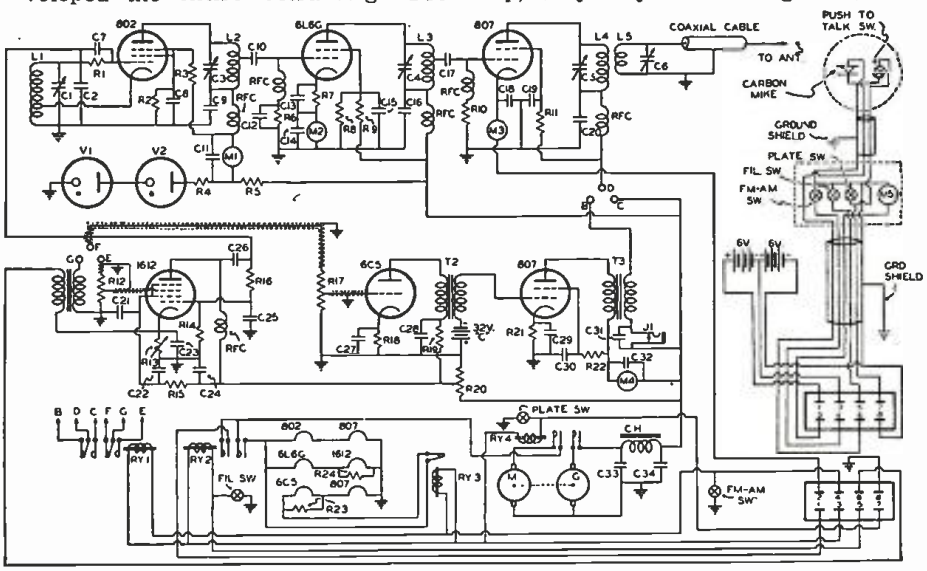
Naturally, when operating AM, any superheterodyne covering the frequency band from 58.5 megacycles to 60 megacycles, may be used. While in the FM position, it is absolutely imperative that a Frequency Modulation type of receiver be employed. The unit is mounted complete and self-contained on one chassis. The generator is mounted on the same chassis with the rest of the equipment. No vibration difficulties with this arrangement were experienced. A number of inter-connecting lines connect from the chassis to the control panel located in the front compartment of the car. By throwing suitable switches, the transmitter is successively on FM or AM as desired by the operator.

There is nothing tricky about the circuits in any way. Standard circuits of known value, and with which there has been known experience, were used throughout. It is a fallacy to attempt an experimental transmitter for mobile operation with anything but simplified circuits in the extreme. Vibration, dirt, and the usual exigencies of mobile work prohibit "tricky" circuits.



**Top-side view of the transmitter chassis. Note the lack of haywire in the type of layout. The r.f. section is in front, the A.F. in the back.**

While the FM-AM transmitter described herein is wholly experimental, it is believed that it is the first step in a direction designed toward interesting the amateur in FM, especially with a view toward National Defense, where FM experimentation is presently being carried on almost solely by commercial enterprises. It is a well known fact that at one time the amateur developed the entire Ultra High Frequency spectrum, and the amateurs owe their existence on the air at this time to that development. Unless the amateur undertakes something in the way of developing Frequency Modulation for the deeds undertaken by our National Defense, it is a grave question whether or not the amateurs will be able, after the National Defense and the International Situation has cleared up, to justify his holding on to the



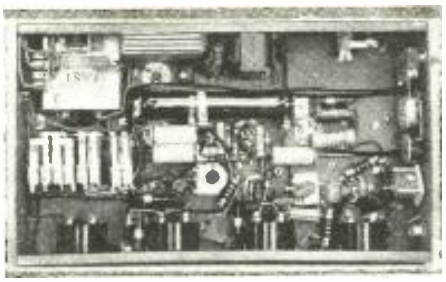

*$C_1$—100 mmf. variable. Cardwell*
*$C_2$—200 mmf. silver-mica. Sprague*
*$C_3$—100 mmf. variable. Cardwell*
*$C_4$—50 mmf. variable. Cardwell*
*$C_5$—15 mmf. variable (double-spaced). Cardwell*
*$C_6$—100 mmf. variable. Cardwell*
*$C_7$—.0001 mf. mica. Solar*
*$C_8$, $C_9$, $C_{16}$, $C_{19}$, $C_{20}$—.002 mf. 1000 v. mica. Solar*
*$C_{10}$, $C_{17}$—50 mmf. mica. Solar*
*$C_{11}$, $C_{14}$—.0025 mf. mica. Solar*
*$C_{12}$, $C_{13}$, $C_{15}$, $C_{18}$, $C_{19}$—.005 mf. mica. Solar*
*$C_{21}$—.01 mf. 400 v. paper. Solar*
*$C_{22}$, $C_{28}$—8 mf. 450 v. electro. Solar*
*$C_{23}$, $C_{27}$, $C_{29}$—.01 mf. 400 v. paper. Solar*
*$C_{30}$—.1 mf. 400 v. paper. Solar*
*$C_{32}$—.001 mf. mica. Solar*
*$C_{33}$—.5 mf. 1000 v. paper. Solar*
*$C_{34}$—4 mf. 1000 v. oil-filled. Solar*
*$R_1$—150,000 ohms, 1 w. Centralab*
*$R_2$, $R_3$, $R_8$—20,000 ohms, 10 w. Ohmite*
*$R_4$, $R_5$—5,000 ohms, 10 w. Ohmite*
*$R_6$, $R_{10}$—10,000 ohms, 2 w. Centralab*
*$R_7$—250 ohms, 10 w. Ohmite*
*$R_9$—35,000 ohms, 10 w. Ohmite*
*$R_{11}$—40,000 ohms, 10 w. Ohmite*
*$R_{12}$, $R_{17}$—.5 megohm pot. Mallory*
*$R_{14}$—.5 megohm, 1 w. Centralab*
*$R_{15}$—30,000 ohms, 1 w. Centralab*
*$R_{16}$—50,000 ohms, 1 w. Centralab*
*$R_{18}$—1,000 ohms, 1 w. Centralab*
*$R_{19}$—25,000 ohms, 1 w. Centralab*
*$R_{20}$—50,000 ohms, 50 w. Adj. Ohmite*
*$R_{21}$—200 ohms, 10 w. Ohmite*
*$R_{22}$—25,000 ohms, 10 w. Ohmite*
*$R_{23}$—4 ohms, 10 w. Ohmite*
*$R_{24}$—6 ohms, 10 w. Ohmite*
*$M_1$—0-75 DCMA. Triplett*
*$M_2$, $M_4$, $M_6$—0-100 DCMA. Triplett*
*$M_3$—0-150 DCMA. Triplett*
*$V_1$, $V_2$—Voltage reg's. VR150's*
*$T_1$—Mike-to-grid. Thordarson T55A16*
*$T_2$—Interstage. Thordarson T81D52*
*$T_3$—Modulation. Thordarson T19M14*
*CH—Filter Choke. Thordarson T7471*
*MG—600 volt-200 ma. Eicor model 124*
*$Ry_1$—DPDT relay. Guardian*
*$Ry_2$—DPST relay. Guardian*
*$Ry_3$—SPST relay. Guardian*
*$Ry_4$—DPST relay. Guardian*
*Sockets—Millen*
*Feed Thrus—Millen 32150*

large share of the radio spectrum he now holds. Nothing is claimed for this Frequency Modulated transmitter in the way of *unusual* transmission. It is, as the title expresses it, an "Experimental" one and should be so considered. Doubtlessly many experimenters will find ways to make one or more, or even many, improvements over the circuits that we use, but we offer the circuits to them as a basis and a starting point, and it should be so considered.

### Circuit Design

If we ignore entirely the audio frequency and modulator section of the transmitter herein described, we find that our circuit resembles a typical electron-coupled oscillator driving into a buffer quadrupler and, thence, into an 807 amplifier. This circuit is, in fact, entirely conventional as far as the r.f. layout is concerned. However, the major changes take place when we apply voltages in the form of audio to the various portions of the circuit.

When operation on FM (Frequency Modulation) is desired, a switch is controlled by means of relays from the dash position, at which position we also control the filament and generators used to furnish power to the transmitter. This switch places the circuit in such a sequence that speech is applied to the grid circuit of the 802 E.C. Oscillator. Were it not for the inclusion of a 1612, or 6L6 limiter tube



Under chassis transmitter view.

following the speech transformers, we would not get the desirable characteristics for Frequency Modulation. It is the function of the 1612 stage to apply the signal in such a manner that it will offer a change in inductance in the grid circuit of the 802, the oscillator. In other words, the 1612 appears to the 802 as a variable inductance and by applying a wave form in the form of speech to the grid of the 1612, we actually *change* the effective inductance of the grid coil in the oscillator. The variations thus caused have a decided effect upon the operating range of the grid of the E.C.O., and by applying certain constants to the circuit, we have been able to spread or change the inductance to *alter the frequency* normally supplied by the tube grid circuit. In other words, if we are to change the inductance either plus or minus, we will change the frequency by a given amount. The selection of the band width, or the amount of frequency we wish to swing, will depend a great deal upon the design of the components used to make up the E.C. circuit as well as those used in the 1612 stage.

Now, in order to obtain a given band width at the output of the transmitter it is necessary to multiply frequency and particularly to arrive at a variation in frequency which we get at the 802 stage. For example, if we *increase*

(*Continued on page* 53)

# FOR IMMEDIATE RELEASE...

***Hot & Spot News will be found in this column every month. Don't fail to read it!***

CHICAGO—*Permo Products Corporation,* Manufacturing Metallurgists have started construction on an addition to their plant at 6415 Ravenswood Avenue. The new building, when completed, will increase their production facilities by fifty per cent and double their present factory floor space.

The additional floor space was made necessary, according to Arthur J. Olsen, President, by the growing demand for phonograph needles, recording styli and alloys used in airplane carburetors, fountain pens, etc.

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CHICAGO—Shipments of *Stewart-Warner* radios from distributors to dealers, for the first nine months of this year, ending August 31, showed a gain of 35.2% over the corresponding period of one year ago, according to Frank A. Hiter, vice president and general manager of Stewart-Warner Corporation, Chicago.

"At the end of this same period," said Mr. Hiter, "radio stocks on hand with distributors and dealers showed a decline of 25%. We interpret this to mean not only that sales are rising, but that the effects of increasing national employment in private industry are beginning to be felt. This, in turn, is resulting in the return of great numbers of consumers to the radio buying market.

"The new features that manufacturers have incorporated in their present models are also responsible for the rise in radio sales," he said. "Radio has definitely passed the gadget stage and genuine engineering developments are being emphasized. Our Concert Grand models are good examples of this trend."

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A NEWLY-ENGINEERED radio receiver which will make available programs broadcast by frequency modulation as well as standard American broadcasts and domestic and foreign short-wave transmission, has been announced by the *General Electric* Radio and Television Department, Bridgeport, Conn. The new receiver, designated model JFM-165, and carrying a recommended list price of $175 in most sections of the country where FM programs are now or shortly will be available, is the first combination model to be built by *General Electric* since the recent formal allocation of commercial frequency-modulation transmission channels by the Federal Communications Commission.

Actually two receivers in one, the new AM-FM set has two super-powered chassis. The AM system has a rated power consumption of approximately 80 watts, and the FM one of approximately 145 watts. Operating cost of the former is about ⅓ cents an hour, that of the latter about ⅔ cents an hour at national average KWH rates. Each chassis has its own full complement of tubes.

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THAT a purely electronic means of colored television is already under development by engineers of his organization, but considered solely in terms of an ultimate goal far beyond the more immediate problems of black-and-white television, is announced by *Allen B. Du Mont,* television pioneer and manufacturer of Passaic, N. J.

Commenting on recent demonstrations of colored television by a leading broadcaster, Mr. Du Mont points out that color is a natural television step ahead. The principles and various techniques have long been available to television workers. Many demonstrations of colored television have been made during the past decade, using mechanical means of filtering at the pickup and a color wheel at the receiver. However, Mr. Du Mont believes that mechanical means are too complicated, and so his engineers have been working on a strictly electronic means for ultimate commercialization. A special screen will be used for automatically selecting and rendering the elementary colored images in proper sequence, without color wheels or moving parts.

However, for the present Mr. Du Mont believes that the industry had better concentrate on commercializing good black-and-white television before essaying colored television. The problems of television today are rather in the direction of evolving satisfactory flexible standards which would allow either transmission of black-and-white or colored pictures agreeable to the majority of television interests, whereby to lay a firm foundation for scheduled television broadcasts to be enjoyed with mass-produced television receivers that will not be obsolesced overnight.

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THE Board of Directors of *Philco Corporation* today declared a dividend of $.25 (twenty-five cents) per share on the Corporation's outstanding common stock to he payable Octoher 15, 1940, to stockholders of record October 5, 1940.

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AN ingenious method whereby a conventional cathode-ray oscillograph is employed as an indicator for determining the transit time of electrical switching equipment, such as relays and contactors, together with a graphical solution of the pattern obtained from the cathode-ray oscillograph, examples of the method and its extension to other problems, is the subject of the latest issue of the *Du Mont Oscillographer.*

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BALTIMORE, MD.—L. O. Myhre has been appointed manager of manufacturing in the Radio Division of the *Westinghouse Electric & Manufacturing Company.* it was announced today by Walter Evans, manager of the Division.

Mr. Myhre comes to Baltimore to assume his new duties from Long Island City, N. Y., where he was manager of engineering and manufacturing for the Westinghouse X-Ray Company.

Beginning his associations with the Company in 1920 on the Graduate Student Course, Mr. Myhre worked for a short period at the East Pittsburgh Works on Cost Reduction and Factory Layout. He then spent approximately fifteen years in the Switchgear Division, holding the positions of Personnel Man, Assistant Supervisor of Production, General Inspector and Assistant Superintendent.

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*PHILCO CORPORATION* has made and sold approximately 15,000,000 radio receiving sets—more than any other producer in the history of the industry—since it entered the radio manufacturing business in 1928, according to a review of the Company's growth and development entitled "The Story of Philco Progress," which has just been published.

"Today Philco is entering new fields," the booklet states. "It is the largest distributor of single-room air conditioning units. It has become an important factor in the household electric refrigerator field. As the opportunity offers, it plans to undertake the manufacture and sale of additional products for which there is widespread public demand, and thus continue its growth and development."

In 1930, only two years after it began the production of radio sets, Philco achieved undisputed leadership in the radio receiving set industry, according to the review. It has held that position ever since.

"One of the most important factors con-

(*Continued on page* 62)

# BENCH NOTES

by **ROBERT KENDALL**
Service Manager, Indianapolis, Indiana

To work, to work
Says Major Burke.
*Army Jingle*

AS this was written the seasonal upswing in the service business has just begun, which for the first few days may have an irritating effect on the man afflicted with *steatopygia,* acquired during the annual summer slump. Auto radios, portables and what not have contributed to straighten out the curve of business activity to some extent, but a mid-summer dip still remains, due to hot weather, vacations, and general all-around laziness. This dip did not occur in the 20's, as service business was abruptly cut off with the coming of warm weather, and the business curve vanished, diving down behind the baseboard to spend the summer with the cockroaches, leaving a long gap between the months of May and September. During this compulsory vacation, the bosses vamoosed, between scattered calls, to fish, swim or play golf, leaving the cheap help to fight the cobwebs. Incidentally, these periods were almost a total loss to this writer, as we never did improve our game enough to break 90.

### Watch Your Step

THERE are a large number of receivers of the 1929-1932 vintage still in operation, but experience during the past year indicates that many of them are beginning to show signs of wear and tear. Due to the substantial construction common to that period, the survivors have usually had a minimum of service, and the various components are now beginning to show their age; and for that reason the service man should be cautious about sticking his neck out by making rash promises when accepting these sets for service. With the inexplicable perversity of inanimate objects, these sets have developed a nasty propensity for folding up a week or two after some minor operation with embarrassing results to the service man.

One local shop has satisfactorily solved this problem, by selling a general overhauling job for $10, which includes checking and replacing all "weak" by-pass condensers, and replacing the 1st A.F. transformer. Since most of these receivers use transformer coupled audio stages this last item is an important consideration, as a certain amount of corrosion takes place, in the course of eight or ten years' service, due to electrolysis through the insulation to the grounded core of the original transformer.

The owner of this shop, A. W. Tellstrom, reports that little difficulty is experienced in selling these $10 overhauls, and results have been very satisfactory to all concerned.

### Medieval Hangover

THERE has always been a faint aura of hocus-pocus around most skilled trades and professions, and radio has been no exception. This is probably a relic of the old guild traditions of medieval times, when all trade secrets were jealously guarded, no matter how trivial. The main reason for this secrecy was, of course, financial, since a limited number of informed practitioners in any line could


*"We found that the Tepee made them feel much more at home!"*

command better terms for their services, and at the same time enjoy the prestige their superior knowledge gave them. A condition of this sort was prevalent in the early days of radio, when several dozen manufacturers carefully withheld any technical data concerning their receivers, which later on were found to be all using practically the same tuned r.f. circuit; and the individuals that knew the difference between a grid and a plate, went about muttering such terms as "r.f." and "a.f." to the great mystification of the uninitiated.

However, that phase has happily passed, and manufacturers generally are now most liberal about releasing technical information, and many of the mysteries of radio are solved for the asking. Some of the implements of radio are still surrounded by a haze of mis-understanding, and the following dissertation is presented for the consideration of the beginner and student, who may have been unduly impressed by the offhand references to the slide rule, affected by some writers.

### The Slip Stick

THE slide rule is a good example of a valuable tool that will be of great utility in certain lines of radio work, and practically useless in others, and a rough outline of its character and functions may assist the radio man in determining its possible value to him. Primarily, the slide rule is an ingeniously simple instrument for the solution of problems involving multiplication and division, practical results being obtained with a minimum of cerebral activity, and in a fraction of the time required by any other method. While ordinarily the rule is considered as an engineer's instrument, an engineer's education is not necessary to employ the slide rule usefully. Anyone who understands the use of decimals can learn to use the slide rule, and for radio work an elementary knowledge of trigonometry will be required.

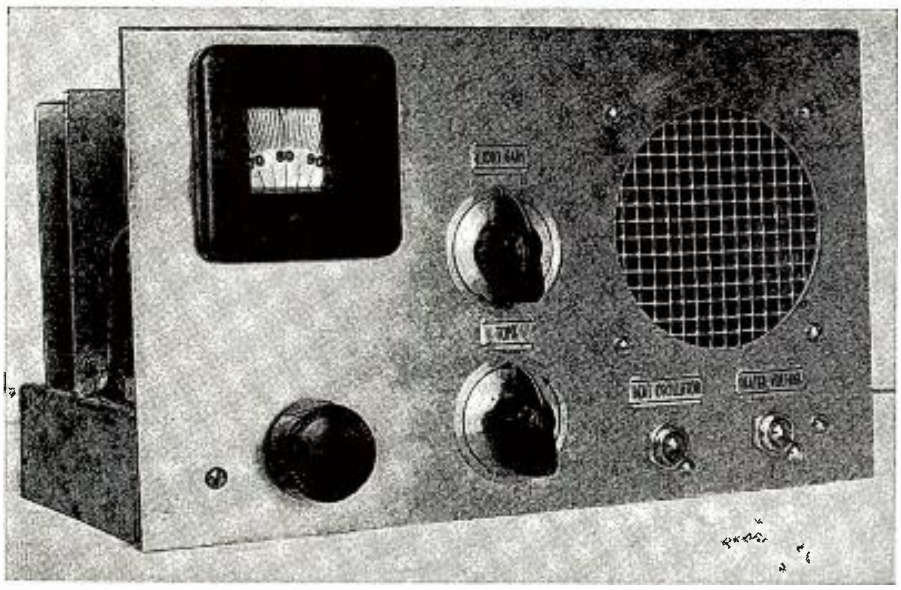
The operation of a slide rule is exceedingly simple. If the edges of two ordinary rulers are placed together, and slid so that 3 inches on one is added to 3 inches on the other, the result will be 6. Therefore, only addition and subtraction of two numbers can be performed on a rule where the numerical divisions are equal, and such a rule would be of small value. But, if the divisions on each scale are laid off logarithmically, 3 added to 3 will produce a result of 9—that is, the two terms will be multiplied by each other. This is in agreement with the rule that adding the logarithms of two numbers is equivalent to multiplying the numbers. Conversely, subtracting one log from another is equivalent to the division of one number by another. While the slide rule is calibrated logarithmically it will not be necessary for the operator to understand logs, although an elementary knowledge will be helpful, and useful for some calculations.

As the average beginner is prone to regard the slide rule as an engineering tool of great precision, it might be worth while to discuss the peculiarities and limitations that generally astonish the novice when he handles a rule for the first time. Upon inspection of the scales it will be found that most numbers cannot be precisely set

(*Continued on page* 60)

# AN EXPERIMENTAL FM-AM MOBILE RECEIVER

by OLIVER READ, W9ETI
Technical Editor, RADIO NEWS



Front view of the FM-AM receiver looks conventional.

***To match the experimental FM-AM transmitter, a similar type of receiver was needed. This one fills the bill, and does a fine job, too.***

DURING the past year, Government regulations have changed the mobile picture considerably as far as the amateur radio operator is concerned. Prior to that time, operation was permitted within the 10 meter band while the car was in motion and this allowed a certain amount of DX to be worked as well as an abundance of local contacts. Now that we are restricted to operation on the high frequencies we must turn to receivers that are especially designed for these frequencies.

Several converters have been placed in service but these have not proved entirely satisfactory as they all lacked sufficient r.f. gain to combat heavy auto QRN. It became apparent that an r.f. stage would be desirable from the standpoint of providing a certain amount of image rejection and to boost the incoming signals to over-ride the tube noises found when the gain was wide open. From several models built, the one selected accomplishes this result in a most efficient manner, and complete details are included within this article.

Its features are as follows: 1—Extreme compactness, the set measuring only 6x6x8 inches, so that it may be mounted directly below the instrument-dash panel in practically any car; 2—the use of a so-called "television type" tube in the r.f. stage; 3—the selection of 5 megacycles for an i.f. frequency; 4—the inclusion of a.v.c. and a b.f.o.; 5—ample output to drive a 3-inch p.m. speaker; 6—full band spread from 56 megacycles to 60 megacycles, self-tracking.

### Circuit Design

The tube line-up is as follows: 1851 r.f. amplifier; 6K8GTX mixer and oscillator; 6K7 i.f. amplifier; 6P7G second i.f. amplifier and b.f.o.; 6Q7 second detector—a.v.c.—audio; and a 6V6 tetrode amplifier. In addition, the use of two miniature neon tubes connected in series are used to stabilize the screen voltage to the oscillator to prevent frequency drift.

An intermediate frequency had to be chosen that would give sufficient gain in the i.f. stages. Several frequencies were used and 5 megacycles was chosen over all others as this offered sufficient gain at a frequency which would keep the signal out of the 3.5 to 4.0 megacycle band. A higher frequency was undesirable as the tendency toward tuned-grid, tuned-plate oscillation within the i.f. amplifier would increase with an increase in frequency, which was not wanted. Other reasons indicated that it would be desirable to limit the tuning capacity to as small a range as possible without sacrificing the performance. When a frequency of 1600 kc. was tried it was found that inter-action occurred between the oscillator and antenna circuits. Other frequencies were tried with other difficulties turning up. The highest frequency attempted was that of 10 megacycles, but the r.f. gain at this frequency fell off to an unsatisfactory level.

The *Hytron* 6K8GTX bantam tube was selected for its low loss characteristics. A metal shield is used as indicated on the illustration. Extremely short leads to the tubes are made possible by the circuit layout used and the reader is urged to follow this as closely as possible. A search of the various tube tables showed only one combination pentode and triode and this was the 6P7G made by *Raytheon*. This tube serves a two-fold purpose. The pentode section being used as a conventional i.f. amplifier and the triode used as a beat frequency oscillator. Note the method of coupling used between the oscillator grid coil return and the cathode of the tube.

The constants chosen for the a.v.c. were worked out to give a proper time-delay to the signals and the action using the values shown is optimum for best performance in mobile operation.

### Mechanical Consideration

Inasmuch as a three-gang condenser is not commercially available of the type used in this receiver, it was necessary to construct one out of standard parts. After much effort, the *National* Type UM condensers were selected as being the ones best adapted for ganging, especially where one section—namely, the oscillator—had to be insulated from the others. Flexible *Bud* couplers are used between each condenser. These will aid the builder in aligning the condensers properly. Baffle shields were cut from Eraydo metal and are placed as shown. Special tapped rods with a 4-36 thread were obtained from a local hardware dealer and these are used to connect the three isolantite mountings of the condensers.

All of the coils are self-supporting and are soldered directly to the terminals on the condensers. The antenna winding on the r.f. coil is interwound and held in place with *Amphenol* "912" liquid cement. A *Millen* dial was selected as it offered a good vernier action and can be read easily in the car when driving at night as the figures are quite heavy and stand out well with illumination. Isolantite sockets are used throughout, just in case any moisture should condense on the chassis during damp weather. The only important place, electrically, of

course, would be in the r.f. and mixer stage. But past experiences with portable emergency rigs has indicated that the slight additional expense is well worthwhile.

The intermediate frequency amplifier is entirely conventional and needs no particular comment other than to keep the leads short between the tubes and the transformers and to tie all parts down securely so that they will not become loose from the constant vibration encountered when installed in a car. The beat-frequency-oscillator was included as an aid in helping to locate weak signals and its addition has been found to be highly desirable. No provision is made on the panel to control the range of the b.f.o. as this can be set on any signal and left permanently tuned for further operation on other signals.

A tone control was added and has also proved to be valuable in reducing tube hiss and other forms of noise having high frequency characteristics.

Inasmuch as a conventional fish-pole antenna is used, together with an automobile type shielded cable and plug, a socket of the bayonet variety was soldered into the back edge of the chassis to accommodate this particular type of connection.

The primary of the antenna coil is designed for an impedance of approximately 40 ohms and this will match properly a typical automobile cable.

No commercial cabinet was available having the dimensions required. So one was constructed from pieces of Eraydo metal cut to proper size. This includes the panel which is supported ½ inch in front of the chassis by means of heavy spacers and bolts. The tone control potentiometer is of the midget type and fits snugly between the panel and the chassis. Leads are passed through a hole provided in the chassis. Two toggle switches are also mounted in a similar manner. One of these is for control of the b.f.o. and the other is the filament switch to the receiver.

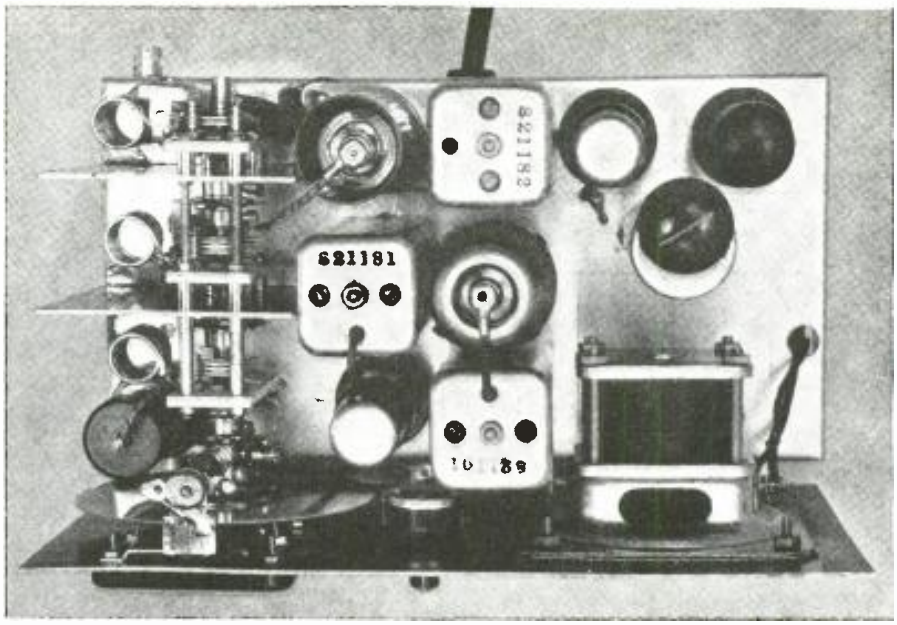
Push-to-talk operation is used on the mobile transmitter in our own particular installation. This controls the relay which is placed in the vibrator supply box and this serves to control the "B" voltage to the receiver.

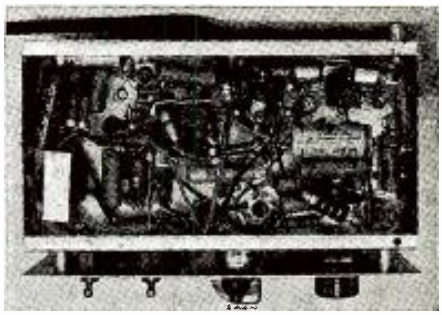
### Power Supply

The complete power supply is built around a *Mallory 552 Vibrapack* and this together with the additional audio filter required are mounted in a standard 6"x6"x6" steel box. This is mounted on the fire-wall on the motor side where the shielding provided by the wall will give some isolation to any hash that might be radiated from this portion of the installation. The cable which connects the receiver to the power supply must be thoroughly shielded and grounded. Furthermore, heavy wire must be used between the vibrapack and the car battery so that no voltage drop will be had from the drain of the power supply. A choice of "B" voltages is available by means of a selector switch mounted on one side of the vibrapack. This is set for 250 volts when the receiver is in operation. The drain under this condition will be about eleven amperes. The power supply box is kept covered to keep out dust which would get in between the relay contacts.

### Tuning and Alignment

Complete coil data is included in the parts list of this article. These are wound with No. 14 tinned wire and they are all ½" in diameter. A padding condenser is used across the oscillator coil and this serves for setting the band so that the band-spread condenser will completely cover the frequencies from 60 to 56 megacycles. Another trimmer is used into the mixer coil, and permits accurate tracking to be had with respect to the antenna coil. Final adjustments are made by altering the spacing between turns on all of the coils so that the full band will track properly from one end to the other. The cabinet should not be placed around the receiver until everything is operating properly and until the tuning has been set.



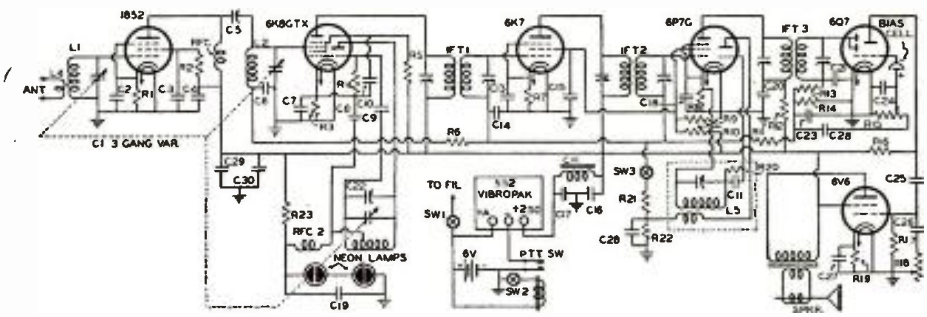



**Top-side view of the chassis. Note shielding between stages. Right: an underchassis view of the receiver.**

### Conclusion

It will pay the reader to use high grade parts throughout the construction of this set. All resistors and condensers must be mounted securely by means of terminal lug strips so that they will be held firmly and will not work loose. The by-pass condensers in each stage should be grounded to a common point wherever possible and this ground point should be common to

(*Continued on page* 51)




$R_1$—400 ohms, ½ w. Aerovox
$R_2$, $R_6$, $R_{21}$—100,000 ohms, ½ w. Aerovox
$R_3$, $R_{19}$—300 ohms, ½ w. Aerovox
$R_4$, $R_{13}$, $R_{20}$—50,000 ohms, 1 w. Aerovox
$R_5$, $R_9$—20,000 ohms, ½ w. Aerovox
$R_7$, $R_8$—700 ohms, ½ w. Aerovox
$R_{10}$—12,000 ohms, 1 w. Aerovox
$R_{11}$, $R_{17}$—500,000 ohms, ½ w. Aerovox
$R_{12}$—1000 ohms, 1 w. Aerovox
$R_{14}$, $R_{16}$—250,000 ohms, ½ w. Aerovox
$R_{15}$—500,000 ohm pot. Mallory
$R_{18}$—250,000 ohm pot. Mallory
$R_{22}$, $R_{23}$—25,000 ohms, 1 w. Aerovox
$C_1$—3 gang made up of 15-15-5 mmf. National UM
$C_2$, $C_7$, $C_{10}$—.005 mf. mica. 600 v. Mallory
$C_3$, $C_6$, $C_{12}$, $C_{15}$, $C_{18}$, $C_{20}$, $C_{26}$, $C_{29}$—.01 mf. 600 v., paper. Sprague
$C_4$, $C_{19}$—.002 mf. mica. Mallory
$C_5$, $C_{22}$—3-30 mmf. padders. Millen 26030
$C_9$—.0001 mf. mica. Mallory
$C_8$—.00025 mf. mica. Mallory
$C_{11}$—.001 mf. mica. Mallory
$C_{14}$, $C_{25}$—.05 mf. 600 v., paper. Sprague
$C_{16}$, $C_{17}$, $C_{30}$—8 mf. 450 v., electro. Mallory
$C_{21}$, $C_{23}$—.00025 mf. mica. Mallory
$C_{24}$—.00005 mf. mica. Mallory
$C_{27}$—10 mf. 25 v., electro. Mallory
$C_{28}$—.1 mf. 600 v., paper. Sprague
$L_1$—6 turns, No. 14 wire, ½" dia., 1" long
$L_2$—6 turns, No. 14 wire, ½" dia., ⅜" long
$L_3$—10 turns, No. 14 wire, ½" dia., 1¼" long
$L_4$—3 to 4 turns, push-back wire. (see text)
$L_5$—Beat frequency oscillator coil assembly. Meissner S21214
$IFT_1$—Input I.F. Transformer. Meissner S21181
$IFT_2$—Interstage I.F. Trans. Meissner S21191
$IFT_3$—Output I.F. Transformer. Meissner S21182
$RFC_1$—5 meter r.f. choke. Ohmite
$RFC_2$—2½ mhy. r.f. choke. Millen 34100
Vibrator Supply—Mallory 552 Vibrapack
Speaker—Utah 3P—3½" P.M. with trans.
Sockets—Millen 33008
Tubes—Hytron 6K8GTX. RCA 1851—6K7—6Q7—6V6. Raytheon 6P7G
Neon Lamps—GE NE 1
Switches—SPST Toggles. Arrow
Dial: Millen 1008

# Serviceman's Experiences

by LEE SHELDON
Chicago, Illinois

**An executive is a man who works too, as Lee finds out.**

BUSINESS had been good. It doesn't take many conversion jobs to bring the total intake up to three figures, and as I looked over the week's earnings I felt a sudden determination well up within me. Perhaps my partner wouldn't like the plan, but it was now—during a lush period—or never.

Some twenty minutes passed before Al came into the store. During that period I developed my idea completely. As he entered, I strode to the front of the shop with the resolved step of a man who can keep both feet on the ground even while he's walking.

"Good morning, Al," I said, very pleasantly.

My partner stopped and stared at me strangely.

"What was that?" he asked, suspiciously.

"I said 'Good morning, Al,'" I repeated.

He leaned back against the wall, as if for support, and stared at me with wide eyes.

"I must be in the wrong store," he said, glancing at the number on the transom. "*My* partner hasn't greeted me decently for years!"

"You and your dramatic training!" I sneered, dropping my cheerful manner. "But you're not going to deter me in the execution of my Plan!"

"Sounded like a capital *P*," my partner remarked.

"It was," I replied, "and don't think I'll scuttle the scheme after your first attack!"

"Here we go again," Al said with a rising voice. "I recognize the symptoms of something expensive. What's it all about?"

"Just this," I explained. "For years we have struggled along doing everything in the shop ourselves. We write our own advertising, peddle the pluggers, answer the 'phone, pick up sets, buy parts for them, install them, deliver the sets, collect, and even do our own accounting. Perhaps it's all right when times are tough; but now, when they're not, we should delegate most of our work to someone else."

"Yehudi has been deported," Al cut in, "and anyone else would want pay for such work."

"Why can't we pay?" I shot back. "The business is big enough now to warrant an increase in staff. Among other things, I intend to employ an assistant. It is simply a natural step in our growth, and from now on, we should be in *Salutary Sales & Service* as executives."

"So *that's* it," laughed Al, "nothing but a plain passing fancy!"

"It *is* not," I declared. "From now on, my every thought and deed will be that of a business administrator. This is something that will change our entire destinies."

"You change yours, and leave mine alone," Al ordered. "Well, what's on the hook this morning?"

I didn't answer, so he resumed the argument.

"You and Hitler," he said, "invent too many synthetic crises. Don't you realize the worst thing we could possibly do in our business would be to trust a stranger with our customers? Personal contact is worth money, and you're trying to throw it away just because you feel like a brass hat!"

"You're wrong," I defended, "just as sure as I'm sitting here!"

"And just because you're sitting there, a whole day is going to waste," he snapped. "Forget it—there's nothing wrong with you a little mature thought won't cure. Now—let's get to work!"

"Gee, I'll go crazy with nothing but my portable radio set to play with."

Al saw I wasn't ready for harness, so he started conciliatory tactics—the last resort.

"Once upon a time," he began, "I went to a new restaurant—"

"Mind if I sit on your knee?" I snarled.

"—a new restaurant," he continued, "which specialized in fried chicken. The cook and counterman owned the place; met each of their customers, and served better food than any other store in the neighborhood. They prospered. I ate there often, and the visits were pleasant: good food, friendly crowd, and personal attention from them both.

"Then, after I hadn't called for a month or so, I returned. Neither owner was in. Strangers served me, the same old atmosphere wasn't there, and—although the food was nearly as good—it didn't taste like it did before. I asked the waiter where the two owners were, and he told me business had become so good they had opened three new restaurants, and were so busy managing them they gave up cooking and serving entirely. Their trade dropped off, and today the place where I used to enjoy my dinners is closed."

"Wind and rain," I replied, and Al went to work without saying anything else. But I knew I was right—otherwise how could the book on business management have cost me six dollars?

I continued with my Plan. Within a week I had bought a nice shiny desk for the front of the store, equipped it with all the necessary trimmings, and hired a bright young lad named Wilbur. I was then set up to handle all the affairs of the store from the front office. Boy, it was swell.

Someone had told me that if your first customer in the day went away satisfied, all the rest of the day's customers would be, too. I looked forward to my first over-the-counter transaction as an augury. Soon Mr. and Mrs. Hunter—two of our old customers—came in.

"Hello, there, Lee!" said Hunter. "What are all the glad rags for—going to a wake?"

"Good afternoon, sir," I replied. "I wear my usual business attire. How may I serve you?"

For a moment both of them looked at me coldly; then they laid a bag of tubes on the counter.

"Test them," they requested.

I leaned over my desk, pressed a toggle switch, and spoke into the home-made communicating system I had installed between there and the test bench. It worked pretty well on test, and—although only fifteen feet separated the two stations—you could hear nearly as well through them as you could through the air.

"Wilbur!" I called, in an evenly modulated voice. No answer. I called again; still no answer.

Finally, after smiling an apology to the Hunters, I walked to the door separating the two ends of the shop.

"Hey," I yelled, "answer that speaker!"

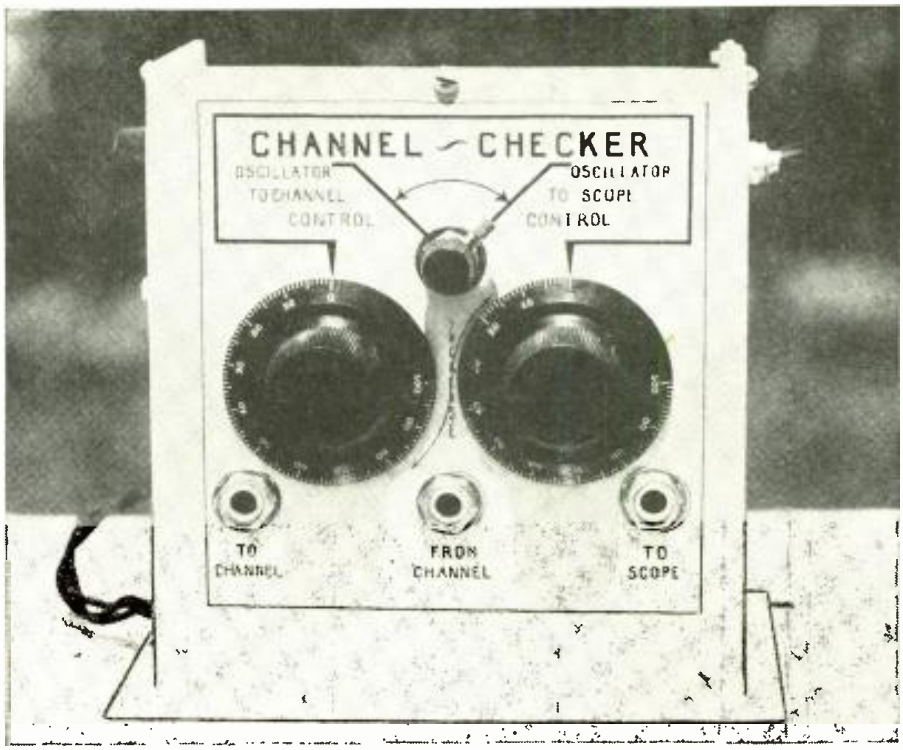
Back at the desk, I tried again. "Wilbur," I said, "these good people want their tubes checked. Please come and get them."

During the testing process, I engaged them in conversation; no doubt they enjoyed it, even though I had to interrupt myself twice and go back to the test bench because Wilbur wasn't very familiar with the tube checker.

An *80* was burned out, and I sold them a new one.

"If I can ever be of any further

(*Continued on page* 44)




# CHANNEL CHECKER

**by JAMES F. GORDON,**
Great Falls, Montana

***It is not enough to have an oscilloscope, it will be necessary to have a source of known sine waves to compare. This unit furnishes it.***

PROBABLY one of the most necessary pieces of equipment used in audio amplifier design, sound work and other audio applications is the oscilloscope. The use of the scope is limited directly by the attendant equipment. Harmonic content of a waveform may be determined with some degree of accuracy by the application of a known sine wave to the input of an audio channel and in examining the output form as shown on the screen. Better accuracy may be obtained by photographing the input and output forms and comparing them.

It is possible to trace the wave patterns on transparent material directly from the screen of the scope thus getting a close comparison. These methods are clumsy and take more time than should be necessary for the average operator to spend on such checks. The inexpensive and simple channel checker described here allows a quick and much more accurate check of harmonic content than is usually possible outside of highly developed laboratory equipment. Actually for the man that must put economy first this little instrument certainly increases the accuracy and usefulness of the oscilloscope.

### Construction

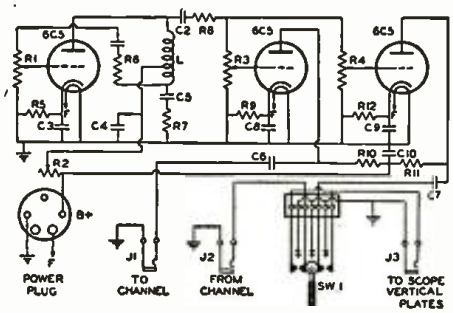
The circuit consists of a stable audio oscillator with separate controls for plate voltage and feed-back voltage to the oscillator grid. Through a blocking condenser the audio voltage is carried through the ten thousand ohm resistor to the two five hundred thousand ohm volume controls which feed the two separate output tubes. The ten thousand ohm resistor minimizes the loading effect on the oscillator when the controls are set at their extreme position.

All of the values shown in the circuit diagram were found to be entirely satisfactory and so were not changed in any way. Depending on the type switch used for changing from input image to output image some audio feedback might be encountered due to too much capacity between switch elements. To overcome this a switch was built up from two d.p.d.t. switches such that a grounded member separates the switch arms from each other. Refer to the sections marked "X" on the switch in the circuit diagram.

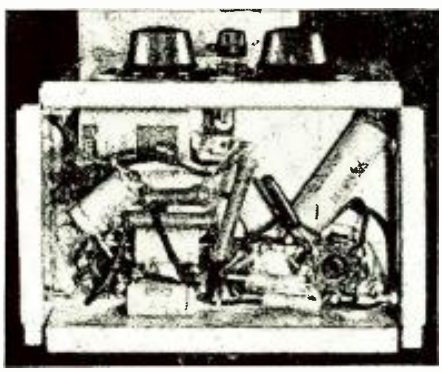
No special chassis construction is used. The parts were grouped so as to afford the shortest connections between them and the parts making up the panel design which is more or less functional. A glance at figures one, two, and three will give a clear conception of the general construction. The panel was first drawn up large size and photographed down to fit the instrument. This is not necessary to the performance but is a simple way to make a neater job. White enamel gives the whole a striking appearance.

The inductance "L" was removed from an old audio transformer which had a center tap. The iron was removed and, with the values shown and with proper adjustment of the plate and grid resistances, a nice sine wave of approximately four hundred cycles

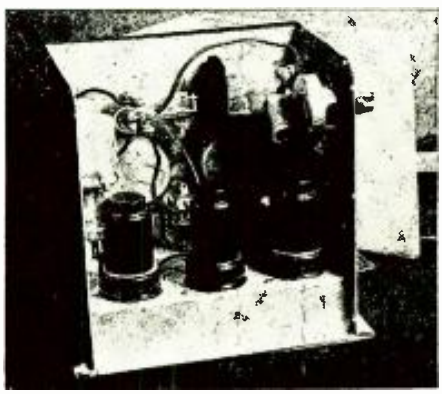
(*Continued on page* 58)




*$R_1$—250,000 ohms, pot. Mallory*
*$R_2$—150,000 ohms, pot. Mallory*
*$R_3$, $R_4$—500,000 ohms, pot. Mallory*
*$R_5$, $R_6$, $R_7$—5,000 ohms, 1 w. Wirt*
*$R_8$—10,000 ohms, 1 w. Wirt*
*$R_9$, $R_{12}$—3,700 ohms, 1 w. Wirt*
*$R_{10}$, $R_{11}$—500,000 ohms, 1 w. Wirt*
*$C_1$—.02 mf. 400v. paper. Solar*
*$C_2$—.01 mf. 400v. paper. Solar*
*$C_3$, $C_4$—.25 mf. 400v. paper. Solar*
*$C_5$, $C_6$, $C_7$—.1 mf. 400v. paper. Solar*
*$C_8$, $C_9$—12 mf. 25v. electro. Aerovox*
*$C_{10}$—8 mf. 450v. electro. Aerovox*



Underchassis view of the unit.



A side view of the unit, opened.

# Communication & Electronic MAINTENANCE

by W. H. BOHLKE
Director of Test Equipment Merchandising, R.C.A. Mfg. Co., Camden, N. J.

***A brief discussion of signal sources—in the air and in the shack. Starting the test bench.***

***Part 2***

IN line with the ideas presented last month about the development of a communication and electric service shop, which would be able to serve the communication field properly, the first of the items to be discussed will be the source of the test signal. This is quite natural in view of the general acceptance of the fact that the signal is the common denominator of all communication systems. Since this condition is true irrespective of the nature of the transmission, which means the exact field in which communication is maintained, the signal source becomes an essential item. If we analyze the requirements of the various branches of the communication and electronic fields, we can arrive at a single signal source which will best fill all of the requirements. With this in mind let us start with the private aircraft field.

### Signal Source for Private Aircraft Requirements

Those men who have had any contact with private flying or who, for some reason, have had the opportunity of glancing over radio literature prepared for the private flyer, have undoubtedly observed that the equipment now being suggested for the private flyer, but which eventually will without doubt be compulsory, covers quite an extensive group. That this should be so is not surprising considering the extensive radio facilities which are made available to the flyer in order to safeguard his life and to make flying an accepted mode of transportation.

Essentially, there are five groups of communication facilities which are available to the private flyer. We say that they are available, but it might just as well be said that they are pretty much of a necessity. True, that the Civil Aeronautics Authority does not make them compulsory, but few men would be silly enough to take off and fly virtually blind, with safety at their fingertips. As stated in the previous installment of this series, some of the landing fields make radio communication equipment, at least receivers, compulsory, if the facilities of the field are to be used, so that the use of radio equipment is in many instances more than just a choice for individual safeguarding.

The five classifications of radio communication are: 1. Radio beacon, range and weather reports, communication (range station transmission to plane) and homing (direction finding). 200-400 kc. 2. Airport traffic control. 278 kc. 3. Broadcast stations for homing: 550-1500 kc. 4. Communication: 2300-6700 kc. 5. Landing instructions: 75 mc.-145 mc.

Taking all of these frequencies into a single complete range, we find that the present day frequency requirements of a signal source extends from 200 kc. to about 145 kc. Now we have a basis to work on.

Looking into the future, particularly in an industry such as flying, it is not too fanciful a dream to say that, that which is provided now for commercial flying will some day in the future be utilized by the private flyer. After all, once a man gets into the air, private or commercial, they have similar hazards and both want to live. Accordingly, if we look into what is being projected for the future in radio requirements for flying, we note that instrument landing is making very rapid strides and that the frequencies spoken about in this range are from about 75 mc. to about 100 kc., with specific frequencies for marker use over landing fields, and other frequencies for reception of the glide path signal. Remote as these operations may seem from the viewpoint of the private flyer, that which interests us is the inclusion of this band in the general overall band we established a few paragraphs back.

From what information is available such operations seem to be set up for conclusion sometime within the next three or four years. Concurrently with such development, maybe sooner according to literature, is the radio altimeter. This device intended to furnish elevation above solid ground rather than sea level, functions at a frequency approximating 500 megacycles. This is out of our range of frequencies, but also does not appear very likely to be used in the private plane for quite some time. Taking all of these things into account, we find that for the next four or five years, which is an appreciable time as radio developments go, the private aircraft maintenance field will not go below 200 kc. and will not go above 145 mc.

As to the nature of this transmission, we do not hesitate to say that before the five years are up, frequency modulation will make its appearance. In this respect we do not speak with any official authority or any advance information, but judging from what has been accomplished in f.m. in the brief time it has been in use and its application to the police field, to be

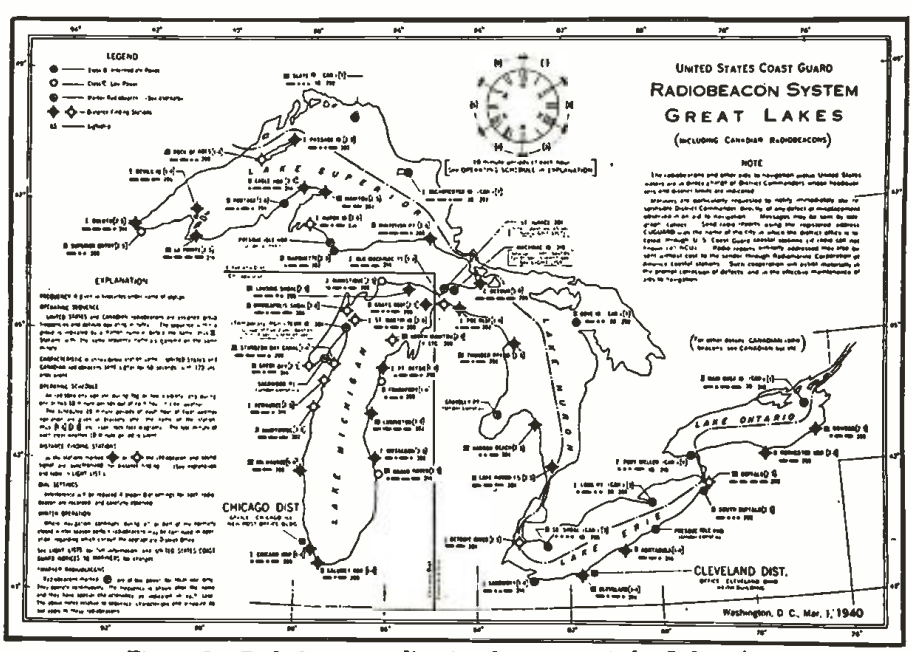



Figure 1. Radiobeacon radio signal sources of the Lakes Area.

discussed later, in our opinion it will make its appearance in the aircraft field as well. If and when it does, it will create some frequency changes in the radio beacon, weather and communication bands, but even if such does take place, it will probably remain below an upper limit of 145 mc. And since most of the testing of f.m. receivers is carried out with a.m. signals, this does not introduce any obstacles to what we are to present later in this article.

The latest information concerning the location of private airfields is now in the process of procurement. Information secured from Washington states that new maps have been prepared and will be available soon. It is hoped to make such data available in succeeding issues, at least to advise where they may be procured for those service shops who might be desirous of contacting aircraft personnel at these private fields and to establish any further facts which might be of aid to them in formulating their plans for future operation.

### Signal Source for Private Marine Radio

In private marine equipment we find three general classifications. One is the lightship beacon and the frequency of operation is from 200 to 400 kc. The second is the broadcast station and this frequency band extends from 550 to 1500 kc., and the third is the ship-to-shore telephone facilities provided in many harbors along the coast. This frequency range extends from about 2000 kc. to 3000 kc., and this too is within the original overall frequency band developed in connection with the aircraft receivers.

Concerning marine beacon stations that transmit signals used for compass bearings, which process will be discussed later in this series when we reach receivers, the accompanying map of Figure 1 shows the location of stations along the Great Lakes and the code signals they transmit for identification. The frequency of operation also is identified. Similar beacon stations are located along the Atlantic, Pacific and Gulf of Mexico coasts. The aforementioned marine range also includes the frequencies employed for communication with the Coast Guard and even ship-to-ship operation.

### Signal Source for Broadcast Radio

This sort of service is familiar to all and if we encompass the full range of frequencies normally used in broadcast operation, foreign and domestic, we find that a range of from 550 kc. to approximately 108 mc. gives us coverage of broadcast transmission, frequency-modulation form of transmission and even the television band. This range as can be readily seen is embraced by the initial overall frequency band developed in connection with the aircraft field. As a matter of fact, no form of service which comes within the sphere of this communication service shop series employs a frequency band which is as extensive as that found in aircraft operations.

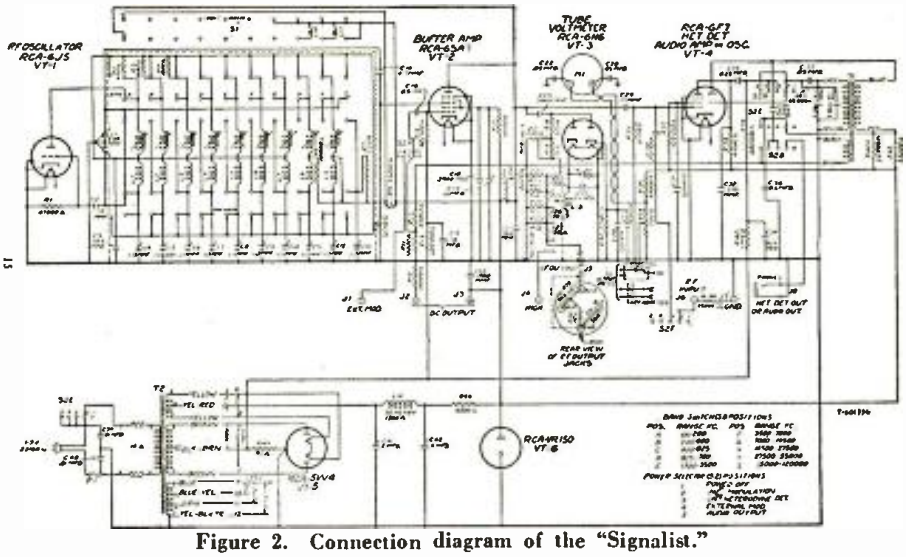


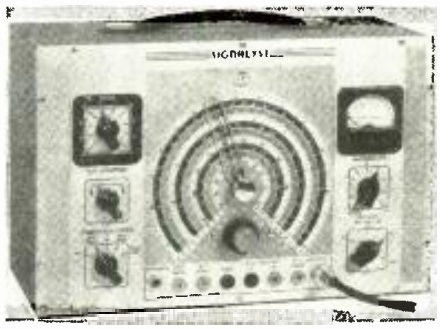

Figure 2. Connection diagram of the "Signalist."

### Signal Source for Police Radio

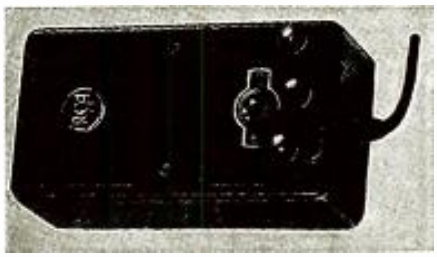
In the police field we have two general classifications, namely municipal and state, which normally utilizes two separate frequency bands. The municipal band is from approximately 2310 kc. to 2490 kc. The state police bands are from 1610 to about 1750 kc. Originally this limit extended to 1712 kc. with the amateurs using the band between 1715 and 1750 kc. Recent changes in regulation call for the amateur to relinquish the band between 1715 and 1750 kc. for use by the police, and instead the "ham" gets the range between 2000 and 2050 kc.

Two-way police communication is maintained over the frequency band of 30 to 40 megacycles. Summing up, the full range of frequencies used by police is found to have a lower limit of 1610 kc. and an upper limit of 42 megacycles with, as has been shown, certain skips in between.

Frequency-modulation transmission experiments are being carried out in several states. Connecticut is operating upon frequencies between 39.180 and 39.50 mc. New Jersey state police are operating upon 39.780 mc., as is North Carolina. The Chicago police are working on 39.00 mc. plus, the exact frequency being unknown at this writing. Virginia, Rhode Island and Massachusetts state police also are carrying on f.m. experiments and without doubt the frequencies are around 39 mc.



Signal Source: The RCA Signalist.



Signal Source: The RCA Oscillator.

As incidental information, as long as we are talking about f.m. transmission experiments, a power company in the Middle West is working at frequencies which approximate 31.46 mc. to 31.76 mc.

Concerning the allocation of frequencies for municipal and state police operation, they are divided so as to minimize interference. A single frequency is allotted to a state for municipal operation and all stations with-

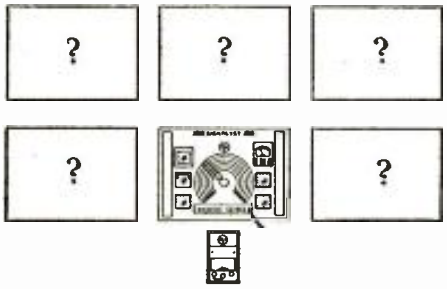



Figure 4. Starting the Test Bench.

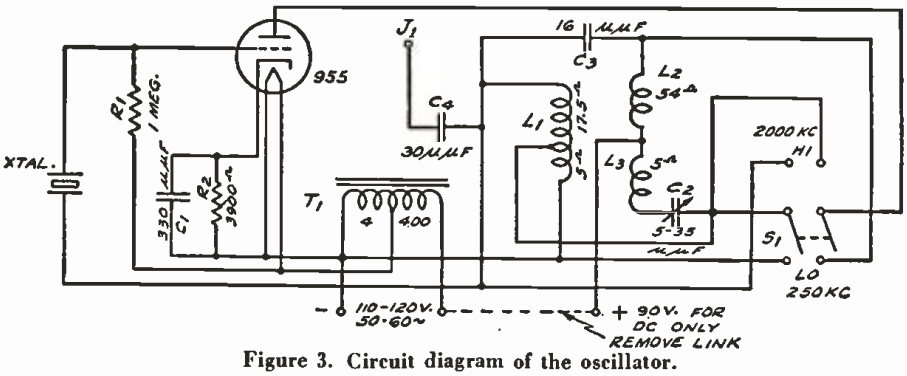



Figure 3. Circuit diagram of the oscillator.

in the same category and within the limits of that state use the same frequency. The same applies to state police. Frequencies are assigned to the different states and similar service employs the same frequency in any one state.

At the present moment, that is, as of September 14th, 1940, according to the FCC, there are about 1000 police installations in the United States operating about 6700 mobile units.

Although concerned primarily with the receivers utilized in these different types of service, some attention must be paid to the transmitters as well. Granted that definite license requirements exist covering the operation and adjustment of transmitters, there is no limiting agencies which prohibit the procurement of the proper type of license by any individual who desires to embark upon this type of service work. Naturally he must comply with certain regulations set up by law. You might call this suggestion to secure a license for such work quite a step, but if we are going to accept the broadest view of what the servicing field really is, it means *everything* that aids its successful development.

Considering the nature of the work, the requirements of such transmitters are entirely within the capabilities of the well-equipped service shop, as will be shown later in this series when we describe different types of transmitters. These transmitters are not of very great power. Usually they are small, for small they must be in order to fit into the cramped quarters assigned to such apparatus in planes, boats and cars.

### Types of Signals

With respect to the types of transmission carried out in the communication field, the signals are of two basic varieties, namely tone modulated during the transmission of various types of beacon signals and speech modulated for communication and when broadcast signals are used for compass work. These are amplitude modulated signals. The experiments being carried on with frequency modulation will no doubt result in the use of that form of transmission of tone modulated and speech modulated signals. But whichever is used, it is no different in general character from those signals which have been received upon receivers that have been coming into the average radio shop, so that nothing new is being presented to the industry.

Concerning the accuracy of frequencies employed in transmitters and receivers, the transmitters are crystal controlled and in many instances the oscillator in the receiver also is crystal controlled. Consequently, the signal source utilized for maintenance work upon such receivers must be capable of a fairly high order of accuracy plus the means of calibration when necessary for definite identification of signal frequencies. This means a signal source and also a calibrating source.

In connection with the detail of accuracy, receivers used in the aircraft and police fields are fixed frequency tuned for specific channel use and invariably are adjusted to a greater degree of accuracy than normally used in sound broadcast receivers. A high degree of accuracy may also be neces-

(*Continued on page* 46)

# AVIATION RADIO

**by CHARLES J. SCHAUERS**

A DEMONSTRATION of actual record communication between airplane and ground by radio facsimile communication, was shown recently at the Bendix airport in Passaic, N. J., utilizing a flying radio laboratory and one ground station for the demonstration.

The entire unit, as installed in the Fokker plane, weighs approximately 35 pounds; operates from either a 6, 12, or 24-volt storage battery; is self-contained, and may be actuated by any radio receiver having an output of 5 watts or more.

Its many uses and advantages to the pilot are quite obvious, because it may be used to provide weather maps, storm warnings, barometric readings, wind velocity and direction, ceilings and other data. The reproductions are then reduced to permanent records and

*Figure 1*

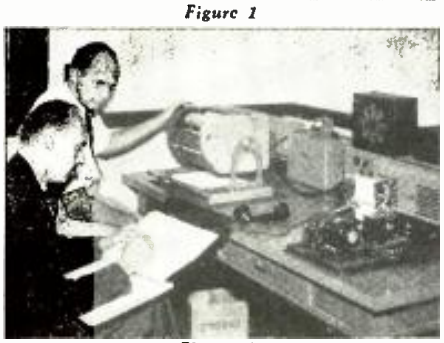


*Figure 2*

referred back to by the pilot when necessary.

This new means of communication is readily adaptable to military as well as civilian aircraft, and opens up an entirely new field in aviation radio communication.

Figure 1 illustrates the complete Duplex Aircraft Unit; showing the power supply at the left of the Duplex Unit; the audio amplifier at the right, and the DB meter between the two units at the right.

Cables are used for inter-connection between relative units which may be placed anywhere in the aircraft for proper weight distribution.

Figure 2 shows a view of the ground station used for the plane to ground demonstration.

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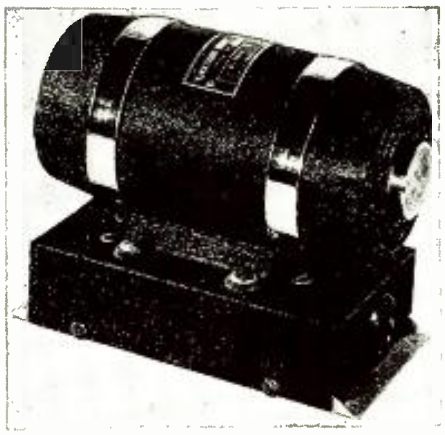
A NEW type aircraft genemotor, used for supplying high voltage for the operation of aircraft radio equipment, is announced by the Carter Motor Company of Chicago. It is of light weight construction, and manufactured in two frame sizes, 35 to 100 watts; and efficiency is increased by using a new type field ring and pole shoes. It has grease packed, double sealed ball bearings, which do not require either oiling or attention. The unit may be operated continuously without overheating, which is very desirable in aircraft radio installations, as well as other types of equipment installations.



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AFTER hearing so much about the acute shortage of qualified radio personnel, one might wonder where Uncle Sam is going to get his qualified aviation radio men, both operators and technicians.

There are many answers to this question, and the main answer seems to be in the installation of "aviation radio courses" by civilian as well as government schools. However, a shortage of qualified instructors is also being experienced and that makes the score "a little less than one!"

From latest reports received, qualified aviation radio instructors are being drawn from the ranks of airline operators and technicians, but this, again, leaves a shortage there. A word from the chief instructor of one of the largest radio schools in the East lends an encouraging light upon the question when he says, "Closer cooperation with governmental agencies is being received every day, and with civilian schools lending their assistance to government schools and vice versa, it won't be long until the existent shortage of all types of radio personnel will be no more."

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FREQUENCY modulated transmission is being put to the test every day by aviation concerns. However, amplitude modulated transmission is certainly taking no back seat, and its popularity is not waning in aviation circles, but frequency modulated transmission is being considered strongly for use by airports for traffic control work, and this will mean new receivers for aircraft who desire to make use of the FM facilities.

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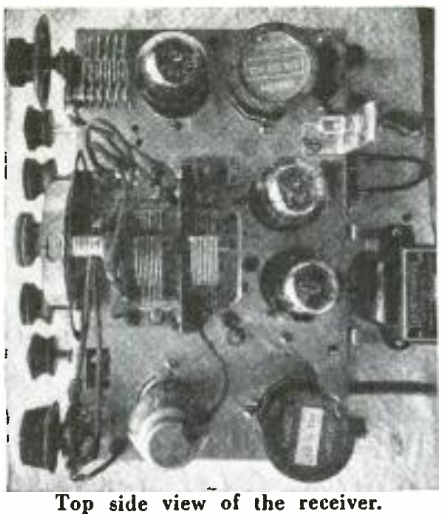
THE aircraft cart, constructed of sheet metal and welded braces, contains two aircraft storage batteries for testing installed aircraft radio equipment. Compartments are

provided on either side of the batteries for holding test equipment, spare parts, and tools.

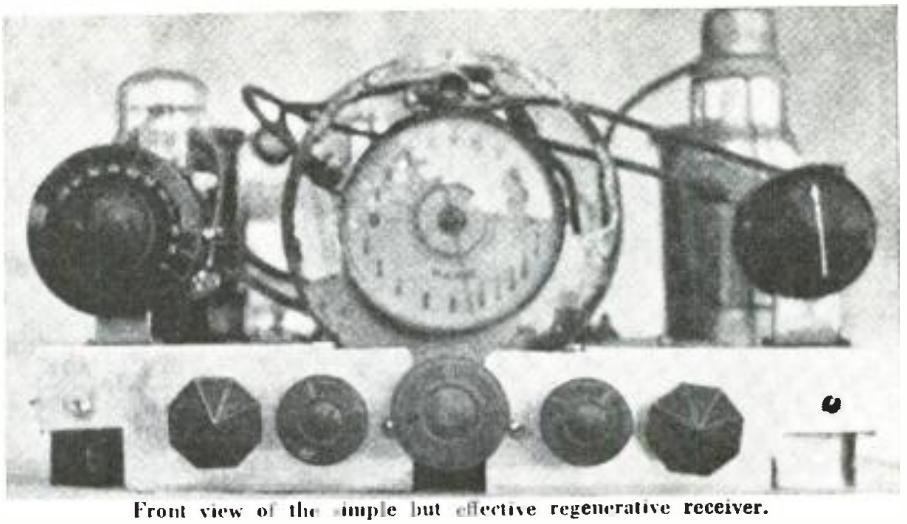
The open cabinet is a combined dynamotor (power unit), tester and "signal tracing oscillator," which is operated from the two storage batteries contained in the cart.

This unit, in conjunction with a pair of phones and test prods, will test any power supply device for ripple, noise, etc., and at the same time provide a means whereby aircraft radio receivers, transmitters, and interphone systems can be quickly tested, by a method devised by the author.

—30—



Top side view of the receiver.



Front view of the simple but effective regenerative receiver.

# IMPROVED REGENERATIVE RECEIVER

by RUDIE C. BARTEL
Comfort, Texas

***This receiver will make a nice unit for the beginner. It is very sensitive and simple.***

THE set herewith described is the result of comparisons of various circuits, and a collaboration of unique methods used to improve the ordinary regenerative receiver, employing one or two tubes.

To begin with, plug-in coils were called for to simplify construction and to improve over-all efficiency. As the author had a desire to strictly "build his own," the coils were hand-wound on "Hammarlund" XP-53 coil forms. The winding data is given at the end of the article.

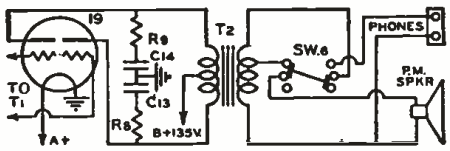
A tuned r.f. stage was necessary to improve efficiency and simplify tuning procedure, by elimination, through inductive coupling to the detector of the usual r.f. coupling condenser. Inductive coupling seems to provide the greatest efficiency. Ganging of C1 works very well, and once C2 is aligned, it can be left alone for any set of coils. Band-spread, a dire necessity, was very effectively provided by C3, a 35 mmf. midget unit.

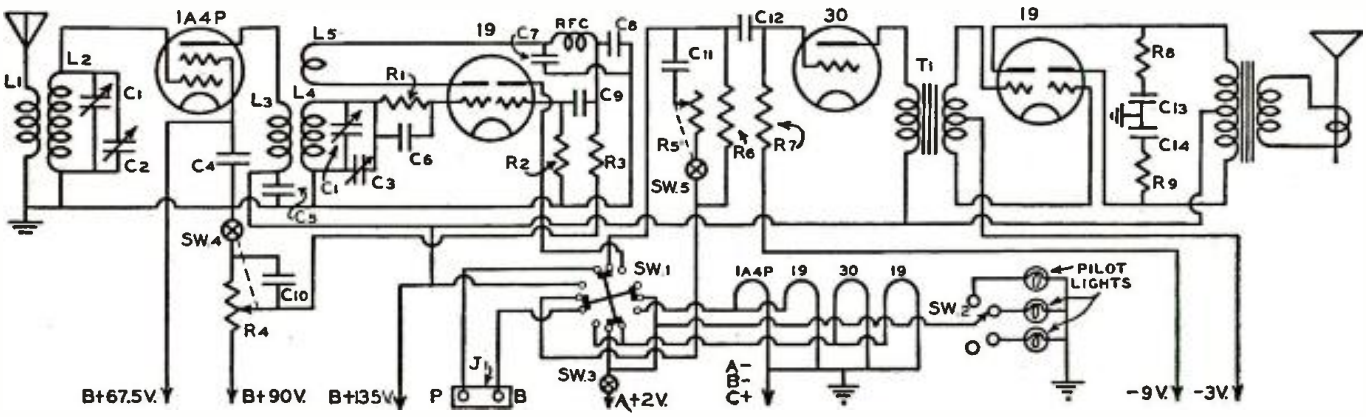
The '19 was used as detector and first audio in order to eliminate the extra tube, if single triodes were used for detector and a.f. The detector is conventional, using a potentiometer for regeneration control.

Hand-capacity effects were also to be eliminated, so the r.f. filter in the plate circuit of the 19 was used with this combination, very little effect of hand-capacity is present.

As the audio portion was to serve as an amplifier for an auxiliary receiver or a small p.a. tuner, an output of at least 1½ watts with fair fidelity was desired. Thus a class B stage using a '19 was chosen. To overcome the inconstant impedance of the speaker load, the resistor—condenser

(*Continued on page* 49)




*$C_1$—140 mmf., each. (Burstein Applebee Co.)*
*$C_2$—35 mmf. compression type trimmer, Hammarlund type EC-35*
*$T_2$—Thordarson output transformer, type T-67S60*
*$SW_6$—D.P.D.T. "Carling" toggle switch*
*$T_1$—Thordarson Driver Transformer, type T-5463 or T-7846*
*$C_3$—"Hammarlund" type "Sm-35-X" band-spread*
*$C_4$, $C_5$, $C_9$, $C_{12}$—.1 mf. 200 v. "Trutest"*
*$C_6$, $C_7$—.0001 mf. "Aerovox" type 1467 mica*
*$C_8$—.0005 mf. Aerovox Type 1467, mica*
*$C_{10}$—.5 mf. "Trutest" cartridge*
*$C_{11}$—.01 mf. "Trutest" cartridge condenser*
*$C_{13}$, $C_{14}$—.05 mf. "Tobe" No. M-50*
*$R_1$—2 meg. ½ watt I.R.C. Type BT-½*
*$R_2$, $R_7$—.25 meg. ½ watt I.R.C. type BT-½*
*$R_3$, $R_6$—50,000 ohms ½ watt I.R.C. type BT-½*
*$R_4$—Yaxley—Y-50M-P, 50,000 ohm*
*$R_5$—Centralab 50,000 ohms tone*
*$R_8$, $R_9$—5000 ohm I.R.C. type BT-½, ½ watt*
*$SW_4$, $SW_6$—S.P.S.T. "Snap-on" switches (on controls $R_4$ and $R_5$)*
*$SW_1$—Yaxley type 1312-L, 4 circuit, 2 position switch (non-shorting)*
*$SW_2$—Jones 4-point tap switch*
*$SW_3$—Carling S.P.S.T. Rotary Switch*
*R.F.C.$_1$—2.5 MH RF choke*

# What's NEW in Radio

*Presto Recording Corporation*, 242 West 55th Street, New York, N. Y., announce a new blower system. This new attachment makes possible the clearing away of shavings cut from recording discs during the process of recording. The blower mechanism comprises two units. One, resembling an amplifier, connects to the regular 110 v. line. The other comprises a special hose attachment and nozzle which fastens to the cutting

arm. A powerful stream of air is directed across the surface of the disc towards the hub and automatically keeps the disc free from grit or other matter which would cause surface noise to result. This unit may be attached to any type of recorder which cuts from the outside-in. The *Presto Recording Corporation*, 242 West 55th Street, New York, N. Y.

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An entirely new type of band for adjustable tubular power resistors developed by *International Resistance Company*, Philadelphia, Pa., eliminates annoying problems frequently met with in using units of this type.

The design and construction of the new IRC adjustable band are such as to assure positive pressure at all times, without danger of wire breakage or damage and without oxidation or corrosion at point of contact. The band cannot be adjusted too tightly and is designed and tempered for temperatures above those met in resistor operation.

The band is of cold-rolled steel, heavily cadmium plated. Contact is made through an opening in the band by a corrosion-proof silver button spot-welded to a stainless steel spring spot-welded to the outer surface of the band. Thus, no matter how much the band itself is tightened, the pressure of the button on the windings remains safe, constant and positive. No matter how often the band may be readjusted for tapping off different resistance values, there is no danger of damaging the resistance windings.

A flexible section at the top permits easy bending for attaching band to resistor, and assures a quick return of the band to its normal round shape once it is in place. Use of the new band is further facilitated by the fact that no nuts or washers are required. There is only one screw to tighten—the thread being on the band itself.

A free sample IRC Power Wire Wound Resistor with the new band will gladly be supplied to manufacturers of original equipment or operating companies upon receipt of specifications. A new IRC Resistor Data Bulletin IV-A gives full details of this new development.

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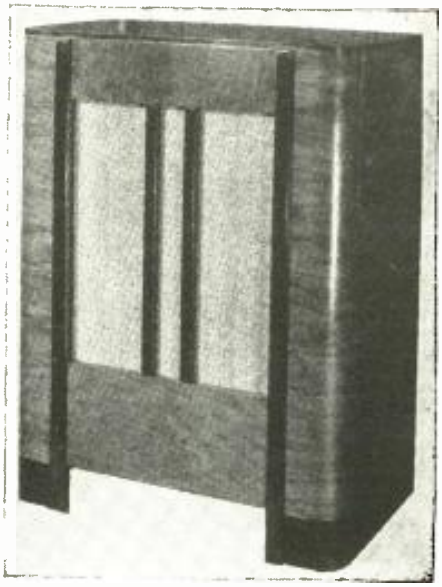
A new 15¼-inch High Fidelity loudspeaker mechanism, available either separately or with wall housing or beautiful console cabinet, has been announced by the Commercial Sound Division of the *RCA Manufacturing Company*. It is designed for use wherever tops in tone quality and fidelity are required, such as in music rooms, audition studios, school auditoriums, dance halls, night clubs, etc.

Also announced was a new type of baffle designed for mounting four 7-inch "accordion edge" High Fidelity RCA loudspeakers in both the new cabinets.

The 15¼-inch permanent magnet loudspeaker handles 15 watts of power, excellent for reproducing phonograph recordings or other sound under conditions of high noise level. The voice coil (impedance 8 ohms) is completely dust proof. It is designated as model MI-6237.

The console cabinet designed for the new mechanism is a brilliantly finished walnut unit built to give correct acoustic response. An acoustic phase inverter circuit is built into the cabinet to extend low frequency response. Model MI-6222, the cabinet stands 32" high, 24" wide and 14" deep.



The wall housing for the new speaker is of heavy veneer, finished in umber grey or, for installations where it is desirable to paint it to match its surroundings, in a neutral color. It measures 28" high, 19" wide and 13" deep, and is designed to give proper acoustic response. It is designated as Model MI-6223.

The new baffle (MI-6224) is cut to mount four RCA 7-inch "accordion edge" loudspeakers (MI-6234) in either the console cabinet or the wall housing mentioned above. Four matching transformers are supplied with and mounted on the baffle.

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*Universal Microphone Co.*, Inglewood, Calif., in October started to distribute its new KD model dynamic microphone to fill what it believes is a long-felt need in the price range. It will list at $16.25 including ten feet of cord. KD will be a running mate for the KO model crystal microphone.

They have introduced a novel innovation for their professional recording machine through the use of the new fluorescent light over the turntable. Besides "dressing up" the equipment, the light will be extremely useful for the microscopes in examining grooves. It will be furnished at slight extra cost.

The company is now also furnishing a 72-150 adjustable power rack and pinion microscope on its professional recording machines as standard equipment. It has a field of seven lines and is used in conjunction with the fluorescent light. Operation is thereby simplified. It is lightweight, includes an adjustable wheel, and is finished in ebony bakelite and polished chrome.

---

A newly-engineered radio receiver which will make available programs broadcast by frequency modulation as well as standard American broadcasts and domestic and foreign short-wave transmission, has been announced by the *General Electric* radio and television department, Bridgeport, Conn. The new receiver, designated Model JFM-165, and carrying a recommended list price of $175 in most sections of the country where FM programs are now or shortly will be available, is the first combination model to be built by *General Electric* since the recent formal allocation of commercial frequency-modulation transmission channels by the Federal Communications Commission.

One of the most interesting features of the new receiver to those who have been enjoying the limited FM programs of the past year are the triple beamascopes, built-in antennas developed by *G-E* radio engineers. Each antenna has been designed for a special purpose, and in the majority of cases the need for an outside antenna or ground connection has been eliminated.

The standard broadcast beamascope, first adopted by *General Electric* for regular a.m. receivers three years ago, is a highly efficient antenna designed for the reception of programs on the standard broadcast band. The new short-wave beamascope, added to several models in the 1940 line, makes possible the reception of foreign and domestic short-wave programs with a much higher degree of sensitivity than was formerly experienced except by means of a special outside antenna. The FM beamascope, latest development along the same line, is a built-in

dipole antenna which eliminates in most circumstances the more complex outside dipole which has been standard for most FM receivers during the past year. In certain areas, and depending to some extent upon the power of the FM station being picked up by the listener, it will still be necessary to rely on an outside antenna of this type. With the growing popularity of frequency modulation because of its static-free characteristics and high-fidelity transmission, it is probable that transmitters of relatively higher power will be placed in service, thus easing the antenna requirements of the set owner.

---

All *Mallory* Tubular Paper Condensers—Types TP (wax-impregnated, wax-filled), OW (oil-impregnated, wax-filled) and OT (oil-impregnated, oil-filled)—now bear a brilliantly colored label which gives better visibility to capacities . . . and instantaneous recognition of voltages by


means of a bottom band of color properly coded to RMA specifications.

The color-code band goes completely around the condenser so that it may be readily seen and the voltage identified no matter how the condenser is placed in the set. Construction remains unchanged; the labels are merely applied over the customary cardboard tube and wax coating.

Shipments of all types are already being made to *Mallory* distributors, and the trade will be told of the new convenience through both publication and direct advertising in full color.

---

The new AUDIOGRAPH Model AMR-15C is a fifteen watt amplifier with built-in phono top, that operates from both 6 volt battery and 110 volt a.c. Because of its extreme low price,

$69.50 list, it is very attractive for use in election installations. Optional equipment includes a two piece leatherette carrying case, which houses two p.m. speakers and all accessories.

New descriptive bulletin is available on request to the manufacturers, *John Meck Industries*, 1313 West Randolph St., Chicago, Illinois.

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, *Sprague Products Company*, North Adams, Mass., has introduced a line of Atom-type midget dry electrolytics, known as *Sprague* Type LM.

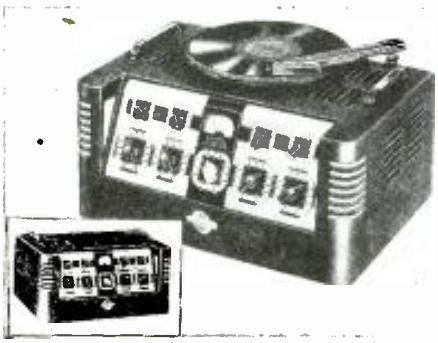
LM Condensers incorporate the same small size and the same dependable construction features which have resulted in such widespread use of *Sprague* Atoms, even in replacing much larger and more costly old-style dry electrolytic condensers. They are enclosed in a sturdy cardboard tube with *Sprague* inner 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.

Extreme sturdiness, both mechanically and electrically, characterize the new power rheostat just introduced by *Clarostat Mfg. Co., Inc.*, of 285-7 N. Sixth St., Brooklyn, N. Y. The design for this control is said to be the net result of several years of engineering effort, including the building and scrapping of many models before evolving the final choice.

Selected resistance wire is wound on an insulated aluminum core. The resistance element is bent round, placed in the slot of the ceramic shell, and firmly imbedded in a cold-setting inorganic cement similar to that used for the well-known *Clarostat* Greenohm power resistors. This construction provides maximum heat conduction and dissipation from winding to special ceramic casing. No corrosion of the wire is possible, nor any weakening, since no high temperatures are required in setting the cold-setting cement used.

A graphited-copper contact shoe rides the brass third-rail ring and the winding, with a positive, velvety sliding contact. The ingenious tripod-type rotor provides for a three-point support on the brass contact ring and the winding, against the concealed helical spring pressure, for the smooth, easy, non-binding rotation. The rotor is insulated from the metal shaft by a center ceramic insulator. The rheostat may be mounted in any position with regard to its terminals and knob rotation, by means of the adjustable locking pin and disc. For the present, only the 25-watt size is available, but larger sizes will follow shortly.

The *Transformer Corporation of America* announces the addition of a new amplifier to its line of CLARION Sound Equipment.



For incomparable efficiency at extremely high power, this amplifier is the perfect choice. Every advanced feature essential to the production of a terrific amount of volume, with superb quality, has been included. The circuit includes 4—6SJ7; 3—6C8G; 1—6C5; 1—6F6; 2—83; and 4—6L6G beam power tubes in inverse feedback. The microphone gain is 125 db. Rated output 71 watts, peak output 99 watts. To facilitate connection to the speakers, four speaker outlets are included. Six input channels allow simultaneous operation of four microphones and two phones.

This amplifier complete with tubes and Volume Indicator Meter, and known as Model No. A-93K, lists at $157.55. The identical amplifier, equipped with a built-in record player, designated as Model No. A-95 K, lists at $176.03.

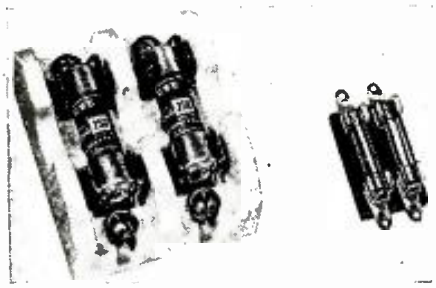
For additional information and CLARION catalog, write to the *Transformer Corporation of America*, 69 Wooster Street, New York, N. Y.

City sponsored concerts with internationally famous guest conductors and soloists appearing in Grant Park, Chicago, throughout the summer months have become one of the country's outstanding musical events.

The installation of sound equipment without the use of a multitude of speakers to amply cover the vast area of Grant Park has been the subject of much engineering experimentation. The installation award was won by the new *Jensen* Type B full range heavy duty systems. Only two of these new units were necessary to provide ample sound for the great audiences. Each unit consisted of 2 Type X *Jensen* High Frequency units; 1—32 cell multicellular horn, 2 Low Frequency speakers with Horn and Frequency Dividing Network.

In announcing the new *Jensen* Type B full range heavy duty systems *Jensen* claims to have met all the requirements essential to peak performances outdoors or indoors. The new units are so constructed that by combining the proper number and kind of system B components a small listening audience or one practically unlimited in size may be accommodated. *Jensen Mfg. Co.*, Chicago.

*Littelfuse, Incorporated*, are now manufacturing Underwriters' approved 3-AG glass enclosed fuses in ratings up to 8 amperes for 250 volt a.c. or d.c. service or less. This is the first time any manufacturer has the Underwriters' Laboratories approval on 3-AG fuses (1¼"x¼" dia.) in current ratings over 3 amperes.



This extension of Underwriters' approved fuses from 3 to 8 amperes opens up many new fields that previously had to use bulky cartridge or plug fuses and their mountings. This applies especially to electric appliances, heavy duty power supplies, amplifiers, radio, motors, etc. *Littelfuse's* new "sleeve type" 3-AG fuses (4 to 8 amps. incl.) have a separate glass sleeve over the entire fuse element that takes the pressure shocks under short circuits. (The 8-amp. rating fuse is powder packed.) The illustration shows space savings possible by using the new 3-AG approved fuse instead of the standard cartridge type. At the left are shown two 250 volt cartridge fuses in bulky and heavy porcelain mounting that measure 2¾"x3⅜"x1⅜" (12.76 cu. in.). At right, and for the same service, are two 250 volt *Littelfuse* 3-AG Underwriters' approved fuses and mounting with overall dimensions (including terminals on mounting) of 1"x2"x2⅝" (1.25 cu. in.). Remarkable space savings are possible as is represented by this example where the actual saving in space is 11½ cu. inches. Bulletin, technical data and prices may be obtained from this publication, or by writing to *Littelfuse, Incorporated*, 4757 Ravenswood Avenue, Chicago, Illinois.

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 5U4G 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.

The entire ensemble is housed in an extremely attractive moderne walnut console, entirely in keeping with the ultra-modern nature of the equipment it incloses.

*Allied Radio Corporation*, Chicago, presents a new cleverly styled KNIGHT 5 tube radio in the low price field. Tuning range covers two bands, 540-1630 kc. and 2.8-6.5 mc. Outstanding features include: the new "Magna-Beam" built-in loop aerial (also has provision for outside aerial if so desired); big airplane dial; A.V.C.; 5-inch dynamic speaker; new Piano-Key push-button tuning on four stations, etc. This set develops 1½ watts Beam Power output. A 1941 circuit, fully licensed by R.C.A. and Hazeltine, includes

the latest tubes as follows: 12SA7, 12SK7, 12SQ7, 50L6GT, 35Z5GT. Also has a ballast BT-1000. The cabinet housing the KNIGHT 5 is handsomely streamlined and is of molded plastic, featuring softly curved lines and louvre-type grille. Cabinet measures 12"x7¾"x7". Operation is from 110 volts 40-60 cycles a.c. or 110 volts d.c. MODEL B10532.

A product of *Allied Radio Corporation*, 833 West Jackson Boulevard, Chicago, Illinois.

*Talk-A-Phone Mfg. Co.*, Chicago, presents a new, low-cost Combination Record Player with built-in Amplifier. Specifically designed for high-quality reproduction of both 10-inch and 12-inch records. Completely self-contained in a single, attractive case; available at a popular price. The powerful amplifier uses 3 tubes with Beam Power output. Delivers astonishing 2-watts power output. Uses oversize-magnet P.M. Dynamic Speaker. Includes: self-starting, quiet 78 r.p.m. rim-drive motor; light-weight, high-fi-

delity offset-head Crystal pickup with minimum record wear; volume control and on-off switch; pickup arm-rest. The *Talk-a-Phone* Complete Player-Amplifier is beautifully presented in a compact case covered in washable waterproof, woven-effect leatherette cloth. Measures: 17½" wide, 12" deep, 8½" high. Weighs approximately 9 lbs.

Model 132 Super-Auto Demonstration Pack is offered by the *Standard Transformer Corporation*, Chicago.

It is a well filtered unit, delivering 12.5 amperes at 3 to 6 volts with a minimum of ripple. It will operate the largest auto radio set all day for but a few cents. It is also very useful to the servicemen to test auto radios. The industrial and special users too, will have many uses for this unit, as it may be used for operating many 6 volt auto accessories, horns, heaters, etc.

It has many applications in the plating field when small lots are being required.

The Super Pack is housed in a beautiful,

modern, streamlined case, attractively finished in black wrinkle. The meter indicates the correct voltage on the output. A tapped switch on the primary of the transformer gives variations to the output voltage. This feature is useful particularly in testing auto radios or in plating where different voltages are required. A fuse in the primary circuit protects it against any shorts in the transformer. An overload relay in the output protects the rectifier and other components against injurious load. All component parts of the pack are designed for long life.

Additional information on the units, as well as other companion units is available from the *Standard Transformer Corporation*, 1500 N. Halsted St., Chicago, Ill., U. S. A.

The Determohm Resistance Box, a product of the *Ohmite Manufacturing Co.*, is now available in 2 new ranges, one of 1 to 9,999 ohms and the other of 10 to 99,999 ohms. These sizes are in addition to the 100 to 999,900 range box previously available.


The *Ohmite* Determohm is a decade resistance box of ± 5% accuracy for industrial and laboratory uses, for radio service men, engineers, experimenters, and schools. One of the chief uses of the Determohm is in the determination of replacement resistors in radio sets. It may also be used as a voltmeter multiplier, or can be used with auxiliary apparatus in an ohmmeter, resistance bridge circuit or in many other applications.

The resistance element is made up of wire wound resistors which are connected to tap switches. The Determohm may be connected directly in radio and electrical circuits which do not cause the instrument to dissipate more than one watt for each tap in the circuit.

The *Ohmite* Determohm is enclosed in an attractive wrinkle-finish black metal case, and the range of each box is covered by means of four switches. Overall dimensions of the Determohm are: width 6 3/16", length 8⅛", depth 3¼".

*Ohmite Manufacturing Company*, 4835 Flournoy Street, Chicago, U. S. A.

The *General Cement Mfg. Co.*, 919 Taylor Ave., Rockford, Ill., announce a new contact and attenuator service kit that eliminates noise and prevents corrosion. An ideal kit for cleaning noisy attenuators, tuners, all-wave switches,


variable contacts, etc. Kit consists of special contact cleaner and special corrosion resistant lubricant. With this Kit you can easily clean those noisy controls and 9 times out of 10 without dismantling the chassis or control unit.

—30—

# SERVICEMEN'S LEGAL ADVICE

BY
TIMOTHY J. HEALY
Counselor-at-law, New York, N. Y.

**MANY servicemen have asked a very pointed question. "Can I use a trade-mark to distinguish my sets and work from that of my competitors?" Sometimes a trade-mark can be used and sometimes it cannot. Since the question is one of general interest, we obtained permission from Beekman Aitken to reprint from his very concise and enlightening monograph, "What's in a Name?" (Copyright, 1940). By reading it the serviceman will see just when he may apply for and use a trade-mark and when he will not be able to do so. T.J.H.**

IT is an easy matter to purchase commodities by their brand name. The housewife daily and usually through habit, purchases articles by names. She may have been using the trademarked product for years or had just heard of it over the radio for the first time that morning. It rarely occurs to her that trade-marks are of ancient origin. Man, from time immemorial has placed his mark upon his wares to identify them as his and to distinguish them from others.

Today some marks are known the world over. The marks VICTROLA for phonographs, WHITE HORSE for whisky, KODAK for cameras and VASELINE for petroleum jelly are known in all parts of the globe. The Celluloid Corporation is owner of the trade-mark CELLULOID. This word is the exclusive property of that company. We might manufacture excellent material but we could not call it CELLULOID. Other famous marks which may be used only by their owners include ANACIN, THERMOS, DICTAPHONE and MIMEOGRAPH.

Trade-marks have become one of the most valuable assets of manufacturers. Over sixty million dollars have been spent in advertising the trade-mark COCA-COLA. The trade-marks LUCKY STRIKE and MAXWELL HOUSE have been conservatively evaluated at forty-five and thirty million dollars respectively.

Careful consideration should be given in selecting a trade-mark. Some qualifications of a good trade-mark are: It should be easy to spell, pronounce and remember, simple in design, suggestive of the good quality of the goods, and different from other trade-marks under which similar goods are sold.

The trade-marks MY-T-FINE for desserts, SUNKIST for oranges and SANI-FLUSH for cleanser have all these attributes. Single words such as ENO, TEK, MUM, KIX and LUX make excellent marks. Coined words are most frequently used as trade-marks. Some which have been most successful in their respective fields include RESINOL for ointment, KOLYNOS and PEBECO for tooth paste, MOLLE and BARBASOL for shaving cream, and VITALIS and GLOSTORA for the hair.

A trade-mark is any distinctive word, emblem or symbol or combination of these used on goods to indicate or to identify the manufacturer. There are a wide variety in use. Pictures such as those of AUNT JEMINA for pancake flour, or the OLD DUTCH girl and the GOLD DUST twins for cleaners are splendid marks. Many persons make purchases by pictures and this "point out" habit should not be overlooked.

Slogans, such as "HIS MASTER'S VOICE" and "GOOD TO THE LAST DROP," may be protected as trade-marks if they appear upon the containers of the goods sold.

These are usually registered separately from the name of the product.

Initials and arbitrary numbers or their combination, such as GE, 57, or V8, are also valid trade-marks. The name of a person, firm or corporation may be registered when presented in a distinctive manner, in association with a portrait, or in autographic form.

But not all words or symbols may be registered as trade-marks. Marks which are descriptive of the goods, such as KANT-LEEK for hot water bottles, and SPEAR-MINT for chewing gum, cannot be registered. Marks which are geographical should also be avoided. Registration of KEM for playing cards was refused as being the name of a Russian river, and TOBASCO for a sauce was refused because it is the name of an estate in Mexico.

The name of a living person may not be registered without his consent; the names of deceased persons however may be used. It follows that before adopting a brand name the search should include a check with the fifty or more thousand names in the Post Office Directory and geographical names in approved atlases, as well as the names of well known persons.

Words in common use in the trade, such as AIR-CONDITIONING for storm windows, and STRAIGHT CUT for cigarettes, may not be registered as they do not indicate the origin of the goods.

Before the turn of the century, little difficulty was had in selecting original names for new products. However, with business expansion over a million trade-marks are now in use, and unless great caution is exercised difficulties are likely to result in selecting a brand name. As early as 1872 the Patent Office, realizing the possibility of confusion to both manufacturers and consumers through simultaneous use of the same or similar marks, established a division for registration. Subsequently, all goods were divided into fifty classifications. One is permitted to register in any class which has not been closed by another registering the same or a similar mark. However, marks in the textile and clothing classifications and those in the soft drink, beer, wine and hard liquor classifications are held in conflict with one another. The Patent Office has thus become the point of central search for those adopting new brand names.

It is essential that the trade-mark adopted be original. A careful search of Patent Office and common-law records should be made before it is adopted. However, the Patent Office does not make searches. A competent attorney should be engaged for this purpose. If a mark is chosen similar to one used by another for a product in the same or conflicting class, the Patent Office will refuse registration and the person who first adopted the mark may usually enjoin use of the same, require all labels to be destroyed and may possibly obtain damages for unlawful use. This is true irrespective of innocent intentions and the amount of money expended in making labels and cartons and in advertising the trade-mark. And it has been held by the Supreme Court of the United States that even disuse for five years will not destroy the rights of the first user to exclusive use in a brand name. But where two manufacturers use the same mark for the same class of goods in markets remote from one another, an injunction will not be granted against the later user, as no present or future competition is likely. Generally, however, priority of use is the governing factor and the first user is fully protected to exclusive use of the mark in all markets in which his goods have been sold or have become known under the trade-mark or in such territory where they are likely to become known through reasonable business expansion.

In trade-mark litigation, the test of similarity is whether the marks are sufficiently alike in appearance or wording, or sound, to mislead the average individual. The mark LADY LIKE for shoes was considered too

(*Continued on page* 63)

# Ringing the Bell


**How to follow up repair jobs to get more work from these same sources.**

**by SAMUEL C. MILBOURNE**

Expert Serviceman, Greenwood, Miss.

THIS month we will present several good ideas for increasing repair sales by direct mail.

Every serviceman should have an alphabetical list of customers' names and addresses and the date they last used his service. If you do not have your list, you'd better start compiling it *right now*. Remember that these names are not picked out of the air as *possible* prospects for your service, but each and every one of them has patronized you one or more times and thus is familiar with you and your service. Don't let these good customers slip away from you, hold them with direct mail advertising!

Periodically, let us say four times a year, you should write your customers a letter, reminding them that you are still in business, that you still want their business and that it is time they again visited you. Determining the correct actual time-cycle of your service may vary with the ideas of the individual serviceman. Personally, we believe that once a year should be the correct period for each radio.

Thus, we recommend the following letters to be spaced as suggested below:

### One Week After Repair

Dear Mr. Smith:

We were very happy to have had the pleasure of servicing your radio receiver last week, and we are taking this opportunity of thanking you for your patronge.

It is our hope that your radio receiver now is operating as well as, if not better than, when you first purchased it. If you do not find this to be the case, please do us the favor of telephoning and reporting the trouble.

We have used the best tubes and parts in the repair of your receiver, we have tested and repaired it by modern servicing methods, and with the latest in test equipment. We want your satisfaction and your continued patronage—that's why we try always to do the *best* service work.

By the way, if you have found our service satisfactory, we really would appreciate your telling your friends about it.

Thanks again! It was a pleasure to serve you!

Cordially yours,
John Doe (signed)
JOHN DOE RADIO SERVICE

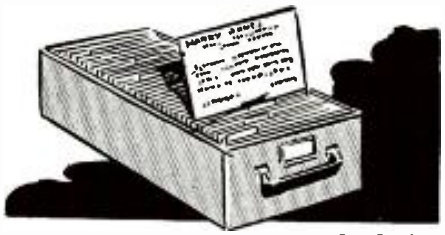
### Three Months After Repair

Dear Mr. Smith:

This is just a note to assure you that we are still appreciative of the repair business you gave us on your radio receiver about three months ago.

Whenever we consider the purchase of service, whether it be laundry, dry cleaning, refinishing a chair, or the repair of an electrical appliance, we are usually anxious to know who performs these services for our friends. If a friend recommends a certain firm as being good in its line, we most likely will act on his recommendation.

That is why we would appreciate your remembering us when your friends' radios are in need of repair. If you will recommend us, we pledge



Make constant use of the card-index!


Keep letters going to your customers!

you that we will do our best to render satisfactory service at a reasonable price and that your recommendation of our services will not be a source of later embarrassment to you.

And, of course, should you, yourself, need quick, efficient radio service in the future, please do not forget that we are as near to you as your telephone. Just phone 1234.

Thank you!

Cordially yours,
John Doe (signed)
JOHN DOE RADIO SERVICE

### Six and Nine Months Later

These two letters should stress the value of keeping a radio receiver in first class condition and the value of having it serviced by you (due to your expert knowledge, equipment, etc.). The actual text will vary with the individual. Another idea would be to use a series of 4 post cards at this point, spacing them at the 6th, 8th, 10th and 11th months after repair. Such post cards can be obtained from your tube manufacturer and cost only the postage. They make excellent reminders of your service.

### One Year Later

Dear Mr. Smith:

Time certainly flies, for it has been over a year since we have had the pleasure of serving you in the repair of your radio receiver. Although your radio may appear to be working correctly, there are many parts which deteriorate with age, such as tubes, filter condensers and speaker cones.

We have found, from our experience, that a check-over once a year often will find some defect which a minor repair will remedy, eliminating a costly repair at a later date. You know that if you have a cavity in a tooth, your dentist can fill it and save the tooth, but if you let this cavity grow, you may finally lose the tooth. You know that a periodical check-up of the performance of your car often eliminates large repair bills later on. The same applies to your radio receiver and, after all, your radio receiver gives you more for your money than any other commodity you can buy today.

Let us give your radio and aerial a check-up—our charge is, as you know, most reasonable for the high quality of our workmanship.

Cordially yours,
John Doe (signed)
JOHN DOE RADIO SERVICE

### 15 Months After Repair

Dear Mr. Smith:

As a good customer of ours, we are mighty interested in seeing that your radio is giving you the very best reproduction possible.

However, it's been a long time since we've had a chance to examine this radio receiver of yours. (About 15 months.) Now a lot can happen to a radio in 15 months, and a lot of troubles aren't noticeable until "Blooey," some night your radio set may just stop playing right at the most interesting part of the program.

To forestall any troubles, give us a call (phone 1234) and we will put your radio in first class condition at our usual reasonable rate.

Thanks!

John Doe (signed)
JOHN DOE RADIO SERVICE

A direct-mail sales campaign among your customers for aerial installations should prove very successful if you write a convincing story. The following illustrates the point.

Dear Mr. Smith:

As an automobile owner, you wouldn't operate your car without tires, or with only one or two tires on the wheels. By the same token, as a

radio receiver owner, we know that you are doing just that, when you operate your radio receiver with an inferior aerial, or no aerial at all.

The aerial, the lead-in wire and the ground connections to your radio are its means of picking your favorite programs from the air with a minimum of noise and static. The better this system is, the better your reception will be. The poorer the system of aerial, lead-in and ground, the poorer and noisier will be your reception.

Phone us at 1234 and let us give you a special price on a modern aerial and ground system. We are specialists in this line.

We guarantee that if your reception is not improved by the installation of one of our aerials, there will be no charge.

That's fair enough, isn't it? You take no risk—you make a real gain in radio reception and you get the complete job at a *special* price.

Remember, phone 1-2-3-4 for *guaranteed* aerial service. Thank you!

Cordially yours,
John Doe (signed)
JOHN DOE RADIO SERVICE

There are many forms of direct-mail advertising—some are very clever and depend upon a "new approach" to get attention. For instance, there is the idea of pasting a new penny to the top of each letter and asking the prospect if he will risk it to obtain more information on the particular product. Then, there is the type which stresses the fact that the goods will be sent on free trial. These are not, of course, applicable to radio service work.

We find that a straight-forward letter, preferably simple in text and with a "friendly," "let-us-help-you" slant seems to get the best results. If you want to send out a "different" letter, write about the value of owning a properly operating radio receiver and the low cost of up-keep as compared to the millions of dollars of free radio programs. Or, if you have just purchased a new "signal-tracer," tell your customers about it, stressing the lower operating costs and, thus, the lower labor charges which will result from its use.

Now take several sheets of paper and a pencil, and go to it. You, too, can "Ring the Bell" with effective direct-mail advertising if you give it some thought.

ALTHOUGH a discussion of test instruments is outside the direct province of this department, we do want to take a little space in which we desire to urge you to consider the addition of a signal tracer to your test equipment this year.

Frankly, we personally seemed to get along very well without one until a few months ago, when we opened up the pocket book, gave the moths an airing and planked down the necessary government lettuce for a signal tracer.

Since then, we have been increasingly surprised that we got along so well without one. The time which can be saved by using a signal tracer (not to mention the savings in frayed nerves) is really remarkable. May we heartily recommend your early consideration of one for your shop?

Just a word of warning. No signal tracer can do your *thinking* for you. As a matter of fact, fully to appreciate

(*Continued on page* 44)


**Manufacturer's Specifications**

**Make:** Speak-O-Phone.
**Model:** RM-16.
**Manufactured by:** Speak-O-Phone Recording and Equipment Co., 23 W. 60th St., N. Y. C.
**Motor:** GE constant-speed, heavy duty.
**Turntable speeds:** Dual 33⅓ and 78 r.p.m.
**Cutting Head:** 15 ohm magnetic—high fidelity.
**Drive:** Inside rim driven.
**Table:** 10 pound precision aluminum-balanced.
**Feed:** Underneath positive drive.
**Amplifier:** Not included (for external amplifier).
**Remarks:** Cuts all discs from 6" to 16" at either the standard speed of 78 r.p.m., or at the transcription speed of 33⅓ r.p.m. outside-in. Its lightweight makes possible the design of a portable unit in two cases that may be carried conveniently. Mounted in a sturdy grey canvas covered case. May be connected to your amplifier or radio for off-the-air recording.

**Description**

The Model RM-16 Speakophone dual speed recorder features: Underneath positive drive to a tru-tangent recording arm. 10 pound precision machined aluminum turntable, High-fidelity 15 ohm magnetic cutter, and a

heavy-duty GE constant speed motor. The entire assembly mounts in a canvas covered case measuring 20"x20"x13" and may be carried about with little effort compared to most 16" recorders. The machine is designed to be used in conjunction with an external amplifier such as is used for the recording studio contained in another article in this issue. The amplifier should be capable of excellent fidelity in order that first class recordings be made. The use of an undercarriage type of drive provides a considerable amount of height to be conserved on the inside of the case compared to conventional overhead feed-screw types of drive.

**Comments**

This recorder is a new item on the market and its design has been brought about by a demand for an instrument that would include all features needed for the making of high grade recordings either as a permanent setup or as a portable unit. This has been made possible by simplifying the drive mechanism and by reducing the weight of the turntable to a satisfactory amount that will permit steady torque, smooth positive drive, and freedom from wows without the extra weight commonly used on this type of recorder. The weight of 10 pounds is sufficient when used in conjunction with a constant speed motor of good power capabilities, and a GE unit fulfills this in a most efficient manner.

The recording amplifier should be capable of furnishing at least 5 watts of undistorted power. Although only a small part of this power is actually required in cutting a record, the reserve is needed for specific applications. The amplifier must possess excellent regulation and be free from any trace of hum. It should also include provisions for both microphone and tuner inputs as well as the conventional playback pickup. Several types of pickups are available on the market that may be used on this recorder. If one wishes high-fidelity results he would do well to consider one of the pickups featuring the "permanent sapphire stylus" that requires no change in order to play back records many thousands of times. These are available in the proper size to fit the Speak-O-Phone RM-16 recorder and plenty of space is allowed on the assembly for proper mounting of the pickup. Inasmuch as a magnetic head cuts records at the conventional "constant velocity" characteristic, a crystal pickup must be equipped with a proper network to match the type of recording procedure used. The manufacturer of the pickup includes this information in the carton when the unit is purchased.

The weighted turntable is rim-driven. This gives positive drive to the table at the inside of the rim where a steady pressure is maintained and which keeps the speed constant at all times. This is highly important for first class results and the maker has accomplished this in a most efficient manner.

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**The Reader Asks**

***What features should I consider as being most important when selecting a recorder from the open market? I don't want to spend more than $150.00 for all of the equipment needed to make good records.***

*ANSWER: First of all—study the claims made by the manufacturer of the recorder and compare these with claims made by others. Second—be sure that the turntable has sufficient weight to permit accurate and steady rotation when under load (press the finger lightly against the revolving table at the side and see if this slows down the table. If it does, the drive might not be sufficient). Third—Determine the quality of the pickup and cutting head by having a record made from some radio program and compare the results against the original as it is heard direct through the amplifier. They should be heard alike. If these tests prove satisfactory —then determine whether that particular model includes a built-in amplifier, radio tuner, etc. If it does, and the price is within the budget, that is the one to consider for purchase. There are so many good recorders on the market today that it is rather hard to make a choice, but like a radio receiver, the best test is by ear. Most recorders selling at the price you have in mind, include a built-in amplifier, operate at 78 r.p.m. only, and cut records up to the 12" size. Some of them include radio tuners, while others do not. At any rate, the selection is not difficult to make if the above recommendations are considered.*

*Furthermore—many recorders sell for less than $150.00 Many of these are limited to the cutting of recording discs that are less than 12" in diameter and are, therefore, not capable of giving as much playing time as those designed for the larger sizes. While this explanation does not apply to all of the recorders, it does not take in the majority of the light-weight machines that possess a standard under-drive cutting mechanism.*

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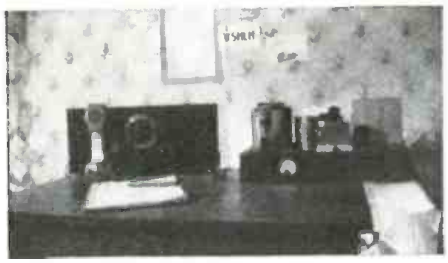
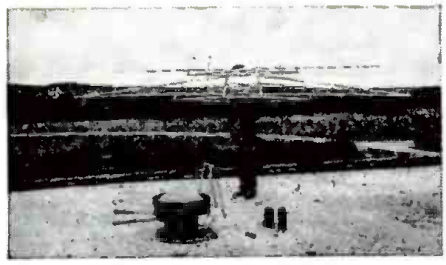
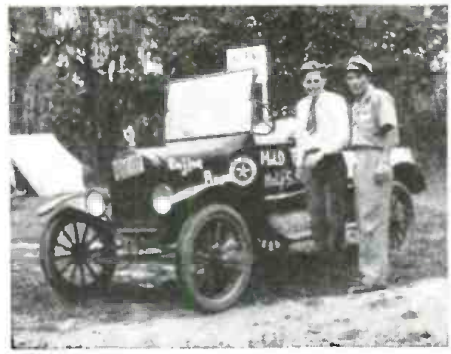


Unionville, Mo.—w9vzq.



w5fwz raises a twent' beam.



Mobile w9hhs es w9ews.

# HAM ☆ ☆ ☆ CHATTER

THE Chicago Area Radio Club Council announces that on November 25th, 1940 it will hold its Fall Technical Mass Meeting. Principal speaker will be Prof. Daniel Nobel, of Connecticut State University. Prof. Nobel was formerly closely associated with Armstrong of FM fame, and supervised the installation of 10 police and 250 car rigs, all on FM. He is now with Motorola, designing FM police and other jobs. Yep, you guessed it, his subject will be FM! Judging by past performances, this Mass Meeting promises to be the best one yet. If you will be in the Chicago area, or live within distance of the Sherman Hotel, don't fail to be there on November 25, 1940. There will be other demonstrations, the exact type of which has not, at this writing, been decided. In all events, the evening will be a fine one. Be sure to be there!

THE Hams can be justly proud of having furnished *Unca Sam* with one-third of his newly acquired FCC monitoring officers. These men are doing signal work in ferreting out any *Fifth Column* and *Subversive material* on the air. It is believed that many more than were accepted, applied. So here's to the American Amateur, bulwark in Communications to *Unca Sam* whenever that venerable gentleman may call on him!

## YLRL NEWS

W9NBX—Enid Carter, Bowbells, N. D., Secretary-Treasurer of the League, reports the following District Chairmen elected by district members for the coming year:

W1GQT—Lida King, Holyoke, Mass.
W2IXY—Dorothy Hall, Springfield, L. I., N. Y.
W3CDQ—Elizabeth Zandonini, Washington, D. C.
W4GFO—Helen Davy, Kingsport, Tenn.
W5IKC—Lou Lacy, Phillips, Tex.
W6RGX—Genevieve Capstaff, Van Nuys, Calif.
W7HHH—Bea Austin, Bend, Oregon
W8PZA—Mildred Wildman, Cleveland, O.
W9OUD—Letha Allendorf, Joplin, Mo.
ex-VE4WY—Micky Turpie, Edmonton, Alta. —Canadian Chairman.

The "Ks" of corresponding number come under the "W" District Chairmen.

W7FWB—Ethel, Wenatchee, Wash., President of YLRL, won the Emblem Contest. Orders are being taken by the Secretary for silver-plated pins, cuts for use on letterheads, QSLs, etc. (Silver and blue are the club colors.)

Ex-VE4VO—Maple Leaf op, Dot of Calgary, recently left the "bald-headed" prairie lands of Alberta and got a glimpse of the ocean at Vancouver with another ex-op showing her the local sights. On her return train trip she unconsciously whistled a "CQ". Ex-VE5MY, the conductor, promptly introduced himself and they had a personal QSO. (That's one way of working them in Canada.)

W9ILH—Carrie Jones has been appointed ARRL SCM (Sections Communications Manager) of Illinois in the Central Division.

W1FTJ—Dorothy (Dot) Evans—"right-hand man" to W1BFT—got the SCM appointment of New Hampshire. That makes the third gal SCM and all 100% YLRL'ers.

Eight of the Leaguers boast two-letter calls: W6EK—Flora Hoover of San Francisco, Calif.; W7NH—Nell Hart, Twin Falls, Idaho; W9UA—Loretta Ensor, Olathe, Kansas, two ex-Gs and three ex-VEs.

Ex-VE2HI of Westmont, Quebec, was listed as VE4HI in a previous issue. (Sorry, Ethel.)

W8ODI—Ruth and her OM, Larry, W8OGK, have left Cleveland for Columbus. HH2ES (Dick Olson, ex-W8LLL from Ludington, Michigan) arrived from Haiti in time to visit with the Beckwiths before their departure and leave with Ruth—his first YL contact—a gift of a carved mahogany Haitian native beating a tom-tom.

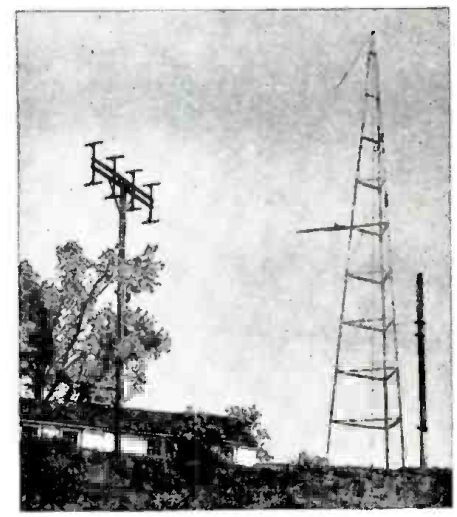
FTS (Forty Traffic System) sent a complimentary copy of their "swell" bulletin ETHERETTES to every leaguer and put on a FTS/YLRL Midsummer Festival, giving the girls an equal opportunity to win some of their nice prizes.

W8SJF—Gladys, Wapakoneta, Ohio, who was first Temporary Eighth District Chairman, has been a consistent BPL'er. She is active in the AARS, FTS, and is NCS on the 20 meter CW Girls' Net. Net Control Stations for all bands will be amounced in next issue and the girls hereby extend an invitation to ALL YL ops to participate, be they members of the Young Ladies' Radio League or not. Some of the nets were discontinued during the hot months.

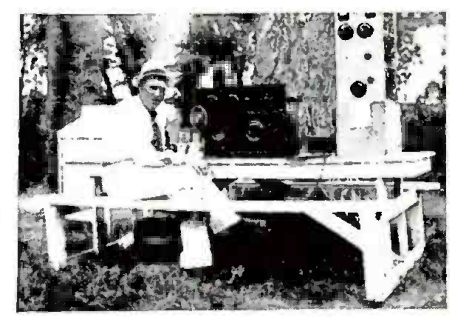
W8TUQ—Irene of Rochester, N. Y., announces another radio merger. On Sept. 16, she was married to W8DOD, Elmer Grabb, Pres. of the Rochester Amateur Radio Association and former control operator at WHAM, where she was employed as staff pianist several years ago. While out on dates, he taught her the code, etc.—at least that was her story—and apparently found her too good a pupil to lose track of after she got her ticket in 1939. Irene, incidentally, is President of the Ladies' Auxiliary of the RARA so we shall look for future membership material from that group. We trust our 73s will have reached them clear out in California, where they planned to visit.

W8SPU—Sycamore, Ohio, has never personally met a YL op altho she has worked numerous ones but the Cleveland girls, whom she planned to visit recently, no doubt made up for such loss.

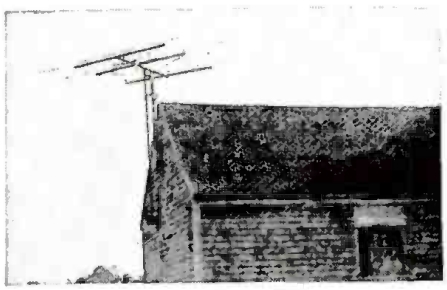
YLRL Unit No. 1 at Cleveland, Ohio, with the passing of the Summer months suffered the loss of four of its members, altho two will return to the "fold" when vacation time rolls around again. W8ODI moved to Columbus, W8CKH returned from Kent University to her home in Dayton, W8TLZ left for college in Chicago and W8SBB enrolled at Kent U., after completing an art course at the Cleveland School of Art. Mary is a pianist and singer and has decided that she ultimately wishes to teach Art and Music (Vocal). To make up for the lack of these girls'



Beauties! Both of w1htq.



w9ido operates on F.D.



Rotary of w1los.

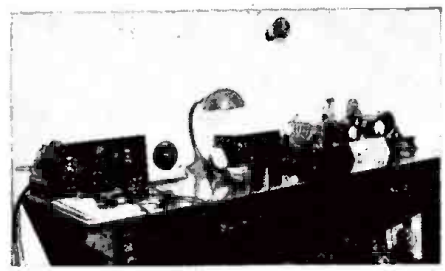


Table-shack of w9dyf.

w5hkj's swell shack.

w9zwl.

w1fro.

w9igu.

w8sjf.

attendance at their recent meeting, W8UGY from Amsterdam, N. Y., drove all the way in from Toledo, Ohio, to attend one of their gatherings. Bernice got lost circling around the city and after five hours from the time she left Toledo, she wound up at Carol's, W8UCY, with her Dad and several brothers. (Two of the girls had gone out to try to meet her at one of Cleveland's busiest corners and had been tooting Hi's until they thot the traffic cop looked at them suspiciously so they returned to the gang.) When Bernice arrived, Carol was serving a big chocolate cake all decorated fancily with YLRL, which looked too artistic to cut. Bernice told that 27 YLs enrolled for the code classes at the Amsterdam Radio Club and she is teaching 8 of them CW. (Wonder which of the ARC boys grabbed the remainder.) Bernice, however, seems to prefer to operate fone and gave the girls her xtal frequencies which are 1810, 1930 and 1950 and says she welcomes a shout from anyone, especially the girls. Hi. The fog was heavy and the group is wondering what time she got back to Toledo. Seems that she is seriously thinking of moving to Toledo so she can commute to Cleveland meets more frequently.

There's an ambitious young lady in Akron, Ohio, who is figuratively "biting her nails" awaiting that coveted pastehoard, which she'll have to countersign to legalize, as she too expects to travel to the monthly Cleveland gatherings just as soon as she gets the "go" signal. Martha Lee Bishop is her name and she has been keeping up a column on Radio Activities in the Akron Beacon Journal and publishing her own interesting chatter sheet.

W8PZA, Eighth District Chairman, just received her Class A ticket, after almost abandoning hopes for receipt of same. She has been made Alternate DNCS Ohio 1 and her army work is keeping Mil pretty busy.

W9NBX, Enid, who put Bowbells, N. D., post-office "on the map" is another one of this fast-growing YL group to receive her Class A. About the same time she got SNCS 2. The "higher bracket" license however had no bearing on the apparent simultaneous receipt of the appointments in the AARS net.

Another busy army girl is Clara Reger of Buffalo, N. Y., who has been asked to take the Erie County Emergency Co-ordination. If Clara isn't teaching someone how to play the piano or how to operate, she's teaching someone how to drive a car.

From 16 to 29, the "Hamettes" aren't so reluctant to tell their age. The YLRL "girls", ranging in age from 13 to 73, have been known in a few instances to evade the question as follows: "Unlimited, hi!", "When Life Begins plus a few", "??????", "Old Enough to Vote," "Over 1 or 10 and under 100", "Old Enough to Know Better," (And you should be too, boys. For shame.)

W9UTO—Mary of West Covington, Ky., got her ticket in 1935 and she is curious to know which, if any, Kentucky gals were licensed ops prior to that time.

W7FTX—Clarice of Corvallis, Montana, is eager to know about how many licensed YL ops there are in Montana. (How about it girls . . . make yourselves known by sending in your requests for application to the league to W9NBX.) Present Montana members are: W7COX, Fran of Miles City; Clarice, of course: W7GUQ, Elizabeth of Whitefish, W7IBH, Hazel of Missoula and W7IFO, Marion of Whitefish. (Some of you W7's might check on these calls given the columnist, giving special attention to the gender . . . don't want the Secretary to issue another ouster: W7FHA in Butte and W7FAZ in Kalispell.

K7HUT—Verna in the Bristol Bay district is 400 miles from the nearest railroad and telephone. She and the OM: K7HAI operate 3.5, 7.0 and 14 mc. but you will usually find her on 80 meters.

Have you ever heard the Holloway Net in operation? W7IEP—Elaine Holloway Keldour of Ft. Francis E. Warren, Wyoming, who has Class A as well as Second Class Radio Telephone License, tells us she along with the following relatives constitute the net: Father, W8QUL and Brother, W8RYX, both of Toledo, Ohio; another Brother, W8QWR of Columbus, Ohio, and an Uncle, W9ZDY, Green Bay, Wisconsin. And if you think Ham Radio isn't catching, make a note of this: Her Mother recently took Class B exams and by now she is undoubtedly a licensed member of the network.

K7ENU is ex-W7ENU—Mary and her OM, K7DIS, left Seattle, Washington, for Nome, Alaska, as the OB took a Signal Corps job for the Washington-Alaska Commissions.

Chicago appears to have a goodly number of YL ops. How about local unit No. 3 cropping up there in Illinois?

W2NAZ—Lenore, ex-W9CHD of Chi—is now settled in her compact NYC apartment. She has the shack in the bedroom and to conserve space has had the speaker hung from the ceiling. She was surprised and delighted to find the quality superb. ("What-nots" and "what next" in these YL bedrooms.)

W2HXQ—Kay at W2USA—has put on some interesting programs over WNYC. While W9DBD, Leta of St. Louis, Mo., visited out East, Kay rearranged her script for one of these B/C programs to include Leta, who talked about the YLRL and got a "kick" out of it as it was her first broadcast appearance. We understand Kay also plans to use W2NAZ and W2MWY, ex-W5IRS from San Antonio, Texas, but originally from Mass. This McGovern girl, besides being a good FTS op, is also interested in flying as a hobby.

W6RGX—Genevieve, Van Nuys, California, Sixth District Chairman, was likewise interviewed about the League over KMPC recently. The girls seem to cover the waterfronts. W6RGX was former 2CMK with portable 2DEZ and got her license when 13 years old, long before she went to college or married 2CDQ her instructor. (There are great possibilities in ham radio.) Peggy claims she is strictly a CW gal but they have a 160 phone rig in the shack.

"MTO" per the FTS Gang means: "Mille Traffic Operator" and they go on to explain it as follows: "An op who has handled in one Calendar Month a total of 1,000 traffic points."

W8SKZ — Ramona—has an almost vertical antenna on the side of one of Cincinnati's beautiful hills and is in the shadow of the antenna of WCPO whereat the OM, W8KKW, is an engineer.

W9TLJ — Elvera, Chicago, Ill., is a registered pharmacist; W8ROP—Ruth, Erie, Pa., is a registered nurse, and W8UCY, Carol, Cleveland, O., is a student nurse. (Which shack hides an op YL medico?)

W8TPZ of Wyoming, Ohio, a suburb of Cincinnati, recently visited W8TAY. Nita returned the visit to Marie's and also visited many of the GCARA (Greater Cincinnati Amateur Radio Assn.) members—thanks to Marie, one of their active number. The main objective of the visits was to formulate and organize a second YLRL unit. W8ALW, a naval officer, arranged to have the monthly meets of the Greater Cincy group in their H.Q. offices. Unlike the Cleveland group, which has a number of YLs in a concentrated area, the Cincinnati girls plan to give code lessons to interested potential feminine QRM'ers to swell their ranks. While in the shack of W8QAD, he worked KC4USB on sked and the girls enjoyed the Byrd East Base contact. With them were Mr. and Mrs. Palmer of Cincinnati, parents of the speaker at KC4USB, Bob Palmer, with whom the sked had been arranged.

To those boys who sent the YLRL donations of money, publications, paper, etc., the girls in the League extend their sincerest gratitude.

YLRL members want to thank the boys, too, for their co-operation on the band, especially when the 10-meter net was in session last season. Eleven ops—ALL YLs—including a K4, were "yapping" one p.m. when a W6 graciously asked one of the OMs to shift a few kc. to avoid QRM. Similar requests came thru to him from other YLs in the net and again he obliged by sliding down a few more kc. When he politely asked if everything were O.K. now, he was told: "That's just fine—now stay there!" When he checked his frequency, he discovered he was several kc. out of the band, according to the way we first "heered" it. Now that's what you call REAL CO-OPERATION.

W4GER, Mary Eliz. Morrison of Hixson, Tenn., doesn't have a receiver at present. Here's an opportunity for someone who no longer needs an extra receiver to visit her on Route 2. (Don't all go the same day.)

Wonder how many of the girls have laid in wait to use their high-pressure YLRL salesmanship on some unsuspecting female, only to discover the "she" was a so-called "YS" (Young Squirt) or adolescent "HE-MALE"?

W8TAY

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W8JFC the antenna expert of Sharonville is also Emergency Co-ordinator for his district. Benny has been studying aviation lately and will be soloing soon.

W8SDD the good-looking policeman of Cheviot is out to give the girls a race on getting that WYLAS Certificate. He claims he has worked YL ops in nearly 40 states.

W8TMI is moving to the outskirts of the big city. BCI in apartment house may have accelerated the move.

W8DBU is really putting out a sig on 160 now since he moved from Cleveland to Wickliffe.

W8GD is ex-W8GKG, Vice President of Cuyahoga Radio Assn.

W8PKF also got back his old call—W8AOK. Incidentally, Fred will have charge of next year's Field Day activities at the CRA and he is already laying grand plans.

W8SSV bemoans the fact he can't use the kind of "rocks" his xyl brought back from W8TPZ's place. She likes to collect fossil specimens.

W8PWY is Asst. Radio Aide in 5th Corps Area.

W8CTI has the recording bug.

W8FMB has been so busy with experimental work in a large motor company that he has practically given up ham radio. He is responsible for having developed more licensed code ops than any other single instructor in Cleveland. He also holds 1st Class Commercial License and it would be a pity to lose him from the ham bands.

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W1MME has been working portable from the Hull Fire Station where he is employed. Ruddy is on ten and 2½ meter fone. W1JOZ is on 2½ meter fone wid a mopa which sounds vy fb. W1MFO is a newcomer to ten fone. Pierre runs 180 watts & is doing o.k. fer himself.

W1JQA—old smoky Joe—has worked 284 stations on the 2½ meter band to date. W1IPA is playing around with 20 fone but says the competish is sumpin oful. W1MRS is on 2½ fone. W1LMG has bn vacationing up North. We're waiting to see some of those pics u took, Bill. Bill is also a camera hug and divides his spare time up between cameras and radio.

K4FOW & hubby K4FAB are breaking thru hr as I type this out. W1EU of Somerville is a newcomer to the ten-meter band. Jack Baer is gg up for his ticket sn. All the Boston hams wish u luck.

W2MLM over at M.I.T. is on 2½ wid a trans. W1MNG has worked 1JDF on 2½ fone. W1KSB is running a pr of 45's TNT wid abt 31 watts input on 2½. He is building an exciter for 40-20-and ten which will probably be in use this winter. Incidentally, the rig has bn in construction for one year. Should be fb, thinks I.

W1JSL and W1MNC are newcomers to the 2½ meter band. W1IID has one of the best sounding sigs on the band. IJQH ditto. Here are a few things I've learned after a short whirl around the 2½ meter band. The band has what we chose to call "clicks." It wrks something like this. You come on the air some nite & hear a round-table gg on & decide to go into it. After a few hours of unsuccessful calling you give up thinking tt the rig isn't getting out. But such is not the answer, the truth is, you just don't fit, believe it or not. Of course,

w9ksa.

w4giw.

w9ztu.

k6smd's yl.

w2kbg.

w9ahp.

w9dnf.

w1joz.

k6smd.

occasionally, if the band is dead, & u r the only station on the air & the gang isn't around then they mite give u a break. But otherwise, nothing doing & u will probably hve to start up a click of your own. We also hve groups of bootlegs on the air who have their own nets and sign no calls. They openly admit tt they r bootics & even go around visiting the local gang. Sum nerve, huh?

W1DNL & pal W1AJA spent Labor Day weekend testing antennas. How about telling us alittle sumpin about composition, Bob?

W1CIB is on 160 fone with a plenty potent sig. 1EJU is on 2½. Since the ban on ten meter mobile operation a flock of the boys hv migrated to 2½ & we find tt the distance tt can be worked is at least as good as it was on five, if not better.

The Boston Hamfest comes off sn. We'll probably cover it if the Ed. O.K.'s it. Should be fb from advance dope. We expect to have six first-rate rcvrs for top prizes & over a thousand in attendance. The local gang has organized the "Amalgamated Fishnet" on the 2½ meter band. W1PI heads it with the title of "Father Neptune" & the rest of the gang also have fish names. Meetings r held every Tue. nite & at the present time initiations r being held, over the air. W1AHD has his ten meter beam located in the attic and controls it from the den. The first nite tt the ten meter band opened up, Al finished working us and took a look around the band. To our surprise, K6FKN came back to him but when it was turned over to AHD, he did not come back. After frantically calling AHD we found tt he had hrd the K6 but became so nervous tt he forgot to throw the antenna sw and—no QSO.

W1FH wrks the Byrd Expedition regularly. W1BCE—the broadcast engineer is on ten fone with a two el rotary. W1FGO of Norwich, Vt. is active on ten, for the benefit of those looking for tt state for WAS. W1MUO is on 2½ wid an inside ant, but will sn hve one outside. W1BDM has a nw 3 el rotary for ten & it really is beaming.

W1HDK & XYL recently paid a visit to W1IXI of Walpole. We hear from good authority tt ordinary curtain rods radiate better than gold plated copper rods on the 2½ meter band. W1KVQ is putting up a ladder mast on his roof so he can experiment with different arrays. He will sn take a hop dwn to 1¼. He is on 2½ at present.

W1MMQ is having trouble with standing waves on his feeders. But he still puts out a healthy signal. W1AGR is an cxpert xfrmr winder-upper, & W1IXI ditto. How's abt seeing JOM fellas?

W1MGQ informs tt he knows an operator who can copy two different sigs coming through on two rcvrs, at the same time and can type it on the mill when it comes thru at abt 30 per. Can u top tt one? We have one tt is just as gd but we'll save it fr next month. A last minit flash says tt W2CQB, a ships op can also perform such feats. I'm from Missouri, the next time u get into Boston, Bob.

W1BDM is putting about 800 watts on 20 c.w. & will probably use fone as sn as the Class A comes thru. Joe has waited 13 wks for it. Now tt Ernie, W1GOU has worked WAC, WAS etc. he has started to work all other stations in the other districts who have the same call letters. Ernie has just moved into a new location where he doesn't hve to worry abt the other 40 odd apartments.

Have u seen W1MRK's QSL? W1IGD has bn closed down for the summer.

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W1MVI (ex W9DBI) masters the drift problem in his rcvr es signal shifter by leaving the filaments on 24 hrs. a day. Al works 75F with 265w.

W1DEG has a nice sig on 75F—250w. to a pr. of RK51's.

W1GQJ is now running remote control with 225w. on 75F and uses a Breting 12 rcvr.

W1LIP visited W1KNJ (Earle) in Belfast, Me. to see what makes the wheels go round down there. Earle runs 30w to an 807.

W3IUN is working portable at Dublin, N. H. on 160m. with 45w to an 807 es a Super Defiant.

W1LYS now uses e.c.o. on 160m. Stuart runs abt 100w to a pr. of tz20's and a Sky Champ. rcvr.

W1MCS also has gone e.c.o. You fellows expecting a lot of qrm this winter??

W1AP is still employed at the FM station W1XOJ in Paxton, N. J.

W1LLP was heard warming up on 160m. Ken has a Hallicrafters HT-6.

W1MQI (one mighty queer Indian) has a good sig on 160m. F with a Stancor 110CM xmtr. and runs 55w.

W1MSP also has a Stancor 110CM xmtr. on 160m. and runs 100w. input.

W1MSX has increased power. Fat is now running 75w to an 809.

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W2LHJ in a mad effort to word some dx with his 40 watts went down from 160 to 40 cw. He came up agn with the QRM still ringing in his ears. Ted is now working his dx on 80 cw.

W2LPE got his W.A.S. on 40. Frank is now on 160 once in a while to keep his gabing in trim with his dx ing.

You can never tell when these E.C.O. boys are going to settle down. They get very annoying when they go swishing up and down the band.

W2LSR is complaining that his sigs can be heard R9 plus up in Maine but when he tries to get half the distance down South, Elmer just can't be heard. Such is life. What Elmer needs is a 160 mtr. rotary beam, hi hi.

W2MRZ likes to have plenty of power, but now that he has it he can't modulate it. Nevertheless Bill has worked half way across the country on 160 cw.

W2MPQ was last heard on 2½ mtrs.

W2JON is building for the U H F s.

W2MkN is working the first district on 2½ mtrs.

W1MX, The Mass. Institute of Technology can be heard putting out a fb signal on 40 es 80 cw.

Every time W2JBI puts his rig on the air, the B.C.L.s put it off. Seymore says that he had his antenna clipped a few times.

W4EEZ at Athens is rebuilding and will be back on 160 shortly. Ralph is doing some nice work there.

W4BZ of Atlanta another ole timer and your writer renewed acquaintance recently after a long spell of wondering what had become of the guy and he tells us that he is very active on several bands.

W4FWD also of Atlanta says that the jr op is going great guns and will probably have his rig in about thirteen or more years Hi.

W4FGU is on ten and forty meters at present time. How about a picture of your rig for this page Om? The weather in our neck of the woods continues to be nothing to brag about being mostly rain and more rain and we cant swim Hi. Oh yeah, from the above some of you WX hounds might conclude that it is raining. Heck it is Hi. Missing our stuff in one issue surc increases our fan mail from our one reader (PC) who hit the bell with his wisc remarks this month Hi. (We know one HC editor that just dont know what art is hi.)

W4FDJ recently received his class A and will probably extend his operations to all bands. His xyl has been away for several weeks and POP has got a little horsy with his remarks. Mebbe Mom will cool him down on her return to the Morgan household.

W4GIAs well known laugh was a feature at recent Cordele hamfest. Boy can that guy talk to the yls.

In re our remarx about missing out in recent issue a local ham ventures the guess that mebbe us wanting to go up to the windy city probably scared the staff of this better type magazine that they threw our stuff out of the window. Sum guys we know are going to make us loose our sweet temper yet.

If Bro Rider continues to write long enough he will finally conclude that hams are the type of guys that swim around with the better known strata of society.

W4EBT, Perry, Fla. is visiting at worlds fair in New York and reports a FB time being had in that village. The gang around Tampa and Sarasota Fla must have had advance notice of your scribes arrival in those towns, as they could not be located on a recent visit there.

Quite a few of W4s are filling out the FCC questionnaire at present time.

W4AGI advises us that he is still very active on 75 phone and 80 CW in Augusta, Ga.

W4GPC is upping his power very shortly with a new pwr supply that he says will deliver the goods. We have found some of the airport operators to be pretty good guys on our rambles, however they orta get em a ham ticket if they want to ever get any fun out of life.

W4ENS says that his in laws have let him adopt his XYLs sisters and they are indeed an attractive bunch to visit.

W4FFI, W4GFF and W4FDE of Cordele have decided that flying is more important than radio therefore are taking lessons at present time.

Some of the northwest Fla boys are taking pictures for a certain magazines contest and say that they cant give your scribe any news this

w9gkn.

w9biq.

w5htx.

w5bv.

kb4ftu.

zl2sx.

w9cpr.

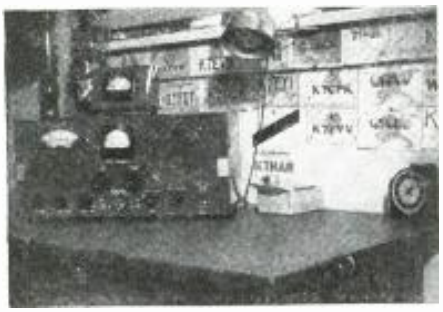
Hamop w1iuy.

month. I hope they win a million or something anyway.

W4AJI had a nice government job offered to finish college course. turned it down in order to him recently. But We regret to announce the final 30s of W4FUR. Birmingham, Ala. *Radio News* extends sympathy to his family.

QRM from the 5th Distc. by W5HMV Windy Bill.

The following dope was sent to me by W5EB Hodge, La. The advance Amateur Radio Club of Hodge and Jonesboro, La. composed of the following members W5ADJ, W5IRO, W5HNW, W5BQD, W5BTH, W5EB, and John Holden, elected W5ADJ Presdt. W5HNW Sect. W5EB Publicity man. Meetings are held each Tuesday night at the home of some member.



Fairbanks, Alaska, SWL.

W5IRO is the proud possessor of an all-band band-switching Xmitter housed in a steamer trunk.

W5ADJ has a heavy foot that got mixed up with his mike cable, he now has a new mike hi.

W5HNW is worried over some QSLs that were not requested.

W5EB had a great time this summer reading W5IRO on CW while the latter was vacationing in Maine.

The Raspberry Gang of Nebraska.

W5BQD now has 1KW on 160 and is AARS Net control.

W5BQD is now housed above his garage, Ainseley had a lot of trouble proving to Uncle Sam that he was born hi.

W5IPX of W. Monroe, La. has joined the regulars on 160.

W5IXI is an active CW hound out in Texas.

W5IKP is known as Windy on 40 (also 160).

W5HZS runs 35 watts on 160 in the old Lone Star State.

Pre-war g8ck.

W5HGW visited his son-in-law W9ZVT and was put to work putting up an ant.

(*Pse Qsy to page* 66)

# Have You Registered with THE RADIO MINUTEMEN OF AMERICA?

★ ★ ★ ★

***Here's an opportunity to join a great patriotic volunteer movement dedicated to "the preservation of our Democracy."***

FOR the past four months there have been repeated statements not only in RADIO NEWS, but in the daily papers, and other periodicals, that there was, and would continue to be, a shortage of radio operators. To some extent, the *Conscription Bill*, recently enacted by Congress, will alleviate this condition. But there will always be a necessity for radiomen of all kinds, not only in the Armed Services of our country, but in civilian life as well.

A member of the Senate Committee on Foreign Relations, has written, in part:

> *"Briefly, this country needs approximately 100,000 trained radio men. It also needs many thousands of patriotically minded citizens who will spend time at their radio sets listening for any dangerous or subversive material in communication channels. We know that there are a great number of broadcasts in foreign tongues and our patriotic foreign-born citizens could perform a real service by listening to these broadcasts in languages which they understand."*

It is in response to this appeal, that the RADIO MINUTEMEN OF AMERICA are being organized. Already many radiomen are flocking to join. There are no dues, nor will it be necessary for any who joins to subscribe to this or any other magazine. The sole qualification will be a desire to help our Government, coupled with a certain amount of radio training and suitably owned equipment.

The RADIO MINUTEMEN OF AMERICA is a non-partisan, non-political group of 100% Americans. It does not propose to supplant any of the presently existing forces of the *Army Amateur Radio Networks*, the *Naval Communications Reserve*, the *R.S.S.L.*, nor the *American Radio Relay League*. It is neither in competition with those nor any other similar groups, nor does it duplicate the efforts of such organizations. It is a co-operative group of radiomen whose sole purpose will be to aid the Government insofar as it is able.

The RADIO MINUTEMEN OF AMERICA are divided into four groups. These are: (1) the professional (paid) radio operators; (2) the amateur (licensed) radio operators; (3) the shortwave listeners with equipment; and (4) all others including servicemen and engineers who want to serve. It is possible for a MINUTEMAN to be a member of more than one group at the same time. As the organization grows, suitable membership certificates and pins will be provided.

Now, just what will the MINUTEMEN do? They will follow the government suggestions, Those in *Group 1* will report anything that they may think is non-American which they may hear or see. These reports will be in writing and will be forwarded to the proper authorities. All and any action which may be taken against 5th Columnists or Subversive Elements will be taken solely through the regularly authorized U. S. Government channels. Protection to informants will be the same which is afforded to anybody by our Government.

*Group 2* will patrol the amateur air lanes, listening for violations of the *Federal Communications Commission Orders* against communicating outside the United States and its possessions. They will also report any communications of a suspicious nature. These reports will be forwarded to the recognized authorities. From the list of amateurs who compose *Group 2*, will come members who are willing to assist local *FCC Radio Inspectors* in the trapping of "bootleggers of radio amateur calls." These amateurs are very necessary, and will aid the *FCC* in cleaning up the bands. Under *Group 2* will also be listed those members who are willing to spend time listening to code transmissions of foreign stations to make sure that the transmissions are not intended for reception by spies, and subversive elements here.

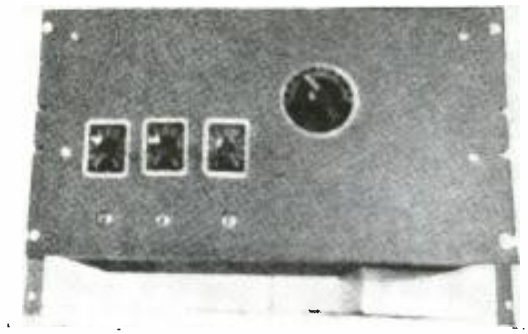
*Group 3* will be one of the most useful of all groups. Here, for the first time, the Short-Wave Listener will be able to be of service to our Government. It is estimated that there are several hundred thousands of these Short-Wave Listeners, and they should be able to render signal service by keeping tabs on all foreign long wave and short wave transmissions. It is known that there are transmissions which are coming over intended for espionage work in these United States. It will be the work of *Group 3* to try to ferret out the transmitters, their location, their times of operation, and wherever possible, to whom the transmissions were intended.

*Group 4* will be comprised mostly of radio servicemen, who from their contacts with customers and the trade, hear and see many things. It was a serviceman who uncovered a vast *Bund* organization in the East. He had been called into repair an all-wave set and noticed a complete broadcasting outfit, ready to go. That coupled with the *Nazi* insignia aroused his curiosity; and, on reporting to the *FBI*, an under-cover transmitter was discovered and "neutralized." The work of *Group 4*, therefore will be of greatest value to our Government.

Finally, it is intended to list the members of the RADIO MINUTEMEN OF AMERICA with our Government as a patriotic group of trained radiomen who are actually serving the *National Defense*. The equipment of the membership will also be listed, and from this latter list the Government will know what type and amount of equipment will be available should a *NATIONAL EMERGENCY* arise.

The RADIO MINUTEMEN OF AMERICA is a vast voluntary organization of trained radiomen dedicated to "the preservation of our democracy." It will be the duty of the MINUTEMEN each to improve his code speed, if he is an operator, and his technical knowledge if he belongs under *Groups 3* and *4*. From time to time, the MINUTEMEN will be advised of the latest

(*Continued on page* 50)



The author's rig looked like this; but you may use your own ideas, too.

# BEGINNER'S 56MC TRANSMITTER

by H. G. GWINN
Anderson, Indiana

***There is no better way to break into the amateur game after you get your "ticket," than to build this rig for the 56MC band.***

SINCE the issuance of the new regulations in regards to the 56-60 megacycle band, requiring extreme stability in this band, I have constructed a MOPA transmitter which for economy, ease of adjustment and efficiency I consider second to none.

I did not wish to spend a lot of money for something I considered using only during the summer months while the skip is on. The unit had to be low in cost and yet constructed so I would be proud to have it as an addition to my regular equipment.

The diagram will show everything very clearly. A metal tube is used as the oscillator. A metal tube was used in the final stage with no indication of self oscillation. But greater output was obtained by using a ceramic base tube. Self oscillation was apparent with this arrangement so a small neutralizing condenser was adjusted to minimum value and wired in.

All wiring was done with No. 12 tinned wire except the two leads to the plates of the tubes, where regular push back wire was used. This makes for rigid assembly and minimizes frequency drift.

By mounting on a relay rack panel good appearance was obtained as well as leaving room for the addition of two more 6L6GX tubes as amplifiers in the future if one is not satisfied with the present output.

Masonite panel was used for its ease of working. Also indicating plates with bar knobs for economy. Do not modulate the final stage without dummy antenna or antenna connected to prevent flash over in the small receiving type variable condensers.

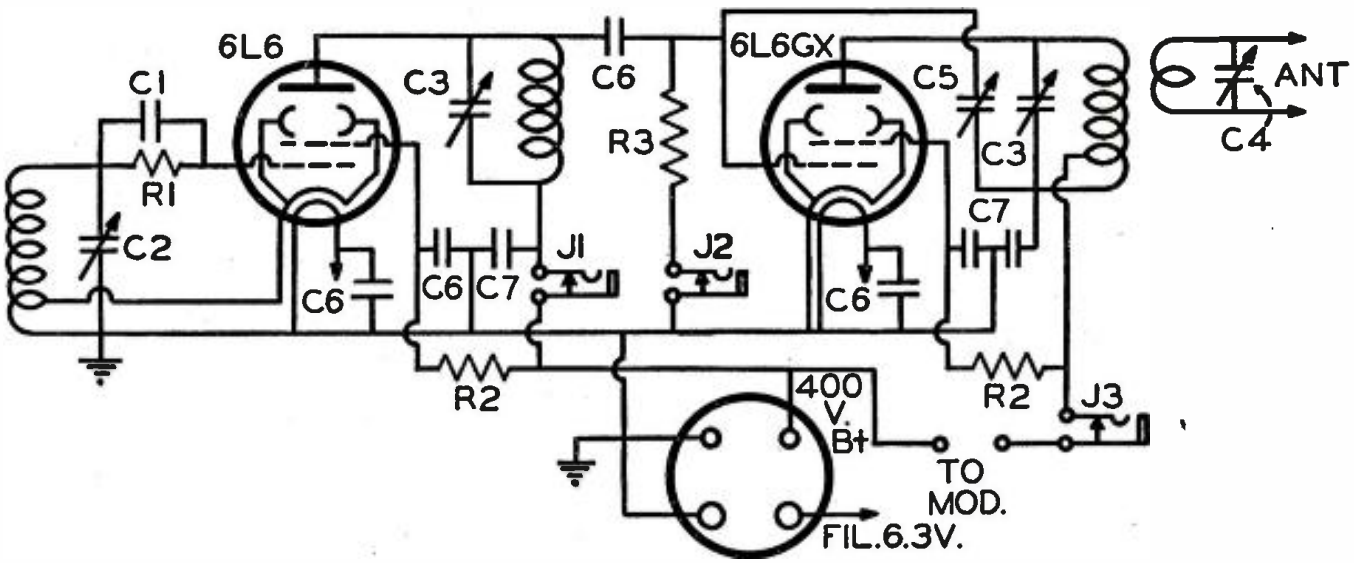
It was found easier to adjust the tuning by setting the oscillator plate condenser to some value and then adjusting the oscillator grid condenser for minimum plate dip. Same to be adjusted with an open plug in the final plate circuit. Check for frequency and if same is one desired, remove plug from final jack and tune same quickly to minimum current with antenna disconnected. No meter is shown as the one on the regular transmitter was used although one can be mounted on the panel with a flexible lead and plug connected so it can be plugged in either jack.

Under working conditions the oscillator current is about 45 mils. The amplifier about 30 mils. with antenna off. Adjusting the antenna condenser will load the amplifier to 75 or 80 mils. for best output, although higher loading can be obtained. Grid current with amplifier in circuit reads 10-12 mils. This is a little high, although no ill effects are noticeable. If there is a tendency to downward modulation, change the .00005 condenser to .00004 which will cause the grid current to read 6-8 mils.

R.f. output was obtained by touching a 110V. 15W. light bulb to the tank coil, with antenna disconnected, which bulb promptly burnt out.

Holes for variable condensers ½" fitted with ½" rubber grommets. Panel enlarged with reamer to fit over

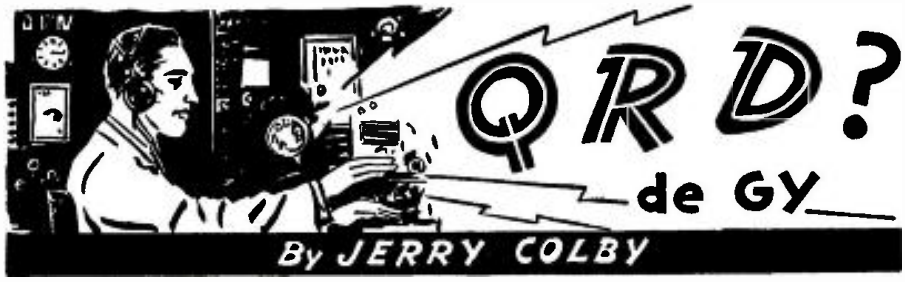
(*Pse Qsy to page* 65)




$R_1$—50,000 ohms, 2w. IRC
$R_2$—20,000 ohms, 10 w. Ward Leonard
$R_3$—10,000 ohms, 10 w. Ward Leonard
$C_1$—.0001 mf. mica Aerovox
$C_2$—.0001 mf. variable. Hammarlund

$C_3$—15 mmf. variables. Hammarlund
$C_4$—75 mmf. variables. Hammarlund
$C_5$—National NC-600 neut. conds.
$C_6$—.00005 mf. mica. Aerovox
$C_7$—.001 mf. mica. Aerovox

Chassis—17"x10"x3". Bud
Panel—19"x10½". Bud
Panel brackets—7". Bud
Dialplates—Bud
Sockets—National




IN a recent column we noted the experiments concerning railroad yards using radio communication between trains and a central tower. Anent this item, Brother Gott of Milwaukee, Wisconsin, sends in the following communication: Quote . . . *The reason that this item interested me is the fact that I, along with Mr. G. N. Harbourt of Washington St. Tower here have proposed to our officials the installation of Train Directors in the terminal with two way radio communication system for the control of all movements within the terminal. Such a system would call for about 30 stationary installations, in interlocking towers, on drawbridges, at switchtender locations, Yardmaster's offices, Signal Supervisor's office, Asst. Supt.'s office and certain other strategic points. Also on about 25 or 30 locomotives and a like number of way cars.*

*Maximum distances would be up to four miles. Most communication being from one half to two miles. Train Director would be in on all cross-communication and would therefore be in constant touch with the progress of every movement, the starting of new movement, etc. He would be in touch with Train Dispatchers in Chicago and would be informed as to main line movements which were coming up and could therefore authorize movements ahead of these main line trains. Levermen on drawbridges would be informed of progress of terminal movements as well as main line trains that were near due or over due and could thus minimize the delay to our trains, because, as you know, boats have preference.*

*About 40 to 45 crews are in daily operation in the terminal at about $35 each. About $1400 to $1600 per day. Savings of from $100 to $300 per day would be assured, due primarily to close co-ordination of movement within the terminal in relation to each other and in relation to main line movements also.*

*The cost would approximate $35 per day for three Train Directors, and a maintenance man. The net savings, then, we are convinced, would be very much worth while, to say nothing of the total elimination of wrecks. Just in passing, we had a wreck at Crystal Lake on March 25th, this year, which cost the company between $50,000 and $75,000 and which would have been avoided had such a system been in operation.*

*Knowing something of the costs of material for the construction of sets, also the cost of sets delivered by the retail dealer ready to go, I am convinced that such sets could be manufactured in quantity to deliver for $50 or less. But knowing the prices the company pays for its signal equipment and most other supplies that it gets, I do not doubt that they would be asked three or four times that amount.*

*I believe that you will agree with me that this is the coming thing. The surprising thing is that it has not come before, but I can explain that by telling you that the RRs are the mossbacks of all industry. Airplanes have it, would not think of trying to get along without terminal despatching via radio. Every city and state police department in the country are rushing into line. Milwaukee has motorcycles with two way communication.*

*FM is just the ticket for such installations. Just a word before I sign off, regarding the jobs that would be created. These jobs would automatically come under the ORT schedule. Men with qualifications and sufficient seniority would bid them in. To be sure, it would create new jobs, and open up room at the bottom. We have taken on exactly 50 new men since March, 1935, when the six day week was instituted. I have reference to the Wisconsin Div'n, and there are 12 others on the C&NW system* . . . Unquote. In our opinion we believe that Brother Gott's letter is the finest selling talk that any radiop can give to a railroad in any town. His facts are well-founded and his arguments carry the punch that comes only with definite knowledge of his subject. So go to it, radiotechs, and see what you-all can do with this ammunition.

---

ALVIN RAMSEY, former radiop USN, now studio electrician for a movie mogul, would like to know the whereabouts of his old buddy, George Amos, who was Pharmacist's mate, First Class, in '23 or '24 when they were stationed at the *San Diego Training Station.* We've been rather successful on past man hunts but this one seems like a tough assignment inasmuch as neither of these fellers have kept in contact with radiomen. But we've taken on this job and with your cooperation, success may crown our efforts again. Let's go, sleuths!

---

INCIDENTALLY, *CTU-Mardiv* announces with justifiable pride the signing of agreements with the entire New England fishing fleet at $165 per month and one week's annual vacation with pay. Negotiations were under way for many years and the culmination of this arduous task certainly proves that in union there is strength.

---

THE *CTU-Mardiv* organization continues to expand. They are opening offices on the West Coast in San Francisco, which certainly should make for increased union activity. Although we can well imagine that competition will be intense, we feel, nevertheless, that the added activity will induce many men who have either not been contacted or who have had a personal

(*Continued on page* 59)

# THE VIDEO REPORTER

## by Samuel Kaufman

WITH wars raging in several parts of the globe and with huge defensive measures being taken in the U.S.A., these are times to rally around the colors and that's just what every true American is doing.

And, in recent weeks, even television rallied 'round the colors.

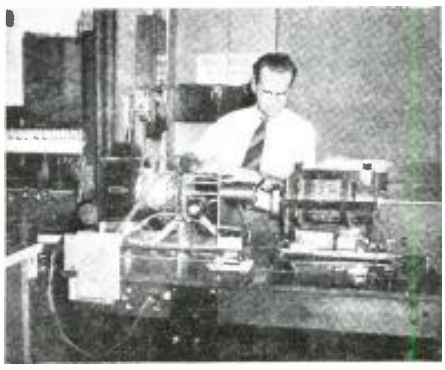
When *CBS*, after an extended period of silence on its video activities, suddenly came forth with a color television system, there was quite a furor in the industry. "Would black-and-white images be shelved?" was a query on every participant's tongue.

*CBS* went to town in a big way in revealing the achievements of its chief television engineer, *Dr. Peter C. Goldmark.* The first demonstration given privately to *FCC Chairman James Lawrence Fly* got an exceptionally favorable "press" but despite the high-pressure publicity technique of issuing "quotes" from prominent observers, some succeeding demonstrations didn't quite prove that the *CBS* system was a thing that would replace black-and-white.

It is true that color images are preferred to black-and-white. But the present simplicity of the latter as compared with the mechanical complications of *Dr. Goldmark's* 343-line color system still gives it an edge in public preferences.

Getting images as natural as possible is a goal of all television engineers. And putting the pictures in natural colors is a step ahead. But consideration must be given the fact that the potential look-and-listening audience, after being accustomed to black-and-white motion pictures, has come to regard the two-tone images as "natural."

A return to the revolving disk—this time in conjunction with a cathode ray tube—forms the basis of *Dr. Goldmark's* method. Similar disks, synchronized, are used at both the transmitter and receiver. Blue, red and



**Dr. Goldmark shows his color video.**

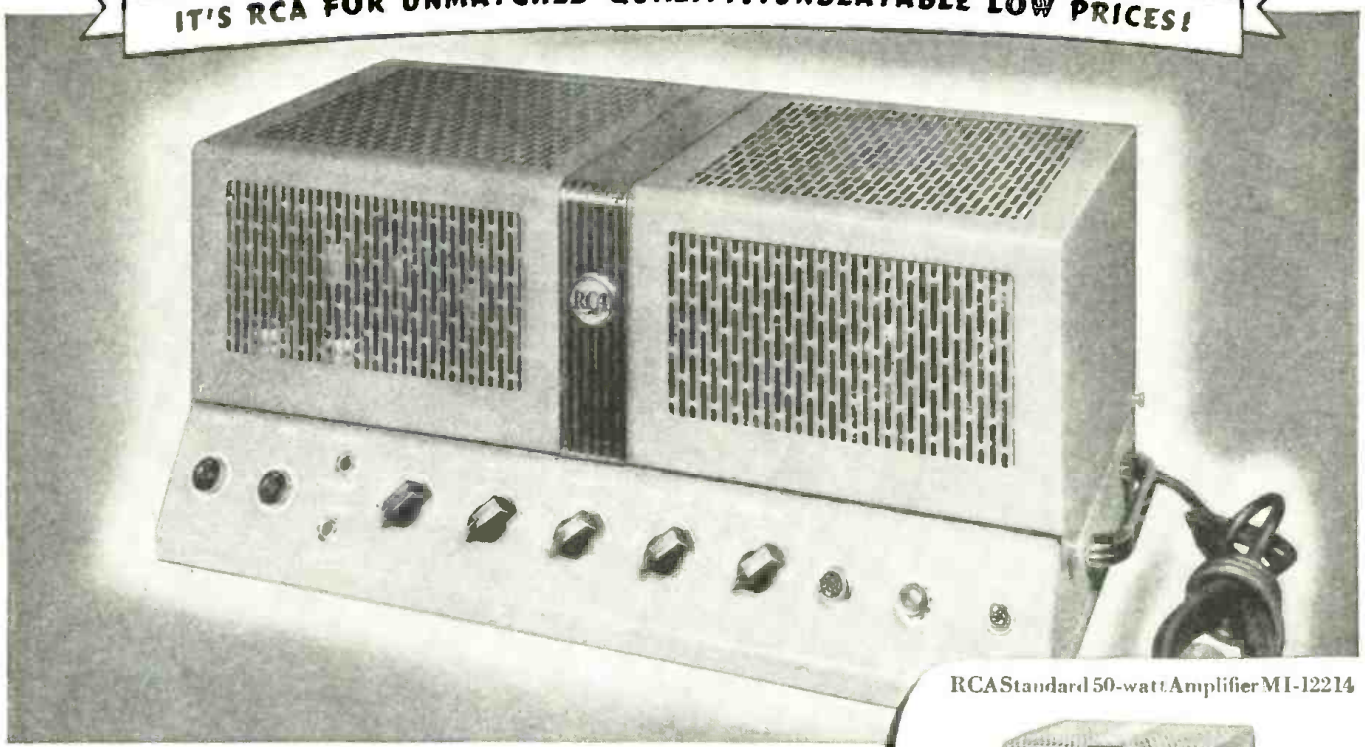
green filters on each disk serve to transmit and receive the corresponding color components of the subject so rapidly that the received image has a natural appearance.

The placing of a whirling disk before the cathode-ray tube of the home receiver cannot be ardently welcomed by those video enthusiasts who hailed the dropping of the old scanning disk in favor of the kinescope. But a big point in favor of *Dr. Goldmark's* system is that he can achieve color reception within the limits of existing television.

The demonstrations were limited to pick-ups of color movies. *Dr. Goldmark* said that there would be a bit of delay until a pickup camera for "live" telecasts in color would be possible. He said the film pickup was actually the more difficult of the two and that's the one he completed first. However true this is, the fact remains that the demonstration would have had much more of a dramatic wallop if live color pickups were shown.

(*Continued on page* 65)

IT'S RCA FOR UNMATCHED QUALITY..UNBEATABLE LOW PRICES!



RCA Standard 50-watt Amplifier MI-12214

# Economy Plus Performance

sums up the story of

## New RCA Standard 50-Watt Amplifier

1. High Gain Single Unit
2. Four "High" and "Low" Inputs
3. Automatic Compensation for Phonograph
4. Bass and Treble Controls

Here's what you've wanted for a long time! This new RCA Standard 50-watt amplifier is the answer to your wish for a single unit, high power amplifier for all around use. An outstanding performer, its moderate cost stamps it a real "buy."

Look at these features! They tell the story: 50 full watts of high quality power . . . four high and low impedance input positions for microphone and phonograph . . . electric mixing . . . inverse feed-back . . . automatic phonograph (bass) compensation . . . Beam power output tubes . . . bass and treble controls . . . high gain . . . no interaction between inputs . . . full frequency response . . . pilot light . . . externally fused power transformer.

No matter what your amplifier requirement, remember—RCA can fill it with *low priced* equipment that will do a real job.

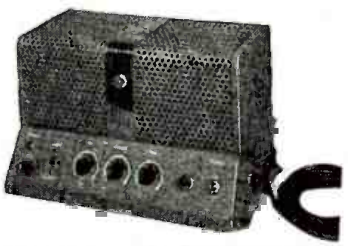
*Any sound system sounds better equipped with RCA Radio Tubes*

RCA COMMERCIAL SOUND

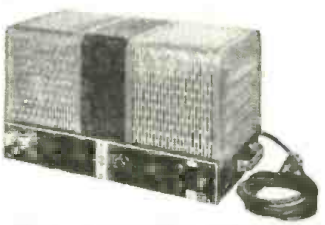
RCA MANUFACTURING CO., INC., CAMDEN, N. J.

A Service of the Radio Corporation of America

RCA 6-watt Amplifier MI-12209 operates from high impedance microphones and high or low impedance phonograph inputs. High gain—excellent frequency response. An outstanding value at a low price.



RCA 15-watt Amplifier MI-12202-B. This medium power, high gain amplifier has two individually controlled input positions for microphone and phonograph. Continuously variable tone control and other features. 15 to 20 watts output—Intra-Tube Mixing, two high impedance inputs, phonograph input jack. Excellent for moderate power installations.



RCA 25-watt Amplifier MI-12205 has most modern circuit design, is extremely flexible, can be used for four input positions for microphone and phonographs; Remote Electric Mixing, bass and treble controls, provision for extra inputs, automatic phonograph compensation, and other features.

## TECHNICAL BOOK & BULLETIN REVIEW

RADIO OPERATING QUESTIONS AND ANSWERS. By Arthur R. Nilson and J. L. Hornung. Seventh Edition. Published by McGraw-Hill Book Company, Inc., New York and London. 415 pp. including index. Price $2.50. This book is written especially for students and operators who are about to take the Government examination for a radio operator's license. The book is not intended to be used as a text book but rather as one for review by readers who are already technically trained in radio communication and whose requirements are a quick review of the essential theory, mathematics and diagrams. Students who need basic instruction rather than a review will find this in a resident or home study school specializing in radio communication courses, and in the several complete text books on the subject now available. The authors' "Practical Radio Communication" is typical of the type of book required. In the preparation of this book the authors have carefully considered all of the requirements involved. An effort has been made to arrange the answers to the questions to include a variety of "key" answers whenever possible. Hence, any rearrangement of the license—examination questions, in the future, will still leave the applicant with a satisfactory solution or answer. Approximately 1,300 questions and answers covering the entire scope of commercial radio operator license examinations, Elements 1 to 6 of the FCC requirements, are included. All answers have been made as compact and to the point as possible to facilitate ease of learning and to encourage supplementary text book reference wherever greater technical detail or basic information is required. This book has been a leader in its field for many years and should be in every radio operator's library. Price $2.50.

ELEMENTS OF ACOUSTICAL ENGINEERING. By Harry F. Olson, E.E., Ph.D. Published by D. Van Nostrand Co., Inc., 250 Fourth Avenue, New York City, N. Y. 344 pp. including index. Price $6.00. This excellent book will be in much demand from engineers and students engaged in the development of various types of acoustical instruments and to those engaged in their application. The reproduction of sound is so common-place today that it is usually taken for granted by the layman. Nevertheless, the developments during the past two decades in the art of communications in sound reproduction have been remarkable. In the early stages of the present epoch of progress the advances were made by pure scientists. As in the metamorphosis of any art, the burden has been gradually shifted to the applied scientist and engineer. These changes have led to a demand for expositions upon the fundamental principles of the new applied science of acoustics from the standpoint of the engineer. Accordingly, this book has been written with the idea of presenting the elements and principles of

(*Continued on page* 66)

# MANUFACTURERS' LITERATURE

RAYTHEON ISSUES NEW DEALER BOOKLET. The *Raytheon Production Corporation,* Newton, Mass., has just released an attractive dealer and service helps booklet containing invaluable aids to *Raytheon* Tube dealers.

The booklet illustrates a multitude of dealer helps, including colorful window displays, counter and shelf displays, window and door identification decalcomanias, service shop tags, tube stickers, etc. In addition to the attractive displays and other items there is valuable technical information for all *Raytheon* Tube dealers and service men.

The *Raytheon* booklet is available, without charge, to all tube dealers through their *Raytheon* Distributor or from any Raytheon branch office. Free. (RADIO NEWS No. 12-100.)

STANCOR'S NEW PACK CATALOG. Pack catalog No. 109-C is now offered by the *Standard Transformer Corporation,* Chicago, in addition to their Service Guide, Hamanual and Complete Catalog.

This valuable book contains information on many stock packs manufactured by *Stancor.* A wide assortment of filtered and non-filtered packs are shown together with technical data and operating graphs on each.

In this catalog will be found packs for use in portable battery radios, to convert them for use on 115 volt a.c., 115 volt d.c. and 6 volt d.c. There are model railway packs, units designed to operate pin games, packs for auto radio demonstration work, time clock, etc. Other packs to be used in electro-plating, to operate telephones, for the operation of solenoids, etc. In fact, many uses will be suggested by the wealth of information contained in the book itself. Never before has there been as much interest in this type merchandise. New developments in the Radio Industry make them highly desirable for many applications, new processes and applications in the industrial field have created a demand for packs such as never before.

The catalogs are free of charge and may be obtained by writing to the *Standard Transformer Corporation,* 1500 N. Halsted St., Chicago. Free. (RADIO NEWS No. 12-101.)

BIG NEW SPRAGUE CONDENSER CATALOG ANNOUNCED. The largest, most complete *Sprague* Condenser Catalog ever issued has just been announced by the *Sprague Products Company* of North Adams, Mass. A copy will gladly be sent free upon request to any reader of this publication or may be obtained from any *Sprague* jobber.

In addition to including a number of important new developments, the *Sprague* 1940 Catalog has been carefully arranged for the utmost convenience in selecting exactly the right condenser for the right job.

New *Sprague* developments cataloged completely for the first time include the new Type LM Atom condensers with universal lugs for either vertical or horizontal mounting; new Atom condenser kits; new high voltage dry electrolytics; new high voltage fixed micas; various new Television condenser types; new interference locater; new *Sprague* de luxe Tel-Ohmike and various others. Free. (RADIO NEWS No. 12-102.)

NEW CATALOG OF MINIATURE PANEL INSTRUMENTS. A new 12-page illustrated catalog covering the "37" line of miniature panel instruments is announced by the *Westinghouse Electric and Manufacturing Company.* These small instruments, approximately 4½ inches in diameter, and available in three mounting styles have a broad field of application, from industrial and radio test apparatus down to the gadget of the amateur experimenter.

The catalog explains features such as dial readability, linear scales, interchangeability of instruments, and numerous others. Operating principles are described and illustrations of the instruments, both individual and installed, are included. Dimension and mounting data are given.

Eight of the twelve pages are devoted to a complete listing including prices of the entire line, direct current voltmeters, ammeters, milliammeters, and micro-ammeters; radio-frequency ammeters and milliammeters of the thermocouple type; and rectifier type voltmeters, milliammeters, and micro-ammeters.

Copies of catalog section 43-370 may be obtained from department 7-N-20, *Westinghouse Electric & Manufacturing Company,* East Pittsburgh, Pa. Free. (RADIO NEWS No. 12-103.)

ALIGNMENT INDICATOR FROM SPARE PARTS. A highly practical gadget for use as an indicator in aligning receiver circuits, as an external "S" meter or signal strength indicator, and for various other applications normally involving a vacuum-tube voltmeter, is briefly described by serviceman Edgar Boles of Marion, Ill., in the August issue of the "C-D Capacitor," a free monthly magazine published by Cornell Dubilier for radio servicemen.

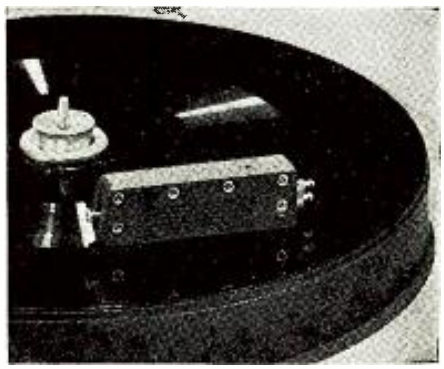
This "output" meter consists of a 6E5 "Magic Eye" tube, operated directly from the line and utilizing a 25Z5 for plate supply. Anyone can

(*Continued on page* 66)

## MIKES—HEADS —PICKUPS—

**Manufacturer's Specifications**

**Make:** Brush.
**Manufacturer:** The Brush Development Co., 3333 Perkins Ave., Cleveland, Ohio.
**Model:** RC-20.
**Type:** Crystal (4-ply element).
**Range:** Substantially flat within 3 db. from 50 to 9,000 cycles.
**Stylus required:** Long-shank steel, stellite, or sapphire.
**Impedance:** 227,000 ohms at 100 cps. at 24 degrees C.
**Weight:** 4¼ ounces.
**Sensitivity:** .001" Amplitude (Approximately) for 125 to 150 volts r.m.s.
**Voltage Input:** For "Constant Amplitude" recording—50 volts.
For "Constant Velocity Recording"—150 volts.



**Description**

The RC-20 Cutter is designed for engraving disc records of the lateral type in wax or other recording materials such as nitrocellulose, vinylite, etc. This cutter includes a four-ply crystal element viscously mounted within a small metal case. The cutting stylus is held securely in position by means of a thumb screw. The cutter has a wide and uniform frequency response and is practically free of harmonic distortion. It is also exceptionally efficient in its operation. permitting the use of a driving amplifier of relatively low power output. Because of the inherent stiffness of the crystal and stylus arrangement, the amplitude and frequency response are almost completely unaffected by depth of cut and variations in hardness of recording materials.

Since this cutter is of the crystal type, the stylus displacement (amplitude) is proportional to the voltage impressed across its terminals over practically its entire frequency range. For this reason, "constant amplitude" records can be cut without any form of equalization. Where desired, commercial "constant velocity" records can be cut merely through selection of a proper coupling circuit to the driving amplifier.

The RC-20 cutter, when connected to the output of an amplifier, represents a capacity load, in which the impedance decreases as the frequency increases. For this reason, it is recommended that a Class A or AB amplifier employing triode output tubes be used. since the harmonic distortion generated in these tubes is relatively independent of load conditions. Power amplifiers employing pentode or beam-power tubes may be used, providing (a) stabilized feed-back is employed in the output stage, or (b) the output is shunted by a resistance of suitable value to stabilize the load impedance. Since the impedance of this cutter will decrease as the frequency increases, this means that, if the cutter impedance is high with respect to its coupling circuit over its entire frequency, the cutter will operate on a "constant amplitude" basis. When the cutter impedance equals the impedance of the coupling circuit, its response will be down 3 db. at the frequency where these impedances are equal. Above this frequency (usually referred to as "turnover" fre-

*(Please turn the page)*

quency), the response will fall off at the rate of 6 db. per octave. In other words, the cutter will operate on a "constant velocity" basis above the "turnover" frequency, and on a "constant velocity" basis below the "turnover" frequency.

By proper selection of circuit components (usually a transformer and/or a series resistance) this "turnover" can be placed anywhere in the frequency spectrum. If the "turnover" is located between 250 and 800 c.p.s., the cutter will engrave commercial "constant velocity" records. If the "turnover" is located at the upper end of the frequency spectrum, i.e., 7,000 to 9,000 cycles per second, the cutter will engrave "constant amplitude records."

**Comments**

Many records have been cut by the writer with this cutting head with excellent results being had with both "constant amplitude" and "constant velocity" methods. In fact—some of the discs showed a frequency response in excess of those claimed by the manufacturer. Crystal cutters are becoming quite popular as the months roll by. The RC-20 is of a high grade and was found to be capable of doing a professional job in every respect. It is extremely compact and may be easily fitted to conventional recording arms. —30—

## For the Record

(*Continued from page 4*)

cluded this all-important subject in their curricula. Nor are males the only ones attending. Great classes of women and girls can be seen bending over their books or listening to the code in all parts of our country. Should the national emergency terminate, this country, for one, would be probably the best radio-equipped country in the World, and we certainly will not lack for trained radio personnel. Some of the social bureaus have been viewing with alarm the increased number of persons training themselves for professional radio, because these agencies feel that when the need for radiomen slacks off there will be greater unemployment in the field and lower wages than ever before. In view of the fact that it is commonly known that the National Defense Program envisages a minimum of seven years, we believe that the radio-trained man or woman will be able to find a suitable place for himself, or herself, in that time, and that when the National Defense situation tapers off, the increased personnel will be absorbed in allied, but non radio, electronic industries.

* * *

WE are happy to report that the RADIO MINUTEMEN OF AMERICA suggestion made by Senator Claude Pepper of Florida, and sponsored by this magazine, is meeting with a tremendous and overwhelming success. Every mail brings more and more applications from radiomen, short wave listeners, servicemen and operators who are willing to help serve their country in time of need.

The most frequently asked question is, "Does the RADIO MINUTEMAN OF AMERICA organization supplant the Army Amateur Radio System, the Naval Communication Reserve, American Radio Relay League, or any other National body?" The answer is definitely, "No!" The RADIO MINUTEMEN OF AMERICA is non-partisan, non-political and is carrying "no axe." It does not supplant the Army, nor Navy Communications systems, reserve, or otherwise. It does not train operators and it does not drill. It is solely a voluntarily cohesive body of radiomen whose sole purpose it is to preserve our Democracy and our American-Way of living.

Government recognition of the RADIO MINUTEMEN OF AMERICA may be forthcoming as soon as the files are complete. We have started a series of "letter conferences" with J. Edgar Hoover, Director of the Federal Bureau of Investigation, and conferences will also go forward with Chairman Fly of the Federal Communications Commission, and other Governmental agencies. The amount of work expected from the RADIO MINUTEMEN OF AMERICA is left entirely to the membership and the beneficial results from the operation of the RADIO MINUTEMEN OF AMERICA will accrue only to our Government. Any actions taken against the subversive elements as a result of their detection by the RADIO MINUTEMEN OF America will be through regularly authorized government office. The RADIO MINUTEMEN OF AMERICA are not policemen. At best, they are detectives.

* * *

IN the vast shuffle for positions in in the Government employ as radio operators and to fill positions with National Defense manufacturers, very little has been said about the serviceman. Eternally to the credit of this group of hardworking and yet little-heard-of men, is the fact that they have not shut down, they have not cut down their shops, and that they are still doing business "at the old stand." One of the most important things in National Defense is the National Morale, and without the serviceman it might be extremely difficult to maintain that morale should a National Emergency arise. We already know that the radio is one of the most common sources of disseminating information. During a National Emergency, much important information would emanate from our own government, and it would become necessary to reach literally millions of people on short notice. The only way this can be done is by radio and the broadcast stations. If the radios in the hands of the people are not kept in good condition, are not serviced, or if the public loses faith in radio, one of the most valuable assets to our government will be lost. It is to the credit of the serviceman that he has not left his shop and gone into the radio factory. He has not left his shop and become a radio operator; he has not left his shop to take on duties which might, at first glance, appear to be more remunerative. He has stayed at home and in his daily servicing work is aiding the Government immensely and keeping open the channels leading directly to the morale of the people.

* * *

IN talking recently to a number of manufacturers who catered entirely to servicemen, the question was asked, "What will become of the serviceman in the case of a National Emergency"? We believe that a great many servicemen will be conscripted into the maintenance department of the Government, and that their infinite knowledge of the receiver will stand them in good stead in keeping our military radio units going. However, no matter how many will be inducted into military service, there will always be a greater number of servicemen left in civilian life. On their shoulders will

fall the work of keeping the civilian radios in condition. It will be through these servicemen and their work that our government will be able to maintain the high Morale of its people. So when you think of National Defense, when you think of radio operators and you think of radio schools, give a thought to the serviceman who, in his quiet way, is going as much as any of these other groups.

* * *

IT is reliably reported that public address systems are becoming more simple. The trend is definitely away from complicated mixers and pads which are hard to service and still more difficult to replace. In their stead we find far more efficient circuit design and layout enabling easy and rapid replacement and repair. Units are more compact than they used to be for the same output power. Vibrationless motors have enabled the placement of turn tables integral with the P.A. unit itself. Frequency Modulation receivers have introduced extended range speakers to the general public, and their use has not been restricted solely to the type of transmission which gave them birth. Most servicemen have found that extended range speakers make excellent replacments for older type units. This is especially true in church installations.

* * *

ANY number of variations of the electric organ have made their appearance on the market and electronic music is becoming most commonplace. However, the number of servicemen who feel themselves competent to adjust or repair electronic pianos or organs is very small and a lucrative field for those trained in this service still remains.

* * *

IN the field of aviation radio, facsimile and Frequency Modulation tests are continuing from day to day, with varying reports of success. So far, Frequency Modulation bids fair *not* to surpass Amplitude Modulation, at least for long-distance hauls. But short traffic control work, for instance, in and around an airport may eventually come to use Frequency Modulation exclusively, although until there is a transposition from amplitude modulated receivers to frequency Modulated receivers in greater numbers among the airplane pilot fraternity, amplitude modulated traffic control tower transmitters will continue in use.

* * *

MARINE radio units continue to get more compact and, at the same time, more flexible. It is no longer unusual to board a yacht and find a telephone which rings when the yacht is being called. More and more people are using marine telephones even on some of the very smallest craft.

* * *

AMATEUR radio is going in more and more for television and Frequency Modulation, and two new magazines in the radio field have made their appearance. One is devoted to the amateur and the other to the Frequency Modulation fan.

Referring to amateur operators, it is interesting to note that practically all the experimentation being done by this very active group is taking place in the ultra-high frequency spectrum, and comparatively little work is being done

in the "long wavelengths," in spite of the increased spectrum space which became available November 1st to those amateurs using the 160 Meter fone band. The hullabaloo that attended the reopening of cathode-modulation, notwithstanding, cathode-modulated transmitters are still in the minority. This is partly due to the fact that a great many high-level transmitters were already in operation when cathode-modulation was reintroduced and partly due to the fact that a cathode-modulated transmitter is somewhat more difficult to adjust to equal in quality that of the high-level plate modulated rig. Radio amateur license applications continue about the same.

* * *

MOST of the factories heretofore devoted to the construction of amateur radio equipment and parts, and servicemen's parts, are going day and night on National Defense orders. However, as may be noted from other sections of this issue, none of the National Defense program has so far interfered with present commercial commitments. The radio amateur is still able to find and buy almost any part which he sees listed in any catalog.

* * *

HOME recording is still booming and a great many radio men are making a practice of collecting contemporaneous news-casts of national as well as international events. In later years to come, these records, showing in word pictures what happened during the year of 1940, will become invaluable. In connection with home recording, the series by our Technical Editor, Oliver Read, on "How to Build a Home Recording Studio," is coming right along. The second part appears in this issue, and the third and subsequent parts will appear in future issues. Actually, this series will take a considerable number of months to complete, but if the readers will be patient they will, at the terminus of the series, find that they are fully equipped to run and build a first-class home recording studio.

* * *

ONE of the features of next month's issue will be a portable transmitter-receiver such as may be carried by hand from place to place. With a slant-wise view toward National Defense, this unit is designed around a well-known commercial receiver which is already portable. Do not miss this article, especially if you are interested in, or a member of, the Amateurs' Emergency Corps. It is hoped that many amateurs will build up this transmitter-receiver since, should a National Emergency arise, of any sort, whether it be a hurricane or a war, these rigs will find extended service.

* * *

THOSE of our readers who are amateurs, are urged to read that portion of the "Washington Communication" in this issue which pertains to the twisting around of foreign call letters by the foreign subversive elements in an attempt to get an American amateur to communicate with them. If you are not sure of a foreign call, *do not answer it.* That, in the final analysis, is the very best advice.

* * *

THAT about completes this month's stint. We have just finished a 4,000 mile tour through the West. One of the most unusual things we noticed was that in outlying districts, especially on Indian reservations, a great number of antennae and quite a few of transmitting rotary beam types were apparent. Truly, it may be said that the radio spreads over our country from Coast to Coast and from Canada to Mexico. It remains the one great source of communication in time of stress as well as a social force which must be reckoned with in considering the national harmony which has only lately come to these 48 United States. The one striking difference between our radio and that of the many dictator-ridden countries is that it is used to give information—not withhold it—KAK

## Serviceman's Experiences

(*Continued from page* 22)

service," I said, "please do not hesitate to call upon me."

Neither answered; but, as they were leaving, I heard Mrs. Hunter say to her husband:

"Wasn't it *interesting,* dear? A peek at Hollywood!"

Business dropped off alarmingly during the following two weeks, despite my assurances to narrow-minded customers that the man I was sending out in my place was a top-notch mechanic. Finally, when one of our best customers refused Wilbur entry, Al stepped in.

"The show's over," he ultimatumed. "Change your tie to one with a lower noise level and get back to work—in the old-fashioned way!"

By that time I was too discouraged to answer. We fired the hired help, but he didn't seem to take it as hard as one might expect. Later we found out he was canvassing all our old addresses and starting up his own business. I'm afraid it's going to be a tough job to weed Wilbur out—especially since I have recommended him personally to most of our steady customers. Ah—sometimes I think radio repairing is a lousy business; why—even the records we sell are two-faced!

Wanna buy a nice, shiny desk? —30—

## Ringing the Bell

(*Continued from page* 32)

the speed and reliability of a signal tracer diagnosis, you must be completely "at home" any place in a radio receiver. You will get out of your tracer just as much as you put into the job in *straight thinking.*

We will not take up space with long recitations of how fast we found some very obscure radio trouble. We have found many troubles in receivers which could have been found by other methods, but the point is that they were found *easier* and *quicker* with signal tracing equipment.

We have no axe to grind for any particular test instrument manufacturer's signal tracing equipment. It is our belief that there are several makes which would prove highly satisfactory. Whether you use tuning eye tubes, meters or a cathode-ray tube to read indications, we believe that a signal tracer will help you in "Ringing the Bell" for greater profit.

—30—

# SERVICEMAN'S CASE HISTORIES



### GENERAL ELECTRIC M-56

(Uses same chassis as RCA-211 receiver.) See the Case Histories listed for the RCA-211 receiver

### GENERAL ELECTRIC M-61

(Uses same chassis as RCA-128 receiver.) See the Case Histories listed for the RCA-128 receiver

### GENERAL ELECTRIC M-62

(Uses same chassis as RCA-125 receiver.) See the Case Histories listed for the RCA-125 receiver

### GENERAL ELECTRIC M-65

(Uses same chassis as RCA-221 receiver.) See the Case Histories listed for the RCA-221 receiver

### GENERAL ELECTRIC M-66

(Uses same chassis as RCA-226 receiver.) See the Case Histories listed for the RCA-226 receiver

### GENERAL ELECTRIC M-67

(Uses same chassis as RCA-224 receiver.) See the Case Histories listed for the RCA-224 receiver

### GENERAL ELECTRIC M-68

(Uses same chassis as RCA-321 receiver.) See the Case Histories listed for the RCA-321 receiver

### GENERAL ELECTRIC M-81

(Uses same chassis as RCA-143 receiver.) See the Case Histories listed for the RCA-143 receiver

### GENERAL ELECTRIC M-86

(Uses same chassis as RCA-242 receiver.) See the Case Histories listed for the RCA-242 receiver

### GENERAL ELECTRIC M-89

(Uses same chassis as RCA-341 receiver.) See the Case Histories listed for the RCA-341 receiver

### GENERAL ELECTRIC M-106

(Uses same chassis as RCA-262 receiver.) See the Case Histories listed for the RCA-262 receiver

### GENERAL ELECTRIC M-107

(Uses same chassis as RCA-263 receiver.) See the Case Histories listed for the RCA-263 receiver

### GENERAL ELECTRIC M-125

(Uses same chassis as RCA-281 receiver.) See the Case Histories listed for the RCA-281 receiver

### GENERAL ELECTRIC M-128-R

(Uses same chassis as RCA-380 Duo H. R. receiver.) See the Case Histories listed for the RCA-380 Duo H. R. receiver

### GENERAL ELECTRIC M-129

(Uses same chassis as RCA-381 receiver.) See the Case Histories listed for the RCA-381 receiver

### GENERAL ELECTRIC N-60 (Auto Radio)

| | | |
|---|---|---|
| Ignition interference | 1) | lengthen the distributor rotor arm by pecning it. This shortens the gap between it and the stationary contacts, thereby reducing the length of the arc |
| Inoperative (no voltages) | 1) | faulty 6X5 tube |
| | 2) | condenser block "shorted" |
| | 3) | condenser across 6X5 plates "shorted" |
| Howling | 1) | try a new 6Q7 tube |
| Noisy | 1) | check for a microphonic tube |

### GENERAL ELECTRIC S-22, S-22-X

(Uses same chassis as RCA R-7 receiver.) See the Case Histories listed for the RCA R-7 receiver

### GENERAL ELECTRIC R-155

| | | |
|---|---|---|
| High noise level | 1) | break cathode connection of 6K7 first i-f tube and bias it through a 10,000-ohm ½-watt resistor. Bypass this with a 0.05-mfd. condenser |

*(To be continued)*

**Electronic Maintenance**

(*Continued from page* 26)

sary in the adjustment of the heterodyne oscillator of television and frequency modulation receivers. However, this is a matter of adjustment and with the proper type of equipment on hand, is by no means any obstacle. However, it does mean more precision work than has normally been carried on and might make necessary breaking a habit, if broad tolerance form of adjustment has become a habit.

In line with the very wide frequency range requirements in the signal source for servicing apparatus used in the various fields just discussed, a special test instrument of unusually broad frequency coverage should be used. Such a unit is the RCA Signalyst. This instrument has a frequency range extending from 100 kc. to 120 mc. in ten bands and the output over this entire range is on fundamental frequencies. This does not mean that harmonics cannot be used; for the few applications where frequencies somewhat higher than 120 mc. are required, such as some of the traffic control receivers used in aircraft which operate up to 143 mc., it is possible to use the second harmonic of the ultra-high frequency fundamental for test purposes such as the second harmonic of 71.50 mc. By using an extremely high fundamental frequency in such applications, the possibility of error due to picking the wrong harmonic for test purposes is avoided.

Much of the apparatus with which we are now concerned, has to be adjusted more accurately than most home radios. Therefore, first and foremost, we need a signal source which is absolutely dependable; one that, when adjusted to the calibrated frequency, will provide not just an approximation, but the actual frequency which is required. Naturally, it is not possible to make a tunable oscillator which will maintain absolutely constant frequency over a wide range, but in this instrument every means has been taken to keep the calibration well within the close limits of plus or minus 1%. To this end the tuning range of each band has been limited to a 2-to-1 ratio, which means that the frequencies are well spread out over the dial and can be adjusted to within very close limits; the mechanical construction has been made rigid, so that frequency shift will be controlled as much as humanly possible.

But in addition, there are occasions when the high precision of a crystal-controlled transmitter is also required in the test signal source. In certain aircraft receivers, police receivers, and the like, which are pre-tuned to a fixed frequency, the receivers must be adjusted exactly to the correct frequency. There are ways of adjusting a test oscillator, calibrating it with a receiver to a known signal, but such operation is neither rapid nor in line with modern technique.

In this instrument, a special heterodyne detector is supplied for just such applications. When the precision of a crystal-controlled transmitter is required it can be obtained. All that is necessary is to feed any desired frequency within the 100 kc. to 120 mc. range into a jack provided in the Signalyst and the signal generator may be adjusted to zero-beat with the calibrating signal. A crystal calibrator, which can be set right alongside the signal generator and will supply a prolific number of crystal-controlled frequencies, is also available and will be described later on in this article.

The schematic of the Signalyst is shown in Fig. 2. The circuit arrangement is unusual; it has to be, to cover efficiently such a wide range of frequencies. Over the first seven bands, extending from 100 kc. to 14,500 kc., the two sections of the two-gang oscillator tuning condenser C1 are switched in parallel across the grid coil and the permeability-tuned coil is used in the plate circuit for feedback. For the ultra-high frequency ranges, a Colpitts circuit was found more efficient and provided smoother oscillation, so the two sections of the gang condenser are switched in series across the entire coil system for each of these ranges. You will note that there is no coil for the highest frequency range; none was found necessary, since the inductance of the leads alone is sufficient to cover the range. A separate copper shield surrounds the entire r.f. coil and trimmer assembly to keep leakage of the r.f. signal to an absolute minimum.

The r.f. oscillator is not modulated directly. Instead, a buffer tube, which also serves as modulator, is employed. This serves to isolate the modulating voltage from the r.f. oscillator and thereby prevents frequency shift which otherwise may occur as a result of applying the modulating voltage directly to the r.f. oscillator. Further, this makes possible a higher degree of modulation, without distortion than is normally available in the more common arrangements.

The modulating voltage may be of any frequency from 60 cycles to 5 mc. supplied externally. This wide range adapts this instrument to television testing in addition to fidelity and other measurements beyond the scope of the usual test oscillator. Modulation percentages up to 90% may be used.

Internal modulation, supplied by a 400-cycle audio oscillator employing the triode section of the 6F7 and its associated transformer T1, is applied to the modulator tube through a resistance network which adjusts its voltage so as to produce approximately 30% modulation which complies with test requirements in virtually the entire communication field, meeting the requirements for sensitivity measurements of aircraft, police and marine receivers, as well as the standards of broadcast receiver testing.

The use of a tube voltmeter for measuring the r.f. signal level removes all doubt as to the r.f. signal strength developed by the oscillator. Without this feature, there would be no sense in having a calibrated attenuator, since we would never be sure if the oscillator signal across the attenuator were always the same level. With the tube voltmeter, and a means of adjusting the r.f. level fed to the voltmeter, the output signal level is always known and no uncertainty can exist.

We mentioned in passing the calibrated attenuator. This is a resistance ladder arrangement which acts as a voltage divider and reduces the signal level in steps of 10 per section. The resistors are electro-statically shielded from each other to provide more uniform attenuation regardless of frequency and so chosen as to

provide a constant impedance at any setting of the multiplier control. This is important, since if a simple potentiometer were used, the loading effect of the input circuit to which the output of the attenuator connects would vary with the setting of the potentiometer. Naturally a constant output impedance is highly desirable for reliable output voltage determination.

The advantages of knowing the output signal level from the signal source as used in testing many of the receivers which come within the communication classification will be apparent when we consider the specifications for police, aircraft, and marine receivers.

In the meantime an example of two such receivers might be of interest. The sensitivity of such receivers is rated in microvolts for a certain output. In a home receiver a low rating of microvolts is naturally important for it gives the owner the opportunity of listening to some of the weaker stations, but it is not absolutely vital to his welfare because, even if he does not get the distance stations, he is able to receive the locals which, more than likely, are on a chain anyway. In police, aircraft, and marine work sensitivity is not only important, but vital, for it is imperative that when a receiver is turned on to pick up a certain signal, that it be capable of picking up that signal, and thereby provide the operator with the information he needs.

The various types of transmitters which are used for communication in these different fields are seldom, if ever, of high power, and usually operate with a limited range. To make certain that reception of the needed signals from these comparatively low-powered transmitters is available, certain sensitivity requirements exist in the receiver. It is imperative that the operator of a police, aircraft or marine receiver be in constant touch with those sources which provide the guiding signals. Men who operate in these fields do not have the latitude available to the home owner. Thus it is imperative, when such receivers are serviced, that the signal source used provide known signals of known level —and by far not the least important is that the signal which is secured from the signal source is that being fed from its output cable into the receiver, and not a leakage signal.

If a signal source is to be suitable for general communication servicing its leakage must be low, otherwise a receiver adjusted in accordance with the attenuator setting upon the signal source, and considered satisfactory because of the required signal output, may prove entirely unsatisfactory out in the field when called upon to deliver the proper output from the received signal.

The above has frequently been mentioned in connection with normal broadcast operation and if you recognize its value in that connection, then most certainly you can recognize the value of practically flawless shielding in those instances where safety rather than entertainment is involved.

We have spoken of the crystal calibrator as being a valuable auxiliary device for use in connection with the signal source. Such calibrators are available which supply fundamental

frequencies of 100 kc. and 1000 kc. (or 250 kc. and 2000 kc.) with harmonics which extend well up into the ultra-high-frequency ranges. A typical RCA Crystal Calibrator is schematically shown in Figure 3.

With these calibrators, either an unmodulated or a 60-cycle modulated signal may be obtained. For calibration purposes, a pure, unmodulated signal is desirable, for which battery operation is usually required. But in the signal source which we have described, regulated and filtered d.c. supply to operate the calibrator is made available at pin jacks on the panel. This voltage may also be used to operate photocells and other light-drain apparatus, thus eliminating the need for batteries.

So much for the frequency requirements and signal source requirements of the various classifications of the communication field, and the two basic units we feel meet all of these requirements. In fact, we know they do, because they already are being used in these fields. Our typical communication and electronic service shop is taking shape. Figure 4 shows the two units described. What will the others be?

As you can readily see, we have not discussed the application of these units. This discussion like several others is being held in abeyance until we have the opportunity of speaking about the receivers and transmitters employed in private aircraft, private marine, police and the other branches of this type of activity which we feel will come within the province of the wide awake radio communication service shop.

The next installment of this series will speak about voltage measuring devices and the requirements which exist in communication receivers and transmitters. Naturally this automatically covers the general run of commercial broadcast receivers. —30—

## Washington Communication

(*Continued from page* 14)

tions) have occurred, such violations having been due to the apparent misinterpretation of call letters of foreign stations. . . . Such errors may be due either to poorly executed sending of the foreign operator or to an error in reception by the United States amateur and may cause the latter to become subject to an official citation by the Commission." Commissioner Fly has stated that an example of such transmission was a Russian station signing the call letters UK4AC, which might be misinterpreted as K4ACU. The matter of twisting call letters by foreign stations in an effort to obtain contact with the United States amateurs has been called to the attention of the amateurs, not only here but in other publications addressed to the amateur.

### Inventor's Symposium

THE Signal Corps, like other branches of the armed service, is being bombarded with inventions. Some weeks ago the President established a National Inventor's Council in the Commerce Department. This is a group of eminent scientists and inventors who were named to go over all kinds of inventions sent in by those who think they can help Defense. All ideas sent to the Signal Corps are forwarded to the Inventor's Council without examination. The N.I.C. operates under great secrecy. It won't reveal how many radio inventions it has been receiving. It says merely that radio has been a very active field and that it has been getting about as many ideas in this field as in any other one. The Council says that some of these inventions look "promising." It is decidedly interested in any new inventions and gives everyone whose invention "looks good" a hearing. The inventor should write the particulars of his device along with necessary illustrations, giving all pertinent information. The patent number should be included, or a statement that a patent is being sought. The Council will examine the idea and if it appears promising will get in touch with the inventor for a demonstration.

### Patent Situation

PRIOR to the National Defense situation, there has always been the question of patents and patent infringement when bidding upon a Government contract. Heretofore, it was almost a Federal requirement of Government order that the bidder guarantee that the Government would not be sued for using an infringed patent. In some respects this has been changed. The Defense Commission says it does not investigate any patent claims. It is not enforcing any patent claims, and on the other hand it is not helping anybody to break them. If a company is manufacturing certain equipment and promises the Government that it will deliver the equipment, the Defense Commission will let it fight its own patent battles.

### No Extension on Paw-printing

IN order to avoid unnecessary hardships to all radio operators and people engaged in communication, the filing date for the responses to the order that the people in communications be paw-printed, was extended by a one month's period, twice, from the original of August 15. Under the provisions of Order 75 as amended the responses were due on or before October 15, 1940. No further extensions were granted. However, the Commission was disposed to accept without further action such responses as might be tardily filed provided they were accompanied by satisfactory explanations of the reasons which prevented prompt compliance with the Order. At the same time the Commission emphasized that arbitrary failure to submit the response in accordance with the Order, or to offer a reasonable explanation of the factors necessitating late filing, will be considered just cause for further action on the part of the Commission. And, incidentally, the Commission is not fooling.

### Navy Intelligence and Radio Operator's Union

THE Navy Department's intelligence unit has in its files complete brochures on all leaders of radio operators unions, especially the maritime unions. The Navy Intelligence men have gone over the records and activities of all of the suspected radicals in the ACA and probably know more about the operator's activities than does the union. It is understood that the Navy Department will move before long to take over the licenses of all operators on American flag ships. Confidential sources say that operators suspected of subversive activities will be replaced by Navy-approved men. The American Legion Convention recommended in a resolution that the Navy take complete charge of merchant marine radio operators. And the Navy did not say no.

### War by Radio

REPORTS reaching military men in Washington indicate that the European aerial war is being directed ever more by radio. There is reason to believe that Germans are flying pilotless bombers—controlled by radio—over London. The British have been defending themselves with radio-directed barrages from the ground. They are using the radio echo method—bouncing radio waves off approaching planes—to battle night raiders. This phenomenon is familiar to most amateurs who have experimented with it and they can testify to its veracity. The method of measuring distance by sound and by radio and thus locating night flyers accounts for the virtual disappearance of searchlights from the London ground defense.

### Communist Party Gets on the Air

REPRESENTATIVES of the Communist Party called on Chairman Fly of the FCC, to protest that the major networks were discriminating against them in granting time for political speeches. Mr. Fly said the comrades had better see the networks about it, not him. They did, and a few weeks later came up with a spot for a speech—at 10:15 P. M. EST.—of their candidate, Earl Browder. The speech, however, was carefully watched—with one hand on the "cut-off" switch.

### Radio Intrigue

INTRIGUE via radio has reached a new high, and scores of Federal agents are devoting full time to the detective work which is necessary to keep track of all the ramifications. The G-men, for instance, are closely following a number of short wave propaganda broadcasts, which they have reason to believe are loaded with code instructions for spies. The FCC has put 80 new monitoring cars in service, with receivers with ranges of from 100 kilocycles to 145 megacycles, and has opened 75 new monitoring stations. Nearly 500 operators have been hired, one-third of whom were hams.

International radio telephone and telegraph stations are the hot spots. Operators who are handling the confidential stuff through these stations are being fingerprinted and carefully investigated. The Nazis would go nuts if they know how much their censors were missing—via radio.

### Point-to-Points

RCA, Mackay and the rest have lost a number of stations in the course of Hitler's march. But as the U. S. has pushed its diplomatic outposts into new spots, the point-to-points, have multiplied. The establishment of a U. S. consu-

late in Greenland, for instance, was followed by the extension of RCA and Mackay facilities there.

You can almost follow the course of events to come, by keeping tab on the new point-to-points. They are spreading through South America to the places where the U. S. is secretly negotiating for new bases and are being set up at Government suggestion as auxiliaries for miltary nets to come. A few weeks before the shooting started at Dakar, RCA opened up a new station in the forgotten Belgian Congo, and has been handling diplomatic reports on the African fracas since. Judging by the secrecy which surrounds Government activity in connection with the Greenland stations, you can watch for a blow-off there very soon.

### Odds and Ends

THE F. C. C. is getting hardboiled these days. It has enough to do keeping track of broadcasts which might affect our national security without fiddling around with unlicensed hams. So it is taking the guilty ones to court and asking for *and receiving* very stiff penalties.

Westinghouse Electric & Manufacturing Company reported the biggest month of August in the history of its company. George S. Bucher, president, reported that this company's orders for the month amounted to $57,352,054.00, and that employment was reaching the peak months of 1929 and 1937. August business showed an increase of 68.8% over July. Business for the first eight months of 1940 showed an increase of 67.1% over the same period of 1939. Orders received by the company during the first eight months of this year amounted to $226,513,813.00. Of this, approximately, $4,000,000 is represented by Government orders for radio equipment. Incidentally, Westinghouse will spend more than $8,500,000 during the coming year to increase its emergency and peace time production facilities. The company's expansion authorization provides some $5,000,000 for machines, tools and equipment, in addition to the construction of 15 new buildings in six different states. Another $6,000,000 has been authorized for maintenance of the expanded plant facilities. Westinghouse is building a temporary building for production of radio equipment for the Government at Baltimore.

The Department of Justice is considering an investigation of foreign language stations in the United States, as reported here last month. Attorney General Jackson has on his desk a long memorandum urging such a program, and giving reason for suspecting a number of stations of broadcasting subversive material.

It is stated that the Signal Corps believes that F. M. is being somewhat oversold. It has not placed any orders which contemplate large scale use of Frequency Modulation. It is keeping abreast of experimentation and use of F.M. and it will go in for it when it is convinced that there is some advantage to it. So far, it has not been convinced: the success of the Germans' F. M. operation in Denmark, Holland, Norway and France notwithstanding. It is said that a large part of military radio is at present U. H. F. operating close to line of sight bands.

As an example of what the defense program can mean to a city, Oscar G. Mayer, president of the Chicago Association of Commerce stated that orders totalling $125,000,000 have been placed in the Chicago region for materials and new constructions in connection with the National Defense program. However, not all of this is for radio. Similar booms are going on all over the country.

One of the beneficial results of the National Defense program has been the reemployment of a great number of skilled workers of 45 years and over. In a preliminary report, covering 4,100,000 workers in 43 states, showed more than 1,100,000, or 20% of this total, were 45 years of age or over. This age distribution for the entire group however, tends to obscure marked variation in age groups of different classes of workers. For example, among workers with experience in skilled and semi-skilled occupations (and radio is one of this group) more than 31% were 45 years of age, or over. As the National Defense program moves on and further orders are placed for radio, it will become more and more apparent that the skilled worker, regardless of his age, will be able to find employment.

Aiding in National Defense and moving along towards standardization, the 1940 National Electrical Code has recently approved a new type installation. The newly revised code permits certain wire of a given size which will have twice the capacity of old wiring with equal safety. This means that in the construction of buildings, electrical loads will be able to be materially increased without putting in more expensive circuits. As an example it was stated that a particular job which would have cost $407.69 under the old provisions, now would cost only $184.36. New rubber and synthetic compound installations are recognized in the 1940 revision of the code. A new wiring method which utilizes the hollow spaces of cellular steel floor construction for raceways is also recognized. The American Standards Association is behind the move to standardize electricity, wiring, etc., as much as possible.

## Regenerative Receiver

(*Continued from page 27*)

network in the plate circuits of the '19 was employed. A very slight loss in volume occurs with such a system, but the better fidelity obtained more than compensates for such.

A tone control was needed both for audio purposes and for cutting down noise in *DX* reception. Switch 5 cuts the control in or out as desired. Switch 1 effectively takes care of fila-

ment and p.a. input switching in one operation.

If a permanent magnet dynamic speaker is preferred, the optional output coupling circuit may be utilized. Switch 6 provides for either speaker operation or head-phone operation for DX'ing late at night.

The three pilot lamps are switched in or out as desired by switch 2. The lamps light respectively the main tuning dial, bandspread dial, and the whole chassis top to facilitate coil changing at night.

Locations of these pilots are indicated in layout. It is very important that the coil connections be made as indicated in the diagrams, as improper coil connection are a "bugaboo" of most beginners.

Needless to say, short leads, wide-separation of the components of r.f. and detector stages, and above all securely soldered connections, are qualities not to overlook.

*1—Aluminum or electralloy panel, 14"x10" (for chassis base)*
*1—Airplane type dial (Allied Radio Corp.)*
*5—Aluminum brackets (for $C_3$, $SW_2$; and pilot light No. 1, and $T_1$)*
*2—Rubber grommets to fit 1/2" hole*
*9—Rubber grommets to fit 1/8" hole*
*3—2v. .06 amp. pilot lights (Mazda)*
*2—Pilot light sockets (miniature screw base)*
*5—4-prong Hammarlund XP-53 coil forms, type SWF-4*
*5—6-prong Hammarlund XP-53 coil forms, type SWF-6*
*Wire for above coils (Indicated in coil data)*
*3—4-prong bakelite large sockets*
*3—6-prong bakelite large sockets*
*2—Twin jacks—J1 and J2*
*2—5-conductor battery cables*
*4—RCA Tubes, 1—1A4P, 1—30, 1—2-19*
*1—2 gang semi-midget precision condenser,*
*Spaghetti tubing, 6-32 nuts and screws, hook-up wire, rosin-core solder, knobs, 1/8" x 1 3/4" aluminum shield panel (R.F. shield) (underneath chassis)*
*Permanent magnet dynamic speaker with 4 or 8 ohm voice coil*
*1—set 2000 ohm headphones*
*1—3" midget dial for $C_8$ bandspread condenser*
*1—1/4" panel bushing*
*4—Brass angle brackets for chassis base corners*
*1—Grid cap for 1A4P tube*
*4" x 1/4" bakelite rod (extension shaft for tone control)*
*1—insulated shaft coupling for 1/4" shafts*
*3—cushioned condenser mounting lugs*
*1—"Goat" Tube shield and base for 1A4 tube*
*1—Utah-Orthovox Speaker, 8", 10,000 ohms, C.T.*

*HAMMARLUND PLUG-IN COIL DATA*

| Coil | Range (Meters) | (L3) Primary turns | (L2 or L5) Tickler turns | (L1-L4) Secondary turns | Turns per inch on Secondary |
|---|---|---|---|---|---|
| A | 17-41 | 5.8 | 3.8 C.W. | 8.7 No. 16 Enameled | 7 turns to 1 inch |
| B | 33-75 | 11.8 | 5.8 C.W. | 17.7 No. 16 Enameled | 12 turns to 1 inch |
| C | 66-150 | 24.8 | 10.8 C.W. | 37.7 No. 24 Enameled | 24 turns to 1 inch |
| D | 135-270 | 47.8 | 16.8 C.W. | 81.7 No. 28 Enameled | 44 turns to 1 inch |
| *E | 250-560 | 87.8 | 33.8 C.W. | 157.7 | |

*Primaries are wound with No. 340 D.S.C. wire. Ticklers are wound with No. 32 D.S.C. wire. Four prong coils are identical to 6-prong except that primary winding is omitted. Primary windings are interwound with secondary windings, starting at ground end of secondary, and have the same number of turns per inch as the secondaries. All coils are wound clockwise, looking down on form. (Ticklers are close-wound.)*

**The primary turns are 95 to the inch using No. 34 D.S.C. wire. The secondary turns are 88 to the inch using No. 30 enameled wire, and the total length of winding is 1.8 inches. The tickler is wound with No. 34 D.S.C. wire, with 95 turns to the inch. Length of tickler winding is .35 inch. All windings are close-wound with primary wound directly over secondary, starting at ground end of secondary. All windings are clockwise looking down on form.*

—30—

## Radio Minutemen of America

(*Continued from page* 36)

improvements to military radio so that they can study them and can be ready, at a "minute's" notice to assist in the maintenance of such equipment. Remember that a foreign air corps was organized along just these lines and became the most feared and most powerful air armada that the world has ever seen. There is no reason why the United States, which has always fostered invention and innovation, as well as initiative among radiomen, should not be able to produce the greatest, the most perfectly trained, and the most alert group of RADIO MINUTEMEN the World has ever known.

You should join! Just fill out the attached coupon and send it in. You will receive full instructions. There is no cost or obligation to you, beyond that which you assume voluntarily, to be ready to help this great country against those whose philosophies and "isms" are prejudicial to the continuation of the American Way of Life.

*Obey that urge to be patriotic! Do it now!*

**RADIO MINUTEMEN OF AMERICA, Dept. C-2,**
**Room 2217, 608 South Dearborn St.,**
**Chicago, Illinois.**

You bet I want to join the RADIO MINUTEMEN OF AMERICA! Count me in under Group(s) ..... (Insert numbers of groups) Please send me full particulars, but I understand that there are no dues, and I won't be asked to subscribe to any magazine. For a starter I give the following information about myself:

I speak the following foreign languages.....

I read the following foreign languages.....

I write the following foreign languages.....

I was born in the U.S.A. ☐ I am a naturalized citizen of the U.S.A. ☐ I am willing to spend ..... hours per week in work in the RADIO MINUTEMEN OF AMERICA.

Name..... Age.....

Address .....

Call (If any) .....

Phone number .....Licensed radio operator?..... (yes or no)

## FM-AM Mobile Receiver

(*Continued from page* 21)

one stage only. All of the tube shells and shields are grounded. The socket for the 6K8GTX has been mounted purposely above the chassis so as to make possible shorter leads to the tuning circuits without resorting to passing the leads down to the chassis and over to the socket pins.

A bottom plate should be cut to fit the under side of the receiver to complete the shielding. This is very important in mobile work and the little trouble spent on details will help to guarantee the results of which this receiver is capable. Nameplates may be added. The ones used on this receiver are cut from regular 1⅜" plates and are cemented to the panel with Duco household cement. This method was chosen in order to cut down on the physical size of the plates which normally require the use of self-tapping screws for their mounting. Performance has been greatly improved over converters previously tried and those who have had difficulty in receiving 5 meter signals should find this set to be an answer to the problem of obtaining good mobile reception.

### Reception of AM and FM Signals

This receiver is capable of receiving both standard Amplitude-Modulated and Frequency-Modulated signals. While it is not able to keep out noise from sources that include amplitude-modulated characteristics, such as ignition hash, it will offer a marked improvement in general reception due to the set's ability to receive a band-width of some 50 kc. This is made possible by the design of the I.F. transformers at the frequency of 5,000 kc.

Although the front end of the receiver is capable of ample selectivity characteristics for reception of standard amplitude-modulated 56 mc. signals, it will, nevertheless, allow signals of approximately 50 kc. band-width to enter the I.F. transformers. In other words—both types may be received *providing the signals do not occupy more than a 50 kc. spectrum.* In the case of a 50 kc. frequency-modulated carrier, we will hear the signals as originally sent, and in addition, will receive any amplitude-modulation that might accompany the carrier.

This is to our advantage as it is then possible to tune to either type of signal and be able to copy both. If the 56 mc. signal included other than voice frequencies—there would be distortion from the higher notes in music, etc. Inasmuch as we are only concerned with voice frequencies, we can discount the possibility of this condition presenting itself.

Tests from an automobile installation showed a decided improvement in reception from frequency-modulated signals in the 56 mc. band. It was possible to get good reception at dead spots previously encountered with regular equipment, and this was had in the midst of heavy automobile traffic where QRN was terrific. The inclusion of a limiter tube would result in even better performance on FM signals, but this would eliminate all a.m. signals from being received. At any rate—the idea works like a charm and has proved itself to be satisfactory for a happy medium for combined reception of both forms of transmission.

## Blitzkrieg Television

(*Continued from page* 7)

The mobile or portable television pickup equipment consisted of eight metal cabinets with carrying handles and protective panel covers, plus the iconoscope camera and also the necessary power plant in the absence of a 115-volt power line. Units and camera could be readily packed in an automobile. Included in this mobile equipment are the camera synchronizing generator, the shading control whereby adjustments are made to correct for excessive highlights or shadows, the camera controls and power supply, the monitor, and the line amplifier. The signals are, of course, fed either to a nearby ultra-short-wave mobile transmitter which relays the pickup to the main transmitter, or via coaxial cable or line direct to the transmitter. The same units can be used as standard studio equipment, mounted in racks. In fact, the units can serve both in the studio and out in the field, in an economical dual capacity.

As for the television service range under the difficult conditions obtaining during the maneuvers, excellent pictorial detail was obtained at distances up to ten miles, after final adjustments had been made. With more thorough installation, good television pictures were received up to 23 miles away from the 50-watt main television transmitter, with a 60 microvolt signal at the set antenna terminals. The images suffered some loss in detail at this ex-

treme distance, due to local interference. However, up to 8 miles the picture resolution was 400 lines, when originating at the studio or at a remote point connected by coaxial cable. When images originated at the mobile transmitter and were relayed by the main transmitter, considerable interference from other transmitters was experienced, and the resolution of the received images was of the order of 300 lines.

The Army officers who viewed the television scouting reports flashing on their receivers seemed highly pleased with the results. The day-time images revealed a wealth of military information, especially as the camera crew, leaving the mobile equipment truck and advancing under cover of trees, bushes and tall grass, got in some nice "shots" with increased pictorial detail. Night television was also essayed, using some 10 kilowatts of floodlight illumination. However, images were relatively poor, since a minimum of 100 kilowatts of illumination would be necessary for satisfactory television pickup.

That this television demonstration took place under the most adverse conditions, is again confirmed in the matter of operating voltages. The main television transmitter, working off the local power line, frequently had to operate on 80 volts, although built specifically for 115 volts. Even so, satisfactory images were put out, despite the limitations of the local power system.

The television crew worked from 16 to 18 hours each day. They set up six field installations for the reception of the television images, in addition to the mobile transmitter, relay receiver and main transmitter with monitoring facilities.

In addition to pickups from the "field of battle," Du Mont engineers set up their camera at the Message Center in Canton, from which point Army officers took part in the telecasts. Among those who appeared before the iconoscope were Major E. L. Upson, I.G.D., Major George B. Barth, F.A., and Majors Anderson and Savage. Assistance in carrying out the demonstrations was graciously rendered to the video engineers by Colonel John C. Moore, First Army Signal Officer.

The successful demonstrations were supervised by Allen B. Du Mont assisted by Richard L. Campbell who is in charge of transmitting equipment at the laboratories, as well as by Dr. Thomas T. Goldsmith, Charles Huffman, Walter Swenson, Anthony Vitale, William Sayer, Herbert Bernard, Charles Bace, Morris Spector, Klaus Landsberg, Newton Smalley, Robert Kessler, Raymond Lafferty, Harold Bests, and Will Baltin, the last-mentioned being the program director of the new Du Mont television station now being completed in New York City.

Highly pleased with the results of this first military television demonstration, authoritative sources look ahead to startling developments in this ultra-modern branch of scouting, particularly if and when special television equipment is designed and built for the peculiarities of military service.

"I was hoping," stated Mr. Du Mont, "that we might try television scouting from the vantage point of an airplane flying over the maneuvers, but no such facilities were available. With our television technique now providing satisfactory pictorial resolution, especially when using the greater number of lines which we get with our synchronizing, halved repetitive rate, and memory screen system, we can provide television images which compare most favorably with standard motion pictures. Thus commanding officers back at headquarters can see precisely what is going on at the front and even in the back areas of the enemy's line by means of aerial television.

"Just a bit more stretching of the imagination, yet entirely within bounds of present-day achievement, and we have the television aerial bomb, whereby a command post can see that the radio-controlled crewless bomb-diver reaches its goal, can line up the target and release the lethal cargo at the precise moment.

"A parallel development can take place in naval warfare, with scouting ships or planes flashing back television reports, and with crewless 'mosquito boats' or bomb-divers remotely controlled with all the accuracy that goes with actual sight at the scene of battle.

"It is to be hoped that in our military preparations we shall not overlook the important role that can be played by television. It is only through the mobilization of such scientific, technical and industrial assets that we can make absolutely sure of our invulnerability in the face of potential enemies whom, until now, have had all the surprises up their own sleeves to the consternation of their victims."

## External Noise Silencer

(*Continued from page* 15)

circuit trimmer of the preceding I.F. transformer must be realigned to resonance. The receiver should now operate in normal fashion, since the only change that has been made has been in the substitution of the last I.F. tube with the 6L7. The trimmer of T1 should now be adjusted for minimum noise. If a voltmeter is available, it can be placed directly across R3 to ascertain when resonance is obtained.

Varying R1 will determine the amount of voltage fed into the injector grid of the 6L7 and, therefore, the amount of silencing action of the unit. The silencer incorporates a variable resistor (R6) in the cathode circuit of the 6K7 which controls the sensitivity.

If you are an amateur operator and have a receiver without some means of noise silencing you should certainly incorporate this unit in your receiver. You will find it especially effective on the higher frequencies where man-made static of the ignition type hampers reception.

If you are a service man, here is an opportunity to increase your income. Home set manufacturers have, somehow, overlooked the fact that the growing short-wave listening public could be made very happy if some or all of the noise on the short-wave DX broadcast bands could be eliminated. Build up one of these units for demonstration. They are easily installed in any superhet receiver using 456 kc. I.F.'s.

**FM-AM Mobile Transmitter**

(*Continued from page* 18)

frequency by four times, then it will be necessary to have a frequency variation in the grid circuit of the 802 which, when multiplied finally, and when it apears at the antenna will be a multiple which will total at least 50 kc. in band width. This does not mean that we must eventually vary the grid circuit by 50 kc. at the input to the E.C.O. If we multiply frequency four times, then it will be only necessary to vary by 50 kc. divided by four, or 12½ kcs. This may be easily done and the 1612 will take care of the necessary changes to be made at the grid circuit of the E.C.O. so that 12½ kc. will be effective.

One thing is to be avoided, and that is to apply any form of Amplitude Modulation to the detector. In other words, all that we are interested in is to *vary the frequency* of the 802 oscillator, both plus, and minus.

Our own particular model has, in operation, a fundamental frequency in the grid circuit of the 802, of 3.6875 megacycles. The plate circuit of the 802 is tuned to twice this frequency, or 7.375 megacycles. This feeds in conventional ways to the following tube, which is a 6L6G frequency quadrupler. Now we have a frequency of 29.5 megacycles in the plate circuit of the 6L6G quadrupler. This feeds to the grid circuit of the 807 in a conventional capacitively coupled manner, and at the plate circuit of the 807 we find that by doubling we have a frequency of 59 megacycles which places this well within the 5 meter band.

Coupling to the antenna is in the conventional manner, and in our own particular car installations, we make use of a short piece of concentric cable of low impedance. This is to eliminate any radiation from taking place within the trunk compartment of the automobile. The antenna should be, for best results, one between ¼ and ½ wavelength in length. Some variation is allowed by incorporating a 100 mmfd. tuning condenser across the antenna coil. In other words, the antenna acts as a *marconi* and is therefore tunable to the band of 59 megacycles appearing in the plate circuit of the 807.

In order to be able to have a continuous check upon the operation of the transmitter, we elected to incorporate several meters. While it is quite possible that we could have used a switching arrangement and thereby eliminated two or three of these meters, nevertheless, we decided to use them due to the convenience in tuning. When a car is steadily in motion, there often takes place severe shock to the equipment. This shock may easily disturb some particular setting. By having separate meters in each stage it is possible to tell at a glance whether or not this jarring has affected our general tuning without the necessity of incorporating the switch in order to follow through the circuits.

Note that a separate meter is placed at the dash, or remote control position, in the automobile. This permits a *visual indication of operation* of the final amplifier and the type 807 tube. Were it not for this meter, and if we did not incorporate some means for monitoring the signal, we would have nothing to tell us whether or not we were actually on the air. By including the extra meter at the dash we are able to follow the plate current of the 807, and this will indicate that proper operation is being had from the transmitter.

### Speech Amplifier

A single button carbon microphone of the push-to-talk variety is used as being the most effective for voice frequency, particularly in mobile operation where background noise is encountered. The 1612 acts as a dual purpose tube in that it presents a variable inductance as far as the E.C.O. is concerned and when the switch is thrown to the AM position, the 1612 acts as our speech-amplifier stage only. The signal is amplified by the 6C5 driver tube and this stage incorporates a .5 megohm potentiometer so that the volume may be permanently set and left alone for AM application. A transformer, coupling the 6C5 to an 807 in Class A, provides enough output to plate-modulate the 807 when used for conventional Amplitude Modulated signal.

This tube, operating in Class A, with fixed bias, affords little difficulty from the standpoint of voltage regulation.

### Construction

In constructing any type of transmitter which is to be used in a moving automobile, it is necessary that every possible precaution be taken to eliminate any hazard which might be caused from the vibration or shock encountered. This means that lock washers

must be used under all screws, that we also make liberal use of so-called terminal strips. These strips are mighty handy gadgets and are used to support such items as resistors and condensers, or any small parts which might wobble around and become loose from continued vibration.

The filaments of the tubes are wired as shown on the schematic diagrams. In other words, the three pairs are divided up as indicated so that we may eliminate filament voltage on the two tubes used for AM when we are having operation on FM. The motor generator is of the heavy duty type and is an *Eicor Model 124*. This motor generator mounts by means of rubber grommets so that the vibration set up by the motor will not be transmitted to the tubes and other parts on the chassis. The rating of this motor generator is 600 volts at 200 m.a., and this is sufficient to allow full output of 35 watts to be had from the transmitter. A relay is used in connection with either a manually operated switch, or a push-to-talk switch at the microphone to control the generator. Note that one pair of contacts is used at the input to the motor of the M.G. and the other pair of contacts opens and closes the high voltage coming from the generator side of the unit. This is done so that we will not have high voltage going through the tubes at the instant filament voltage is removed. In other words, as soon as the transmitter is placed in the "stand-by" position, we are free from any voltage being applied to the plates of the tubes.

The parts are laid out as indicated on the illustration and no difficulty should be experienced in locating each particular unit. Note that a baffle shield is made up as indicated, and this is necessary to provide sufficient shielding between stages to isolate the grid and plate circuits from one another so that inter-action will not occur. The entire transmitter is mounted into the trunk compartment on shock mounts. These rubber supports are used by the aircraft companies and also by the police departments as they offer an efficient means for holding the unit in place and also permit considerable jarring before vibration actually takes place on the chassis. Their inclusion is recommended to all those contemplating such a unit as this in an automobile.

### Tuning

Tuning can be greatly simplified if one possesses an accurately calibrated receiver. The input, or the grid coil of the E.C.O., should be set somewhere in the vicinity of 3.5 megacycles in order that we arrive at the proper frequency at the output of the 807. The plate circuit of the 802 E.C.O. will be tuned to somewhere in the 40 meter band and will be the multiple of the frequency selected for the grid circuit. In other words, the plate circuit is tuned to *twice* the frequency of the grid circuit. Next, we must set the plate tank of the 6L6G quadrupler to *four times*, or somewhere in the 28.5 megacycle band.

We now have multiplied our original frequency appearing in the grid circuit of the 802 E.C.O. until we have arrived at 10 meters, or 29.5 megacycles. This signal is fed into the 807, which also acts as a doubler, and the frequency will again be multiplied by two in order that we obtain our five meter output in the plate tank of the

807. That's all there is to it, simply decide on some particular frequency for the grid circuit of the E.C.O. that will give you the frequency desired in the 5 meter band at the output of the 807. Once this frequency is selected, it is a simple matter to change. In other words, we have a great latitude in frequency control, and we are able to cover the entire 5 meter spectrum.

Adjustments can best be made by having someone listen to the signal with a receiver similar to that which appears in later pages of this issue of RADIO NEWS. The audio gain control placed across the secondary of the microphone input transformer should be at once adjusted so that the signal appearing at the receiver will be 100% readable. Too much gain in this position will cause an undue shift in frequency. Too little gain will not permit enough gain to be made across the capacity of the grid circuit to allow any degree of frequency modulation. Therefore, it is necessary that some experimental work be done, particularly by having one listen in on the receiver in order to determine just where the best setting is.

### Voltage Regulation

If we are to make use of any type of electron coupled oscillator, particularly with battery operation, we must incorporate some means for stabilizing the voltage appearing at the plate of the oscillator tube. This is accomplished in the transmitter described through the use of two type VR150 regulator tubes. These are wired in series in conjunction with a dropping resistor to limit the current appearing across the two tubes. The ionization within the tube and the properties of the tube make possible a particular voltage to appear at the plate of one tube and to remain there over quite a wide variation in applied current or voltage. In other words, if we select a voltage of 300 for which the two tubes in series are capable of handling, then we may have quite a variation in applied voltage coming from the power supply and still we are able to maintain the 300 volts appearing at the plate of the E.C.O. providing the voltage does not drop below 300 volts coming from the power supply.

Inasmuch as we have plenty of voltage available, this condition presents no problem. In no case, should the constructor attempt to eliminate these two tubes if operation is to be had from a motor generator in conjunction with batteries. If we were using a voltage stabilized power supply from 110 volts, it would be possible to eliminate them.

If the constructor will follow the above instructions intelligently, he may be assured of having a unit which will give both excellent AM and FM transmissions, and a unit which will break through the QRM with little difficulty.

## History of Radio Tube

(*Continued from page* 8)

those days and my first grid leak was simply a pencil mark on the panel connecting the grid and filament binding posts. With this device, the "audion" became very popular in 1909.

In 1911 I moved to San Francisco as Research Engineer for the Federal Telephone Company. In 1912 that company was then establishing long distance telephone calls from San Francisco to Honolulu. They used a buzzer and ticker system. It was not very sensitive. They could barely read the messages from Honolulu, so they asked me what I could do in developing an amplifier. I again went to work on my baby. From New York I got a supply of "audions." I now got the amplifier to work without much difficulty, first singly and then with two audions in cascade.

The two-cascade system diagram on the black-board shows what the circuit consists of, however, the greatest voltage I could use was 50 to 60 volts because the vacuum was not sufficiently high at that time. So I took all of the tubes to San Francisco to a maker of X-ray tubes. He re-tubulated them and got a much higher vacuum. I could then easily use 200 volts of B battery. I always used individual B batteries, one for each amplifier stage, first a common A battery. As a result of those experiments, I developed the cascade amplifier into what later became an invaluable device. On one occasion after breaking my next to last good "audion," I tried to make one audion do the work of two, feeding the output energy back into the grid circuit. This set up a terrific howl in my head-phones. That was the first feed-back circuit in radio history. At that time, instead of using the transformer, I tried the auto-transformer or choke coil and found that I could couple the second audion with the first in that manner.

In 1913 I got back to my own laboratory in New York. One of the first improvements thereafter was made by

Dr. Hudson. He experimented with the Tungsten filament, wrapped a fine tantalum wire around the Tungsten and found it increased emission; called it the "Hudson X" filament. The "hams" clamored for these audions.

In 1913 in my own laboratory, I began to develop the feed-back circuit for use both as a receiver and as a transmitter. I also began to make these tubes in my own plant. Had lots of trouble in mastering this complex art in those early days.

The next step was to go to the type of transmitter tubes we see today. About that time, in 1915, the Western Electric Company adopted the same design for their transmitter tubes. The chief difference was that they used oxide coated filaments. The Western Electric Company erected a transmitter in connection with the first Naval wireless station at Washington, and were soon able to telephone the Eiffel Tower in Paris. From that point progress in tube construction became a matter of engineering design. The entry of America in the World War increased the demand for enormous quantities of these tubes, and during this time, General Electric Company, as well as Westinghouse began to make them.

The history of the radio tube for the last 24 years is too well-known to bear repetition. —30—

### Breaking the Blockade

(*Continued from page* 9)

suing silence was evidence they had been torpedoed and sunk. It was a gruesome feeling to know that fellow human beings were being sent to watery graves. And to live with the fear that you might be next, to be afraid to gaze out over the waters for fear you might spot a U-boat out there!

October 15: Just heard the msg from the American freighter, *Blackhawk,* saying they had picked up the survivors of the *Emile Miguet.* 88 survivors in all. Radio station KEPT was the only one busy today. How that "sparks" must have worked, giving the story of the rescue to the Associated Press and trying to get the photographs requested by the *New York Times.* I was afraid to open up and ask any questions, so I just listened to their chatter.

October 16 was very quiet; no sigs heard all day.

October 17: The German submarines had a very busy day. The English tanker, *Yorkshire,* was torpedoed in latitude 44.52N, 14.31 West at 4:40 P.M. One half hour later the *City of Mandalay* was sunk on 44.55N, 14.35W. We were headed for them but were a great distance away. On my return to the shack I was both relieved and thankful to hear that the SS *Independence Hall* (American) had picked up both ships' survivors.

At this time we were in latitude 47.47N, 21.58W. and heading straight for the U-boat territory.

October 18: French naval station at Toulon sent out submarine positions to all ships . . . One at 45N, 14W at noon GMT; another at 50N, 14W at 0000 GMT and another at 51N, 01.20E at 0915 GMT. I had to laugh tragically when I received this because they got the U-boat bearing from the distress msgs of already torpedoed boats. They were in a sense, martyrs, risking their

lives so that others might be warned and saved. Whyinell didn't they send out warships to blow those monsters to Hell, instead of just sending out radio warnings? Oh, well, I suppose ordinary guys like me will never be able to figure out the whys and wherefores of war maneuvers.

I took the msg up to the skipper and remarked, "From the position given of the first sub it would seem he was the one who got the *Yorkshire* and the *City of Mandalay.*"

He looked up at me with drawn face and replied, "Yes. And we'll be right on the spot of submarine number two between twelve and five tomorrow afternoon." I walked away thinking . . . if that sub should get curious . . . Well, it would be the end of this diary.

Sea moderate . . . ideal for submarine operations. Night calm, no wind, sky slightly overcast. We have our lifeboats swung out ready. . . . SOS calls hammering in the earphones all day. It's not necessary to send SOS any more—just a series of S's to save time. An English station pipes up asking for positions of distress signals . . . air jammed . . .

October 19: First distress call was transmitted by the English steamer, *City of Guilford,* which was attached by submarine in latitude 46.56N, 12.09W. Then the SS *Imperial Star* said, "please help, U-boat coming up. We're in latitude 49.54N, 7.52W." The distress calls ended quickly proving the sub had won. Poor chaps didn't have a chance. Another series of S's split the air as the SS *Chan MacLean* reports being attacked by submarine in latitude 46.12N, 9.44W. Then quiet . . . just a splotch of oil on the water. . . .

Our position now 48.35N, 15.42W. I was beginning to feel very pessimistic about our chances of reaching port. Any port would do right now.

October 20: Our position now was latitude 49.15N, 9.45W. Fine weather, calm sea. Heard the *Independence Hall* is expected at Bordeaux station at 3 P.M. with 300 survivors aboard; stretcher cases. Need clothing for them and additional food supplies. Also medical supplies. Ship only had accommodations for 40, including the crew. Lord, imagine the grief of the survivors! I could visualize the steward on that boat trying to make room for those unfortunate people. He must have gotten grey hair trying to stretch his food supplies. . . .

Atmospherics shattered by a powerful spark note GNKM . . . GNKM . . . SS *Rockpool* . . . we are being gunned . . . GNKM. He was sending slowly, tensely. We are being gunned. Please send planes . . . SS *Rockpool* . . . we are zig-zagging . . . GNKM . . . Please send pla . . ." The stillness after that heavy harsh spark note could have been cut with a knife, it was so thick. The plane must have raked the radio shack and caught the radio operator . . .

Heard the *Independence Hall* sending a msg to the American Consul, Bordeaux. . . . List of clothes so large suggest you have truck load assorted women, children and men. Mostly men average size at dock on arrival. At present list consists of 120 pairs shoes. . . .

It is now 8 P.M. and a submarine torpedoes the English boat SS *Halizones* 40 *miles* SW of Bishop Rock, 243° from Land's End. Right on our route. Maybe we'll pick up survivors about 1 a.m., the skipper says. That is, if we aren't stopped. We saw a convoy at 10 p.m. of a few ships hugging close together in the darkness. We had an idea that at least one of them would follow us. Maybe we will reach LeHavre after all. I was beginning to cheer up and my cloak of gloom slipped off my shoulders when I figured that no submarines could stop us now. It would be too dangerous for them. There were many warships around. And German subs must stop a neutral country's vessel before sinking it (if they think they are warranted in doing so) and to halt a ship they must use their blinker lights at night, which could be seen by any warships around. Tomorrow we'll be in the English Channel . . . I hope. Midnight . . . Our position now is latitude 49.44N, 3.29W. Just sent my "expected arrival" report. Was that a relief. Expect to arrive LeHavre Pilot station early in the morning and to be docked by 9 a.m.

October 21: Air very quiet today. No distress calls. Perhaps the subs are running out of torpedoes . . . or maybe they want to be in port over the weekend. Nice break for all concerned. What a life . . . War . . .

Well, it looks like we'll be safe now. I don't think we'll be bothered by any one except the French customs inspectors. And are they suspicious. They go looking for trouble. Don't even let us keep our matches. God, that skyline looks good to me. But I gloomed up again.

We've still got to return home!

## Channel Checker

(*Continued from page 23*)

is the result. These will vary with the type inductance used and some experimenting may be necessary before these results are obtained.

### Operation

With the instrument here shown it is impossible to check frequency distortion. The idea of creating a small easily constructed instrument with as few parts as possible was the factor which eliminated any method for checking frequency distortion which would have embodied a much more complicated audio oscillator arrangement.

By manipulating the control on the side of the instrument (R2 in the diagram) the grid characteristics of the oscillator tube may be overcome where numerous and complex waveforms appear in conjunction with the original audio frequency. This has little or no use except as to demonstrate such a condition, however with the proper manipulation of the oscillator controls two or more wave forms with a definite phase relation may be set up such that one may check phase distortion to some extent.

Since phase distortion is not ordinarily noticed in audio design this use of the instrument is problematical. With the controls R1 and R2 set to give a symmetrical distortion-free image at the oscillator frequency, and this applied to a channel input and with the output image showing no appreciable change, it would be assumed that the audio channel was essentially free of harmonic distortion.

In operation, to check for harmonic distortion make a connection from the jack marked "To Channel" to the first stage of the channel under observation. Turn upper control switch to the left hand position which switches oscillator voltage through left hand control to the channel under observation. Make a connection from the output of the channel under observation to jack marked "From Channel," then make a connection from jack marked "To Scope" to scope vertical plates.

If other than a low gain stage is under observation it is necessary to use a step down transformer so that the voltage output of the channel is low enough to allow proper adjustment of the scope picture. The left hand control of input to the channel under observation must not be increased to the point where the input tube grid is overloaded since this would give a false reading on the scope. For public address equipment and other equipment having low impedance outputs to voice coils it is necessary only to connect across the voice coil for output voltage.

When proper amplitude is made and scope synchronized turn the upper control switch to the right hand position which puts the original signal on the screen of the scope. Adjust the right hand control until image is of the same vertical amplitude as when switch is in left hand position. By simply turning the upper control switch to the left or right one has either the output form or the input form on the screen.

There is enough persistence of vision to allow very accurate comparisons. In checking harmonic distortion it may

be found that the wave is one hundred and eighty degrees out of phase with the original. In this case the use of a center tapped transformer between the output and the scope fixed so that the center tap is grounded and with either leg free to be switched to the vertical plates. Never try to check harmonic distortion by coupling off one side of a push pull channel as the resultant wave will not always be representative of the true output waveform. It is good practice to use shielded leads for all connections to the checker.

The foregoing explanation does not limit the instrument to a single audio channel but from any audio input to output whether it be from microphone stage to final r.f. amplifier or receiver output if there is more than a negligible amount of harmonic distortion it shows it quickly and easily.

## QRD? de Gy

(*Continued from page* 38)

aversion to a delegate, to sign up with a new man. We are for unionization of radiops because the last seven years have shown what can be done to get better wages and better working conditions when men stick together and work together as a unified whole. So good luck, *CTU-Mardiv.*

A CONSENT decree under which radio station *WJW* is permanently enjoined from violation of the Wage-Hour Act and agrees to pay $4540.29 in wages for unpaid overtime to 43 employees was signed by Judge Paul Jones in Federal Court in Cleveland. Judge Jones, in ruling on the case, held that once radio programs are put on the air they become goods moving in interstate commerce and that radio stations, therefore, are subject to the provisions of the Wage-Hour Act. This was the first case filed by the Wage-Hour Division of the Labor Department against a radio station. Restitution to employees, to be made within the next six months, varies from 93 cents to one individual to $810.76 to another. This may be interesting to some of the gang who have been working long hours in BC stations. We imagine that this decision by a Federal Court would set a precedent covering a lot of territory in this long hour proposition all over the country. Our legal knowledge is rather limited, but we do know that a legal precedent is a good thing to start with in any court argument.

SO another chapter is written to the future of radiops. But times are different today than they were a few short months ago. The *FCC* is guarding the air-lanes, radiop watches and radiop communications, and many lanes of travel have been cut off because of the Hellish embroilment overseas. What the future holds for our country's welfare is in the laps of those who know best what to do. But whatever they do, let us always remember that it is "our country, right or wrong." And you men are in the best position to help our country ferret out subversive activities, espionage action and spy activities because radio is one of their main means of communication. 73 . . . . ge . . . . GY.

## Recording Studio

(*Continued from page* 14)

screw protected with a film of vaseline at all times in order to prevent rust.

The turn-table on the right, which is a *Presto Model-6D,* has been in service for a considerable period of time and has given an excellent account of itself. This particular model requires that the table be removed in order to change speed from 78 to 33⅓ r.p.m. as it is necessary to change the rubber drive wheels by hand. Later models, now available, make this procedure unnecessary. We use this particular unit for the recording and playing back of "constant velocity" records, while the other table is used for the making of "constant amplitude" recordings in conjunction with a high-grade crystal cutter, not illustrated. Or, as the case may be, to use them both for "constant velocity" recording for continuous cutting or playback. Complete details and theory on "constant amplitude" versus "constant velocity recording" will appear in the concluding article of this series.

### General Data

We have now taken the reader through various steps in the assembling of a complete recording studio. This has included the description of the various units required and the means of obtaining proper layout has been discussed. Several readers have written in asking whether the wood construction of the console was sufficiently rigid to permit such a weight to be mounted on the assembly. The answer is, definitely, yes, providing the console is carefully constructed and braced and, furthermore, that it rest on a floor which is not subject to vibration.

The amplifier, as illustrated, has been found to be ideal under all conditions and no changes are contemplated for a long time to come. Hum level is not audible, fidelity takes in the spectrum from 39 to over 10,000 cycles at less than 2½% maximum distortion at full volume. As to results, in general, we might make one comment, that is that reliable authorities who have heard some of the discs cut with this equipment have stated that these were superior to those generally cut by the large broadcasting companies. There is every reason to believe that the serious minded reader may obtain equally satisfactory results providing he applies certain principles, to be discussed later, to this art. Finally, may we remind the reader that in order to obtain first class work it is necessary to have good tools. This applies to the art of recording in its full meaning.

Next month we will go into the process of recording in the studio and from off the air. The writer would welcome any comments from those now engaged in this type of work, either as a profession, or as a hobby.

## Bench Notes

(*Continued from page* 19)

past the third digit. For example, the number 1866 can be set somewhere between 1860 and 1870, the position of the final 6 being only a good guess. As for such a term as 18667, the 7 will be ignored, except for the fact that the term is nearer 18670 than it is to 18660. To the man still obsessed by the accuracy demanded in the school room, where results must be worked out to the last decimal, such a condition may seem most objectionable at first glance. After a little sen-

sible thought on the subject these small errors can be dismissed and the rule used with confidence.

When the indicator is set midway between 1860 and 1870 the reading is approximately 1865. In the case of the term 1866 the maximum difference is 1, an error of about 6/100 of 1%. For the term 18667, the maximum difference is 17, an error of less than 1/10 of 1%. While errors for successive settings may be more or less cumulative, some cancellation takes place, and generally speaking, operations carefully made on a 10-inch rule, will have a maximum error of about 1/10 of 1%. In practice this is usually *considerably* better than the accuracy of the methods used to obtain the data from which calculation is made.

Another point that often confounds the beginner, is the fact that on the rule itself no distinction is made between different numbers that have similar digits. That is, the setting for 4.55 is the same as that for 455 or .455. This seemingly gross defect is of little or no importance. Anyone qualified to use a slide rule can readily see that the result of a number multiplied by 455 would be 100 times the result obtained, if the number was multiplied by 4.55. The approximate magnitude of the result can be estimated mentally in most cases. For example, if 215 is multiplied by 455, the result will be somewhere around $200 \times 450 = 90{,}000$. This is a commonly used method, recommended in most manuals. Another convenient method is factoring by powers of 10, thus, $2.15 \times 10^2 \times 4.55 \times 10^2 = 2.15 \times 4.55 \times 10^4$. On the rule, 2.15 is multiplied by 4.55 and the result increased mentally by $10^4$.

For ordinary applications the Mannheim rule will serve adequately. This type has four scales (A, B, C and D) on the face, and sine, log and tangent scales on the back of the slide. With such a rule problems involving multiplication, division, squares, cubes, roots, proportion, angles and logs may be readily solved—a range that will cover most radio work. A high grade rule of this type will cost in the neighborhood of six or seven dollars, which may be a little more than the beginner cares to spend. There have been a number of low-priced rules offered in the past year, some selling as low as 25c. Many of them are poorly made, and not worth carrying home. Often the sine, log and tangent scales are missing from the back of the slide, a most important feature to the radio worker.

As many students may prefer a low priced rule at the start the following points should be considered when buying. The slide should work smoothly in the stock under all conditions, that is in its normal position, or when turned over to use the sine and tangent scales. While a slight amount of friction is desirable, just sufficient to keep the slide in place after adjustment, it is not likely that any of the lower-priced rules will meet these conditions. In high grade rules, special methods are provided to regulate the tension on the slide as required.

The cursor, which is a glass plate with an engraved hairline indicator, should be carefully inspected. It should slide easily along the rule, and permit very close adjustments to be made without difficulty. In several of the cheaper rules it has been noted

that the cursor was of such poor mechanical design that close accurate settings could only be made with considerable trouble. The accuracy of the hairline should also be checked. This can be quickly done by setting the cursor at any number on the D scale—then the number on the A scale directly under the hairline should be exactly the square of the first number. Make this check at three or four places along the scale.

If it is necessary to order a low-priced rule by mail, it will probably be advisable to order on approval, subject to inspection, as it will be difficult to determine otherwise whether the rule has the desired qualities or not. One of the best rules available at a low price is Keuffel & Esser's "Beginners" Rule No. 4058 W, priced at $1.25. This is a well-made Mannheim type rule with smooth running cursor, sharply defined scales, and compares favorably with higher-priced instruments. As should be expected, no provision is made to regulate the tension on the slide.

For ordinary service work the value of the slide rule will be almost nil—since most of the occasional calculations required for service work are rather simple, and can be solved in short order on a scrap of paper; but to the experimenter or man engaged in work where calculations are made regularly, the slide rule will prove a most valuable instrument that will more than repay the short time spent in learning its operation. If the student intends to engage in work where the slide rule will be used regularly to advantage, it would be advisable to buy a first-class rule at the start. In that case one of the "Polyphase" rules would be indicated. For anything short of advanced engineering, the "Polyphase Duplex Decitrig" rule would probably be best. Anyone who contemplates an engineering course should consult the math prof as to the most desirable type of rule for his purpose. As a matter of information, the word "Polyphase" is not the name of a type, but is the trade mark for certain rules made by Keuffel & Esser Co., the best known of American manufacturers.

The mathematical tricks that can be performed on the slide rule are too numerous to mention, but one may be cited to give an idea of its capabilities. For example, $2.26^{.384} = x$. It's pie on the slide rule, and we don't mean 3.1416 either!

## For Immediate Release

(*Continued from page* 18)

tributing to Philco's record of achievement is its research and engineering activities," the history of the company continues. "Philco maintains one of the world's largest research laboratories devoted exclusively to radio and television engineering and the further development of these arts. A staff of approximately 230 Philco engineers, scientists and research assistants is constantly at work developing and improving the company's various products. The research organization not only designs and prepares specifications for each year's models, but is also engaged in experimental work to develop new products to add to those already being manufactured and sold.

"Once new principles of radio engineering have been worked out to the satisfaction of the research staff, it is a major policy of the company to give them quick commercial application. On many occasions in recent years, Philco has demonstrated its flexibility and adaptability by making available to the public the benefit of new developments as soon as their value had been established."

One of the outstanding examples of product development by Philco was its introduction in January, 1931, of the first practical automobile radio receiving set to sell at prices the public could afford to pay, according to the booklet, which continues: "Growing demand for Philco automobile radios immediately made itself felt, with the result that the company has always held the position of leadership in the automobile radio business. Since 1930, Philco has made and sold approximately 3,000,000 automobile radios—considerably more than any other manufacturer."

Other notable examples of Philco engineering and research include the development in 1933 of special all-wave radio sets for the reception of foreign broadcasts, magnetic tuning which made it possible for Philco to be the first manufacturer to provide satisfactory push-button tuning, wireless remote control of a radio receiving set, introduction of the first portable, self-powered radio receiving set with a self-contained loop aerial, and elimination of all aerial and ground wires from home radio receiving sets.

In June, 1940, Philco announced the development of the photo-electric phonograph which marks the first fundamental improvement in the phonograph since Thomas Edison's discoveries in the recording and reproduction of sound. This new kind of phonograph not only reproduces what is really on the record, for the first time, according to this review of Philco progress, but makes possible a notable improvement in tone and quality and increases the useful life of records by at least 900 per cent.

## Servicemen's Legal Advice

(*Continued from page* 30)

similar to LADY LEE for footwear. Registration of INO for medicine was refused because UNO has been previously registered in the same class. GREEN RIBBON for whisky was refused registration as GREEN RIVER had been registered. However, if the purchasing public might believe goods bearing a similar mark are made by the same manufacturer, the first user is entitled generally to exclusiveness in the name although for a different class of goods. For example, the Patent Office recently cancelled the mark SITROC-LUX for tissue in view of prior use of LUX for soap, both items being used in bathrooms. Care should also be taken not to adopt as a trade-mark a word which is similar to a design mark previously registered. For instance, the Patent Office refused to register a design showing a bouquet of flowers as another had already registered the word BOUQUET for the same class of goods. It is also important that the mark is not obstructed for use on goods one may wish to sell in the future; this should be ascertained at the time of the initial search.

After registration a trade-mark is presumed to be owned by the registrant. He may sue in the federal courts to prevent illegal use. He may prevent the importation of goods bearing brand names simulating his. His notice of registration, "Reg. U.S.A. Pat. Off." deters others from copying the name of his product. Trade-marks are valuable business property. They should be protected as such.*

* *From "What's In A Name?" by Beekman Aitken, Esq., Copyright, 1940.*

## As I See It!

(*Continued from page* 10)

and as the bound copies started coming back from the bookbinder, interest in the contents was aroused, with the result that we have been looking through these magazines and certain peculiar things came to the front.

We talk about magazines being out of date, but believe it or not (with apologies to Ripley), a surprising number of the magazines are anything but out of date. People say that history repeats itself—most certainly radio does. Much of what is being written today has appeared before. Naturally not those things which represent modern day application of elaborations of radio theory, but much of the theory we speak about today was mentioned then. One thing in particular was found very interesting. For some reason a discussion started among some of the men with whom we work about copper oxide rectifiers. The argument was concluded by reference to a copy of the *"IRE Proceedings"* of February, 1931.

Looking through the magazines, it seems to us that explanations years ago were far more complete than they are today. Perhaps it was due to the fact that more space was available in the magazines of yesteryear; the magazines were fatter because they sold more advertising space—but whatever the reason, many of the things we miss in today's papers were published years ago in RADIO NEWS, *Radio Broadcast, Radio Craft, IRE, Radio* (the California paper published many years ago), *QST* and the others.

After all, the very basis of radio communication has not changed in twenty years and we doubt if ever it will change; therefore it is logical that articles written about radio theory five, ten or even fifteen years ago

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should be as good as anything written today—and when we find that the opportunity then existed for more deliberate and complete explanations—those places where those explanations appear are even more valuable today than they were at the time of issuance.

Yes sir, many a profitable hour can be spent looking through those old magazines. Well versed as you may be, you'll find something which will catch your eye—something that read over again will clear up some particular point about which you don't think much until it is called to your attention. Periodic review is a marvelous way of keeping old information new and maintaining a well-rounded out knowledge of things radio. Yes, we even recommend spending those spare moments—at least some of them—reading rather than building test equipment. The rest of the spare moments you can loaf, for loafing is a necessary part of every man's existence.

Some day we hope that this radio library of ours is going to be as fine as any in existence in America. And we are going to enjoy spending some time each day looking through and reading old radio periodicals. Crazy as it may sound, there is a thrill in the anticipation.

## Beginner's 56 MC Xmtr.

(*Continued from page* 37)

heads of jacks. ½" hole for jacks fitted with rubber grommets. Socket holes cut with a socket punch. Mounting holes for sockets 1⅜" between centers. Distance between jacks and variable condensers 2½" between centers. Distance between sockets 3½". Holes for standoffs ⅜". All grounds connected together with common ground wire and B—.

Coil Data

Oscillator Grid Coil. 7 Turns, 1½" diameter, 1¾" long. Tap at 1½ turns.

Oscillator Plate Coil. 4 Turns, ¾" diameter, 1" long.

Amplifier Plate Coil. 6 Turns, ¾" diameter, 1¼" long.

Antenna Coil. 3 Turns, ¾" diameter, ½" long. —30—

## Video Reporter

(*Continued from page* 38)

Demonstrations of color television are not too new. But commercializing color methods will be a new step—and a great stride at that. But that hasn't been done yet. However, *CBS* executives made not-too-definite references to January, 1941 as a possible starting date for a regular color program service.

*Dr. Herbert E. Ives,* of the *Bell Labs,* demonstrated color television as far back as 1929 with a fifty-line image produced by a three-color filter arrangement. His system involved optical blending of separate signals transmitted for each primary color.

Most enthusiastic comment on *Dr. Goldmark's* color system came from *Gerald Cock,* former *BBC* television director, now serving as North American representative for the *British broadcasting monopoly.*

"It is a miracle!" he said.

Much regret was expressed over the necessity to suspend television program service in the London area as an emergency war measure. Yet, we can't help but wonder whether or not television is playing an important technical role in military and naval operations.

—30—

## RADIO PHYSICS COURSE

by Alfred A. Ghirardi

A *power detector* is one that will not overload when very large r.f. input signal voltages are applied to its grid circuit, and which will handle considerable electrical *power* in its output. Power detectors are usually operated with rather high voltages. Either a grid bias type or a grid leak and condenser type of detector may fulfill the conditions of power detection if they are operated properly.

Receivers built during the early days of radio employed two or three stages of tuned radio-frequency amplification using the three electrode tubes of the 201-A, 226, or 227 type which were the only ones available at that time. It was impossible to secure much amplification per stage with these tubes, because of the difficulty of preventing oscillation due to feed-back in the tubes themselves, and other forms of feed-back coupling. Therefore, the signal was not very strong when it reached the detector, and it was necessary to use at least 2 stages of audio-frequency amplification after the detector in order to make the signal strong enough to operate a loud speaker satisfactorily. Now that it is possible to build high-gain r.f. amplifiers without oscillation troubles, thanks to the screen-grid tube, in modern receivers the signal voltage is first amplified greatly before it reaches the detector. It is not uncommon to use 5 and 6 high-gain amplifier stages before the detector, both to obtain high gain and the necessary number of tuned circuits for satisfactory selectivity. Therefore, the detector must handle quite large signal voltages without distortion, and in most cases feeds directly into a single power output audio stage and then to the loud speaker. It is in receivers of this kind that *power detectors* must be used, for the signal voltages are entirely too large to be handled by the old forms of detectors. In some cases, the loud speaker may even be operated directly from the output of the detector without employing any audio amplification. Linear and power detectors are very closely related in practice, since they usually go together, although no detector has a perfectly straight-line characteristic. In the usual meaning of the term, "power detector" is used in connection with detection when the r.f. signal voltage applied to the detector input is at least 1 volt or more.

According to the information obtained by Mr. F. E. Terman from several thousand tests on power detectors (the results of which were published in the Dec. 1930, *I. R. E. Proceedings),* power detectors of the grid leak and condenser type can be made to produce satisfactory detection under all conditions, provided the proper values of plate voltage, and grid leak and condenser are employed. The proper values for suitable weak signal detection are different from those for strong signal detection. Some of this data is reviewed here.

"When a radio-frequency signal of at least several volts amplitude is applied to a suitably adjusted grid-leak detector, the action taking place in the grid circuit is different from the action for voltages less than 1 volt.

(*To be continued*)

## Ham Chatter

(*Continued from page* 36)

W9FPB has been on 3775 Kc. most of the summer with 15 watts to a 6L6, due to difficulties with the 6L6-809 rig. (How do you neutralize an 809 anyway?) Expect to have the other set back on the air soon though.

---

W9WIQ, formerly of Portal, N. D. has moved his Collins 30 FXB and National HRO to Harvey, N. D. where Jack is employed as Soo Line telegrapher. W9DAO, W9HHN, and W9ERR assisted in packing the contents of Jack's fine hamshack.

W9HIG, North Dakota's youngest YL hamop is now regularly enrolled in the AARS. Jerry is now fourteen years old, having received her ticket at the tender age of thirteen. Her rig has push-pull 42's in the final at 40 watts, and her receiver is a Sky Buddy. She usually inhabits 3525 kcs in the early evening.

W9DAO, of Bowbells, N. D. has a new 500 volt power supply and will soon be blasting the ether on 3795 kcs with a 100 watt push-pull 6L6 oscillator. Judd has been on 160 phone for some time but has an itch to try out his new bug.

W9HHN, the "Sage" of Woburn, N. D. will leave about November 15th for the west coast on his annual vacation. Bill is station agent for the G. N. and travels on a pass.

W9HHN, Johnnie, of Minot, N. D. called at W9NBX and W9ERR's hamshack in Bowbells and inspected the equipment there. Johnnie expects to have 400 watts on 80, 40, and 20 cw this winter.

W9ZVW, of Lignite, N. D. and points west has been absent from his usual spot on 1903 kcs but may be expected back on the band with the first snow-fall. Harold has the most powerful ten watts in western North Dakota.

W9ERR, the old wolf hunter, has been appointed County Auditor of Burke County, and is now too busy to do much hamming. However, Chuck finds time to do a bit of building now and then and his next rig will be a 10 watt phone modelled on the Stancor 10P Kit.

W9NBX, xyl of W9ERR, will be SNCS2 for N. D. AARS this winter. Enid may be heard any evening on 3525 kcs between 7 and 9 pm. Her rcvr is a RME69.

W9WWL of Williston, N. D. is phone NCS for the North Dakota AARS again this year and has his Kw on 1912 kcs nightly for AARS traffic. Tony will be a father by the time this is printed.

W9HMC of Powers Lake has a new hobby. He is now a gold miner and has been off the air all summer. "Ole" will have a Kw going if his mine lives up to expectations.

W9YJL, "Ribbs" has moved to an apartment in Minot, N. D. and is unable to run his power there. He will be on all cw bands with 75 watts soon. "Ribbs" is SNCS for the N.D. AARS cw net and is handling traffic every evening.

W9NBX got her class A ticket after waiting four months for the FCC to make up its mind. Seems that everybody who took the exam at Bismarck last May had the same trouble.

W9ZKL, repairman, in Minot, N. D., has moved from Fishers Auto to the Maytag Electric Store. "Myrt," W9AFK, Glenn's xyl works 10 meters most of the time now, but is on 80 meters Monday nights for AARS drill.

W9FLC, Bob, is now at the CCC Camp at Foxholm, N. D. and is studying up to be a CCC op.

W9ABQ and W9ABT, brothers living north of Bowbells, N. D. are building a couple of half mile long V beams for the winter season. "Dude" and "Stub" have most of northwest North Dakota to build V beams on and are making use of their opportunity. Both boys are building new ten meter rigs this fall.

W9LEM, Kenny, has resigned his position with the Gamble stores and will now devote his time to "Ken's Radio Shop" and hamming. Look for him on forty meters from midnight to 3 a.m.

W9LMA, Herb, of Flaxton, N. D. is now on the G. N. Extra Board and carries a cot strapped to his suitcase.

W9EHQ has gone to Collegeville, Minn. (St. John's) to take up engineering. We expect to hear Chuck on the air from there soon. Chuck is also a model airplane fan and has a large motor driven model which he expects to radio control. His rig is an RME transmitter and a Breting 12 receiver.

W9BBY, Ernie, has a Jr. op now and must stay up nights anyway, so he is building a new receiver for the winter season. Look for Ernie on 80 meter cw.

W9EEK, Stan, Crosby's Maytag Manager, has moved his rig from the shop to the house, and if his wife will let him use the new Hallicrafter receiver he bought, he will return to 160 meter phone this fall.

W9DVL, of Berthold, N. D. is proprietor of a filling station and repairs radios for a side-line. "Pete" throws a wicked hamfest!

W9OKM, Kenmare CCC op is making regular trips to Minot to visit a yl who interferes with his traffic skeds from CCC hqs. Look out Romer.

W9GZH, Dan, of Powers Lake, N. D. has been off the air all summer due to work at the Breding Hardware Store. Now that the crop is in Dan will have more time for hamming.

W9MYD of Fessenden, N. D. recently won a scholarship and may be leaving N. D. soon for school. Nice work, Gene.

W9HBR at Rawson, N. D. has been getting good results with a 6L6 rig on 160 meter phone.

W9QOZ and W9QNW, brothers living near Velva, N. D. have the rural power line in at their place now and have built "big city" rigs. The Wincharger is now on a vacation. Their antenna masts can be seen from two miles away on highway number 41.

W5HHU runs 30 watts to a single 807 and gets out swell.

W5AAN of Denton, Tex. is an early bird DXer.

W5IBS and W5GII of Hamburg, Ark. are brothers. Ed 5IBS is on 160 fone, Dick 5GII operates 75 fone, both Xmitters are in the same room and they never hv any trouble working out, they can always work each other hi.

W5JCM es W5GOH are two live wires on fone in Dallas, Tex.

W5EWD a smoke ball smoke eater of McComb City, Miss. was burned about the face in a fire in that Metropolis but fortunately not seriously.

W5GMR Tom of Many, La. we regret to learn has sold out lock stock and barrel keeping only an ECO to work CW. We really do miss old Tom's voice on the bands.

W5JDS is getting out nicely wid his new rig on 40.

W5VJ is an old timer on 75 fone wid a sweel sig.

W5AXS N.C.R. Comander in Baton Rouge, La. recently took his annual cruise. Shirley is also Police Radio supervisor in B.R.

W5DNV Jimmy in Jackson, Miss. can be heard regularly on 75 fone.

## Book Review

(*Continued from page* 40)

acoustics to the engineer. Material for the test is the subject matter of thirty lectures prepared for presentation at Columbia University. The book includes the current acoustic practices in radio, phonograph, sound motion pictures, public address, sound reinforcing and sound measuring. Practically all modern transducers, such as microphone, loud speaker, headphones and phonograph pick-ups are treated from the mechanical or the acoustical impedance view point. A knowledge of acoustics' principles is not required for an understanding of the subject matter. The text may be read and understood by anyone familiar with the principles of elementary physics and simple electric circuit theories. Price $6.00. —30—

## Manufacturers' Literature

(*Continued from page* 40)

throw it together in a few minutes and at a cost of next to nothing.

It is actually a vacuum-tube voltmeter in which the 6E5 functions not only as the tube, but as the indicator as well.

In aligning a receiver it is only necessary to connect the grid circuit of the 6E5 across the a.v.c. circuit of the receiver under test, then adjust the trimmers for maximum closure of the "eye." There is the advantage over most other types of indicators, that receivers can be aligned using an unmodulated oscillator for the signal source. If desired, this instrument may be left connected across the a.v.c. circuit of experimental or ham receivers, to serve as a tuning or "S" meter. Free. (RADIO NEWS No. 12-104.)

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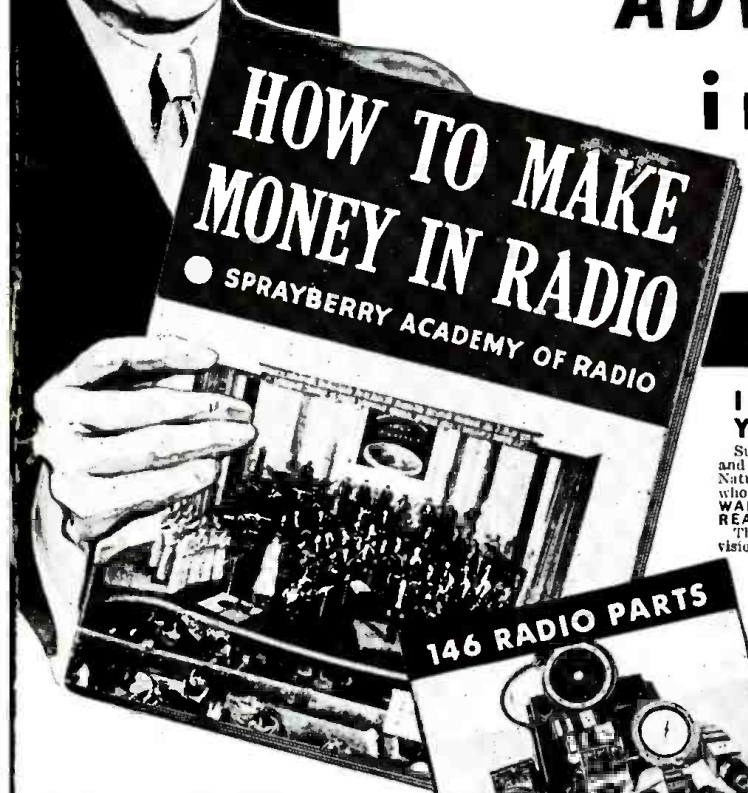


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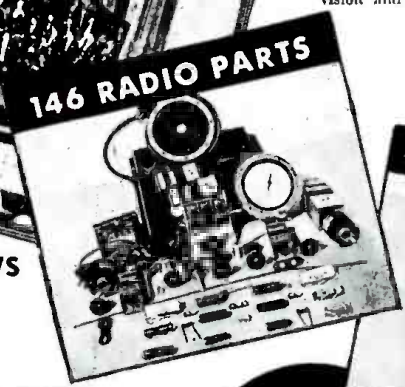



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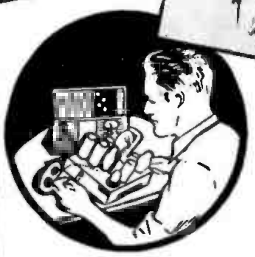

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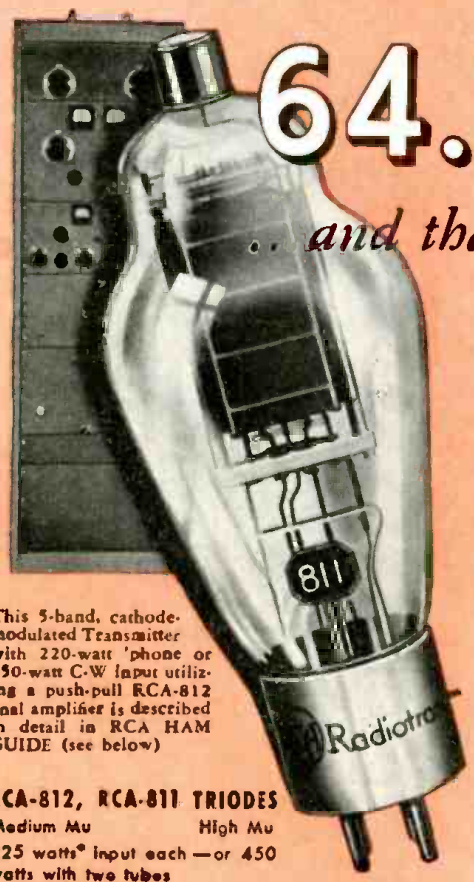


This 5-band, cathode-modulated Transmitter with 220-watt 'phone or 450-watt C-W input utilizing a push-pull RCA-812 final amplifier is described in detail in RCA HAM GUIDE (see below)

**RCA-812, RCA-811 TRIODES**

Medium Mu — High Mu

225 watts* input each—or 450 watts with two tubes

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60-Mc operating at full ratings—up to 100 Mc at reduced input.

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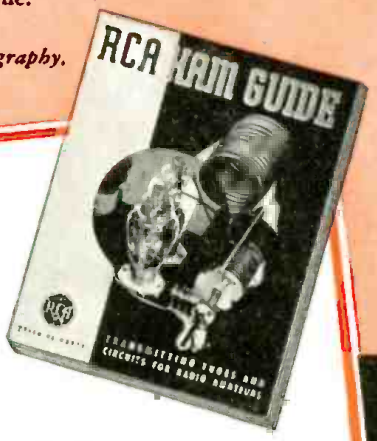


**RCA HAM GUIDE**

**15c Amateur Net Price**

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