

RADIO NEWS

MARCH
1942
25c
In Canada 30c

Loctal Tube



RADIO in the FIELD ARTILLERY
POOR MAN'S RECORDER
ECONOMY SIGNAL TRACER

You're "In The Service", Too



You radio service engineers may not be in uniform, but you've got a big job in helping maintain the home front. It is up to you to keep receiving sets in operation, no matter what shortages and restrictions may grow out of wartime needs.

Mallory knows what an enormous job the home front involves, and you may depend on Mallory and Mallory Distributors for help with that job. Mallory Approved Precision Products put quality parts at your disposal for efficient, economical replacements. They give you the benefit of the Mallory time proven standardization program, tremendously important now that inventories are so short.

Furthermore, Mallory engineers are putting their backs into the task of overcoming the handicaps imposed by material shortages and wartime demands. They have set out to keep you supplied with necessary replacement parts for the home front. They have made great strides in developing new supplies to take the place of critical materials. They have an eye to the future, too—Mallory research is working today as never before to maintain Mallory leadership in the field.

And when you are confronted with a skull teaser that defies solution—remember Mallory—for friendly technical help that's yours—free for the asking.

Rely on Mallory—you will find it pays.

P. R. MALLORY & CO., Inc., INDIANAPOLIS, INDIANA Cable "Pelmallo"



Get Into RADIO Quick!

RADIO TECHNICIANS in Demand More Needed Now Than Ever Before



RADIO TECHNICIANS, OPERATORS hold good jobs in the 882 Broadcasting Stations in the U. S. with average pay among the country's best paid industries. Aviation, Police, Commercial, Marine, Government Radio, forging ahead even during the War, employ Radio Technicians and Operators. Soldiers, Sailors, Marines with Radio training win extra rank, pay, are ready for good jobs after their military service is over. I train you to be ready when Television opens jobs in the future. Mail the Coupon for complete details.

REPAIRING, SERVICING, home and auto Radio sets (there are now 50,197,00 in use) gives good jobs to thousands, offers more opportunities now than ever. Loudspeaker Systems are another source of profit for Radio Technicians. Many Radio Technicians operate their own spare time or full time Radio business, servicing, repairing, selling Radio sets. Get the facts. Mail the Coupon.



These Men and Hundreds More Got Their Start This Way

\$200 a Month in Own Business



For several years I have been in business for myself making around \$200 a month. Business has steadily increased. I have N.R.I. to thank for my start in this field.—**ARLIE J. FROEINER**, 300 W. Texas Ave., Goose Creek, Texas.

\$5 to \$10 Extra a Week in Spare Time

I am engaged in spare time Radio work. I average from \$5 to \$10 a week. I often wished that I had enrolled sooner because all this extra money sure does come in handy.—**THEODORE K. DuBREE**, Horsham, Penna.



Operating Naval Radio Station



I am now operating the Radio Range Station, one of the new simultaneous types, here at the Naval Air Station. Glad to give N.R.I. its share of credit in the success I have had thus far.—**GRIFFITH SECILER**, Radioman First Class, U. S. Navy. (Address omitted for military reasons.)

Learn At Home To Make \$30 \$40 \$50 a Week

MAIL THE COUPON! Find out about the many opportunities Radio offers you to make more money quickly and to prepare yourself for a good-pay job after the War. Whether you're eligible for military service or exempt, you should get my 64-page Book, "Rich Rewards in Radio." It's FREE. It tells about Radio's present and future opportunities and how I train beginners at home in spare time to be Radio Technicians and Operators; how I teach operating principles of Army, Navy, Civilian Defense Radio equipment.

5 Reasons Why You Should Learn Radio Now

(1) *The Radio Repair Business Is Booming.* Because of the shortage of new sets, and increased interest in Radio programs, fixing Radios offers many extra new opportunities for Radio Technicians. (2) *U. S. Government is calling for thousands of CIVILIAN Radio Technicians.* Operators and is paying well for their services. (3) *Government Orders for Radio Equipment,* amounting to millions of dollars are creating opportunities for men with Radio training to earn good pay, overtime. (4) *Radio Is Ready to Expand After the War.* Television, Frequency Modulation, Electronic Instruments and Controls will offer new opportunities in the future. (5) *Extra Pay in Army, Navy, Too!* Radio Training offers men likely to enter military service, soldiers, sailors, marines, many opportunities to win extra rank, extra prestige, more interesting duty and earn up to 6 times a private's base pay.



Why Many Radio Technicians Make \$30, \$40, \$50, a Week

Radio is one of the country's fastest-growing peace-time industries. It is a vital industry during wartime, too. That's why N.R.I. trained Radio Technicians and Operators earn good pay in practically every branch of Radio today; in Broadcasting, Aviation, Commercial, Police, Marine, Government Radio Stations; in Radio Factories; fixing Radio sets in spare time or full time; in Radio businesses of their own. Many fields of Radio are expanding fast during the war. Many more new branches of Radio (Television, Frequency Modulation, etc.), held back now, will create new peace-time opportunities after the war. N.R.I. gives you the required knowledge of Radio to take advantage of these present and future opportunities.

Beginners Soon Learn to Make \$5, \$10 a Week Extra in Spare Time

Part time Radio Technicians have more opportunities now than ever before. In fact, many men I train prefer to hold their regular jobs, and make extra money fixing Radio sets in their spare time. I give you special training and show you how to start fixing Radios early. As you progress with my Course, I show you how to do more and more money-making Radio jobs. Many men I train pay for their Courses, and have extra money to spend besides, by doing Radio repair work while learning.

How I Give You Practical Experience While Learning

Very soon after you enroll I start sending you my 6 Big Kits of Radio Parts. As my student you spend about half your time building Radio Testing Equipment, Radio Circuits, Complete Radio Sets, small Radio Transmitters, Frequency Modulated Circuits. You conduct more than 100 Radio Experiments, make more than 600 Radio measurements which give you broad practical experience. My fifty-fifty method of training—half working with real Radio parts, half studying my lesson texts—holds your interest—makes learning Radio at home fascinating, practical.

Find Out How I Train You for Good Pay in Radio—NOW!

MAIL THE COUPON BELOW! I'll send my big 64-page book FREE. It tells about my Course; the types of jobs in the different branches of Radio today; Radio's opportunities for the future; shows letters from more than 100 men I trained so you can see what civilian and service men are doing, earning. You owe it to yourself to get these facts NOW. MAIL THE COUPON in an envelope or pasted on a penny postcard.

J. E. SMITH, President
Dept. 2CR, National Radio Institute
Washington, D. C.

MAIL NOW for Quick Action

J. E. SMITH, President, Dept. 2CR
National Radio Institute, Washington, D. C.

Mail me FREE, without obligation, your 64-page book "Rich Rewards in Radio", which tells about Radio's opportunities now and for the future. (No salesman will call. Write plainly.)

NAME..... AGE.....

Address

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





by THE EDITOR

Vol. 27

RADIO NEWS

No. 3

Trade-Mark Registered

The Technical Magazine devoted to RADIO in DEFENSE, including articles for the Serviceman, Dealer, Amateur, Experimenter and Recordist

CENSORSHIP

UNCLE SAM is taking no chances. A rigid censorship has been placed on the release of any information that might be of help to our enemies. This applies to radio programs, the press, and to publishers of various magazines. The Editors of RADIO NEWS are conscious of this responsibility and have taken proper steps to avoid publishing technical data on the design of equipment that is being used by our armed forces.

It is common knowledge that we are engaged in a superhuman effort to produce radio equipment far beyond normal requirements so vital statistics that include *production figures cannot be released*. A few readers have requested information on various ultra-compact transmitters and receivers. In times of peace, we would comply with those requests for design and constructional data on various radio items but now we must politely refuse such requests. We are sure that our readers will appreciate the need for this precaution and that they will cooperate with us. After Victory has been achieved by the United Nations, there will be plenty of information released. In the meantime—there is plenty of activity in Radio—don't forget that! New developments are in the making and we shall publish much informative material on these subjects without revealing military secrets.

Now is the time for intensive study—*make good use of the opportunity.*

THE AMATEUR STATUS

MANY hams are disturbed by the continuous change in orders affecting their activities. No one is to blame but the amateur for this precautionary procedure. At this writing, there is a divided opinion regarding the possibilities of future activities. The hams have served the cause of humanity on many occasions in times of peace. *We are no longer at peace and we cannot expect Uncle Sam to be lenient with us when we "rub the fur the wrong way."*

Many stations were permitted to operate in defense nets up to a few weeks ago. The privilege was abused by certain individuals that insisted on conducting the usual "rag-chew" over the airlines. As a result, all activity was ordered to cease. Such conduct cannot be tolerated in times of war. We would not be the least bit sur-

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Cover Picture: RADIO NEWS Photo—6Q7 Loctal Tube.

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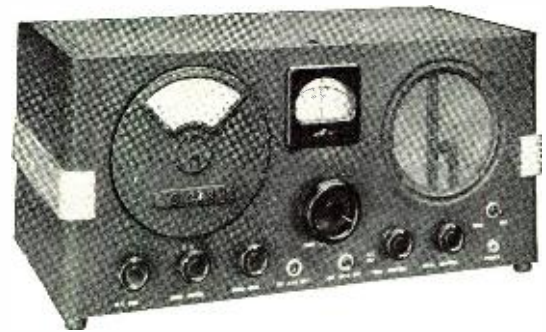
DAVEGA

WORLD'S LARGEST RADIO DEALERS
PRESENT **HALLICRAFTER** RECEIVERS FOR NATIONAL DEFENSE

The New 1942 SUPER SKYRIDER SX-28



The new 1942 Super Sky Rider Model SX-28 sets a new high in quality performance. 15 tubes, two stages pre-selection, calibrated bandspread inertia controlled, micrometer scale tuning inertia controlled, Tone and AC on-off, beat frequency oscillator, AF gain, RF gain, crystal phasing, adjustable noise limiter, send-receive switch, AVC-BFO switch, bass boost switch, phono jack, 80/40/-20/10 meter amateur bands calibrated, band pass audio filter, push-pull high fidelity audio output, 6-step wide range variable selectivity. \$179.50.



The SKYRIDER MARINE (Model S-22R)

Specifically designed for marine service, in the range from 16.2 to 2150 meters (18 mc. to 110 kc.). Improved image rejection at the higher frequencies is achieved through the use of 1600 kc. IF Amplifier. Built for 110 volt AC-DC operation. Variable mica condensers are especially treated to maintain adjustment under continuous exposure to salt sea atmosphere. **\$74.50**

HALLICRAFTER SUPER DEFIANT



Complete answer to good reception requirements. The SX-25 tunes from 550 kc. to 42 mc. in 4 bands. Twelve tubes—2 stages of preselection—Separate calibrated bandspread frequency meter tuning. **\$109.50**

HALLICRAFTERS SKY CHAMPION



Has all the essential controls for good amateur reception. 9 tubes, 4 bands, tunes from 545 kc. to 44 mc. Automatic noise limiter. AVC switch. Standby switch. Inertia bandspread tuning. Separate electrical bandspread. Beat frequency oscillator. Battery Vibrapack, DC operation socket. **\$54⁵⁰**

HALLICRAFTERS S-19R

Continuous coverage 550 kc. to 44 mc., four bands, electrical bandspread, built-in 5" Dynamic Speaker, six tubes, built-in line filter.



\$32⁵⁰

HALLICRAFTERS S-29

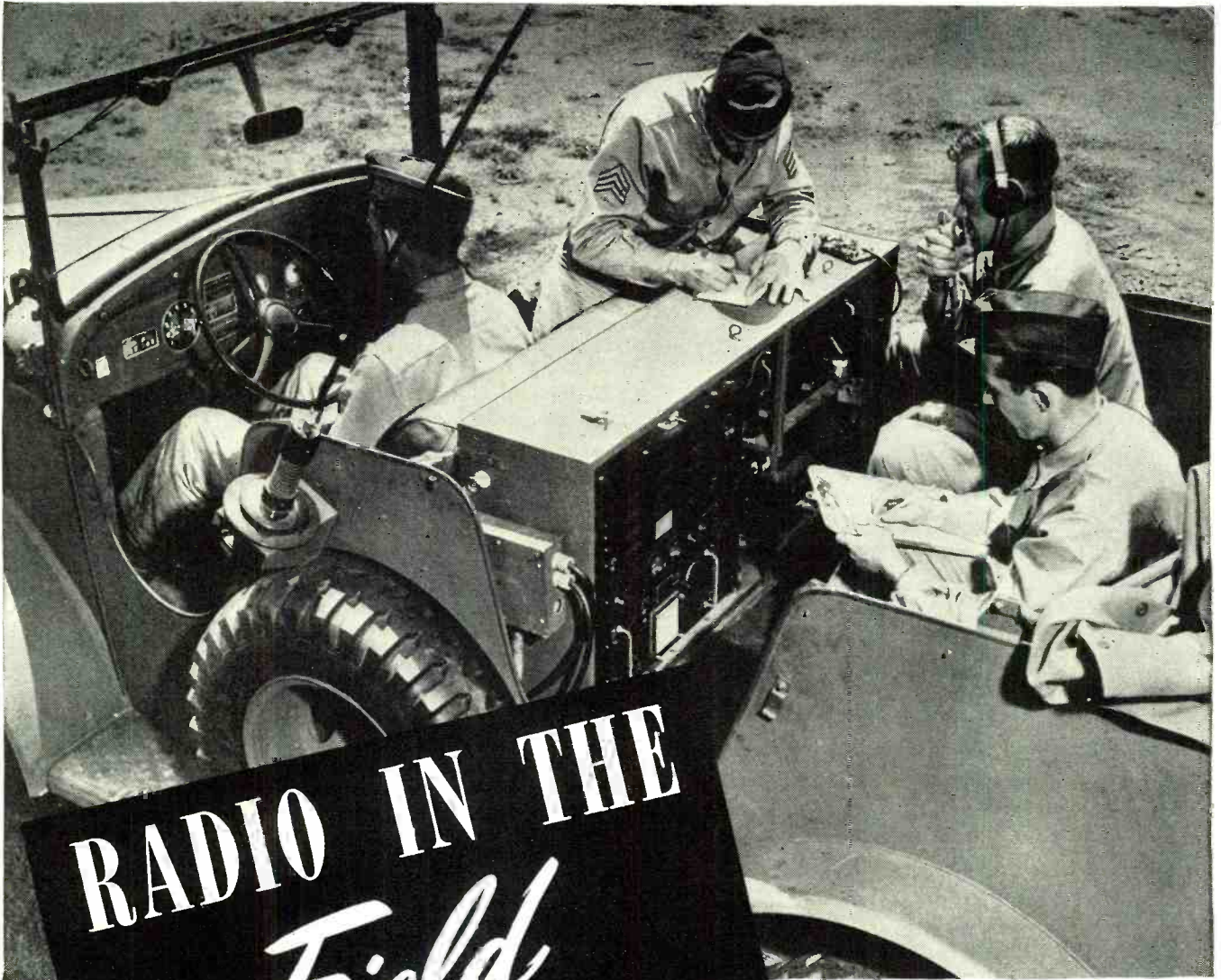
The Sky Traveler—Take it with you or use it at home. A Hallicrafters designed to communications tolerances—Frequency coverage from 550 kc. to 30.6 mc. (545 to 9.8 meters) on four bands. Self-contained antenna with high gain coupling circuit provides truly remarkable reception throughout its tuning range. 9 tubes. Operates on either 110 volt AC or DC or from its self-contained batteries. 18 lbs. Price



\$69⁵⁰

AMATEUR DIVISION
63 CORTLANDT STREET
NEW YORK, N. Y.

DAVEGA



RADIO IN THE *Field Artillery*

A radio-equipped command car shown in communication with headquarters. The unit has equipment for both key and phone and is extremely flexible.

by
the Communications Officers,
Field Artillery School, Ft. Sill, Okla.

Artillery Radio furnishes communications for Fire commands, tactical messages and warning signals.

IT should be realized that the communication system is the means by which a commander maintains control of the operations and movements within the theatre of action. As the brain, through the nervous system, controls the movement and action of the other members of the body, so, also, does the commander, through his communication system, control the movement and action of his subordinate units. Of the means of communication available to the

commander one of the more important, radio, will be discussed.

Radio in the field artillery may be said to furnish communication for three classes of messages, namely: warning information, fire commands and tactical messages.

In today's war, experience has shown that artillery positions can, and will be, attacked by airplanes and by tanks. In an attack by planes or tanks on an artillery unit, there are two conditions possible: One, if the attack

is unexpected, the result to the artillery is usually disastrous; two, if the artillery unit knows the attack is coming, the result is far different. To keep from being surprised by tank and plane, a warning system has been organized. The primary means of communication in the warning system is the radio.

The artillery's chief weapon, the cannon, is placed in rear of the supported unit in a concealed position where it cannot be observed by the

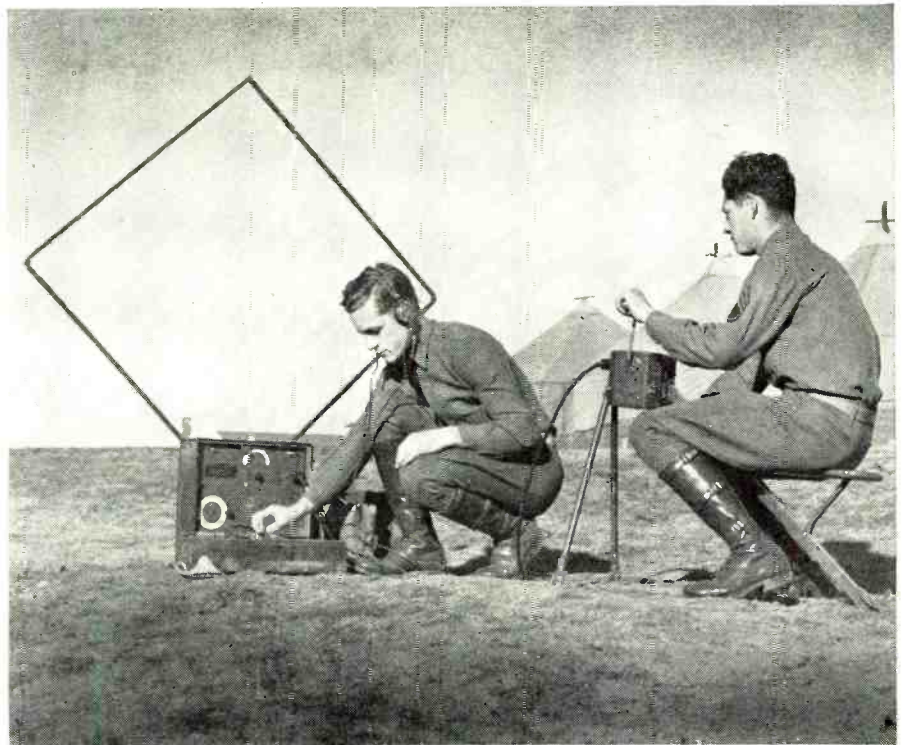
enemy. Consequently, the targets at which it aims cannot be seen from the cannon. The field artillery-man has devised a method whereby observers, who can see the enemy, but are located at a distance from the gun, can calculate data to aim the gun at the target. Thus, fire commands usually originate with observers, and must be transmitted to the guns by one of the means of communication available.

Normally there are three types of observers: the observer, the air-observer, and the forward observer. These observers have available several means of communication for the transmission of their fire commands. However only the radio is considered here. The observer is usually well up on a hill where he may view the enemy. A small set transmitting voice only is used to communicate with a similar set at the gun position.

Radio is used from ground observers only until wire communication is installed, or when other means fail. The air observer, of course, is in an airplane. He communicates with a portable ground station which relays his data to the guns. The forward observer is provided with a small set of the same type used by the observer. It works with a similar set at the gun position. The forward observer usually is up in the front lines, moving about as the action progresses. Because he is constantly in fire swept zones, his is the most exciting job in the artillery.

Tactical messages are those pertaining to the tactical employment of a unit. A commander is provided with a number of means of communication with which to transmit tactical messages. Radio, in the artillery, is one of the means employed.

Liaison requiring communications in the artillery is established between

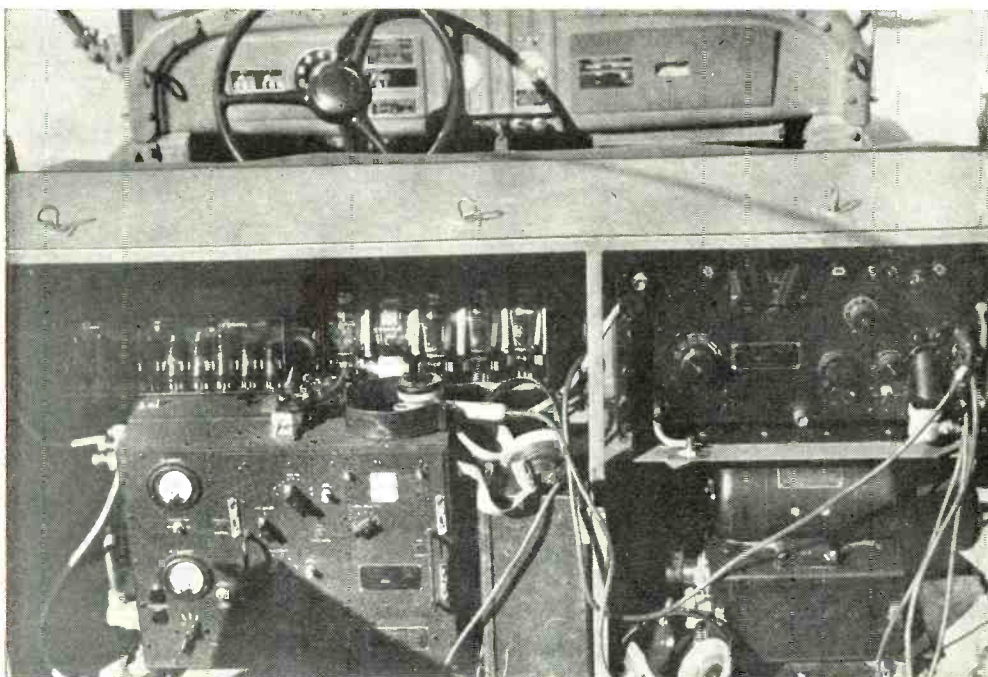


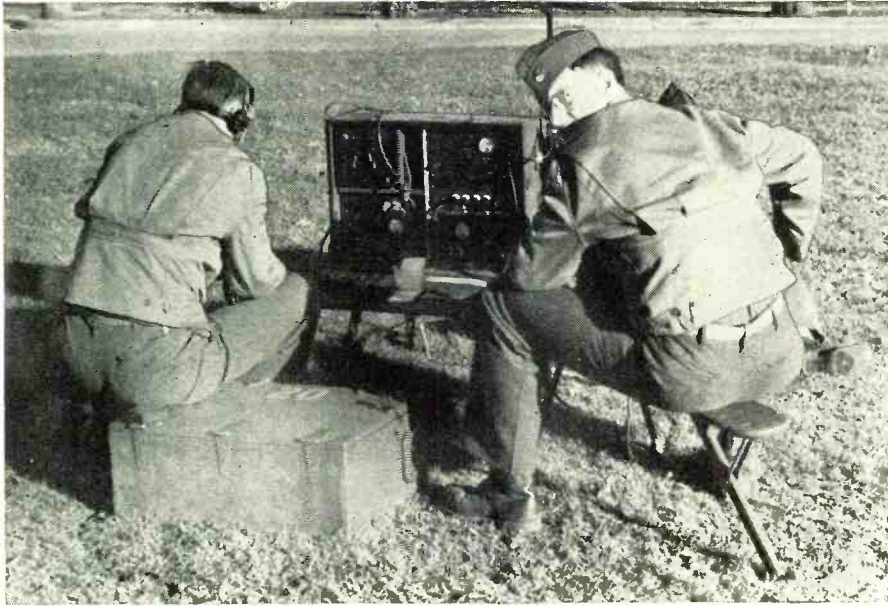
Above: SCR-161 equipment in communication between brigade and battalion. Set operator is Pvt. J. N. Johnson, and at generator is Sgt. C. T. Zapata.

Right: SCR-194 Walkie-Talkie used at observation post to communicate with gun positions uses phone only.



Below: Vehicular equipment of tactical net uses voice- and tone-modulated signals. Note the supply of spare tubes in the special rack.





The Field Artillery is well equipped with an assortment of transmitters and receivers to handle any situation. This is the SCR-178 in action.

an artillery unit and the unit it supports. That is, liaison is established with the *Infantry*, the *Cavalry*, the *Armored Force*, or with other *Artillery* units. The messages sent by liaison officers may be: requests by the infantry for artillery fire on a designated target; information both of the enemy and of friendly troops; and, in some cases, fire commands. To send these messages the liaison officer uses all forms of communication. He may use either of two types of sets that are available for liaison communication. One type is light and may be operated while moving. The other type can be carried but must be placed to operate.

Artillery, with the armored force and with the cavalry, uses radio as its primary means of communication. In both of these forces the pace is so

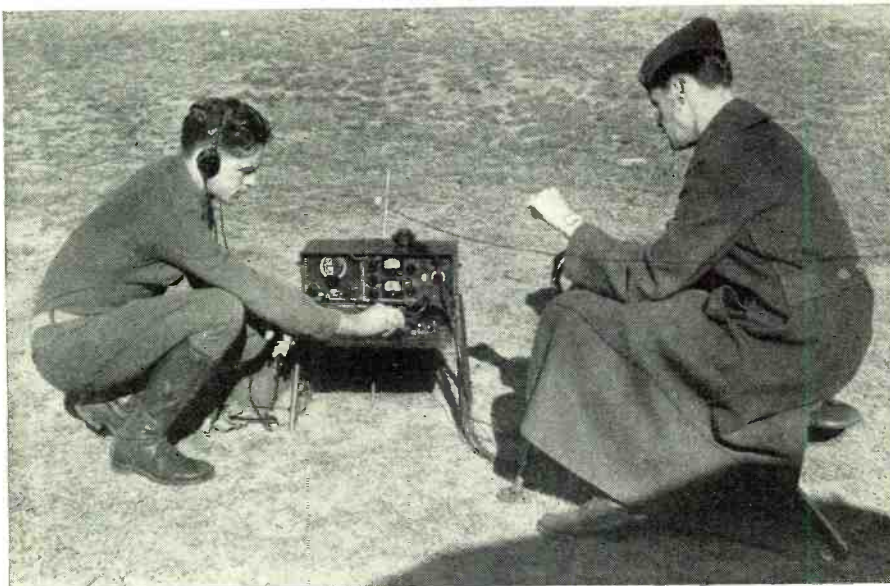
fast that usually there is not time to establish any other means of communication.

Radio has several inherent disadvantages. Some of these can be partially overcome while others are so serious as to *preclude* the use of radio entirely in certain instances.

One of the principles of war is *surprise*. During the world war, particularly in the latter stages, both sides were able to obtain only a limited amount of surprise. The military intelligence sections of both armies became so good at their jobs that it was thought by many persons that surprise in modern war was impossible. However, the Germans in their operations of the past two years have been able again to secure surprise.

In fact they have obtained a marked degree of surprise in practically all of

Pvt. J. N. Johnson and Sgt. P. Hill operating the SCR-288 set designed for tactical net and ground communications. Antenna is tied to nearby tree.



their operations. They have obtained it by the use of secrecy, movement and deception. That is, they have been able to move decisive forces into position to launch an attack without the enemy knowing it in time to take counter measures.

Because radio can be intercepted by the enemy, it cannot be used if surprise is to be obtained. Even though all messages are encoded still the presence of many radio signals in an area would surely give away the presence of a force therein. The German panzer units, although being well equipped with radio communication, maintained radio silence until the unit was committed.

Certain sets are easily located by enemy direction-finding equipment. During world war one the American Radio intelligence units had fair success in locating enemy installation. If a target thus located was important enough, of course it was taken under fire. Artillery is an important target, so it behooves an artillery unit to keep its location a secret. It must watch its radio communication to see that the unit's location is not being advertised over the air.

In selecting personnel for radio operators it has been found that only those possessing a better than average intelligence make good operators. A code aptitude test and an intelligence test is given each student entering a radio school. Only those of high rating are allowed to enter the radio section. They come from all walks of life and from many sources. Any number of amateurs, electrical engineers, farmers, clerks, and men of no profession pass through the course and go on to make top notch soldiers.

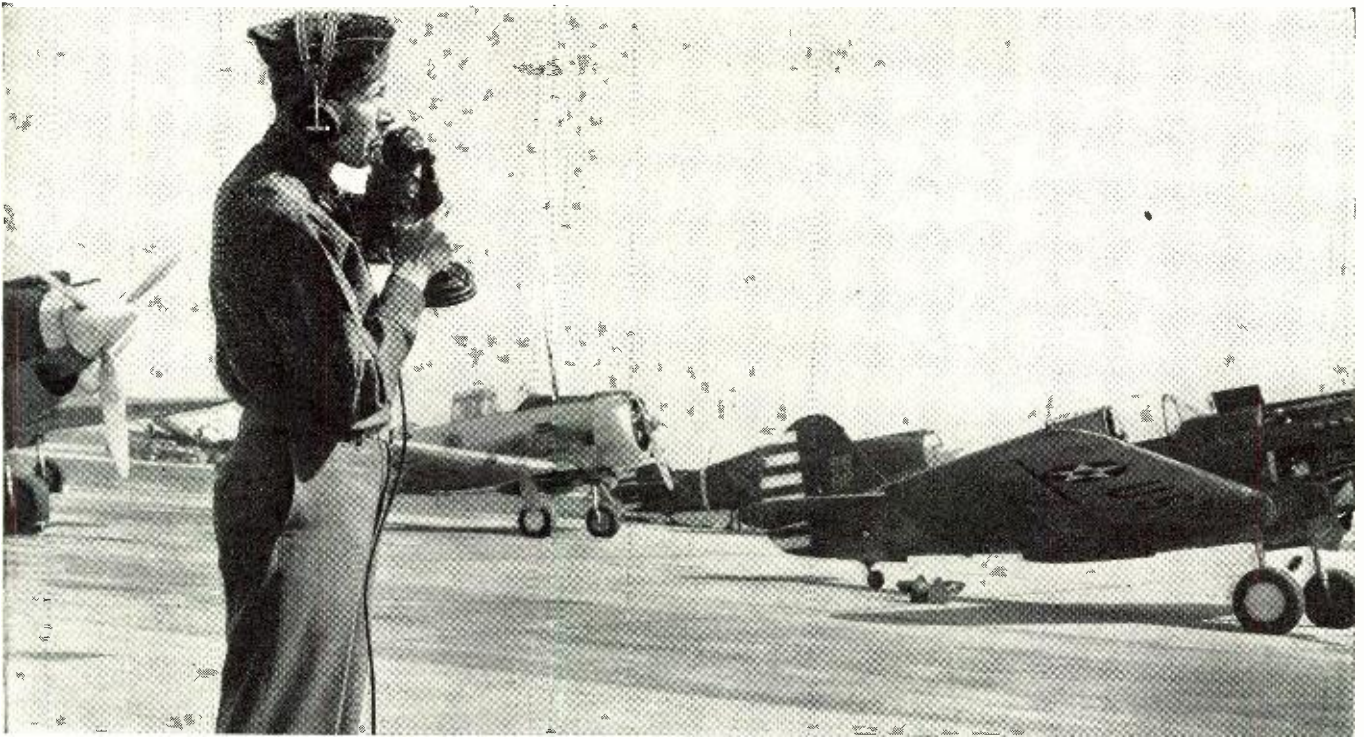
The student receives his training in four phases: basic training, technical training, team training, and combined training.

The basic phase consists of the school of the soldier; that is, how to shoot, how to march, discipline, personal hygiene, and fundamental soldiering. He has been through this period before he comes to the radio school.

In school his technical training is started. He learns the international code and attains a speed of twenty words per minute. He learns army procedure. He is put through a course in which he learns elementary electricity and magnetism, radio theory and practice, and installation and operation of field artillery sets. He must pass a written examination showing his knowledge in such things as fundamental radio theory, operation of vacuum tubes, receiving and transmitting circuit analysis, modulation, and detection. He must pass a practical test on the operation of sets used in field artillery. In other words, he must prove to the school that he is a radio operator before he is graduated.

His team training is started at the school but is never finished. This could be said also of the other two phases,

(Continued on page 50)



Holmes I. Mettee photo

America's winged fighting ships communicate with each other and receive orders from the ground via new Western Electric 2-way radio equipment.

Radio and the Victory Program

by *Lewis Winner*

Market Research Engineer

First complete report on the Victory program's effect on the production of receivers and on associated components for our civilian use.

WITH the treacherous, cowardly attack on Pearl Harbor came a new era for Americans, an era of dynamic thought, planning, and most important of all, ACTION. Although American methods could hardly ever be described as desultory, they certainly look as if they might have been, in comparison with the tremendous activity of the day. In the radio industry, this new drive is particularly true, for radio today is truly the sharp toothed sabre of the services.

Without radio, our massive tanks, fleet craft, huge bombers and even our well-schooled troops might just as well not be placed in motion. Their dominant mobile effectiveness has all been planned on the use of radio, to maintain that all-important constant contact. Correspondingly, it is apparent that an endless stream of equipment will be essential for the effective maintenance of communications. And present plans are for the production of over two billion dollars' worth of military radio equipment during the next three years, to afford such an endless stream of apparatus.

Although the total income of the radio industry was approximately two hundred million dollars in 1941, the highest ever, and accordingly many times below that outlined for the Victory program, this increased production schedule will be met, thanks to

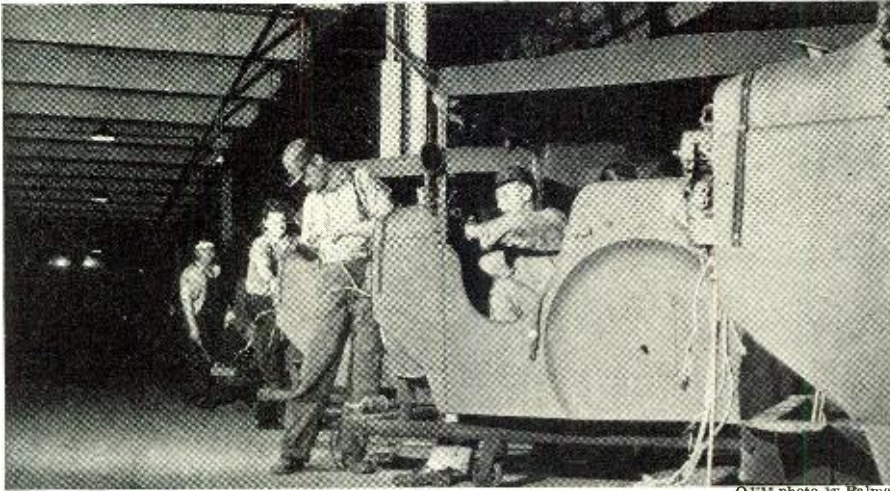


General Electric photo

Electrically heated flying suits for the U. S. Army Air Corps.

new and unusual methods of design and manufacture. This tremendous shift of activities might appear to mean that civilian production will have to cease completely. Fortunately this is not so, at least for the present and several months to come. Important testimony to this fact has been given by the heads of many of our largest manufacturers, who have declared that it will be entirely possible to produce, though on a somewhat curtailed basis. This is further attested to by the recently announced 75% production rate (25% reduction) covering January, February and March. This scale is on the basis of 675,000 sets monthly or 2,025,000 sets for the first quarter, as compared to 2,700,000 receivers for the first quarter, last year.

At the expiration of this period, the greater brunt of the military production will begin to bear down, and accordingly further reduction in civilian



Army reconnaissance cars being equipped with radio. Shielding is extensive. OEM photo by Palmer

manufacture will be enforced. According to authoritative statistics, production for the next period will be reduced to about 55% of that in 1941 and then to 70%. This production schedule will have to be adhered to even though there is sufficient material to make more receivers. This spreading of production and conservation of materials will thus be of assistance in maintaining production later on, even though it may be on a still lower production basis. Contrary to "unconfirmed reports," it is hoped that civilian production will never cease completely. Production may be brought down to as low as 10 percent as one executive told a group of delegates, but some production will be maintained.

There will be little in the way of new design, either physical or electrical, in the receivers, to be produced on the new schedules. Manufacturers will simply continue to make models now being made and even reduce the types. In addition, where new models are being planned, but not tooled, the proposed new models will not be put into production. This reduction in the numbers and types of receivers will be quite evident around April. Since no plastics will be allocated for cabinets, both fabricated and wood cabinets will be processed almost exclusively. I say, almost, for some manufacturers have their own plastic plants and therefore may continue to produce some models this way, although inventory control may even prevent that final step.

Monitoring foreign broadcasts on sw. NBC photo



The receivers covered in these reduced production schedules are both the ordinary broadcast type and amateur type. Now, the amateur type of receivers brings up another problem, the solution of which is predicated on the action to be taken by the Defense Communication Board. To date, the amateurs have been ordered off the air and then placed back again several times. I refer, of course, to those amateurs who are engaged in defense communication work. Though their work is acknowledged essential, the duties assigned to them are of such an important nature, that it is vital that the governing control be in the hands of the proper jurisdictional body.

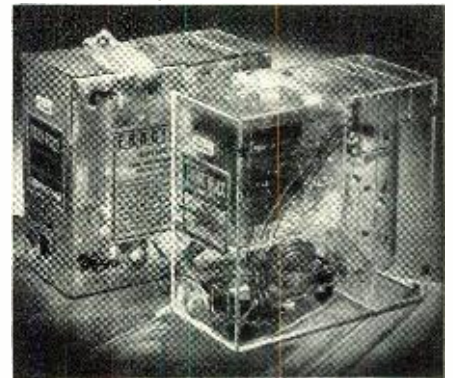
That is where the puzzling bottle neck has prevailed for quite a while. It is believed that the newly organized WPB will issue clarifying statements. From a preliminary review of the situation by several qualified authorities, it appears as if the amateur and his equipment will be included in an all-out network that will not only be under direct Government supervision, but under military control as well. With the ironing out of this problem will come the appropriate arrangements for the manufacture of amateur receivers and transmitters on a more effective scale than the rationing system described earlier (transmitter production for amateur use has been curtailed in many plants completely).

With the steady decline in receiver production will come the incline of receiver maintenance and its corresponding need for an assortment of parts and tubes. Up to within the last few weeks of January, dealers in New York, Chicago, St. Louis and Los Angeles have been able to supply up to 90% of their orders with corresponding shipments from their suppliers. Since that period, shipments have been sketchy and will probably remain that way until an official policy of replacement parts is issued.

According to the authorities, the program to be followed will allow the manufacturer of parts to produce on much the same scale as receivers, except that the decided reduction in re-

ceiver production will be eased. Actually the parts that will be affected in the allocation plan, will be those in which are used, strategic metals that are not replaceable by other metals or alternate materials. Fortunately to date the only remote possibility of that lies in the dry electrolytic capacitor in which aluminum foil must be used. Should the restriction on aluminum become complete, then it would be necessary to provide other types of capacitors. However, this possibility does not appear as if it will come to pass for two reasons. One is that production of aluminum is being stepped up at such a pace, that a scarcity does not appear apparent, and the other is that new aluminum processing methods that have already been announced, make it possible to extract aluminum from abundant domestic clays. One such method called the Hixson-Miller process, uses high alumina high silica content clay, instead of bauxite.

If other material difficulty problems arise, the alternate method as suggested by Dorman Israel at a recent I R E meeting, could be used most effectively. In his plan, he points out, for instance, that it is perfectly feasible to use some type of a ceramic for a chassis instead of steel. In some instances, porcelain 1/2" thick with the sockets as part of the base have already been successfully used. Pressed board or heavy



Modern Plastics Competition photo
Plastic cases cover radio sonde-track.

mache has also been used. Under the present conditions it is the belief that aluminum, nickel and cobalt will be allotted, to permit the elimination of the electromagnetic field that used .25 pound of copper in the 1940 receiver.

If Alnico V will be available, a .2 pound magnet will work well, and use but .02 pound of aluminum, .01 pound of nickel and .01 pound of cobalt. Additional filter condensers using .016 pound of aluminum may have to be used, but the net saving of aluminum in the receiver will be .14 pound out of a total of .19 pound used in 1940, or about a 75% saving. If Alnico V is used, the steel used in the speaker will decline rapidly with the redesign of the magnetic circuit. Another interesting point in his plan covers the use of silver. Silver wire is twelve times the cost of copper wire. A condenser-tuned radio uses .08 pound of copper in

the loop antenna. By using iron IF cores, it is possible to design two transformers that will use .02 pound of wire. This totals .10 pound. And if silver is used, the cost increases about 40c per set. But in the same way, .05 pound or 15c of silver wire could be used in the permeability tuned set. This method of allocating and adapting affords a saving of .42 pound out of a 1940 usage of .52 pound of copper, or about an 80% reduction.

Speaking of silver, we find that this metal is rapidly becoming a popular choice in receiver design. There is sufficient silver available in world markets. It is worked easily and can be had in sheets, strips, rod, tube and wire, etc. Advantages of silver include high resistance to corrosion and high electrical and heat conductivity. Silver is also an effective substitute for tin in solders. A recent report issued shows that a lead-silver solder has been developed that has a flow at 580 degrees F. This particular solder is composed of 2½% silver and 97½% lead.

Another silver-alloy solder contains 2½% silver, .25% copper and 97.25% lead. This material starts to melt at 580 degrees F., and flows at 661 degrees F. These, of course, are relatively soft solders and are not to be confused with the silver brazing alloys and hard silver solders with melting points at 1175 to 1600 degrees F.

Copper which recently was declared null and void for practically everything, is now available in those parts of radio where conductivity or current carrying is a factor. Included are the full run of parts from the antenna down to the volume controls. Excluded are the dressy parts such as cabinets, dials, escutcheons, knobs, and copper shafts.

Jewel bearings and jewel bearing materials recently placed under allocation, may decrease some activity in the production of sapphires for needles for a while. Adequate substitutes have already been developed. These will probably soon make their appearance on the market. Until the advent of the war, the manufacture of jewel bearings was practically a complete European project, much of the delicate work being done in Switzerland. Because of the extremely fine handcraftsmanship required, the development of production schedules cannot be as rapid as desired. However, with the increased knowledge of their manufacture becoming more and more prevalent, it should not be long before we are able to produce these jewels in greater quantities.

The subject of jewels brings us to instruments and their place in the Victory program. Although the production of test instruments has been increased and increased, there has been a shortage of many types. However, with greater allocations of necessary materials being made, increased production introduced, and simplification of ordering offered too, servicemen should not only be able to keep their



RCA photo

Huge radio ear of the 122nd Coast Artillery in use at Fort DuPont.



OEM photo

Our tin supply comes from mines in far away corners of the world.

instruments in perfect condition, but obtain others that are *essential* to their work. I say *essential* and mean that, for unless sufficient proof can be offered that the required new instrument is essential to effective maintenance and repair, the new instrument will not be forthcoming, in any too short an order.

The freezing of automobile manufacture and the consequent decreased production of auto sets will create a new healthy market of repair for the servicemen next spring and summer. Several of the larger auto set manufacturers have completely curtailed production and by the spring, it appears as if the reduction in manufacture will be extremely severe. Of course, every effort to maintain production of replacement parts for these sets will be made. However, in view of the critical metals used in the man-

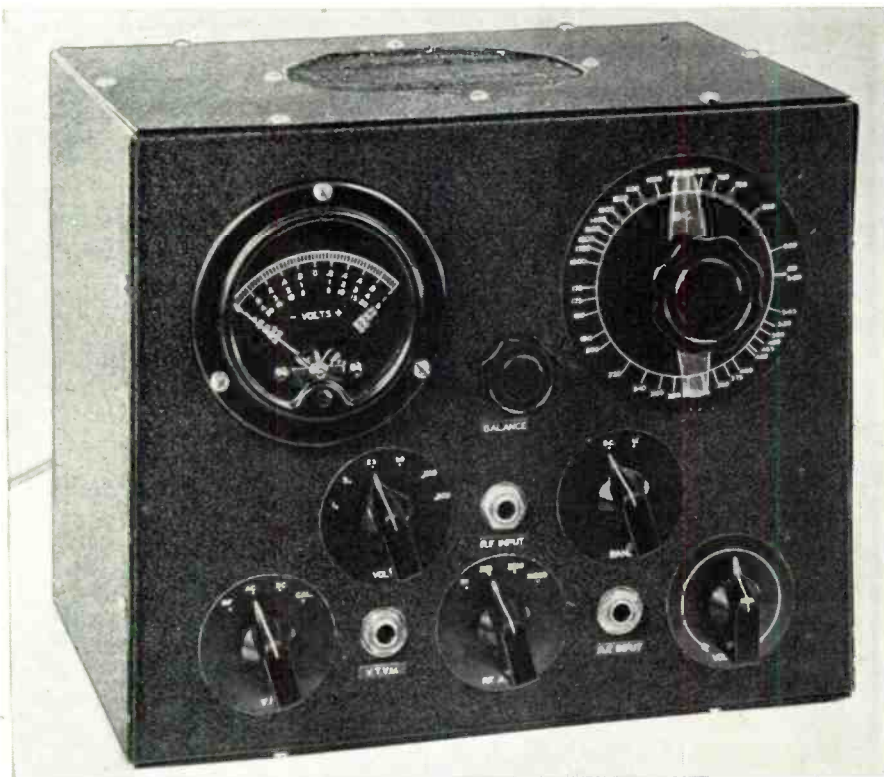
ufacture of many of these parts, such as heavy aluminum or zinc for the cans on the electrolytics, production may become increasingly difficult. Suitable substitutions are being studied, but thus far no effective alternates have been found.

In a recent ruling, the Civil Air Patrol was given priority assistance to obtain civil aircraft repair parts and accessories. In this same ruling, aid was also extended to county police with city and state police included too. They will all receive the preference rating of A-10. This order will expire March 31, 1942.

Both the police and aircraft patrol are large users of radio equipment. This ruling clarifies a problem that has been hanging fire for some time.

Probably one of the most important issues at stake in the Victory produc-

(Continued on page 46)



The completed tracer looks like a commercial product with its special plates.

A LARGE supply of test equipment is needed by our armed forces. Servicemen can build a modern Signal Tracer at reasonable expense.

This layout was found to be ideal. An inexpensive speaker may be used.



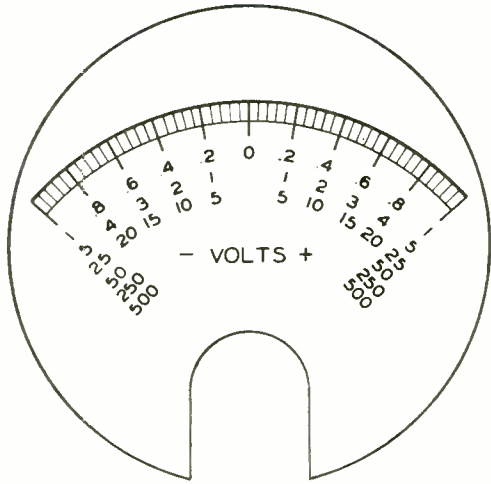
Economy Signal Tracer

by
RAYMOND B. FRANK
Technical Editor

THE huge quantity of mail received after the publication of the Signal Tracer by R. K. Wheeler in the August, 1940, issue of RADIO NEWS indicates a great interest on the subject of "signal tracing." The general trend of the mail indicated the need for a lower cost instrument of simple design. With the cooperation of Mr. Wheeler, the following design was arrived at and the cost was greatly reduced by the use of a simplified coil and condenser assembly, a low priced cabinet and other economies. For those who must cut cost to the bone, this Signal Tracer may be built without the output stage, in this manner conserving on cost of parts. However, wherever possible we recommend the model be built as shown so that its greater convenience may be had.

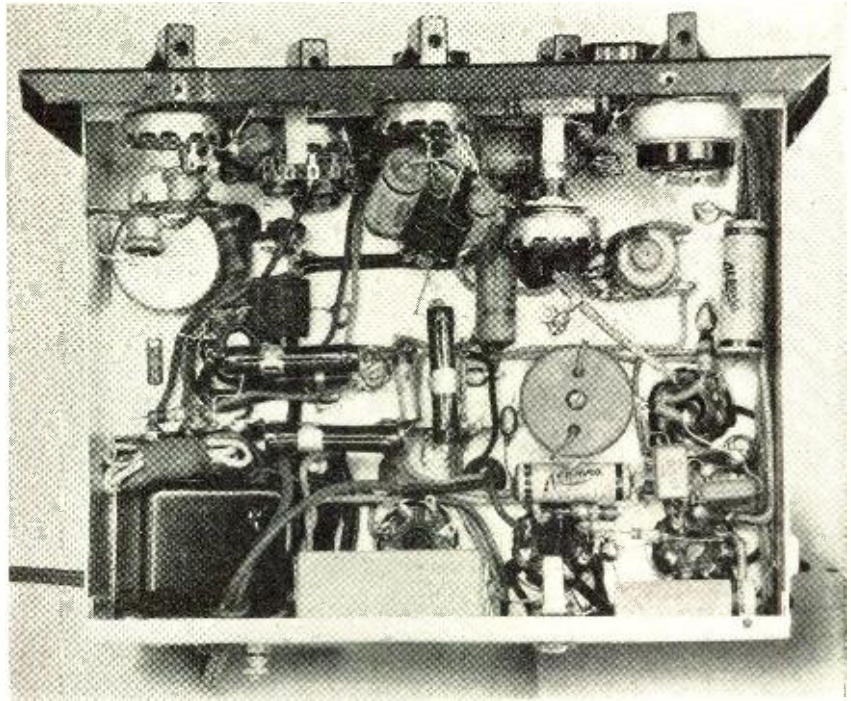
Two years of experience show that the Signal Tracer is used about 90% of the time for making d.c. measurements with V.T.V.M. or r.f. measurements in the b.c. and i.f. bands. Little use was found for the short wave bands except to check the frequency of the oscillator which can be determined easily by observing the image response with a strong signal input. Amplification at high frequencies is difficult to obtain with tuned r.f. stages.

Even the best commercial models do not attempt to obtain equal gain at high frequencies. The short wave bands were, therefore, discarded permitting the use of a single tuned stage, requiring only two coils, one covering 1800 to 550 kc. to take care of broadcast frequencies while the other covers the most used i.f. frequencies between 170 and 560 kc. By use of a special coil designed by Carron it



This full-size scale may be cut out and fitted on most instruments.

Right: Note the bias cell mounting position in this underchassis view.



was possible to simplify the switching, using only a single-pole, single-throw switch for the band switching. The plate circuit of the second r.f. tube is coupled to the diode detector by means of a shielded 80 mhy. r.f. choke. The grid of the first r.f. stage contains an attenuator circuit which gives multiples of 1, 10, 100 and 1,000. The V.T.V.M. uses an ordinary 3" O-1 ma. Triplett meter. This may be obtained from the manufacturer with a zero

center scale, or a scale such as accompanies this article may be cemented over the regular one.

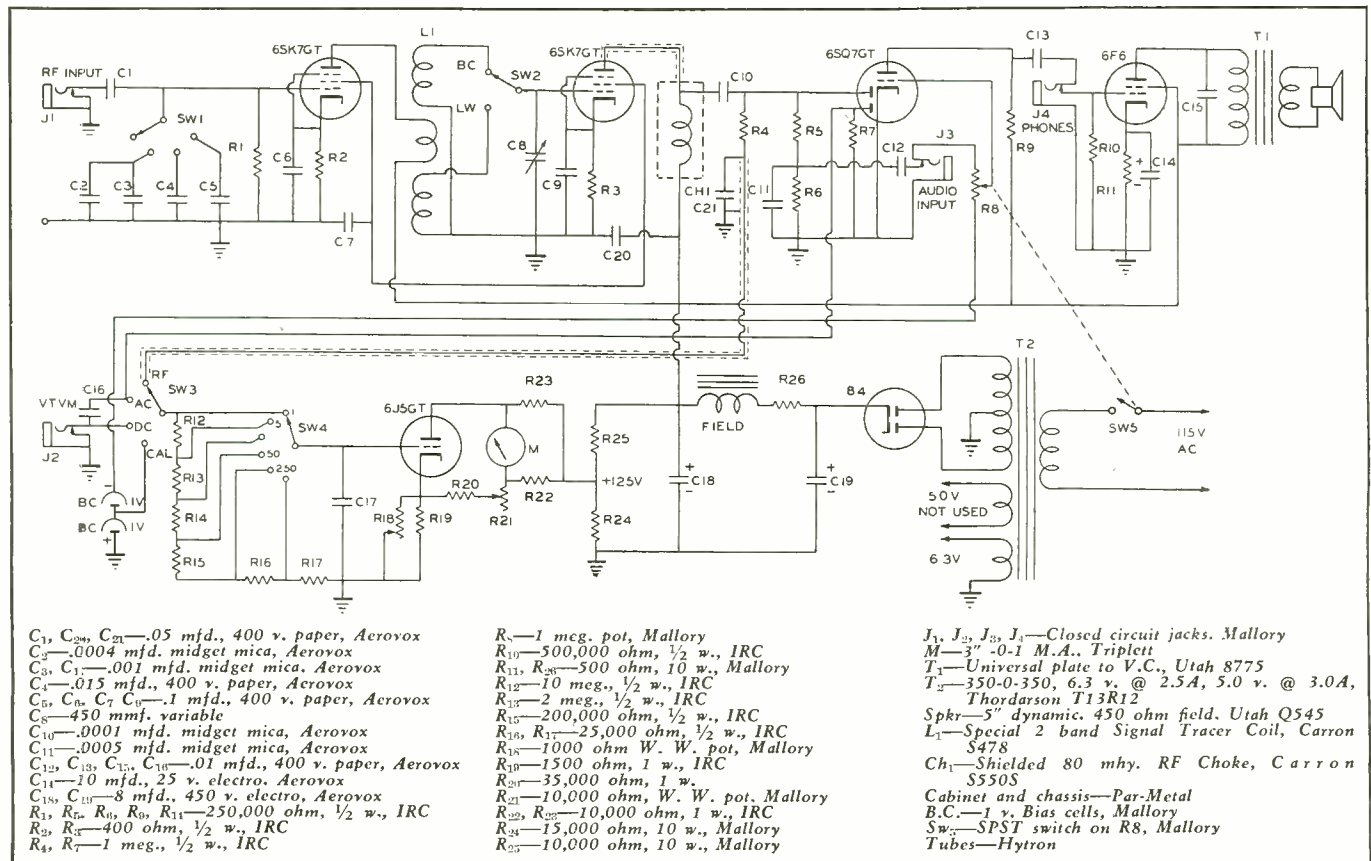
Construction

In the search for a low priced cabinet, an 8" x 10" x 7" Parmetal utility box was found.

A 7" x 9" x 2" chassis makes a neat unit for mounting the various parts and fits nicely into the cabinet. The various units mounted on the front

panel are: on the upper left, O-1 ma., on the upper right the dial for the tuning condenser, while between them is mounted the balancing resistor for the V.T.V.M. Below this is mounted the voltmeter range switch and the band switch, while between them is mounted the r.f. input jack.

Along the lower edge is mounted the voltmeter switch, V.T.V.M. input jack, r.f. attenuator, a.f. input jack and the gain control. A phone jack



to enable the use of headphones is mounted along the rear edge of the chassis. A 5" speaker is mounted in the top of the cabinet and the cone protected by a piece of screen wire.

The layout of parts can be seen plainly by referring to the top view of the chassis. The power transformer is mounted at the left rear corner of the chassis, while along the rear edge are mounted the 84 rectifier, 6F6 output stage, and the 6SQ7GT diode detector and first audio. The 6J5GT V.T.V.M. tube is mounted just behind the meter, while the 6SK7GT 1st r.f. tube is mounted near the front center of the chassis just in back of the meter balancing control. The second r.f. tube is mounted just behind the tuning condenser. Care will have to be taken in mounting the tuning condenser so that it will clear the speaker when it is opened.

A cutout for the power transformer may be made by drilling a number of small holes along the lines of the desired cutout and then sawing between these holes. The edges of this cutout should be smoothed with a file to remove burrs. The b.c.-i.f. switch is mounted on a small bracket approximately 2" behind the panel in order to benefit from short coil leads. Condensers for the r.f. attenuator are soldered directly to the attenuator switch to keep stray r.f. fields as small as possible.

Resistors for the various V.M. ranges are mounted directly on the switch terminals. The on-off switch is mounted on and controlled by the gain control. Shielding should be used where indicated in the drawing. The volt meter "set" resistor is mounted near the left front edge of the chassis, the shaft sawed off short and a screwdriver slot cut in it with a hacksaw. Filter condensers are mounted along the rear drop of the chassis. The r.f. choke in the plate of the second r.f. stage should be mounted as close to the tube as possible. The plate lead must be shielded to prevent oscillation.

Some 1,000 ohm-field low priced speakers do not have large enough wire to carry the total current drain of this unit which is in the vicinity of 70 ma. A 450 ohm Utah speaker was selected and a resistor used in series with the field to give the necessary voltage drop to reduce the plate potential to approximately 240 volts. An 84 tube was selected for the rectifier in order to protect the meter while "warming up." By using a heater type tube for the rectifier all tubes reach operating temperature at approximately the same time. In this way the meter is prevented from going off scale during the "warming up" period.

Bias for a checking calibration of the V.T.V.M. is obtained from a one volt bias cell while a second cell connected in series gives a total of two volts for bias on

the audio section of the 6SQ7GT. By using fixed bias on the audio section of the 6SQ7GT any audio voltage which may be developed across the cathode resistor in this tube is eliminated.

Terminal strips soldered to the chassis are used to provide convenient mountings for the various resistors and condensers. The dial knob for the tuning condenser has a 3" by 1/2" strip of celluloid glued to it to form a pointer for the dial. This strip of celluloid has a line scribed in it which is then filled with India ink for greater visibility.

The various dials used were made by first lettering the scales and markings on Bristol board to twice the desired size and then having a half-size Photostat, both positive and negative, made of these original drawings. The negative of the Photostat is then used and cemented to the panel by means of Duco household cement. By making these dials twice the normal size originally, small inaccuracies in the lettering are reduced so that they are not noticeable in the finished product.

It will be necessary to have three test prods for use with this unit. For this purpose three foot lengths of shielded single-conductor microphone cable are used. These are equipped with shielded phone plugs at one end and needle-pointed test prods at the other. Ordinary needle test prods were sawed off about 3/4" from the needle end and forced into 6" lengths of 3/8" (inside diameter) fibre tubing.

The lead for the audio test prod is connected directly to the prod itself, while that for the V.T.V.M. has a one megohm, 1/2 watt resistor inserted within the prod handle. The r.f. prod may be constructed either as shown in the August, 1940 article or from two 4" lengths of pushback wire twisted together to form a small condenser of approximately two mmf. capacity. The capacity of a lead of this type is such that it will not disturb any circuit under test. A ground lead must be used to provide a return for the circuit under test. This lead is a short length of flexible wire connected to the chassis of the Signal Tracer by a bolt and nut on the rear edge of the chassis near the line cord. The other end of this lead is equipped

with an "alligator" clip which may be clipped on the chassis under test.

Testing

After completion of the wiring, the unit should be turned on and the tubes allowed to warm up. The calibrating resistor in the cathode of the 6J5GT tube should then be adjusted with the volt meter switch on the "calibrate" position and the range switch set on 1 volt. By trying various settings of this resistor, readjusting the meter to zero with no calibrating voltage applied, a point will be found where the reading of the meter with one volt applied will be exactly full-scale.

When the selector switch is moved from calibrate, the meter should return to the center "zero" position. Failure of the meter to return to zero either indicates a "gassy" tube or misadjustment of the calibrating resistor. A "gassy" tube may be detected by rotating the range switch to various positions. Any appreciable change in the zero position of the meter is an indication of gas. The only remedy for this is to replace the tube. After the meter has been properly adjusted, it should be checked on various d.c. ranges by comparison with a standard meter. Readings should be within five percent of that obtained with the standard meter. After the V.T.V.M. is operating properly on d.c. it should be switched to a.c. and the prod connected to an a.c. source.

As the insulation of the diode plates in a 6SQ7GT tube is not very great, not more than 100 volts a.c. should be applied except for brief intervals. After the V.T.V.M. is operating properly, the audio prod is connected to a source of audio voltage such as the grid of one of the audio stages in a receiver. The quality of the signal emanating from the speaker should be good. Plugging in a pair of headphones should silence the speaker.

If the audio section operates properly, an r.f. signal should then be applied to the r.f. input either from a signal generator or receiver. The r.f. stage should be tuned to resonance with this signal after selecting the proper band on the b.c.-i.f. switch. Rotating the attenuator switch should cause a progressive loss of gain as more capacity is connected across the input stage. It will be found that the gain at the low frequency end of the b.c. band is somewhat greater than that obtained at the high frequency end. However, this is not a serious objection as the gain of most receivers is greater at the high frequency end and this compensates to some extent for this defect.

Switching the V.T.V.M. to the r.f. position with a signal applied to the r.f. input should cause a considerable reading of the V.T.V.M. which will vary as the tuning condenser is swung

(Continued on page 53)



"If that's the kind of stuff you listen to I'm sorry I fixed it!"



The Serviceman Reaches War Age

by RUFUS P. TURNER

NO longer are we preparing for a war that is away in the offing. That war is now here! Overnight, our defense labors have been transformed into war work. With the entire nation girded for the fight, the status of every civilian occupation is affected. The radio serviceman, like other workers, must prepare to carry on his business on a war-time basis.

The serviceman must transform his point of view and ready himself for his new tasks as quickly as possible. Upon his shoulders rests the responsibility of keeping the public listening. He must keep the radios going. The public must never be permitted to stop listening for authentic news of military progress, for emergency announcements, and alert signals. The serviceman's job is going to be a man-sized order as civilian radio materials grow scarcer with increasing Government demands and technical help and competition dwindle with mounting enlistments.

The radio serviceman had no job to perform in 1917. In fact, he had not yet come upon the scene. When the United States entered World War I, the only private radio owners of any importance were the scant 2000 hams who, incidentally, were immediately ordered off the air. There were no newscasts; the public received its information regarding the war declaration from the daily papers, sometime after the incident. Today, there are nearly 29 million radio homes in the United States, according to census figures, and additional sets are installed in cars. President Roosevelt's war message to Congress came over those receivers. Over the same radios will come an endless flow of official communiqués, air raid warnings, and other announcements of public importance—at the time when they are of greatest importance—for the duration of this war. No American life or property must be in jeopardy because of set breakdowns.

The private broadcast receiver is as important to our way of life as a military radio is to life on the battlefield. Broadcasting is essential to preservation of the national morale and keeping the public properly informed. It is a means of communication, not alone of entertainment. The serviceman's great duty is to maintain this vast instrumentality whereby the Government is enabled to keep in touch with the American people. Now that we are at war, every radio repair shop is a part of the arsenal of democracy.

A number of radio servicemen who are within the military age limits, physically fit, and unmarried will sign up with the armed forces. Those who are left behind must rejuvenate their own businesses and absorb those of the men who have gone to war. Keeping the radios going without interrup-

tion is going to be a time-and-a-half job.

Special War-Time Obligations

Now is the time for servicemen to act upon those things they must do to prepare for war-time renovation. Each man must consider what kind of radio work he is apt to be called upon to



Many servicemen will have to work during the night hours if needed.

do if the fury of war strikes at his town, and get ready to do that sort of work.

It is the patriotic duty of every serviceman to equip himself educationally and materially to service sets under wartime conditions. He must purchase any needed tools and equipment now while they are still available. Servicemen called to arms will undoubtedly offer their equipment and clientele lists for sale to local fellow tradesmen at attractive figures, and to some fellows this will be an opportunity to obtain test gear no longer available to the public.

Now is the time for each service

shop to modernize tube testers and set analyzers. Test equipment should be accurately calibrated *now* and prepared for a long run without factory checkup. All such gear should be placed in A-1 condition, since factory service will undoubtedly grow harder to obtain as the war progresses.

For the same reason, it will be imperative to keep a complete stock of replacement parts for every piece of test equipment. Likewise, circuit diagrams and service instructions for this equipment should be obtained now from the manufacturers and carefully filed, if not originally obtained with the equipment. Our test equipment must not hopelessly collapse on our hands. We must be prepared to keep our meters and measuring gear in a state of top efficiency.

The serviceman must keep a complete stock of replacement parts in his bins. Repair parts of every representative type should be on hand. *There must be no hoarding*, or we all shall suffer. Simply keep a full, normal stock on hand.

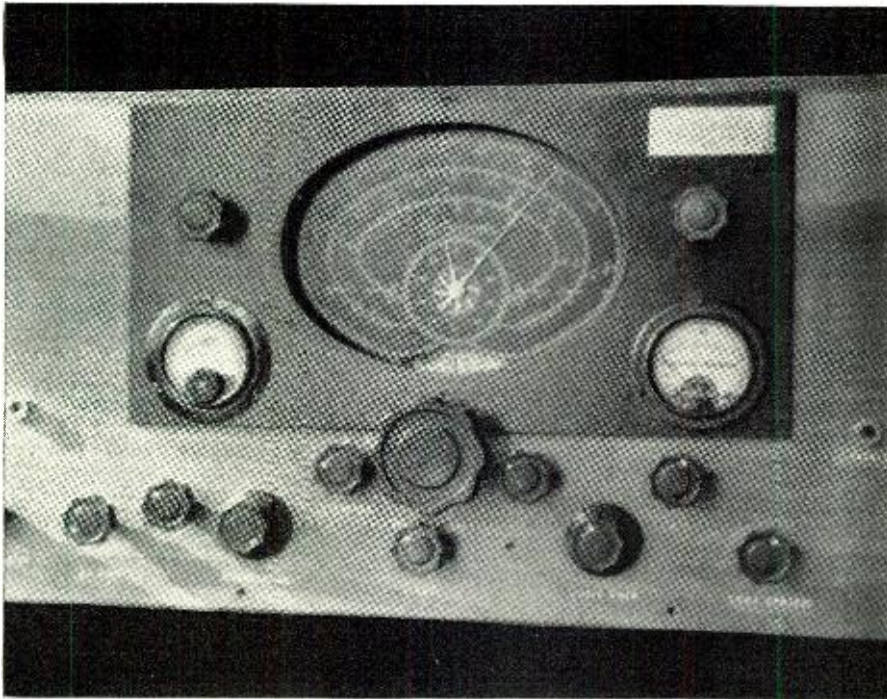
Conservation is also important and must be a part of the serviceman's war-time creed. Any useable parts should be saved, however old in style they may be. Every part which has any potential usefulness in repair work should be salvaged from discarded sets.

Complete service data on all receivers (circuit diagrams, alignment instructions, etc.) must be gathered together now, if the repairman does not already own the standard service manuals. As many job kinks and tricks of the trade as possible should be made a part of the serviceman's working knowledge.

As a final step in preparedness, the serviceman should provide a safe place in which to keep his stock, tools, and test gear. The safest part of his building, from a standpoint of security during bombing raids, fires, etc. and of being reasonably burglar-proof, should be chosen.

We recommend that servicemen learn quickly, but well, everything they can about PA systems, transmit-

(Continued on page 57)



All of the controls are important for full efficiency of the receiver.

HI-FI RECEIVER

by **JOSEPH MARSHALL**

An examination of the usual radio junkbox should result in discovering many parts that are suited for constructing this set.

BY THIS time many an amateur and radio experimenter has discovered that various radio parts and components badly needed for the construction of that new dream receiver or transmitter are no longer available because of Defense Priorities. This unavailability, however, novel as it may be to some is nothing new to many of us. Long before the arrival of National Defense many of us had found it impossible to obtain various excellent parts because of an old fashioned condition known as Family Priorities, a system under which baby's shoes rate AA1, sonny's spinach A1, mamma's hats B2 and pappy's transformer G6, a rating which when reached finds the pay envelope empty and hence the transformer unavailable.

Now it doesn't make much difference whether you have the money but the store hasn't the transformer to sell, or whether the store has the

transformer but you haven't the money to buy it; in either case the transformer is unavailable and somehow or other you have to do without it. Those who, because of Defense Priorities, are suffering this condition for the first time may consider the situation hopeless and the best cure to put the plans for the dream set back in the hope chest. Let me, a chronic sufferer from the malady but of the old fashioned cause, hasten to assure them that this is not necessarily so. It is quite possible to improvise fairly adequate gear under such circumstances. As an example I present herewith the Marshall (Series IV Model 3) High Fidelity Communications Receiver which owes only about a third to parts stores (and the last instalment of that will be paid in another month or two) and two-thirds to junk boxes and various other noncommercial sources. Moreover, the thing works and a little better than receivers of similar design.

The easiest thing about whipping up this receiver was the defining of the design problem. It was simply this: we wanted a receiver with, on the one hand, the ability to "get" stations comparable to that of the better commercial communications receivers and, on the other hand, the ability to reproduce the programs received with a fidelity comparable to that of the better commercial high-fidelity home receivers. The reason for the specifications was simply that we could by no means afford two receivers in the family and the only alternative was to get one to do both jobs. The execution of the design was something else again. But finally it was managed. I do not claim that the problem was solved perfectly. You can't acquire the Holy Grail on peanuts and that's all we had to spend. But the final result is a good approximation and will do till our millenium arrives.

Since one of the two important qualities desired was that of high fidelity reproduction, the receiver was designed backwards, beginning with the speaker. The tone quality of a receiver is no better than that of the speaker. So we searched for a speaker. A co-axial unit was out of the question; likewise the lovely bass-reflex combinations. We searched the junk piles and bargain counters and finally found a *Jensen* 12 inch with a burnt out voice coil at a neighboring serviceman's shop. We looked up the manufacturer's specifications in our collection of circulars (very handy to classify and identify your junk) and found that they claimed a pretty good high frequency response for the speaker. So we put in a new voice coil. Total cost \$3.50.

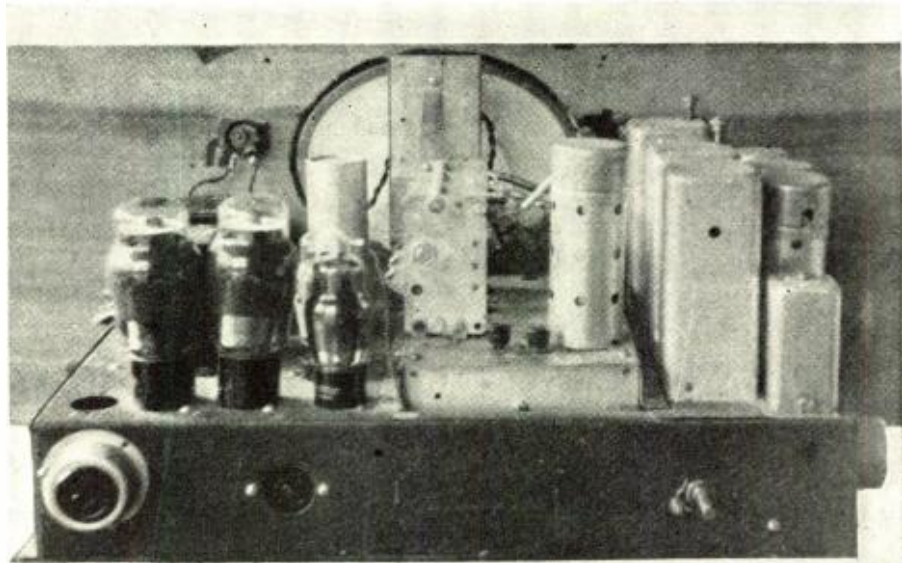
The next thing was to make the best of the speaker by providing a good baffle. After considering the various methods we chose the simplest and cheapest. Our house happens to be so arranged that the partition wall between living room and kitchen divides the house into two approximately equal parts. The wall was of plaster board construction. I cut a hole in the middle of the wall big enough to take the speaker and mounted it securely with the front facing the living room and the back facing the kitchen. The only precaution necessary is to see that there is no air leak between front and rear of the speaker cone, and that the space between the walls is fixed up so that the sound waves cannot enter between the walls but only into the two rooms. In our case a square box slightly larger than the speaker was mounted in the hole, padded with old carpeting and covered with grills harmonizing with the scheme in each room.

The results of this arrangement were considerably better than expected. The low note response is below 30 cycles and very surprisingly, the high frequency response exceeds 10 kc. (the 10 kc. jingle bell interstation interference can be heard plainly in the high fidelity position).

This is not too amazing considering that the shortest way around from front to back of the cone is 18 feet with one door open and almost infinite with that door closed. Moreover, the programs are heard uniformly as well all over the house and for once Mamma can hear Lowell Thomas while preparing supper.

Where landlords or finicky XYL's preclude a duplication of this arrangement, some other baffle will have to be used. An infinite baffle such as described in RADIO NEWS January 1940 would be the cheapest equivalent. Or, if you have a fireplace you don't use, by putting the speaker in the opening, padding the inside with old carpets, etc, and making things nice and tight so that the back wave can only go up the chimney, you can get a very nice infinite baffle too.

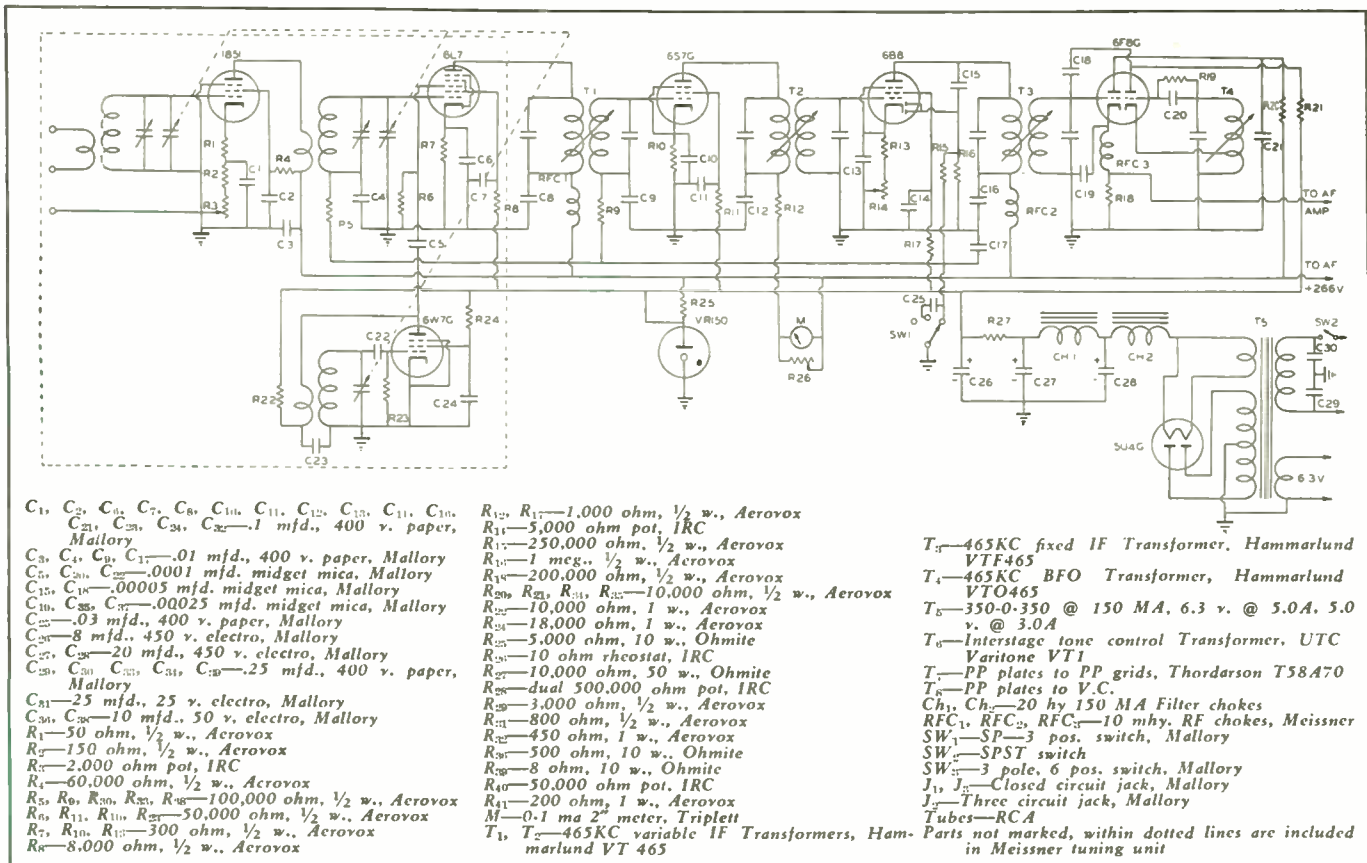
The next step was the design of the audio amplifier. Our specifications for this were set by the speaker. A response of from 30 to 10,000 cycles and an output of about 10 watts. In our case, two other factors entered. One was that we had in mind a tone control circuit which required an extra 20 db. of gain; the other was that we had a nice transformer taken out of a big Philco and a set of chokes to match which could supply no more than 150 mills of current steadily. 6A3's would meet both the fidelity and current requirements. But the necessity for 20 db. of extra gain would have required too much pre-amplification. Moreover, we had 6L6's on hand. However, under ordinary conditions 6L6's would draw from 120 to 150 mills



Input and output sockets are mounted on the back edge of the receiver.

and keeping in mind the dozen or so other tubes we intended to use in front, we could not budget more than 80 to 90 mills on peaks to the output tubes. Again consulting our library we came up with a low voltage low current application of the 6L6's. Since this application is not well known, yet applicable to many home built receivers, I give the details:
 Zero signal plate voltage...266 volts
 Zero signal screen voltage...266 volts
 Zero signal cathode current... .81 ma.
 Max. Signal cathode current... .92 ma.
 Self bias resistor... .257 ohms

Bypass condenser...10 mfd. or more
 Output at grid current point.....
10.5 watts
 Total distortion.....4 percent
 To reduce the distortion and improve the frequency response 10 percent inverse feedback is incorporated. A simple method of equalizing plate current is used. Instead of a single 250 ohm resistor, a 500 ohm adjustable resistor is used. The two cathodes are connected one to each end of the resistor and the slider is grounded. To balance current, shift the slider until both tubes draw equal current.

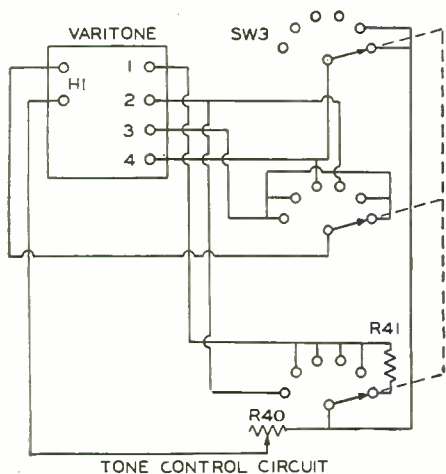


Two by pass condensers are required.

For an output transformer we used an RCA universal found in an old set. The interstage push-pull to push-pull transformer was also taken from an old deluxe BC set. It did not have a split secondary but by taking it out of the case, splitting the wrappings carefully, we found the center secondary lead which is a loop, and cutting the loop, soldered another lead to it.

The tone control circuit is rather unusual, but we have found it well worth the cost. A UTC Varitone transformer is used to couple the 1st and 2nd audio stages, as well as to give the tone control action, in conjunction with a 3 pole 6 position rotary switch and a 50,000 ohm volume control. The result is an extremely versatile and flexible equalizer and tone control.

In the first position, left to right, the treble is attenuated and therefore the bass brought up. In the second, the bass is attenuated and the treble



brought up; the third attenuates the middle frequencies and brings up both highs and lows; the fourth is similar but sharper; the fifth attenuates high and lows and brings up the middle frequencies; the sixth is practically a single frequency filter peaked at 1000 cycles. In all these positions the potentiometer permits adjustment of the degree of equalization to a maximum of 20 db.

A few words about the application of the circuit. In the first place it permits the equalization of the total sound system. In our case it was found that the bass response was extremely good but the treble was low. We found that we got nearly a linear response by placing the switch in the treble position and the control one-third on. To suppress the highs for cutting down static and noise, switch to the bass position and adjust the pot as much as desired. In that case the low notes will remain the same but the high notes will be lower in volume. If it is desired to lift the bass volume, on the other hand, the same thing is done but the volume is increased until the high notes are of the same intensity as before, in which case the low notes will be relatively louder. Many like this characteristic.

The second position permits increasing the treble response. This is handy when listening to music with the i.f. sharp because of the necessity for selectivity. The treble can in this way be lifted up to make up for the lack of high note amplification in the i.f. Another use is when listening to rebroadcasts of European commentators. Often they come in very muffled and unintelligible. By increasing the treble response we remove some of the muffling and improve the intelligibility.

The third and fourth positions are particularly good to equalize recordings, particularly the older ones.

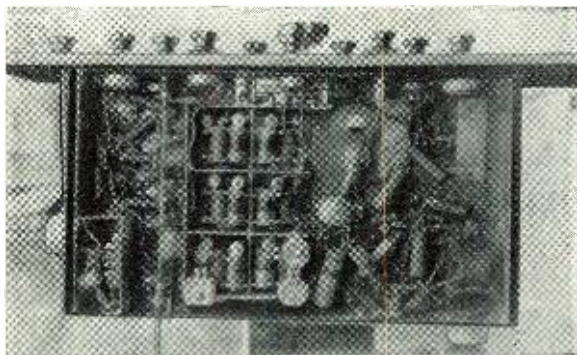
The fifth position is useful in voice communication. In this position both the low notes and high notes are cut down while the frequencies between 200 and 3000 cycles remain the same. This often enables one to bring ham voices out of the mud of interference, heterodynes and receiver noise quite often making all the difference between intelligibility and plain noise. The sixth position has an effect somewhat similar to a single signal crystal filter. The BFO is set for 1000 cycle beat note. With the tone control circuit in this position the audio system passes a 1000 cycle note but greatly attenuates all other frequencies including of course heterodynes and static. Since the BFO will produce a 1000 cycle beat note with only one (or at most two) stations only that signal will be audible. It is not claimed that the system is as good as a crystal filter; but it is an improvisation which works quite well 80 percent or more of the time, and even with a crystal filter is well worth the use for its efficacy in cutting background noise, heterodynes, and static.

The rest of the audio amplifier is simple. The only other unusual feature is the volume control, a twin potentiometer is used as a constant impedance T pad. No matter where the slider is set the impedance of both output and input remains very close to 500,000 ohms. Since the hook-up may not make the connection clear a brief

description might be in order. The two sliders of the pots are wired together and left floating free—i.e., there is no connection to them. The top of the rearmost pot is wired to the detector output, the bottom is grounded; the top of the front pot is wired to the grid of the 1st AF tube, the bottom is left floating.

To test the connections, put your ohmmeter between ground and the top of each pot and work the control over the full range. The resistance should remain 500,000 all the way. The principal result of this arrangement is that the amplification of the 1st audio tube remains constant over the full frequency range at all volume control settings.

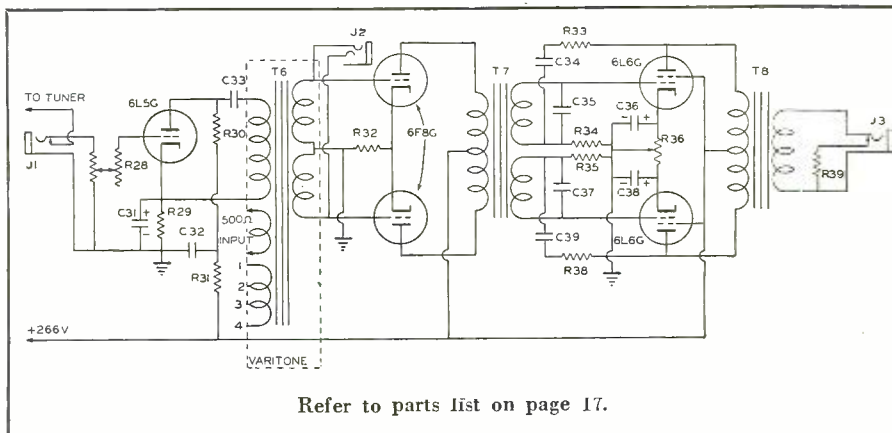
Next was the detector and to keep it up to high fidelity requirements a cathode-loaded triode of the infinite impedance type was used. This detector will handle modulations up to 100 percent without distortion, a considerable improvement in this respect over the diode. This requires a sepa-



The r.f. coil assembly is mounted underneath the chassis.

rate AVC source and a very simple arrangement is used requiring no extra tubes or extra parts. A 6B8G is used as the second i.f. amplifier and the diodes, coupled to the primary of the output i.f. transformer supply the AVC voltage. This system does have one disadvantage; there is some feedback of harmonics of the i.f. frequency and in a subsequent version it was replaced with a separate 6B8, resistance-coupled. However, the harmonics are not too much of a nuisance and can be tolerated in the interests of simplicity

(Continued on page 63)



Refer to parts list on page 17.

Part 6

RECORDING discs are divided into two general classifications. The home recordist generally uses the inexpensive variety for maximum economy, while the more serious-minded recordist purchases the better grades of metal or glass-based "acetate" discs for his work. These are preferred to the paper type as the surface noise is considerably less and the fidelity improved. Moreover, these may be had in sizes up to 16" for transcription work and for those who wish to record entire radio programs in 15 minute sections.

It might be stressed that the type and quality of the disc will determine to a great extent the final results from the cutting. Many of the cheaper blanks are very capable of good fidelity when proper needles are used. However, for best results, it is better to select one of the metal-base type. These lay perfectly flat on the turntable, and this is a tremendous advantage when any attempt to cut high-fidelity records is made. Of all blanks tried, and there were many, only a few of the paper-base types would stay flat. Most of them curled up and made recording difficult.

Some recorders cut better with certain blanks than with others, and the best way to determine which is most suitable is to try several makes all cut under the same conditions. Just because the manufacturer states that his own disc should be used does not mean that it is the best disc for that machine. Recording discs should be chosen with care. They must have a mirror-smooth surface, be free from bubbles or any grit, must lie perfectly flat on the table, and have a coating that is neither too hard or too soft.

If the surface is too hard—there will be a scratchy effect and the disc will not cut properly. If the material is too soft—the high-frequencies will suffer and the record will have a short playing life.

The thickness of the coating should be at least .006", so that a cut of .002" may be made. If the depth of cut is less than this amount it will not be possible for the play-back pickup to stay in the groove when the record is played.

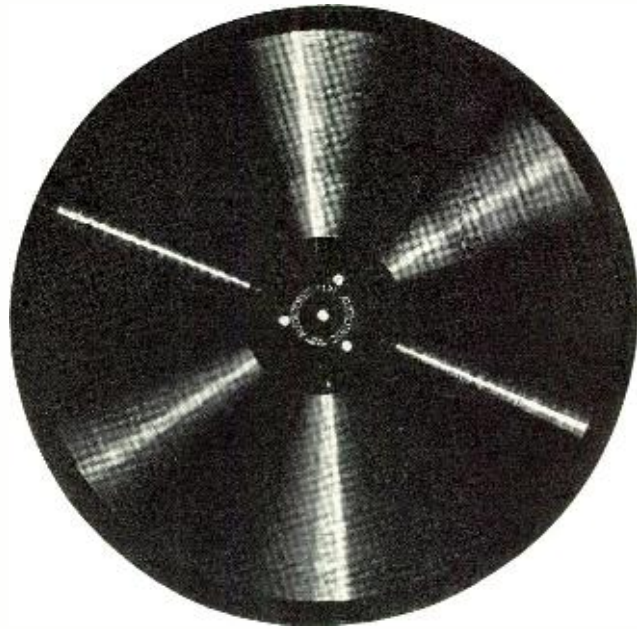
Cellulose nitrate and cellulose acetate discs are best suited where high quality is required in instantaneous recording. They are available in all sizes up to 17" for the making of master discs. These are best cut with a sapphire stylus and played back with either sapphire or treated needles. The reasons for this will be covered in later chapters. Furthermore—they possess a surface noise which is considerably less than the other types and will reproduce a wider frequency range. They are, therefore, better suited to slow-speed recording where the surface noise becomes high with poor discs and needles. These discs must be kept in metal containers as most of them are inflammable, and

Theory and Practice of DISC RECORDING

by **OLIVER READ**

Managing Editor

The Recordist should understand the many points involved in the selection and in the application of various types of discs.



Properly-cut discs appear shiny.

also will dry out and become hard if kept in high, dry temperatures for long periods. Always purchase this type disc from a source of supply that has a large turnover for this class of merchandise to insure fresh clean stock.

Probably the best way to determine the merits of a disc for use with a recorder is to make a series of test cuts—in other words to run off a few grooves on the machine without the amplifier turned on and then to play the record back with the volume control full-on and the amplifier running. By observing the surface noise of the record, one may get an accurate indication of the cutting. At any rate, some cut-and-try will be needed before a final decision can be reached as some recorders cut better with inexpensive discs than do others.

It is extremely important that the Recordist understand the application of the disc as it is used in both professional and in home recording. Too often one blames the disc for poor quality results when, in many cases, the results were unsatisfactory due to

lack of knowledge on the subject and not to a poor blank. This is not always the chief excuse for poor cuttings and other factors must be dealt with in order to complete the analysis of underlying faults that spoil so many records. Choosing a disc for use on a recorder requires that the purchaser buy the ones best suited to his equipment.

The subject of disc durability refers to the record blank in its original un-cut form. As long as the blank is left un-cut it will keep in satisfactory condition for considerable periods of time. After it is cut the problems of preserving the record become more acute. There are three main enemies against the disc after cutting: *wear*, *dust*, and *harmonic distortion*.

The amount of record *wear* will depend a great deal upon the type of playback needle used. We have stressed the importance of using needles of proper shape in our past articles. They must have a point radius which will fit into the bottom

(Continued on page 45)

War-Time Radio Service Problems

by **SAMUEL C. MILBOURNE**

Service Engineer

Civilian sets must be installed, serviced, and maintained as a necessity in protecting public life and property.



THE need by our Government for trained radio servicemen and operators becomes hourly more acute. The new draft regulations mean more servicemen will join the colors, and a consequent depletion in civilian radio servicemen's ranks.

It has been stated unofficially—and this is no rumor—that Uncle Sam hopes to have 60% of the available American radio servicemen in the armed forces or doing some type of National *Offense* work by early Spring!

One hundred and twenty-five thousand airplanes need radio equipment. This equipment must be manufactured, tested and installed. It must be maintained. It must be serviced. Now, consider all of the other radio equipment which is already in use, or which will be rolling off the production lines within the next twelve months for ships, tanks, scout cars, radiolocators, field and headquarters communication systems, and the thousand and one other places radio is needed for vital communication work. This equipment *must* be installed. It *must* be maintained. It *must* be serviced. It *must* be 100% perfect at all times—because upon it depends the whole success of our war effort.

Do you wonder why Uncle Sam is scratching his head and calling on all able-bodied radio servicemen to give him a hand?

Then, consider for a moment the civilian radio service problem. Some seven or eight million radios a year are ready for the junk pile. At least an equal number need attention in one form or another. These sets must be serviced, or they can no longer be used to keep up civilian morale. Once present stocks of new receivers run out, there is expected to be a real scarcity of new sets. Thus, every possible set now in use must be "kept perkin'" as long as possible through the pluck, the perseverance and the intelligence of radio servicemen.

Brothers! That's a big order to fill for our country, but we can do it if we will observe some common-sense rules of business conduct. Let's see how those of us who will continue our civilian businesses can do the best job for Uncle Sam.

There are three necessities basic to radio servicing. These are:

1. Labor.
2. Test equipment and tools.
3. Repair parts and material.

Under *labor*, we may further divide the necessities as:

1. The *time* to do the job.
2. The *technical knowledge* to do the job.

Time, as I have stressed repeatedly in RADIO NEWS, is the basic bottleneck of any radio service one or two-man business. Each servicemen can cram into his day only so many hours of work. The more hours-per-day he works, the more sets he can repair. The shorter the per-set time, the more sets he can repair. If he can average one set an hour, he can do eight sets in one day, but if he average two hours per set, he must work twice as long to do the same amount of repair work, or, if he works but eight hours a day, his output must be but half that of the faster man.

This is all very elementary, and you might well wonder why I take the space to stress the point, but there are ways to *cut* the time-per-set average and here they are. Use them for your own sake and for the sake of your country.

1. *Do no free estimating.* An estimate for which you are not paid means time thrown away. You *have* to make every minute productive. A "*shopper*" is a *waster of your time and your country's time*. Demand a minimum price and stick to it. Every hour so saved means another hour you can use to make one or more other repairs.

2. *Do as little pickup and delivery work as possible.* Make it a rule that, when the call is received, you will not fail to inquire as to the *size* of the receiver. Ask if it is a small table model, or if it is a large console. If the set is small enough for the customer to carry, ask him to bring it to your shop and to pick it up upon completion of the repair. Tell him that there is a scarcity of radio servicemen, and that those who are left *must* conserve their time for actual repair work. Now, here is the *clincher*. Say, ". . . and, Mr. Brown, you will be *saving money* by doing so, because this will allow me to pass my saving in time along to you as a *cash* saving on your repair." There are few people who can resist this type of appeal. You may state a definite price saving if you want to by

having two minimum prices, i.e., 75 cents for the shop and \$1.50 where the set must be picked up and delivered. Don't back down—you can get it, but remember the basic reason is not to "nick" the customer, but to conserve your time and to establish a precedent which will do much to help the whole radio service business in the post-war days to come.

3. *If you do not have a phone—have one installed.* The telephone is a real time-saver if you will let it work for you. Always make a definite appointment for every call at a customer's home. Even though the customer says, ". . . Oh, I'll be home all day," ask her to be sure that she is home between certain times. Allow yourself some leeway. If you think that you will be at the customer's home at 10 in the morning, make the appointment for between 9:45 and 10:45 a.m. This allows you 15 minutes ahead of time and 45 minutes grace in case you are detained unavoidably.

After a definite date has been made, if for some reason you get tied up and can't make it, phone the customer again—apologize for the delay—and make a new appointment. Make all estimates over the phone, instead of going back for a second visit to your customer's home. Finally, never go out on deliveries until you have phoned and assured yourself that each customer will be at home.

For customers who do not have phones, I suggest that the appointments be handled by postcards, or you can arrange to make pickups and deliveries during the dinner and supper hour.

4. *Use unskilled help wherever possible.* By unskilled help is meant help unskilled in radio servicing. There are many things that a serviceman does during the day which could be done equally well by a helper with just a little training. These include:

- a. Keeping the shop clean.
- b. Keeping the stock in order.
- c. Preliminary answering of the phone.
- d. Writing and mailing of cards, orders, bills, etc.
- e. Selling and testing of tubes, and routine shop selling.
- f. Running errands of one type or another.

A young high school boy (or even a



Sonora photo

Radio factories are engaged in the huge task of supplying military and civilian sets and parts to meet war demands.

girl) could be used in this capacity by most servicemen.

5. *Shop by phone or mail wherever possible.* My suggestion regarding ordering from jobbers (when the store is in the same town) is to order by phone and have the material sent out by the local delivery service. This saves *your* tires and *your* car. Like the other suggestions, it is aimed at conserving *your* time and the consolidation of mass functions. If there is no delivery service, phone anyway and have the parts packaged so that you can pick them up "on the fly." This isn't as pleasant as shooting the bull with the counter clerk for a half hour, but it saves more of your vitally needed time.

Get through your head once and for all that you are an important cog in National Offense. Your services are absolutely necessary. Conduct yourself accordingly. Don't waste your time and don't let other people waste it for you!

Follow the foregoing rules for clipping the repair time per set average, and you will be astonished at how much time you can save, and how much more you can do, in a week.

Now, let us consider ways to im-

prove your technical knowledge so that you can do a better repair job—more quickly.

First, don't give up your sources of technical information. Keep your name on manufacturer's and jobber's files so that you will continue to receive information on new products and changes in prices of old products. Keep getting your technical magazines like RADIO NEWS, for it is through these sources that you will keep informed on major changes in conditions—changes which are occurring every minute.

For instance, do you know that there is a proposed plan to enlist servicemen's services, on a part-time basis and in their own shops, to assemble certain types of radio equipment for our Government? When and if this plan breaks, you will hear of it through your radio magazines, such as RADIO NEWS.

Second, you can improve your technical knowledge by systematic study of the text books you now own, and then by buying and studying additional radio service texts. Drag out that Ghirardi's "Modern Radio Servicing," or Rider's "Hour A Day" series. Attend your local servicemen's meetings.

Keep abreast of local developments in the ever-changing situation. Allot a certain amount of time *daily* to study and improvement.

The second basic necessity in radio servicing is proper test equipment and tools. New test equipment is becoming harder and harder to obtain. Government orders have just about tied up the output. Meters, particularly, are hard to obtain. New models of test equipment are practically nonexistent. Design on civilian needs has been frozen for the duration. Supplementary tools, such as pliers, wrenches, socket punches, drills, etc., are getting harder and harder to find. Once more, Uncle Sam must have his orders filled first. Everything in the test equipment and tool line has increased in price, and there may be further increases.

What to do? Every serviceman needs new test equipment from time to time. How should he handle the test equipment and tool problem?

This problem should be handled in the same way as the problem of his automobile and tires. Use care in the operation of present test equipment. Make it last longer. If it needs re-

(Continued on page 61)

LETTERS

HUNDREDS of letters have been received ever since the January Special Defense issue of RADIO NEWS hit the newsstands. We are presenting a few more excerpts from these letters as follows:

"May we extend our heartiest congratulations for the exceptional piece of work represented by this January issue, and our best wishes for your continued success."

A. R. KLOOS
Advertising Manager
The Benwood Linze Company
St. Louis, Mo.

"The National Defense issue of RADIO NEWS is one of the best special editions in the field of trade journalism that I have ever seen. The stories are well-illustrated and written by men of authority in each subject. I also like the feature of showing a picture of the author in each case. I believe this issue will be of great help in making people in the radio industry conscious of the important part they are playing in our war efforts."

R. E. APPEL, Publicity Director
Worner Products Corp.
Chicago, Illinois

"The issue appears to be rather complete, covering as it does the application of radio by all the military services. The extent to which this is being done, as revealed by your magazine, will be reassuring to the average citizen who, especially at this time, is eager for information on all phases of the military situation. The issue appears also to be of value in helping radio men eligible for military service to decide for what branch of military service their qualifications are best adapted."

E. K. JETT, Chief Engineer
Federal Communications
Commission
Washington, D. C.

"The issue is so good that I believe it would be of immediate interest to Commanding Officers of the various Signal units of the Western Defense Command and Fourth Army. . . . I shall be glad to see that appropriate distribution is made."

J. J. GRACE, Colonel
Signal Corps
Office of the Signal Officer
Headquarters Western Defense
Command and Fourth Army
Presidio of San Francisco,
California

"It is indeed an interesting issue."

LOWELL MELLETT, Director
Executive Office of the President
Office of Government Reports
Washington, D. C.

"The magazine has been placed in the Library of the Marine Corps Schools where it will serve as a reference for current developments in the Radio Field."

S. M. HARRINGTON,
Brigadier General
U. S. Marine Corps, Commandant
Marine Corps Schools
Quantico, Virginia

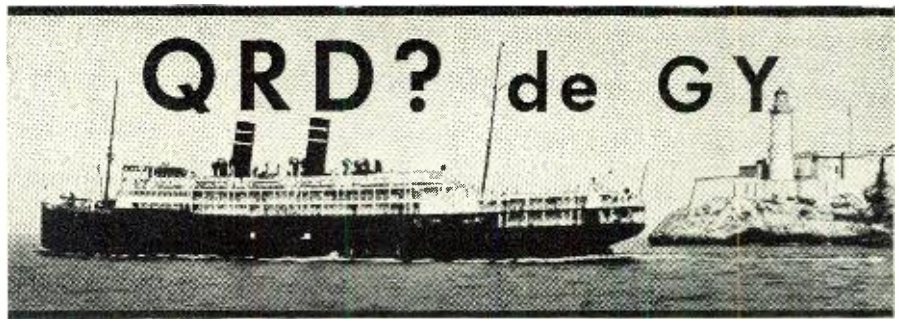
"It is much the most complete publication of its type . . ."

D. P. PAGE, Major, Specialist
Publication & Special
Assignment Branch
War Department
Bureau of Public Relations
Washington, D. C.

"The valuable educational work which you are carrying out through the medium of your various publications is a fine contribution to the National Defense effort."

Navy Department
Bureau of Aeronautics
Washington, D. C.
(More letters on page 60)

You readers who have not received a copy can still order them at regular copy prices. However, there are a limited number available and it will be necessary to act now!



by JERRY COLBY

WHILE ambling down the street one day, in the merry, merry month of . . . Daw-gone if that wasn't off-key. But nevertheless, ye ed was moseying down one of Los Angeles' highways the other day when he ran smack bang into Brother Brown, he of the silver head-gear. So after a lot of the preliminary, Brother Brown, whose past record as an op is well known, wails that he had just been turned down by the Navy Department for an operator's billet not because of a lack of radio-operating ability, not because of any mental instability and not because of a bad ticker, but only because he had kum-apart molars. Now whyinell, rightly squawks Brownie, does an op need teeth. Do we have to go out and bite the Japs to win this shindig?

In the rush of many other matters which have been overtaxing our medium mentality, we forgot to mention an Xmas gift from one of our friends that for downright usefulness has no equal. It was a pocket knife, with the station letters WLO imprinted upon it. Since we left the Ol' Nyvy, a knife was only something which was issued with a uniform. But today Brother Underwood's gift has found more uses than would have been suspected. F'r instance, whittlin'. Sez WLO Manager Underwood, "please note that I have a new xmtr on 27 meters. The problem of obtaining a crystal for the SW rig involved uncertain delivery, not to mention the difficult matter of raising the thirty bucks. So I decided to grind one myself. As I have been assigned to the same freq as WOD Beaumont I asked Brothers Knight and Thomas at WOD how I was coming in. Well, they spent a couple of afternoons helping me, a competitor, get my crystal smack on their own freq. How's that for cooperation! It's one of the characteristics of the American Way. During the process of grinding the crystal down I gave it about two too many rubs and moved it past 11310. So to bring it back I put a little india ink on it. But this made the crystal sluggish, and my keying was lousy (pahdon the French). So another friend, Brother Verlander of the S/S Pan Crescent wrote and suggested that since I was having trouble keying the crystal stage, I should let it run and key the buffer. And now Brother Maynard of the S/S China Arrow who has been checking me says

the improvement is 100%. It pays to have friends and the help and suggestions I've gotten from them warms me old heart." To which we echo "and how."

Brother A. W. Holmes writes from Islington, Ontario, Canada, to enquire "I would like to go back to sea again and would like to know what the possibilities are of getting on some of those ships they used to have running down to the West Indies and South America flying the Canadian or monkey flags. It has been a few years since I operated down that way so I don't know if that kind are still running and if so who owns them or operates them as far as radio is concerned. If there is a chance of getting on one of those ships is a Canadian allowed to join the union? Or is it limited to Americans? I have a Canadian First Class License and have had ten years experience at sea so am not exactly a novice at the game." To which we'd like to enquire how come Brother Holmes can't seem to snag a Canadian billet? The grass is just as green on the home front as that in far off fields.

Dear Ed: I have intended to write long before this, but for some unknown reason have kept putting it off. However, I'm writing in ref to July, '41 RN, about the pic of the steamer at the top of your QRD? column. It so happens that I have a June, '38 RN, and in this mag R. D. Hutchens gave a very gud story of how the SS Siboney relayed an SOS to N. Y. from the shore state (WAX) at Miami during a hurricane of Sept. '26. In this art. is shown several pics, one of the Siboney leaving Havana Harbor, another shows the Rdo shack with the 2 kw. Arc rig and the call letters (WRN) on the bulkhead above the clock, another shows radiop Hutchens conversing with an opr. and the last pic is of (WAX). Guess I should have introduced myself and the handle is B. B. Brown of the USS Perkins, one of Uncle Sammy's radiops . . ." Which goes to show how much in awe they hold the Japs, these Navy men who can still find time to think in other channels outside of the horrors of war. More power to 'em and plenty of good luck from us to them.

The VWOA chapter out in this neck of the woods (Hollywood, where men aren't sure of themselves since women are wearing pants) finally gathered
(Continued on page 43)



SERVICEMAN'S EXPERIENCES

by LEE SHELDON

IF there's anything certain about my partner, it's his unpredictability. Since a few days after December 7, we've both laid off the war as a subject of conversation because it took up too much time, but it came up suddenly yesterday, all right.

When I came into the shop, there he was, screwing a picture-frame to the wall. He had put a Defense Bond poster under the glass, and had pasted a line of script saying *Remember Pearl Harbor* across the top. It made me kind of mad, because we had an advertising card in the frame—a real slick one, saying *Let Us Replace Your Worn-out Tubes*, with a drawing of some tubes, looking very worn-out. Snappy, eh?

"Hey, Al!" I shouted. "What's the idea? Have we gone out of the tube business?"

He gave a final twist with his screwdriver and stepped down from his chair.

"No, we're not out of the tube business," he mocked, like Jack Benny talks to Mary Livingston, "but we've gone into a war that's *more* important."

"War nerves," I muttered, as I walked past him to the back of the shop. Al followed me.

"I heard that," he said. "Don't you think it's important to buy Defense Bonds?"

"It's not that," I explained. "I'm as patriotic as the next fellow, I guess. It's just that so many things in this war have already affected our business that I don't see why we have to go any further!"

"You're one of those guys," Al said, "that won't admit a war is on until they smoke. You're right in one sense, though—we can't *win* the war in *Salutary Sales & Service*, but we can do a lot to help. Remember what Roosevelt said in his speech the day after we declared war? 'And in the difficult hours of this day, and through the dark days that may yet be to come, we will know that the vast majority of the members of the human race are on our side.' That's what the whole fight boils down to: if more people are willing to sacrifice and work and fight to get rid of Hitler than those who want to keep him, he's done for, sure as shootin'. Every time we give up something that helps the fight along, we, as business partners, are contributing to the hours needed to shorten and win the war."

"I don't get it," I answered. "Does anyone expect me to win the war with an ohm-meter, or shorten it with a soldering iron?"

"That isn't as far-fetched as you might think," Al replied. "We can help, and right here in this shop. For instance—we know that rubber and gas are important, and can use the truck less. We can cut running time in half on every job we complete in the customer's home, instead of hauling it back to the workbench. That single item, when multiplied by the number of servicemen's cars, means plenty to the nation.

"When we order parts, we can ask that they be mailed, instead of demanding the distributor's truck be made to detour to our door, just to save a day's time. The post-office may be slower, but we can explain the situation to customers by being a little more patient with them than we usually are. Few of them would object if they knew the idea in back of a slow delivery.

"In advertising, we can save paper by cutting down on those pluggers we've been giving to the wind for the past five years. Sure—there is plenty to be said for them in times of peace, but the mortality factor in door-to-door distribution is something terrific, and it would be better to postpone "throw-away" campaigns until after the war. Some paperwork is necessary, of course, in accounting—but you'd be surprised to learn how much of it can be cut out by a little imagination and brain-work.

"When we order replacements, we should first be sure we can't salvage something in our shop. Anyone who spends a year or two in the repair

business finds he has filled his shelves, without deliberate planning, with an accumulated bunch of parts and sets, and, with a little willingness and skill, can resurrect plenty of stuff he would ordinarily class as worthless. In a war, it's not only a matter of dollars and cents—it's a matter of patriotism.

"Take that midget in the corner. I'll bet neither of us have thought of it for two years—ever since we got it as a trade-in from Russell. Well, sir—I tore it down yesterday, and I have a nice little batch of resistors and fixed condensers, all rated and valued for quick use. Sure, the set was an old one, and it didn't play—but there was only *one thing wrong with it*. All the other parts are as good as they were the day the set came off the production line. It's not double-crossing a customer to re-use such parts in his up-to-date chassis, just because we have enough intelligence to measure condensers and resistors, and put them to work again.

"With stuff that is beyond redemption, it is, of course, best to throw it away—that's only common sense, and decency to the customer, who, incidentally, should have a reliable radio for bulletins all through the war.

"Man-power is important, too. Some servicemen are drafted, and learning to operate more efficiently will help to release others for work the Government finds they are better suited for. Another thing—we will be working in the homes of some customers whose former repairman have been drafted. In such cases, don't try to phenagle the customer away from the man that's drafted. That wouldn't be fair to the fellow who, after all, is fighting for us in war, rather than against us in business. Besides, the customer won't like you for it, when he knows his old serviceman is in uniform.

"When scrap metals collect, we can use a little brain-work and make sure they get to a place where they will help to relieve a possible shortage. By the way—there's a wheelbarrow full of defunct Mershons under the workbench. I'm going to empty them out and mash the copper cans flat tonight. When we find out where they're needed most, we'll get them there."

Al stopped to light a cigarette.

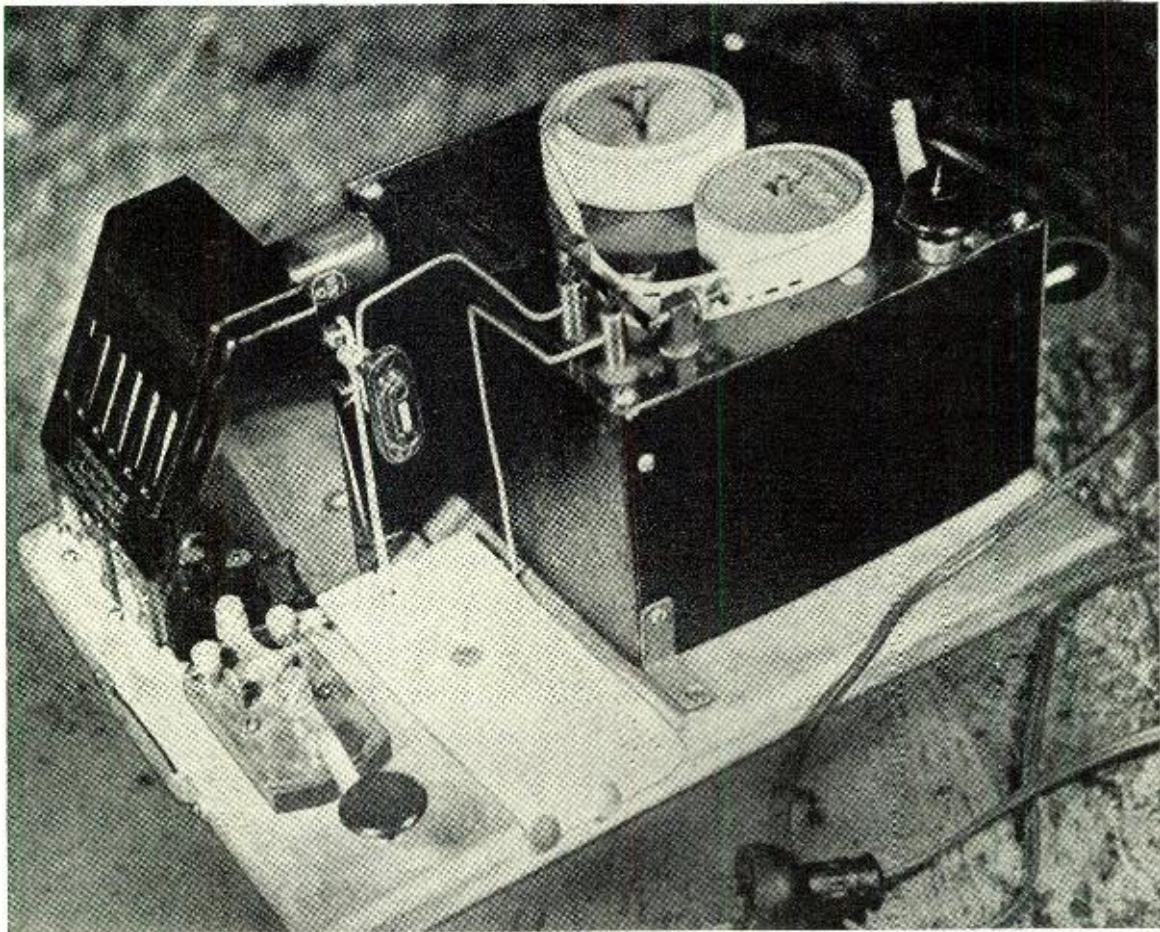
"Yes, sir," he declared.

"This struggle gets into everything. We should be glad to get into this fight on the

(Continued on page 47)



"He forgot his instruction book!"



A complete assembly may be mounted on an old drawing board. It permits the use of equipment in any location.

Build This Automatic Code Machine

by **FRANK PETRAGLIA**
Radio Instructor

An old discarded hand-wound phonograph motor is suited to the construction of an up-to-date automatic code sender and receiver.

WITH the quietus now imposed on the amateur bands by the national emergency, and existing c. w. transmissions being mostly above twenty words per minute, those whose code copying speed is below this level may well feel frustrated in the matter of how they are to keep up or improve their copying proficiency. Of the many alternatives, none is perhaps as effective as owning a code practice machine. Here is a device which provides a steady source of clear, rhythmic signals at variable speeds which answers the needs of the beginner as well as the code expert.

In constructing the automatic sender, the phonograph motor which is required to provide the drive for the code tapes is about the only item which introduces the factor of expense, but if this hurdle is overcome the addition of an exceedingly useful piece of equipment to one's shack is derived. The comparative costliness of commercial types of code machines has been an obstacle to their wide use and has obscured their effectiveness as a source for copying practice.

Oddly, few attempts have been

made to devise home-built versions for this patient code-teacher, which is indeed strange considering that we have created homebrew editions of everything in radio except substitutes for the speedy little electron itself. The home-built code machine described in this article may be assembled easily, and possesses all the characteristics necessary in a good machine.

The entire assembly consists of two main units: the motor unit, with one stationary and one revolving post for the code tapes, and the oscillator unit. Both are illustrated herewith, pictorially and schematically. The motor used is the ordinary hand-wound portable record-player type. With the invasion of the phono-radio combination

into the record-player field, any number of these old-type motors have been discarded as obsolete; hence, it should be a simple matter to procure one at small expense.

To provide proper turning speed for the tapes, no adjustment of the motor-mechanism is required. This, however, is not the case with electric record-players. Rather complicated and delicate gearing adjustments are required for converting the electric types for code machine use. The author has found that the expense of the electric motor and the trouble involved in conversion does not warrant the undertaking. The hand-wound type comes "ready-made" and serves the purpose admirably. Check the spring

and the speed regulator for steady and even turning when selecting one of these motors.

Most old-type portable phonograph cabinets measure around one square foot in size. Where it is practical to do so, you may mount the components of the contact-points' circuit directly on the record-player top. The completed model shown in the photograph represents any ordinary foot-square home-built box. Obviously, individual judgment may be used as to desired over-all size and this will be determined by the size of the motor. In most cases compactness will be preferred.

The oscillator may be enclosed, the various components being mounted securely inside the cabinet and controlled by the filament "on-off" switch which is clearly visible in the photograph. Another, breadboard assembly arrangement may be used, as illustrated. The oscillator unit, key, and compact-sized code machine are all mounted on a thick board of not more than one foot square.

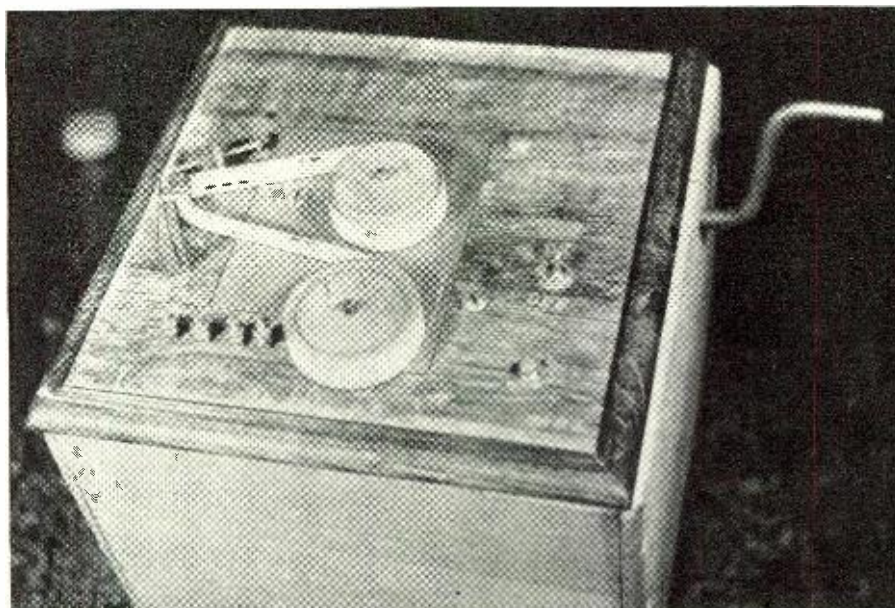
Before going on to some of the fine points in regard to the wiring assembly, etc., it may be well to first discuss the oscillator, which will be recognized as one of popular vintage. A single dry-cell supplies the filament of the 1H4, 30, or 1G4G and a 4½ volt C battery furnishes plate voltage. The first two are 2-volt tubes, but they will work satisfactorily on 1.5 volts because of the small emission required for the low value of plate current drawn.

Most often the selection of a proper transformer is the only difficulty encountered when assembling simple code practice oscillators of this type, and it may be necessary to experiment with a few audio transformers before the most suitable one is found. If you buy a new transformer, the smallest and cheapest one, rather than one of superior grade, will work best. An old "junk-parts" transformer out of an old set of a decade ago will more than likely provide just the inductance characteristics required. Any ratio up to 6 to 1 will do.

The pitch of the oscillator tone is important. The .006-mfd. capacitor shown in the diagram is a good value for a pleasing tone signal. However, a value of .001 mfd. may be used for raising the pitch. Similarly, a higher value, of approximately .025 mfd., will lower the pitch. The pitch can also be altered by lowering the plate voltage to about 3 volts. Correct transformer polarity is necessary for oscillation. If oscillation is not obtained, reverse the wires at the primary terminals of the transformer. This oscillator has the advantage of hundreds of hours of battery life, portability, and the fact that it can be used anywhere with absolute freedom from power requirements or danger of electrical shock.

The Automatic Keying Circuit

How does the automatic sender work? Referring to the illustration, it will be seen that the contact arm



This foot square wood box is suitable for mounting the completed assembly. It should be heavy enough to stay put when rewinding the spring motor.

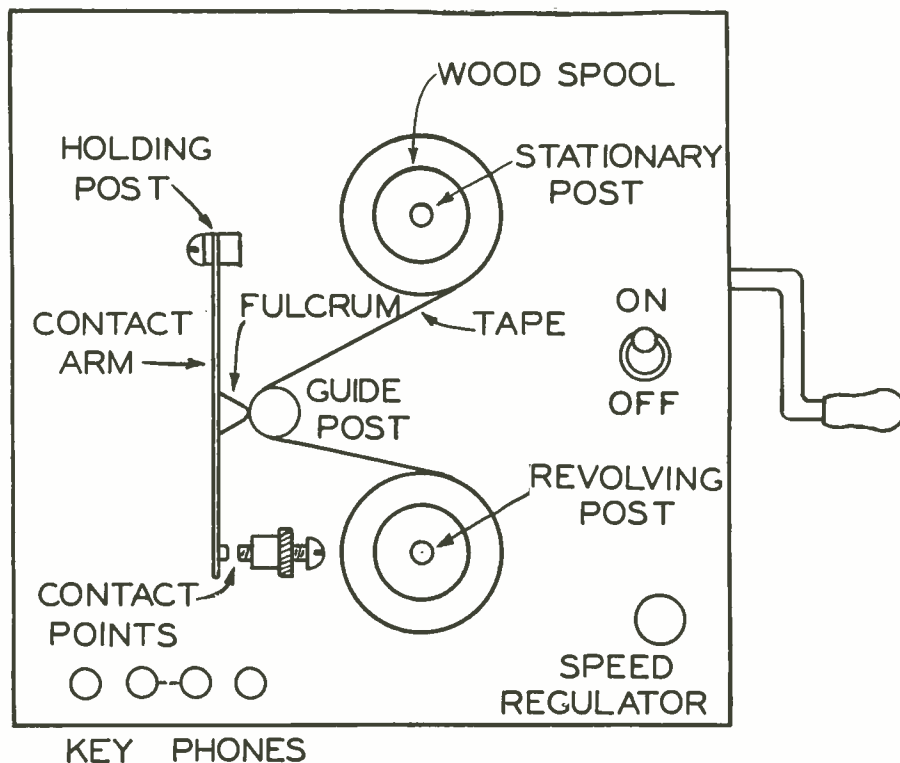
and contact points are, in effect, a keying arrangement. As the tape slides over the circular tape post, the dot-and-dash perforations in the tape come under the cone-shaped fulcrum. Between perforations the blank parts of the tape cause the contact-arm to open, breaking the circuit. However, as the dots and dashes come under the fulcrum the contact arm closes at the contact points and the circuit is completed. In this manner the oscillator is keyed automatically by the series of code characters on the tape.

The contact arm is a small strip of spring steel, 5/16" by 2½", one end of which is inserted into a thin slot at the holding post and held by a small

machine screw. The cone-shaped fulcrum is located at center of the arm, being soldered or riveted thereto, and the contact point is inserted within 1/8" from the other end. The holding posts for both the contact arm and the other contact point, whose function is performed by another screw of about 10/32 size, may be up to 1/2" square. Note that a knurled lock-nut is provided at the latter post. It will be found that repeated adjustments are necessary at the keying gap.

The detail of the guide-shaft is also illustrated. This is cylindrical in form and slightly grooved to allow the fulcrum to operate properly, and its sur-

(Continued on page 60)



POOR MAN'S RECORDER



An inexpensive diaphragm-type crystal microphone gives satisfactory results with this recorder.

TAKE no insult at the title "Poor Man's Recorder." It smacks of irony and it was intended to be. We have seen so many articles on recorders for the "Averageman" that, in looking them over, and finding that their cost in most cases runs well over \$100.00, it seemed to us that the averageman was not taken into consideration at all. The recorder we are about to describe was intended for the man who, with not too much money in his pocket, is interested in building a recorder with which to play around, yet need not necessarily come up to professional standards. The parts for this recorder totals about \$33.00 at *current* prices.

The recorder is built around a basic foundation unit consisting of a fairly good motor, weighted turntable, 8 ohm magnetic cutting head, and crystal pickup, all mounted on a metal plate. This unit sells for only \$15.10. The balance of the recorder consists of a simple high gain a.c.-d.c. amplifier, an inexpensive microphone, a 6" p.m. speaker and a single-pole-double-

by **L. M. DEZETTEL**

Eng. Allied Radio Corp.

This article has been prepared for our readers who have requested construction data for the building of an inexpensive portable recorder.

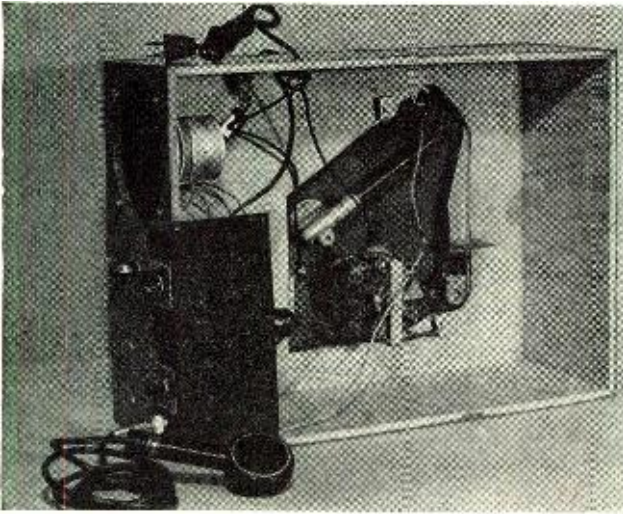
throw rotary switch. The entire assembly was built into a wooden case measuring 15" wide by 20" long by 7" high.

This case was actually a little larger than it needed to be, but you may use your own judgment on this matter. The recording unit itself occupies a space of only 13" by 12¼" on the motor board and extends 2½" above and 4¼" below the board. From this, you can get an idea of just how compact the entire unit can be made with a little careful figuring.

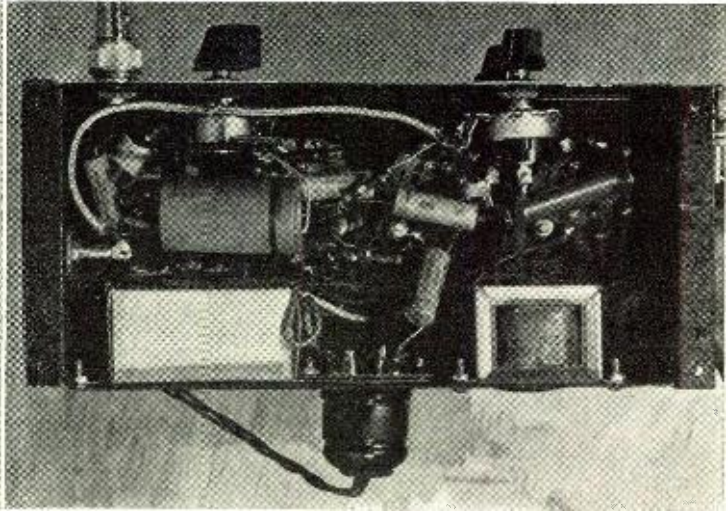
In building this unit, our main object was to produce a recorder that was simple to operate, easy to build

and at the same time *low in cost*. Controls were kept at a minimum—no tone controls—no equalizers. The three controls are *microphone gain*, *phono gain*, and *playback-record switch*. The two holes shown to the left on the front panel of the recorder, are for the neon bulb volume level indicators.

What do you think of a volume level indicator whose electrical parts come to only 26c? That's a fact—two 8 cent neon bulbs, and two 10,000 ohm resistors make an excellent and accurate volume level indicator. A study of the circuit diagram will show just how this is done. The resistor values were



Note how the amplifier is held within the case.



Only a handful of parts are used in the amplifier.

chosen so that at normal cutting level one neon bulb would be always flickering. When the other bulb begins to flicker, the indication is that you are approaching the overcutting point.

The amplifier was built up in an inexpensive way, by starting with the *Knight* 4 watt a.c.-d.c. phono amplifier kit which sells at a low price. Then, too, you have the advantage of a chassis that is already punched and formed. It was only necessary to drill one hole, and that for the microphone connector. Five socket holes are already in this chassis, one having been used for a ballast tube. By re-selecting the tubes so that their filament voltages equal the line voltage, the ballast tube is eliminated and the extra socket hole is used for a high gain amplifier stage.

The filament of the tubes selected actually total 129 volts, but this is not too far off normal for proper operation. The output of a pair of

35L6GT tubes in push-pull is more than enough to operate the cutting head and speaker.

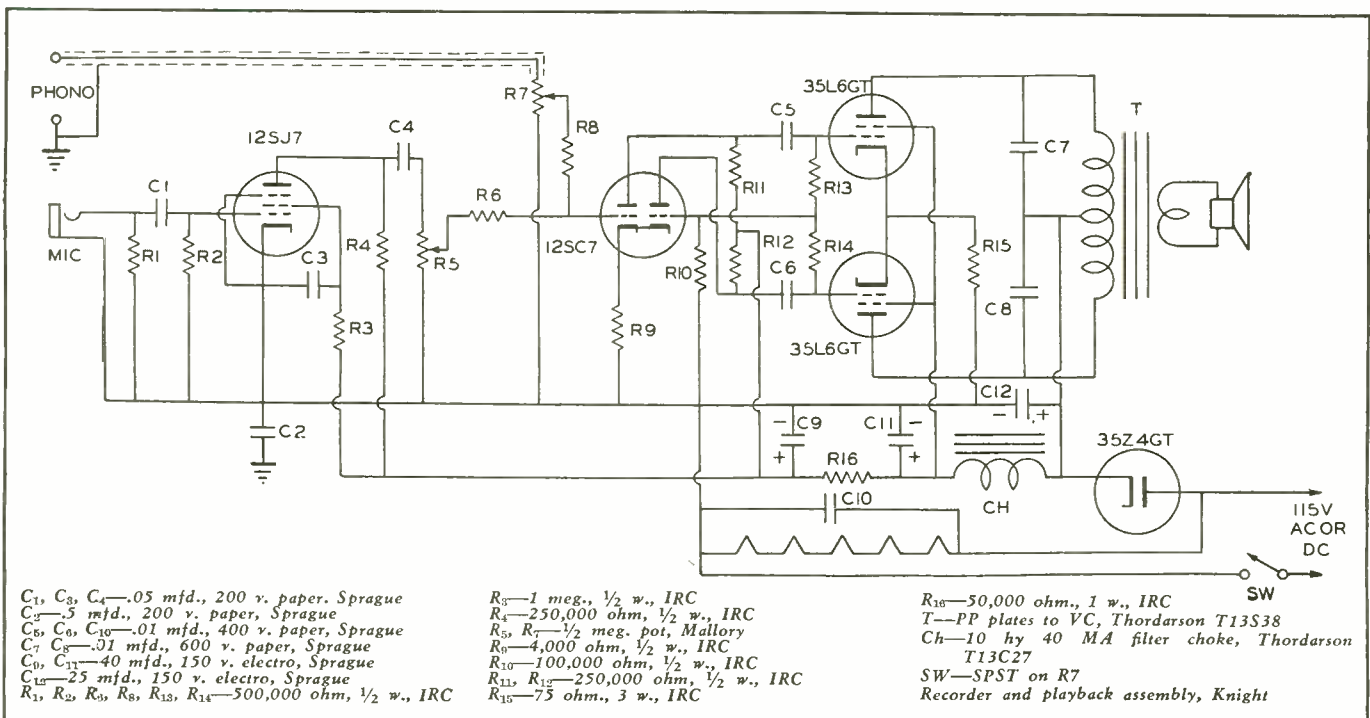
A study of the circuit diagram of the amplifier will reveal that it is straightforward, simple and without fancy frills. No cathode bypass condensers are used. The cathode of the 12SK7 high gain tube is returned directly to ground and grid bias is obtained by means of "contact potential," controlled by the 5 megohm resistor. The other two stages being operated in push-pull, it is not necessary to bypass their cathode resistors. Lots of filtering is used, however, to keep the hum down.

The ground points shown in the circuit diagram are made to the chassis. You will note that the common negative return of the circuit is not connected to the chassis as it is part of the line voltage supply. The microphone connector, too, must be insulated from the chassis. Unfortunately

the return on the microphone must be common with the internal ground in the circuit and a well insulated microphone should be used. If you do encounter hum, you can be sure that it will clear up when you juggle some of the common negative returns around a little.

For instance, all returns belonging to the input circuit should connect to one point. All returns belonging to the mixer circuit, should connect to one point. Notice the simple method of mixing the phono and mike circuits in the 12SC7 inverter tube. There is a slight amount of inter-action when both controls are manipulated together, but if you didn't know about it, you would never notice it. The phase inverter is of the balanced type and works very nicely. You will have no trouble with it.

The output transformer is not mounted on the amplifier. It is separated. (Continued on page 54)



"THE RADIO HANDBOOK," Eighth (1942) Edition. Published by *Editors and Engineers, Ltd.*, 1300 Kenwood Road, Santa Barbara, California. 640 pages 6½" by 9½", profusely illustrated with 577 line drawings and half tones, and 41 tables. Price of clothbound edition, \$1.75 in continental U.S.A., elsewhere \$2.00. THE RADIO HANDBOOK is a general compilation of information on the practical aspects of radio. Its content can be divided into three classifications: (1) basic theory of electricity, radio, vacuum tubes, and antennas, written from the standpoint of practice rather than from the engineering viewpoint; (2) constructional information on the building of a wide variety of types of high frequency and u.h.f. transmitters and receivers for phone and c.w. use, coupled with information on the construction of many useful pieces of test equipment; (3) tube characteristic tables, reference charts and graphs, and a collection of formulas useful to the practicing radio-man.

The list of the 27 chapter headings gives an excellent indication of the subject material treated. These are, in order: Introduction to Amateur Radio, Fundamental Electrical and Radio Theory, Vacuum Tube Theory, Radio Receiver Theory, Radio Receiving Tube Characteristics, Radio Receiver Construction, Transmitter Theory, Radiotelephony Theory, Frequency Modulation, Transmitting Tubes, Transmitter Design, Exciters and Low Powered Transmitters, Medium and High Power R.F. Amplifiers, Speech and Modulation Equipment, Power Supplies, Transmitter Construction, U.H.F. Communication, U.H.F. Receivers and Transceivers, U.H.F. Transmitters, Antenna Theory and Operation, Directive Antenna Arrays, U.H.F. Antennas, Transmitter Adjustment, Test and Measuring Equipment, Workshop Practice, Broadcast Interference, and Radio Mathematics and Calculations. There are the three additional sections in the back of the book devoted to Appendix, Buyer's Guide, and Index.

"AUTOMATIC RECORD CHANGERS AND RECORDERS," published by *John F. Rider Publisher, Inc.*, 404 Fourth Avenue, New York City. 744 pages.

Within the past ten years the popularity of automatic record changers has grown by leaps and bounds. From a very modest beginning in the more elaborate radio-phonograph combinations, record changers by the tens of thousands are now found in all sorts of jobs, with and without a radio receiver.

Some of these devices are surprisingly simple in their make-up and functioning, while others have the most complicated of mechanisms to perform the same tasks. However, they all have one thing in common: an electric motor to drive the turntable and the record-changing mechanism. Since this prime mover is of such importance, the subject of small electric motors has been dealt with quite extensively in the text.

In line with the subject of motors is the control of their speed in connection with phonographs and recorders. Many different methods are employed to insure this constancy of rotation of turntables, the more widely used being discussed, as well as the devices used for changing the turntable speed from 33½ to 78 r.p.m.

Lately a great many recorders have appeared on the market and as these devices

(Continued on page 54)



by **CHARLES J. SCHAUERS**

(Continued from last month)

IT must be remembered too, that even though tuning condensers are constructed of *Invar* and that carefully designed oscillator circuits are employed, if no provision is made for voltage stabilization within the receiver and/or power supply, changes in frequency are likely to occur. But this is usually adequately taken care of by employing accurate voltage dividing networks, proper loads, constant charging generator systems, heavy duty storage batteries, and even voltage regulator tubes. . . .

In the tropics where humidity is high, if coils are not treated with special compounds to keep the wire insulation dry, trouble develops in very short order. "Salt corrosion" also effects traveling contacts on rotary switches, necessitating frequent cleaning. Some manufacturers enclose all rotary switches in moisture proof containers which seems to be more or less standard practice. Where humidity is extremely high, electrically-operated heaters are sometimes employed to drive out excessive moisture, but this is a problem aboard aircraft where battery power is limited. Especially aboard small aircraft that are equipped with low capacity batteries.

One operator who did a tour of duty in the tropics explained the moisture problem this way: "When the shift at the ground station was over for the night I'd never turn the receivers off. After a month or so after I had arrived at my new station, I found that the receivers were losing their "oomph." Pulling the lid off one of the receivers one morning after reporting on duty, I saw enough moisture in one of them to carry a good sized life boat. When the chief operator walked in I told him that the receivers were practically dead. Laughing, he told me that the humidity at this time of the year increased with resultant trouble in our receiving set-up."

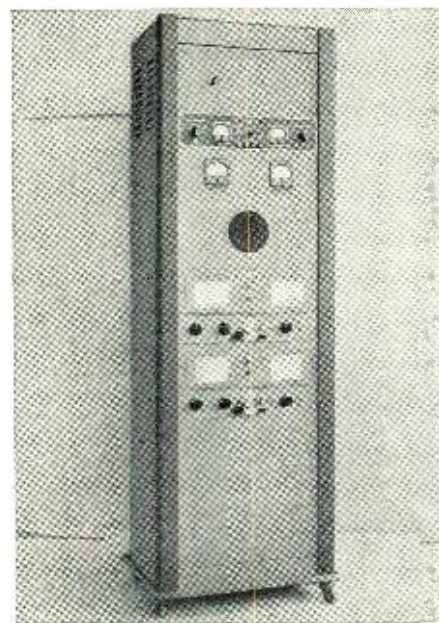
"They'll dry out in a couple of hours," he said. "Just sit back and take it easy."

"Here was two hours wasted! I had a lot of traffic to take care of and when my proficiency and efficiency reports went through I wanted them to be high, not low. I then thought of the idea of installing light bulbs in the receivers, but there wasn't enough room inside the cabinets.

My problem was finally licked when I accidentally left the UHF receiver

on over night. The next morning it started with a bang after increasing the volume a little. I've been told that the same trouble existed in airplane receivers too. Well, to make a long story short, I just left every receiver on in the place over night. Did that for about a month until the chief operator caught up with me. Now that I'm here I hear they're going to install 'Tropicalized Receivers.' Just my luck, I guess!"

Even though some receivers now on the market are not destined for service in humid climate, our American



Ground Station Transmitter.

manufacturers pride themselves in taking extraordinary pains in providing tropical receiver protection for domestic use. In some parts of the United States, regions may be found wherein the humidity parallels that found in the tropics during certain periods of the year. If sets not given tropical protection are used in these regions, troubles do develop which sometime cost the owner more than the initial protection would have.

A question was asked sometime ago concerning the cleaning of equipment which had either been submerged in saltwater or had been in very humid climate. The statement was made that every metal part of the receiver and transmitter under discussion was covered with salt crystals and badly

(Continued on page 52)

Part 2—Electrical Terminology

LAST month it was stated that a student undertaking the study of radio could not be satisfied by just considering electricity as "juice" which flows in a conductor. He must, if he is to be successful in his study, understand what electricity is, and the peculiar drifting of electrons which constitutes the current flow. Having gained this knowledge, however, it is quite permissible for the purposes of the present lesson to go back for the moment to thinking of electricity as a sort of fluid which, although one which differs from other fluids in that we cannot see it or feel it, and which is so "bodyless" that it can flow easily through the most solid metal, nevertheless is comparable in many respects to common fluids such as water.

If electricity is to be controlled, measured and utilized effectively, it is necessary that there be some standardized terms and units which will be generally recognized and understood by those who have occasion to deal with it. We have such terms for water, for instance. We specify the quantity of water in gallons, its speed of flow in gallons per minute, its pressure in pounds per square inch. All of these terms are of the utmost importance and significance to the water-supply engineer, the hydraulic engineer, the fireman and plumber. Without them the fireman would be unable to specify the pumping facilities required to force the streams from his hose lines to the upper floors of burning buildings, the water supply engineer would have no way of determining the correct sizes for water mains, the plumber the right size for water pipes in a building or the hydraulic engineer the size of flumes and spillways and other design features of the features of the great hydro-electric generator plants.

Equally useful terms and units of measure have been established for dealing with electricity. Certain of these are so fundamental that we cannot discuss even the simplest applications of electricity without a knowledge of them. There are other, more specialized terms which will be encountered as this study of radio progresses but these fundamental terms are the important ones now.

The Coulomb

The most fundamental electrical unit is the coulomb. Although one finds it referred to very little in practical electrical or radio work, it is the basic unit from which other more common units of measure are derived. It is the measure of quantity of electricity—just as the gallon is the quantity measure for water.

We are so accustomed to thinking of electricity in terms of flowing current that it is perhaps a little difficult to think of it in terms of non-flowing quantity. Suppose, however, we connected into an electrical circuit some sort of device into which the current would flow but from which there is no exit. If this device were disconnected from the circuit, after a time it would contain large numbers of entrapped electrons and it would be said to hold an "electrostatic charge" (stationary electrical charge) the value of which would be equal to the sum of the charges contained in the individual electrons thus entrapped. Thus it would contain a quantity of electricity and this fact would be demonstrated by connecting an electric lamp across its terminals. Immediately this lamp would light up and remain lighted until the electrostatic charge had dissipated itself in the lamp.

The charge represented by a single electron might serve as a unit of electrical quantity measure but would be so small as to be substantially valueless—like using the drop as a unit of measure for water when speci-

PRACTICAL RADIO COURSE

by ALFRED A. GHIRARDI

The author covers the theory of Ohms law.

fying the quantity stored in a city's supply reservoir. The larger unit, the coulomb, has therefore been adopted. Technically it represents the amount of electricity contained by 6,280,000,000,000,000 electrons. Practically it is an amount of electricity capable of lighting a 100-watt lamp for approximately one second.

It is only rarely that reference is made to electricity in terms of static quantity. We are far more interested in the useful performance of electricity in practical circuits. This almost invariably involves the factors of rate of current flow and the electrical pressure which causes current flow, the units of measure for which are the ampere and the volt.

The Ampere

The rate at which current flows in a conductor could be expressed in terms of coulombs per second, just as we express the rate of water flow in gallons per second, or per minute. It has been found more convenient, however, to employ a single word for this—the "ampere." When electricity flows through a conductor at a rate of one coulomb per second, the rate of current flow is said to be one ampere. Thus in the case of the 100-watt lamp to which reference was made above, we would say that the current flow approximates "one ampere" instead of "one coulomb per second."

In many radio and other vacuum-tube applications the value of current flow is very small. Rather than deal with small decimal fractions of the ampere, therefore, the "milliampere" (1/1000 or .001 ampere) is commonly used. It is far easier to say or write "10 milliamperes," for instance, than "one one-hundredth part of one ampere." For even smaller currents the term "microam-

pere" is convenient meaning 1/1,000,000th of an ampere or 1/1000th of a milliampere. These prefixes "milli" and "micro" find such common use in radio terms that their meaning should be carefully memorized.

The Volt

A current will flow through a conductor only when electrical force is applied to cause it to do so. This is exactly equivalent to the conduct of water in a pipe line. If the pipe is tilted to provide gravitational force, or if a pump is inserted to provide mechanical force, the water can be made to flow. Without some such force it will remain immovable.

In electricity, such a force is that which exists between two bodies or points that are electrically charged to different intensities or different polarity with the result that one exercises greater attraction (or repulsion) for the electrons in the conductor than does the other. This force is variously known as "electromotive force," "electrical pressure," "difference in potential" and "voltage," but in any case its unit of measure is the "volt." Technically the volt is defined as the difference of potential at two points between which one coulomb of electricity can be transferred with an expenditure of 1 joule of energy. More practically, the volt represents the value of electromotive force (e.m.f.) which when continuously applied across a conductor having a resistance of 1 ohm, will cause a current of 1 ampere to flow.

The Ohm

While there are many good conductors of electricity, there is none which does not to some extent retard the flow of electric current. Silver and copper are widely recog-

(Continued on page 48)

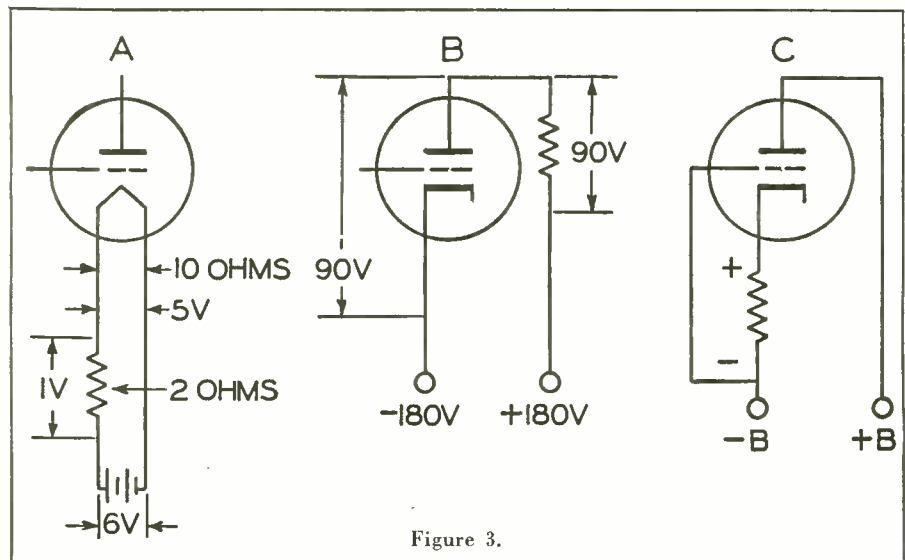


Figure 3.

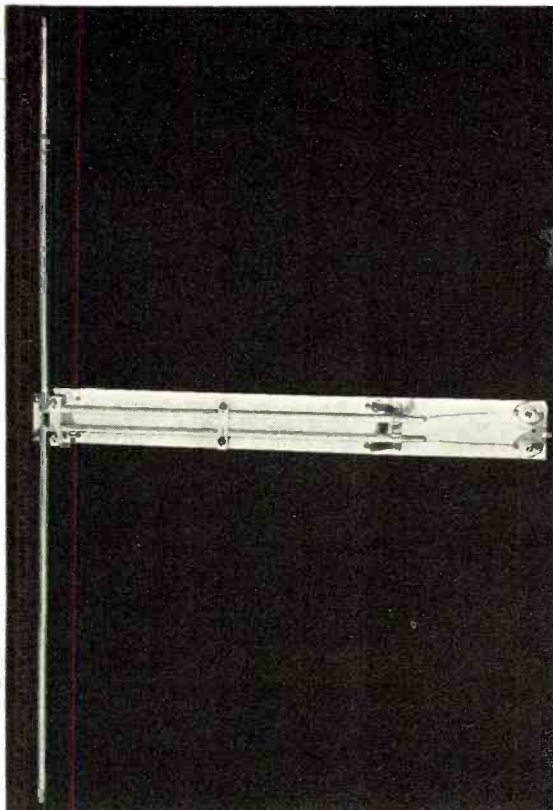


Fig. 1.

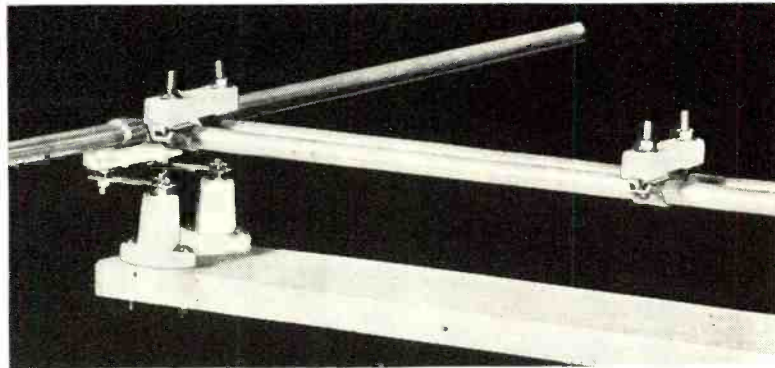


Fig. 2.

Three views of a highly efficient uhf antenna designed for 2½ meters. This "Q" is assembled easily and may be set up for emergency operation in little time. Note spacers on the tubing. Full details are given in the text discussion.

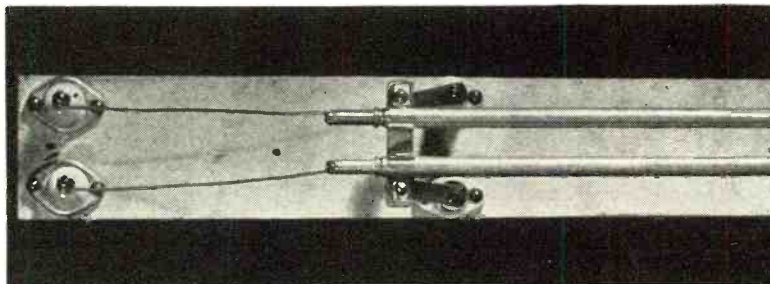


Fig. 3.

Washington which will again permit hams to serve their local communities. This time, however, safeguards will be thrown up to prevent a repetition of the earlier troubles.

No detailed official announcements have been made up to the time that this is being written but, based on unofficial information, the proposed set-up appears to be about as follows:

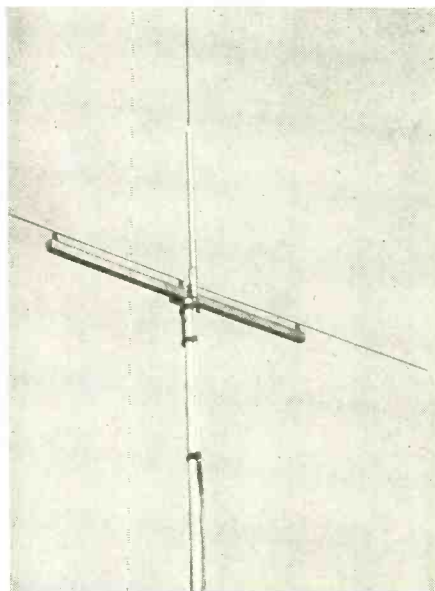
A local official cannot obtain authorizations for hams within this area without first drawing up a complete emergency communications plan, including a detailed description of the proposed (or existing) organization, functions, etc. If, after study in Washington, this plan is considered practical and approved, application forms will be supplied to be filled out by each individual amateur included in this organization. These will undoubtedly call for a listing of the emergency equipment available and for other information indicating the ham's qualifications for the defense work. Then, if in the opinion of the DCB and the FCC the interests of local defense will be served, individual authorizations will be issued, permitting operation as a part of the local network.

It is expected that operation will be limited to frequencies above 56 mc. except for certain types of service which will probably be permitted under special restrictions on the 80-meter band. Evidently the 10, 20, 40 and 160-meter bands are definitely out "for the duration."

The government is especially interested in seeing organizations set up on the basis of other than single small communities. In other words it is con-

sidered that a communications net established on a county-wide basis is preferable to perhaps a half dozen small nets representing a few of the individual towns within that county. It is quite apparent that in an emergency adjacent towns and even cities would have to cooperate with one another in matters involving fire equipment, police, medical services, etc. Should the telephone lines be out for any reason it would be obviously desirable that the emergency radio net provide for communication not only within towns but between towns. This

Combination doublet for television, and vertical coax antenna on 2½.



is likewise true in the case of air interceptor work which depends for its success on a continuous flow of information from its civilian lookout posts which may be distributed over a relatively wide area.

There is the consideration also that a given number of hams, organized on a county-wide basis can provide more effective service wherever it may be needed than would be possible with this same number broken up into small local groups each confined to organized operations within its own town limits. In the latter case those towns which boast no hams would be left stranded, as might also the outlying areas.

It may be that the details of the proposed plan for again bringing the amateur into active participation in defense will undergo some changes before official general announcement is made from Washington. According to reliable sources of information, however, it seems certain that the plan will go ahead and will be along the lines described, at least in its essential details. We know several ham organizations that, on the basis of unofficial information coming out of Washington, are going ahead with preparations—building or revamping equipment, making car installations, revamping antenna layouts, etc.

One word of advice is offered to hams: *Don't write to the FCC as an individual to request authorization to operate your equipment.* Such requests will probably not even be answered. In effect the individual ham is no more, at least until the war is

(Continued on page 55)

Manufacturer's Literature

Our readers are asked to write directly to the manufacturer for this literature. By mentioning RADIO NEWS and the issue and page, we are sure the reader will get fine service. Enclose the proper sum requested when it is indicated. This will prevent delay.

Sylvania Tube Characteristics Sheet

A new Renewal Tube Characteristics Sheet has been released by the commercial engineering department of the Hygrade Sylvania Corporation.

A new type format distinguishes this Characteristics Sheet from previous editions. Each tube type is horizontally ruled off so that any particular characteristic desired can be seen at a glance.

It is a twelve page booklet and contains not only average tube characteristics, but also Panel Lamp characteristics and tube and base diagrams. It is available free, but, in view of paper shortages, we request that radio servicemen and service departments of radio shops order for bare requirements only and give a single copy the greatest possible use. Hygrade Sylvania, 500 Fifth Ave., N. Y. C.

New 16-Page Ohmite Catalog

A new, up-to-date, 16-page Catalog listing over a thousand stock items in Rheostats, Resistors, Tap Switches, Chokes and Attenuators has been is-



sued by the Ohmite Manufacturing Company, Chicago.

This new Catalog 18 is especially useful today for quick reference by engineers, maintenance men, purchasing agents, servicemen, jobbers, and amateurs. It gives illustrations, descriptions, ratings, prices and other
(Continued on page 58)

SERVICE HINTS

Here are three more servicemen's aids that will help to increase his revenue.

CARDS . . . CONTACTS . . . CARE

TIEING up special events before the public's mind with the necessity of having radios in good condition proved a successful business-builder for the Acme Radio Service Laboratory, Inc., 3827 N. Illinois St., Indianapolis, Ind., according to the proprietor, R. R. Foster.

Each year Foster mails about 25,000 post cards to a carefully selected list of persons residing in his section of the city. The cards are mailed about once a month. The chief group of persons reached by this method are families moving into new homes. Foster obtains their names by referring to the Indianapolis Commercial, a daily business newspaper carrying that information. Special cards are sent to these families welcoming them to their new home and pointing out the desirability of having their radio in good condition as they start life in a new location.

Most of the cards Foster sends refer to a coming event, such as the Kentucky Derby, the 500-Mile Memorial Day automobile race at the Indianapolis Motor Speedway, The World's Series, and similar events, and ask the question: "Is your radio in good condition so you can hear and enjoy this event?" The cards also contain drawings depicting the coming event.

The card drawing the greatest response, Foster says, was one giving the new dial numbers of stations after the re-allocation of March 29. Many persons remarked how useful this card was and how much they appreciated it, he said.

When a new station opens up in the city—and there have been two new ones in the last year or so—Foster prepares post cards saying: "Indianapolis welcomes Station _____." The card gives the station's dial number and asks the customary question about the condition of the radio owned by the person to whom the card is addressed.

Two years ago when Foster's shop obtained the first Rider Chanalyst in the city he advertised that fact in post cards, pointing out the value of such an instrument in a radio repair shop.

The Acme Laboratory has a uniform charge for checking a radio and informing the owner what is wrong with it and how much the cost of repairing it will be. This charge is 50 cents for small radios and \$1.00 for large ones, or \$1.50 if the large radio is picked up by a man from the shop.

MAKING the fullest use of personal contacts is the quickest, surest method of building a radio service business, according to J. C. (Jack) Ream, who, with T. W. (Tom) Ewing, operates Albuquerque Radio Service at 3018 East Central Avenue, Albuquerque, N. M. The business, three years old, hit the thousand-dollar-a-month gross business mark three times in the first eight months of 1941.

Rendering public service is the best road to personal contacts, Mr. Ream has found. A public address system is furnished free for any kind of non-commercial event. Principally events sponsored by civic clubs. Grateful club members are handed business cards which they keep and use, when they need service on their own private radio sets. "Once we got 'em into our store" says Mr. Ream, "we've got them for customers, because we make it a point to surprise every customer with better service than he expected, for less money. We render the kind of service that we would like to receive if we were the buyers, and it pays big."

Mr. Ream says that the large number of business cards which he and his partner give out, through creating personal contacts by free service, and listings in the telephone directory are their best paying forms of advertising.

TWO simple methods of building good will for his business have been practiced successfully by R. R. Foster, of the Acme Radio Service Laboratory, Inc., 3827 N. Illinois St., Indianapolis, Ind.

These are the washing and polishing of all radio cabinets before the sets are returned to the owners, and the rejection of radios considered as not worth repairing.

"Many persons remark, 'Are you sure that's my radio, it didn't look like that when I brought it in?'" Foster relates, "and some say that now they'll have to polish up the rest of their furniture so it won't look too bad alongside the newly-polished radio cabinet."

Foster points out that shining up the cabinets is an inexpensive way to win good will. He employs a junior technician who does the polishing in his spare time.

Rejecting sets that are in such bad condition they are not worth repairing might lose a few dollars for the time being, he admits, but in the long run the practice will make money for the repairman because people will have confidence in him.

-30-



Another Instance of How IRC Helps Servicemen Build Business

THIS little tag, factory-packed with all IRC Volume Controls sold through the jobbing trade, is designed to be hung on the control knob whenever you use an IRC Control for replacement. Read it carefully. You'll quickly see that there is no better way of building public confidence. No customer will fail to see it. None will fail to be impressed with the fact that you have used a replacement of highest quality.

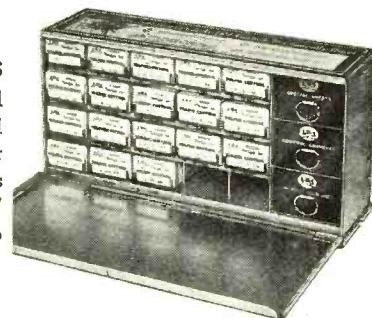
The reverse side of the tag has space for your name, address and 'phone number. This not

only serves as a reminder to call you when future service is required—but it is also suggested on the tag that customers recommend your services to their friends. This means that the tag actually does double duty in working for you.

Use IRC Controls to insure utmost quiet and long, dependable performance on every job. Use the IRC Volume Control Tag to build confidence, insure future business and to build new business from people who may never have heard of you before!

Save Time...Money...Work...on Control Replacements

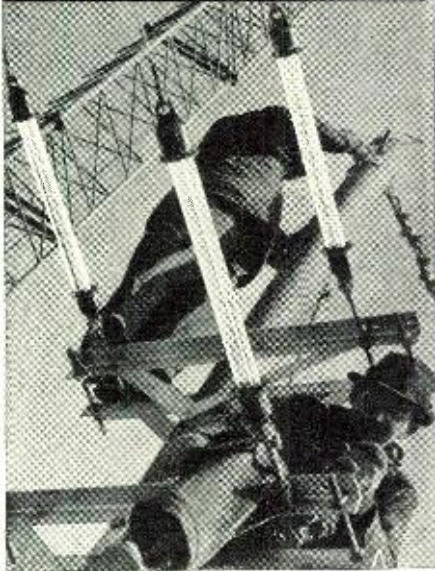
By actual count, 10,859 of the radio models listed in the IRC Control Replacement Manual call for one or more replacements that can be supplied from the 18 Type D Controls and accessories included in the IRC Master Volume Control Cabinet. The Cabinet equips you for prompt service on the big majority of jobs. It saves you money, because Type D Controls with Tap-in Shafts can often be used in place of costly "specials." It saves time because Tap-in Shafts are easier and quicker to install. Ask your IRC jobber for details—today!



RESISTORS and CONTROLS

INTERNATIONAL RESISTANCE COMPANY, 401 North Broad Street, Philadelphia, Pa.

KDKA chooses PYREX INSULATORS



HIGH electrical resistance, low power loss, low surface conductivity, resistance to corrosion, high strength-to-weight ratio . . . these are properties vital to good radio insulation.

Now examine glass. Compare it with other materials. Then you'll know why PYREX brand Insulators—made from special borosilicate glass—deliver better reception, better transmission, and unfailing service . . . why you'll find PYREX brand Navy type strain insulators at work for famous Westinghouse Station KDKA. For catalog, write Insulation Division, Corning Glass Works, Corning, N. Y.

| HOW HIGH DOES YOUR PRESENT MATERIAL STAND ON THIS CHECKUP ? | | | | | |
|--|-----------------------|----------------------|-----------|----------------------|----------------------|
| PROPERTY | BOROSILICATE GLASS | LOW-LOSS SILICATE | PORCELAIN | CELLULOSE ACETATE | PHENOLIC RESINOID |
| High scratch hardness | 6 | 5 | 3 | 1 | 2 |
| Low thermal expansion | 6 | 4 | 5 | 1 | 2 |
| High dielectric strength | 5 | 2 | 1 | 3 | 4 |
| Low dielectric constant | 6 | 3 | 5 | 4 | 1 |
| High volume resistivity | 5 | 4 | 3 | 2 | 1 |
| Total point score | 28 | 18 | 17 | 11 | 10 |

FOR AMATEUR and
PROFESSIONAL SERVICE

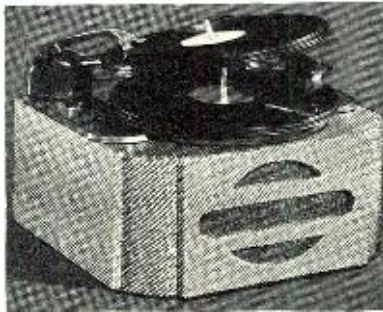


"PYREX" is a registered trade-mark and indicates
manufacture by Corning Glass Works.

What's **NEW** in Radio

New "Mirror-Tone" Home Phonograph

A new line of "Mirror-Tone" home phonographs has just been announced by *John Meck Industries*, 1313 W. Randolph St., Chi-



cago. Attractively covered with brown tweed aero-cord, the "Bar Harbor" model has a built-in automatic record changer which will play a half-hour program of 10 or 12 inch records.

The case of this table model is acoustically resonated to provide finer tone quality. One ounce low pressure crystal pick-up and high fidelity amplifier with specially matched speaker are included.

Jiggers . . . ?

A new product, *Jiggers*, should have instant appeal to all electricians, electrical service and maintenance men, contractors and manufacturers of electrical products.



Each *Jigger* is a small, self-contained soldering unit that contains just the correct amount of 50-50 solder and flux hermetically sealed within a waterproof heat-generating outer shell. To obtain a strong, perfectly soldered electrical connection, it is only necessary to push the wire splice into a *Jigger* and touch a lighted match to the *Jigger* as shown. The *Jigger* shell ignites and produces the proper temperature to flow the solder into the splice. The burnt shell is then dropped off and a smooth, perfectly soldered splice is revealed. Simple, fast, clean, without waiting for soldering iron or torch to heat up. No muss or fuss. No solder pot. No waste.

Oil-Filled Plug-in Capacitors

In step with the growing popularity of the plug-in capacitor technique, already widely used in the electrolytic and wax-filled paper types, the *Aerovox Corporation* of New Bedford, Mass., announces a new Series-72 oil-impregnated oil-filled capacitor with four-pin base that fits into a standard UX socket, as distinguished from the octal base of other plug-ins.

The aluminum-sprayed tin-plate round can comes in 2, 2½ and 3" diameter sizes, and from 2½ to 4¾" high. It is provided with a mounting ring with lugs, so as to be held securely in place and in accordance with Underwriters requirements. These oil-filled plug-ins are available in single-section units

up to 16 mfd., and up to 4-4-4 mfd. in multiple-section units, in both the 400 and 600 v. D.C.W. ratings.

These plug-in oil-filled capacitors are particularly desirable for equipment used by the Army, Navy, police, broadcast stations, public address and sound movie systems. They are ideal for aircraft radio where duplicate receivers and transmitters are not available but where prompt servicing of single units is absolutely essential. The UX base insures the correct insertion of the capacitor into the circuit.

Merchandising Tags for Serviceman

Attractively printed tags to help radio technicians merchandise their service and reliability to the customer are now included in the cartons with all IRC Volume Controls for replacement use.

Entitled "Your Serviceman Knows Quality," the tags are signed by the *International*



Resistance Company and are designed to impress customers with the fact that the new controls installed in their radios are of the same design and construction as IRC controls used in marine and aviation radio, as well as in other exacting communications uses.

The back of each tag invites the customer to recommend the serviceman to their friends. It contains space where the serviceman's name, address and telephone number may be written in or rubberstamped.

Strings attached to the tags, enable them to be fastened to control knobs so that customers cannot fail but see them when the jobs are delivered. One tag is included with each IRC replacement control and servicemen who have already seen them are loud in their praise of the idea. They regard it as an important move by a well-known manufacturer to help them build the type of consumer confidence that is so essential to their own business success.

Turner 211 Dynamic Mike

The *Turner Co.*, Cedar Rapids, Iowa, is offering a new Dynamic Microphone, Model No. 211, for radio stations, loud speaker systems, P. A. men, bands, and others requiring a quality microphone with extended high frequency range. Some of these new models are already giving fine results in broadcasting studios.

Turner 211 Dynamic utilizes a new type
(Continued on page 59)

Spot Radio News

IN DEFENSE AND INDUSTRY

Presenting latest information on the Radio situation.

Special to RADIO NEWS
by Alfred Toombs—RN Wash. Corres.

HERE'S some advice for small manufacturers who are anxious to put their factories into war work: **DON'T COME TO WASHINGTON.**

At least, don't come until you know what you want, whom to see and whether that person is to be found in the Capitol. And how are you going to find out these things? It's easy.

The Department of Commerce maintains a *Service and Information Office*, the function of which is to facilitate the dealings between Government and the perplexed business man. You see, there are approximately 3,000 government purchasing agencies—scores of which are buying radio equipment—and it is obviously impossible for the average business man to figure out which of these he should approach.

To solve this situation, the *Commerce Department* has assembled a staff of experts on Government purchasing, who know or can find out at all times what Government agencies are buying what materials. If a manufacturer of radio parts wants to find out what his plant can do to help in the battle, he should write to the *Service and Information Office*, Room 1060, *Department of Commerce*, Washington, D. C., tell something about the facilities he has available and ask to be put in touch with the proper agency.

If he wants to come to Washington to discuss the possibilities with the interested authorities, the *Service and Information* office will make a definite appointment for him. Many a business man who has come to Washington and found himself lost and baffled in the bewildering bureaucracy will appreciate the value of this service.

THE *Signal Corps* of the Army, faced with the job of procuring radio equipment on an unheard of scale during the next year, has done some reorganizing for the job. Of great interest and significance is a fundamental change in *Signal Corps* policy in distributing contracts. In the past almost entirely dependent on the big manufacturers, the organization at last has launched a program which will bring the smaller companies into prominence. The new program calls for wide distribution of contracts for the standard and less complicated apparatus among small suppliers and manufacturers. Likewise, it is planned to bring about widespread sub-contracting of component parts for the larger and more complicated apparatus, which will be assembled by the big manufacturers.

As a result of the suddenly increased demand for air craft detector equipment and similar apparatus, the *Signal Corps* has established a new and important *Radar Division* to handle the development of this material. Lieut. Col. Tom C. Rives, who formerly headed the *Research and Development Division*, is in charge of *Radar Division*. Under the

new division will be the *Aircraft Radio Laboratory* at Wright Field, Dayton, O., which is directed by Lieut. Col. John H. Gardner. The *Radar* work at Wright Field is directed by Lieut. Col. Hobart R. Yaeger.

In charge of the *Research and Development* work of the *Signal Corps* will be Lieut. Col. James D. O'Connell. The laboratory at Fort Monmouth, N. J., under direction of Lieut. Col. Rex V. D. Corput, Jr., is under the *Research and Development Division*.

The decentralization thus effected will bring the Army specialists in these various radio fields in closer contact and will enable the service to better its record of keeping ahead of the world in the radio field.

THE *Civil Air Patrol*, the nation-wide organization of private flyers which is being organized for patrol work within the country, needs radio operators. The operators will be used to maintain contact between planes flying in the patrol and their home fields. The planes will be patrolling pipe and communications lines and performing like functions, under direction of the *OCD*, the *CAA*, the Army and Navy. Volunteers can get further information from their local patrol organization or from the *CAA* or *OCD*.

THE *Signal Corps* of the Army is expanding the number of *Electronics* trainees in the branch from 500 to 1,000. Enlistments are being sought. Applicants will be commissioned as lieutenants and must have either a college degree in elec-

trical communication or electronics physics or the equivalent in practical experience.

The *Navy* has opened a training school in high frequency radio in Chicago, under direction of Lieut. William C. Eddy, U.S.N. Rtd. This school, said to be the only one of its kind, will train about 100 students every two months.

Lieut. Eddy is one of the top-ranking television experts in this country and during his service in the Navy made a number of inventions in the field of sound amplifying and radio transmission which are now standard in our submarines. The space, the faculty and all the facilities for the new school have been contributed by Balaban and Katz Corps. owners of television station W9XBK. The Navy will be in direct control of the school.

Applicants are required to have a high school education and either an amateur license, or experience in radio repair or high frequency design, transmission or reception.

THE hams have no one to blame but themselves for the fact that they got a rather unceremonious bums rush off the air in January—and just when it looked like things were going so well for them.

As you have been told several times by our Washington correspondent, Government officials had every intention of working out a sensible arrangement, after the war declaration, whereby certain trusted hams would be allowed to continue on the air, in the service of their country. So, after the initial crackdown which followed the Pearl Harbor raid, officials began reinstating hams in connection with civilian defense and other activities. Nearly 2,000 were back on the air by the middle of January.

Then came the blow. The *Defense Communications Board* requested that all licenses be revoked, which action was taken promptly. The inside reason for this, it can be revealed here, was the lack of discipline among those who were allowed to stay on the air. Instead of sticking to business, the hams lapsed back into casual chatter. The wildest kinds of rumors flew through the air and began to circulate in all parts of the country. In addition, some military information which our enemies would have been delighted to possess was inadvertently included in the chatter.

The *Defense Communications Board* had no choice. But because there are many things the hams can do in the war effort, it appeared advisable to work out some system under which a certain number could be restored to the air. It has been announced that a limited group of amateurs will be allowed to cooperate with the Government in war work. Already, in certain areas, a number have been reinstated to aid in aircraft warning. More will follow. But those who get their tickets back will behave this time—or else. Take heed, you hams!

LAST
MINUTE

Flashes

OF vital importance to all manufacturer's, wholesalers and dealers in radio equipment are the regulations issued by Price Administrator Leon Henderson, covering prices on radio equipment, effective February 9. The regulations established the rule that manufacturers must not charge more for radio, phonograph or television sets, radio tubes or parts than their highest price on October 15 or the three-month period before that date.

Exempted from the price ceiling are equipment or parts designed for commercial, police or military uses—and juke boxes. The list of articles covered by the price ceiling is very extensive, and includes all parts.

Mr. Henderson pointed out that he was establishing the price ceilings—one of the first set established after passage of the new price control law—because of the increase in demand for sets, coupled with the increasing demand on manufacturers for military equipment.

GOVERNMENT

THE reorganization of OPM into the *War Production Board* put one of the most popular men in the radio manufacturing field in a top spot in the direction of our war production. The appointment of J. S. Knowlson as chief of the *Division of Industry Operations* places the former president of the *Radio Manufacturers Association* in one of the most important jobs in the war organization.

Mr. Knowlson, since coming to Washington at the behest of Donald Nelson, has made a good record—good enough to win the confidence of his boss, Mr. Nelson. In the latter days of OPM, Mr. Knowlson was acting director of the *Priorities Division*. He did the best he could with that ponderous organization and toward the end seemed to have cleared up many of the difficulties. He has a much tougher job on his hands now—but one which he is well qualified to handle. In a word, his new task is conversion—conversion of the great American peace time industrial machine to the production of war materials.

His entire industrial career has been devoted to conversion—making big ones out of little ones. He started in business with a one-tool plant in up-state New York. He was making gimmicks, when he saw a big market for gammacks and so converted his plant to gammacks. By following this process for many years, he built quite an establishment, and quite a reputation. In the dark days of the depression in the early '30's, the *Stewart-Warner* company fell on evil days. Mr. Knowlson's reputation as a conversion expert earned him the chance to take charge of *Stewart-Warner*.

He took this company, which had been making speedometers and like instruments, and put it into the radio and refrigerator field. Business began to boom. Then, when the emergency caused by the war in Europe first made itself felt, he decided his company had better do another conversion job. He turned part of the plant into manufacturing ordnance, and the machines that had been turning out radio-phonograph combinations began to stream forth machine gun parts. This spring, the conversion of the *Stewart-Warner* plant, of which Mr. Knowlson is president, will be complete. It will be doing almost nothing but war work.

He is a hard worker, extremely well liked in Washington. He loves the out of doors, yearns for the days when he had time for the wide open spaces. It is his belief that today the country's factory owners are not manufacturers of condensers or fountain pens or automobiles—but are, rather, custodians of certain tools and equipment which can be used in turning out war materials. He feels that it is his job to line up the plants and the tools to make the weapons which will smash our enemies.

LITTLE noted, but highly important in the future of the radio industry, was the appointment in January in Washington of the *Patent Planning Commission*, which is to survey the possibilities of new industries and to preserve present patents for post-war industry. You're thinking a long way ahead when you wonder about what's coming after the shooting is over—but a little thought on this subject might not be amiss at this critical time.

THE announcement by the President that this country would produce this year 60,000 airplanes, 45,000 tanks and 8,000 merchant vessels threw into the discard any prior estimates which had been made on the amount of radio equipment which would be needed for war purposes. Previous to the Presidential statement, it was believed that production of civilian radio would continue until summer. But that's out now.

Late in January, the *War Production Board* announced that all manufacturers who had turned out more than \$1,000,000 worth of radio sets in 1941's first nine months would have to curtail their output for the next 90 days by 45 per cent. Most of these companies were booked almost 100 per cent for war orders, anyway. The smaller companies, who made less than \$1,000,000 worth of radio sets in the 1941 period, were ordered to reduce their output 35 per cent. This was done so that they might keep their labor forces and production facilities intact until the Government could hand them war orders.

The program now calls for the production of \$2,000,000,000 worth of radio equipment for the armed services this year. Practically everyone of those airplanes, tanks and ships will require radio equipment—and in addition there is increased need for equipment elsewhere in the Army and Navy.

It is almost impossible to conceive the size of the program which the radio manufacturers are undertaking. It means the complete cessation of the production of civilian equipment, WPB officials believe. It seems likely that at the end of the 90-day period of curtailment, all radio manufacturers will be on a 100 per cent war basis—with the possible exception of one or two plants which may be manufacturing one or two simple "Victory Model" civilian sets, on behalf of the entire industry.

Some serious dislocations are in prospect. Already, desperate efforts are being made to speed up the manufacture of tubes. The demand for tubes this year will be ten times greater than last year's entire output. This is the most serious bottleneck at present.

Officials who clearly foresee what is to come are giving fair warning that the situation is going to be serious. Service men will have to face the prospect of being unable to get replacement parts. Because when there aren't any more tubes, there just aren't going to be any more tubes. It is even possible that commercial broadcasting stations may have to go off the air when their equipment is worn out.

Charged with keeping essential communications functioning and with the production of communications equipment which we must have is the newly formed *Communications Branch* of the *War Production Board*. This group, which will bring under its jurisdiction the various units of OPM which dealt with radio, is under the direction of Leighton H. Peebles.

Mr. Peebles is an engineer, wise in the ways of Government. He studied under the late C. P. Steinmetz and, as a young engineer, came in contact with a young short-hand expert, named David Sarnoff, who was destined to go places in the radio industry. Mr. Peebles, as an engineer with the J. C. White Co., built stations for the old *American Marconi Wireless Corp.*, back in 1913. He came into Government service in 1931 as a *Commerce Department* expert, later went with NRA, then with the *Securities and Exchange Commission*.

YOU can look for the Government to step in and take control—to all intents and purposes—of the big short-wave stations in this country which are sending our news and propaganda abroad. The friction between the privately-owned stations and *Coordinator of Information* Donovan's office has been increasing.

The stations, in spite of a very tight system of checks which the Government has put upon them, continue to make boners which have international repercussions. For instance, a short time after the war started, there emanated from European sources a rumor that Marshall Petain would step down as head of the Vichy-French state. This was widely printed and broadcast domestically in this country. The *State Department*, trying to keep Vichy on the friendly side and knowing that the story about Petain was pure propaganda which was being circulated for a purpose, asked the Donovan office not to use the report on its international broadcasts.

These broadcasts, it must be understood, are accepted abroad as official U. S. Government statements. All other Governments own and operate their own international stations and Europeans do not understand that in this country there are privately owned radio transmitters which send forth material other than Government propaganda. Therefore, when there was a slip up in the check on one of our short-wave stations and that broadcaster, on his own, put the rumor about Petain on the beam for Europe, there was a great furore. The Vichy French got on their high horses and before long, our Ambassador to France, Admiral Leahy, was on the long distance phone to Washington, using some very salty seaman's language. The repetition of incidents like this will eventually mean complete Government control.

THE Navy, having undertaken the regulation of the use of ship radio for the duration, has made public certain general instructions governing shipboard operations. A complete understanding of these regulations will save operators a lot of grief.

The use of radio by a ship in convoy, of course, is strictly prohibited, except under such conditions as the commodore of the convoy may set forth.

For other ships, the rules in general provide that allowable traffic should be restricted to that required in distress cases, in navigation of the ship and in making necessary port arrangements. Any calls which are likely to disclose the position of ships to the enemy are forbidden. Pleasure craft, except in distress, are expected to refrain from using their radio.

However, less restricted conditions in radio usage are required of vessels on inland waters and the Great Lakes, unless the ships are proceeding to sea. Reception of radio signals and commercial broadcasts will be permitted except in cases where the nature of the receiving equipment would enable an enemy ship to obtain a bearing. The vessels operating on inland waters and the Great Lakes may transmit traffic "limited to distress, navigation and business, but this authority does not extend to transmission of messages relating to future operations of vessels which are to proceed to sea. . . . Traffic should be reduced to a minimum. Radio reception (including the use of broadcast receivers) by commercial vessels is authorized."

OF INTEREST

How You Can Defend Your Home

A 64-page book, designed to acquaint the men, women and children of America with the latest official and authentic information on what to do in the case of an air raid, goes on sale shortly throughout the country, according to an announcement issued by M. C. Gaines, President of Jolaine Publications, Inc., its publishers.

Prepared with the assistance and co-operation of the U. S. Office of Civilian Defense, its sixteen pages of text matter constitute the first popular compilation of all available material on air raid preparations and precautions. Forty-eight pages of the book are devoted to authentic illustrations and descriptions of over fifty American, British, German, Italian and Japanese war planes, together with three additional silhouette views of each. This feature, "How to Spot the Planes in the Sky," was especially included for its appeal to children, as well as for its value to the voluntary aircraft spotters working with civilian defense organizations.

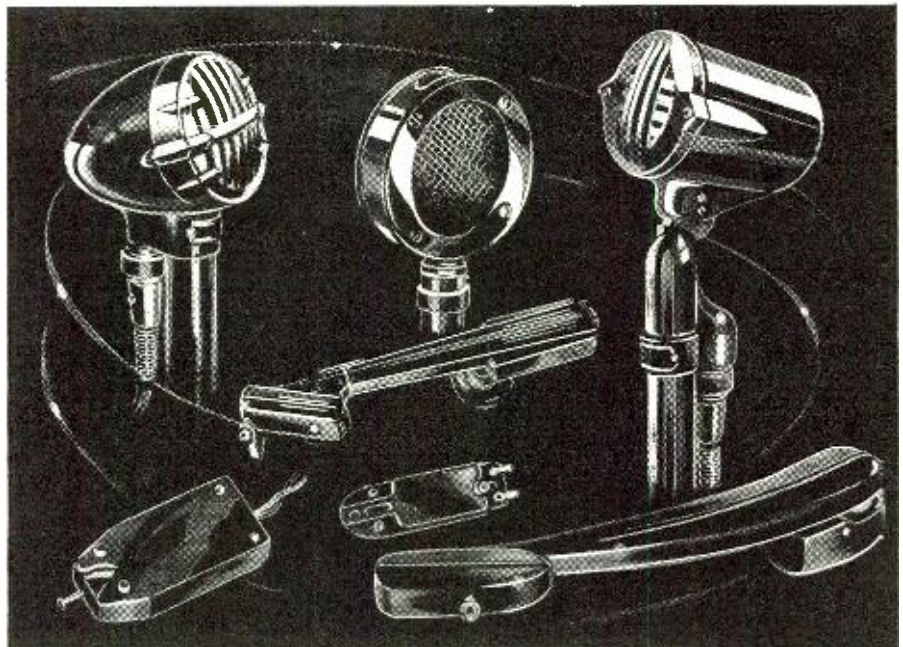
It contains, in addition, First Aid Hints, Air Raid Drill Procedure for Schools, OCD Insignia and excerpts from addresses by Mayor Fiorello H. LaGuardia, U. S. Director of Civilian Defense and Mrs. Franklin D. Roosevelt, Assistant Director. The 64 inside pages are printed in rotogravure and the two color covers have been "varnished" to insure durability. A hole has been punched in the upper left corner of the book, so that with a string or wire it can be hung on a hook or nail in an easily accessible place in the home. The back cover of the book is an appeal to "Keep 'em Flying!" through the purchase of U. S. Defense Savings Bonds and Stamps.

U.H.F. Range System

NEW YORK.—A two course ultra high frequency radio range development of a type which is expected to replace the radio beam system now in use on the airways of the United States within the next few years was described at the winter convention of the Institute of Radio Engineers.

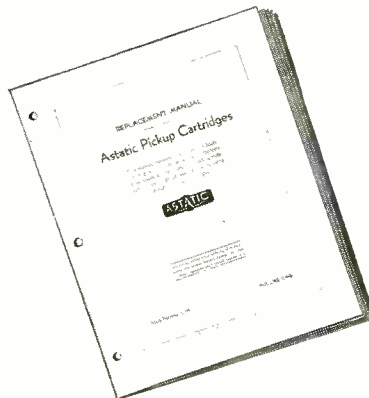
The new development operates on 125 megacycles, a wave length 400 times shorter than the wave length in use at present. Experimentation indicates that this ultra high frequency system eliminates static entirely and greatly diminishes the danger of multiple courses and the distortive effects which mountains, rivers, ore deposits and other influences of terrain exert upon radio beams, factors which have been held responsible for airline accidents. The new system provides precise and complete information to the pilot. It shows him whether or not he is to the left or right of his correct line of flight and whether he has flown beyond the radio range station or has not yet reached it, an extremely important point of information in bad weather.

All experimentation and field work on the new development has been conducted at the C. A. A. Experimental Station at Indianapolis Municipal Airport where the apparatus has been inspected and flight tested with satisfactory results by airline administrators and pilots.



Confidence in Astatic Products Shown by Manufacturers' Use

Most convincing proof of the dependability of these products is shown in the fact that Astatic Cartridges are used by a great majority of America's leading manufacturers of radio-phonograph and sound equipment. Confirmation of this statement is found in a "REPLACEMENT MANUAL for Astatic Pickup Cartridges" which includes a listing of manufacturers using various type pickup cartridges. This Manual, published for the convenience of Radio Jobbers, Dealers and Service Men, was compiled by The Astatic Corporation with the kind cooperation of radio set and phonograph equipment manufacturers.



To obtain your
FREE copy of this
handy manual,
see your Radio
Parts Jobber.

THE ASTATIC CORPORATION

YOUNGSTOWN, OHIO

Licensed Under Bush Development Co. Patents

In Canada: Canadian Astatic Ltd. Toronto, Ontario

INDUSTRY

Conservation of Critical Materials

WASHINGTON.—The War Production Board acted recently to meet huge Army and Navy demands on the radio manufacturing industry and to conserve critical materials by ordering sharp cuts in production of receiving sets for civilian use.

Reductions also were ordered in output of phonographs and radio phonograph combinations.

Effective immediately, Limitation Order L-44, issued by Acting Priorities Director J. S. Knowlson, provides for an average monthly curtailment in production during the next 90 days of more than 40% below the monthly output during the nine months ended September 30, 1941. Similar cuts were ordered in the number of tube sockets in the sets produced, which will result in corresponding curtailment of the number of tubes used in new sets.

The order does not affect production for certain government defense agencies, besides the Army and Navy, nor for lend-lease requirements, police departments or similar agencies of public authority in the United States, and contracts covered by a Preference Rating of A-1-j or higher.

In addition to freeing facilities for vital war work, the order is designed to accomplish savings during the 90-day period of an estimated 750 tons of copper, 100 tons of aluminum, 25 tons of nickel, and 3,400 tons of steel.

Class A manufacturers, those who sold more than \$1,000,000 worth of radio sets and phonographs for civilian requirements during the first nine months of 1941, were ordered to reduce output by 45%. Class B firms, whose sales were under \$1,000,000, must curtail production by 35%.

The radio manufacturing industry, which employs many thousands of skilled and semi-skilled workers, has been asked to undertake a \$2,000,000,000 military production program. Civilian output must be reduced drastically so that receiver and parts makers and allied branches of the industry can participate in this effort to the fullest possible capacity.

It is estimated that 60,000,000 radios are now distributed among 87% of the American homes. Permitted civilian production during the next 90 days, together with stocks now in manufacturers' and dealers' hands, will meet essential replacement requirements.

Class A companies already have received or soon will be awarded big war orders, and swift conversion of their plants to 100% military activity may be expected. Until a larger number of the small (Class B) firms receive more Army and Navy orders, the lighter curtailment ordered in their production will provide them with sufficient civilian operations to keep their skilled labor force intact.

The sales value of radios manufactured in 1940 was approximately \$177,000,000. In that year, the industry employed about 50,000 persons. The annual payroll was about \$75,000,000. Estimates for 1941 show substantial increases in these figures.

The first 9 months of 1941 were chosen as the base period.

Use of Copper in Radios

WASHINGTON.—An explanation of Conservation Order M-9-c regulating the use of copper in radios was issued recently by the Division of Priorities.

Generally, manufacturers are prohibited from using copper or copper base alloy except to the extent necessary for carrying electrical current. Only enough copper may be used to carry the amount of current required, leaving a reasonable factor of safety. All decorative uses of copper are prohibited.

No prohibition has been placed on the sale of radios manufactured within the limitations of the order.

Manufacturers Aid Army-Navy

NEW YORK.—A unanimous agreement to supply the Army and Navy with "all pertinent technical information" concerning all inventions and developments in their industry was submitted to Washington recently by the radio manufacturing and research organizations of the United States.

The agreement, in the form of a recommendation for a pool of information on secrets in the construction of communication, signaling, remote control, navigation, and direction-finding apparatus, was presented to the War and Navy Departments by Major Donald K. Lippincott of the Signal Corps and J. W. Wright, Civilian Observer for the Navy Department.

About 100 representatives of the leading radio makers, after a series of meetings with Government representatives, adopted the recommendation without a dissenting vote.

The recommendation provides not only for the supplying of all technical information on radio apparatus requested by the Government, but also suggests the Government itself order the manufacture of required apparatus by whatever company it desires, under Government license.

Major Lippincott, at the request of the manufacturers, served as chairman of a committee on research information selected by the industry. The committee included such men as Edwin M. Martin of the Farnsworth Television & Radio Corp. of Fort Wayne, Indiana, W. R. Ballard of American Telephone and Telegraph Co., O. S. Schairer of Radio Corp. of America, Victor Beam of Westinghouse Electric & Manufacturing Co., and E. D. Phinney of International Telephone and Telegraph Co.

Change of Address

The Henry P. Segel Company, manufacturers' representatives, will be located at 221 Columbus Street, Boston, Massachusetts. This change of address will be effective January 5, 1942.

Milton Auster Named to Government Post

Milton Auster, pioneer in the radio industry and member of the sales staff of the New York Sylvania Radio Tube distributor, The Dale Radio Company, was appointed recently and is now functioning as business specialist on radio parts in the Emergency Management Office of the Office of Price Administration, Washington. He is devoting his full time to his new government position.

Mr. Auster has been associated with the radio business for twenty years and is particularly well known in the eastern territory.

Sylvania Pres. Looks Into 1942

NEW YORK.—We enter 1942 with the treacherous attack on our forces at Pearl Harbor fresh in our minds. That savage blow had one redeeming quality as far as we are concerned—it completely unified the nation and silenced all opposition to a Victory Program, replacing the National Defense Program.

Just as France found small comfort in her Maginot Line, we find no satisfaction in mere defensive action and preparation, and turn with heart and soul toward a program which every red-blooded citizen will endorse—the utilization of all our resources, our brain power, every available minute of time, every piece of production equipment, with one objective in mind, that being the provision of every weapon of offense our armed forces need to carry the battle to the enemy. We must crush those foes who would rob us of life, liberty and the pursuit of happiness, replace freedom with slavery, and return to the long outmoded code of "Might Makes Right." We must be ready to give up many things considered necessary to our way of life—without grumbling, complaint or question—if by so doing we can shorten the war and save the lives of our sons who are fighting, as well as the lives of those who may otherwise be bombed, shelled or captured by enemy action against non-military objectives as well as military objectives.

Admiral Gang Goes Hunting

CHICAGO.—Loaded down with elk, bear and other game, Ross D. Siragusa, President of Admiral, Ken Turner, Chief Engineer for Admiral, and C. C. Miller recently returned from a two-weeks' hunting trip deep in the wilds of the Selway River Preserve in Idaho.

One of the highlights of the trip was the two-way radio communication carried on between the hunting party and Bob Jones, Admiral's Circuit Engineer, in Chicago, by means of an Admiral 79-P6 portable set converted into a 40 and 160 meter receiver and transmitter.

U. S. Television Conversion

NEW YORK.—Mr. Hamilton Hoge, president of the United States Television Mfg. Corp., announces that his firm has now completed the conversion of all of its television receivers to the new standard set by the National Television Systems Committee. United States Television is believed to be the first television manufacturer to complete such conversions.

RCA Gets New Assistant Pres.

NEW YORK.—Dr. Charles B. Jolliffe has been appointed assistant to the president of the Radio Corporation of America. In making the announcement, David Sarnoff, President of RCA, who made the selection from the personnel of the RCA organization, said that Dr. Jolliffe, in addition to his new duties, will continue the position he has held for some time as Chief Engineer of the RCA Laboratories.

After serving as instructor of physics at West Virginia University, and from 1920 to 1922 at Cornell University, Dr. Jolliffe became associated as physicist with the Radio Section of the Bureau of Standards. His research was in radio wave propagation and the development and maintenance of standards of frequency.

You Can Hear
A **LL** *the News!*

Now is the time to listen in to world news . . . and you can with a Hallicrafters SX-28. Engineered for precision performance no matter what the operating circumstances may be. Shortwave radio listening is an exciting adventure especially when you are using a fifteen tube Hallicrafters SX-28 with its six bands and a frequency range of from 550 kc. to 42 mc. This short wave receiver incorporates every necessary feature to insure top quality shortwave reception. Ask your Hallicrafters distributor.

the hallicrafters co.
CHICAGO, U. S. A. *Keep Communications Open*



COMMUNICATIONS

Communication Technicians Needed By Government

WASHINGTON.—The United States Civil Service Commission has announced examinations for two types of positions for persons experienced in communications work. The first is for telegraph operator, \$1,800 a year, and the second for communications machine operator (multiplex, simplex, or teletype), \$1,620 a year. The Commission expects various Government agencies to make heavy demands upon the employment lists established as a result of these examinations.

All the appointments will be made in Washington, D. C., and vicinity.

No written test will be given but applicants will be rated on their experience and other qualifications. To qualify as telegraph operator, applicants must have had at least 2 years of experience as operator on a Government or commercial wire, and must be fast senders with either hand or bug. They must be able to transmit plain and cipher messages at 35 words per minute. Applicants who cannot copy messages on a typewriter or whose experience has been on a train wire or in a small branch city office will not be considered qualified.

For communications machine operator, 6 months' experience is required in the operation of a page or tape teletypewriter, or other similar communications device. Three months of this experience must have been acquired in commercial

telegraph practice or in Government service. Applicants must be able to type by touch system at a sustained speed of 35 words a minute on a multiplex, simplex, or teletype machine.

Applications must be on file with the Civil Service Commission, Washington, D. C., not later than March 3, 1942. Copies of the examination announcement giving full instructions for filing, and application forms, may be obtained at first- and second-class post offices, or from the Commission's central office in Washington.

Opportunity Knocks

WASHINGTON.—The Navy offers an exceptional chance to "get in on the ground floor" of a new radio development—the radio locator, used for detecting planes and other craft. Enlistment of radio technicians for specialized training and duty in connection with this new device is now under way.

In order to secure men who have had practical radio experience, first enlistments are being made in the rating of Radioman Second Class, Naval Reserve. This rating pays \$72 per month, plus complete clothing, food, lodging, medical and dental care, and all other Naval benefits. Married men receive an additional \$1.15 per day dependency allowance.

Applicants must (a) be male citizens between the ages of 17 and 50, (b) be a high school graduate, (c) hold or have held an Amateur Class A or B license, or, if no amateur experience, be actively engaged in radio repair or service work or have had experience with transmitting or receiving equipment.

Men selected will be sent to a Naval Training School for an intensive eight months' course in mathematics and radio theory and its application to the locator devices. Pending completion of the Navy's new Radio Material School on Treasure Island in San Francisco Bay, students will attend the Radio Training School at Noroton Heights, Conn. (if enlisted east of the Mississippi River) or Los Angeles, Calif. (if enlisted west of the Mississippi River).

Students who successfully complete the course of instruction may be recommended by the Officer-in-Charge of the School for advancement in rating up to and including Chief Radioman (at \$99 monthly, plus allowances).

This training and duty in connection with the new and secret radio locators will prove especially attractive to the man who wishes to make radio his profession, since it embraces a branch of the radio science which will have many commercial applications when the emergency is over.

All Navy Recruiting Stations are prepared to provide any additional details that interested, qualified radiomen may desire.

Hams—Take Note!

WASHINGTON.—Eugene SeEVERS, Jr., Clinton, Iowa, George K. Lemke, Phoenix, Arizona, and Walter E. Marrs, Pine Bluff, Arkansas, have had their amateur operator license suspended for remainder of term for communicating with a foreign station in violation of emergency regulations.

Orren Alfred Walden, Dallas, Texas, has been suspended for communicating with a foreign station in violation of emergency regulations and because of failure to keep a proper station log in violation of Commission's Rules and Regulations Governing Amateur Radio Stations and Operators, Section 12.136.

YOUR PLACE IN THE WAR ECONOMY

In a Democracy the people are free to listen—and the truth is told them. They are accustomed to hear what is going on—even while it is happening. It is vital to the national morale that radio continue to play its important role. To do so, good reception is as necessary as efficient broadcasting.

By maintaining broadcast receivers in good working order, you are performing a patriotic and important duty. You are helping to keep the nation united.

You can spot trouble and make repairs faster when equipped with dependable RCP Test Instruments—the biggest buys in radio.

We don't say that finer instruments aren't built. We say RCP Test Instru-

ments are designed to provide maximum flexibility for meeting every problem the serviceman will encounter. Why buy what you don't need and can't use? RCP eliminates the frills to give you the best service instruments at lowest prices. Compare them point for point with other makes.

RCP Test Instruments are available for civilian use only if qualified under P-100 preference rating. See your distributor for details. Have you RCP's big new Catalog No. 125—1942 edition? Many improved tube and set testers—the finest for your purpose—at rock-bottom prices. Write for it *today!*

MODEL 702 SIGNAL GENERATOR

Complete, only \$27⁹⁵



- Most complete instrument possible for modern service shop or experimental laboratory. Embodies latest improvements in circuit and mechanical design.
- Range 95 Kc. to 100 Mc. Direct reading. Continuously variable.
- Unmodulated, or modulated 30% at 400 cycles; 400 cycle output for external connection. Can be used with outside sweep circuit and wobulator for oscillographic wave analysis.
- Five-step calibrated attenuator, 1 to 500,000.

MODEL 446 AC-DC MULTITESTER

Complete, only \$11⁹⁵



- Hundreds purchased for school training and war use. Mass production makes low price possible. The equivalent of 25 instruments in one case, complete with batteries.
- Bakelite case 3" sq. D'Arsonval meter, accurate within 2%.
- DC voltmeter 0/5/50/250/500/2500.
- DC milliammeter 0/1/10/100/1000.
- DC ammeter 0/10.
- AC voltmeter 0/10/100/500/1000.
- Ohmmeter 0/500/100,000/1 Meg.
- Four decibel ranges—8 to 55.
- Four output ranges—same as AC volts.
- No instrument so complete at so low a price! Portable model, 446P, only \$13.95.

RADIO CITY PRODUCTS CO., Inc.

88 PARK PL. • NEW YORK, N. Y.

RCP dependable TEST instruments

PERSONNEL

Crosley Appointment

CINCINNATI.—Appointment of Ben T. Roe as manager of distribution of the manufacturing branch of The Crosley Corporation has just been announced by Robert I. Petrie, vice-president and general sales manager. In this capacity, he will have direct supervision of the field activities of the company's district sales managers throughout the country and their contacts with the company's distributors.

D'Alelio Appointed Chemist of G-E Plastics Department

NEW YORK.—The appointment of Dr. G. Frank D'Alelio as chemist of the General Electric plastics department, effective immediately, has been announced by W. H. Milton, Jr., department manager. In his new post Dr. D'Alelio is directly responsible for the direction and supervision of the plastics department's swiftly expanding laboratories and research activities. He will make his headquarters at One Plastics Avenue, Pittsfield, Mass., the principal unit of G-E's five-plant plastics set-up.

Sylvania Names New Assistant Chief Engineer

SALEM, MASS.—Named Assistant Chief Engineer of the Hygrade Sylvania Corporation, Radio Tube Division, is Walter L. Krahl, formerly Division Engineer of the Salem, Mass., Radio Tube Plant of the company.

G-E Appoints C. G. Fick to New Position

SCHENECTADY.—Clifford G. Fick has been appointed assistant designing engineer of the transmitter division of General Electric's Radio and Television Department, it has been announced by J. M. Howell, manager of the company's Schenectady Works.

Mutual Issues Statement on Radio Censorship

NEW YORK.—In connection with the government radio censorship instructions, following is a statement by Fred Weber, General Manager of the Mutual Broadcasting System:

"The Mutual Broadcasting System is confident that our affiliated and member radio stations will recognize the practicability and soundness of the newly-issued government radio censorship instructions, and will comply with them in all their programs which are transmitted to the network. These regulations, we believe, will help radio exercise its part in the great national war effort."

Paul Ware Heads Radio Club of America

PASSAIC, N. J.—That oldest of radio organizations, the Radio Club of America in continuous existence since 1909, has elected from among its members a true veteran radio amateur and professional, Paul Ware, to head its activities this year.

President Ware, or simply Paul to ra-

dio old-timers, has always been identified with radio matters. Born in 1893 in East Orange, N. J., he lost little time becoming a radio amateur, and has remained a "ham" to date. Since 1939 he has been with Du Mont Labs., Inc.

Television Put to War Time Use

NEW YORK.—Television, which has long been placed by the public in the ranks of interesting playthings, was lifted to the status of a defense weapon of national importance, when a television class in instruction for air raid wardens was broadcast by NBC recently in New York City, and relayed to the General Electric Company's receiver in the Helderberg Mountains near Schenectady, 129 miles northwest of New York.

Air raid wardens, police chiefs, fire chiefs, and their associates, who were in-

vited from the nearby villages of Altamont and Berne to witness the experiment at the G-E relay station, expressed the opinion that the television class was the most practical method of instruction yet devised.

RCA Sound Installations Make Record

CAMDEN, N. J.—RCA sound amplification systems now take to the sea in two recent unusual installations that are part of another record breaking month.

One of the two novel installations was the placing of a sound system by Sound Sales & Engineering Company of Houston, Texas, in a tug boat under construction at an Orange, Texas, shipyard. An interesting note of the installation is that the 6-watt amplifier supplies sufficient output despite the high noise level of the engine room.

PROFESSOR SQUEEGEE SMASHES THE ATOM

After walking to his desk, Professor Oswald Z. Squeegie, PDQ., COD, carefully wound his watch, dropped it into the cuspidor and tucked his chew into his vest pocket. Then he faced the eager, upturned faces of his class.

"Listen to me, you intolerable numbskulls," he shouted. "Today we're going to study the Atom. What's more, we're going to smash the Atom right here in this room. S'help me!"

The Professor paused, reached for a coughdrop, got an eraser by mistake and chewed it vigorously. Then he cleared his throat and continued:

"The Atom, as you ought to know but probably don't, is the unit of all matter. It is the alpha of everything—the smallest, theoretically indivisible portion into which anything can be divided and still maintain its identity. In that respect, it is a good bit like the salaries most of you will earn when you graduate—if you ever do.

"How to smash the Atom has long puzzled scientists, including myself. However, we won't go into that today. Instead, we'll deal with an entirely different type of Atom—the Sprague Atom Dry Electrolytic Condenser, appropriately named for its small size and great durability. This, however, is a type of Atom that *can* be smashed. What's more I'm gonna smash it!"

After ten minutes search, the Professor finally found an 8 mfd. 450 volt Sprague Atom in his cigar case—also a similar midget dry electrolytic of another make. These he connected into a weird electrical circuit on his desk. Then he slowly turned on the juice.



"Now," he gloated, "both condensers are rated at 450 volts and that's exactly what they're getting. As you see, nothing happens. We'll step the voltage up to 500. Now up to 525. Note that the other condenser is beginning to sizzle, although the Atom is still in good shape. Here we go to 550 volts—now to 575—now to—goodness me!"

There came an explosion not unlike that of a giant firecracker and the heads of the class suddenly disappeared beneath their desks.

"You're all wrong," shouted the Professor gleefully after order had been restored. "You thought I smashed the Atom—but I didn't. It was the other condenser that blew up—not the Atom."

Sure enough, the Atom on the desk was still connected—now hissing a bit under the strain of over 600 volts but functioning perfectly.

"The Atom," continued the professor, "is especially protected against blow-outs—against moisture, heat and whatnot. The way to smash the Atom is not merely a matter of overloading it. The way to smash the Atom is this."

The professor grasped an axe hung over a sign "Use only in case of fire." Swinging this with the skill of a woodchopper and shouting wildly all the while he brought the blunt end down on the Atom—again and again and again.

"There!" he screamed, gleefully looking at the shattered remains. "We've done it. We've succeeded where others have failed. That, gentlemen, is how to smash the Atom. Class dismissed."

A TYPE FOR EVERY DRY ELECTROLYTIC REPLACEMENT NEED



SPRAGUE PRODUCTS CO.

North Adams, Mass.

GOOD CONDENSERS — EXPERTLY ENGINEERED — COMPETENTLY PRODUCED

BC - RSA

Mutual Files Suit Against RCA, NBC for Ten Millions

CHICAGO.—The Mutual Broadcasting system has filed suit Jan. 10th in the United States District Court in Chicago for \$10,275,000 in damages against the Radio Corporation of America and its subsidiary, the National Broadcasting company.

The suit charges RCA, NBC, its officers and agents with engaging in "an unlawful combination and conspiracy

among themselves and with third persons, to injure plaintiffs by hindering and restricting Mutual freely and fairly to compete in the transmission in interstate commerce of nation-wide network programs."

The action charges that restrictive contracts by NBC with broadcasting stations deny the Mutual system an equal opportunity in obtaining business in cities where there are less than four full time radio stations.

Damages of \$3,425,000 under this alleged restricted competition in network broadcasting is claimed by Mutual. Under provisions of the Sherman anti-trust act a judgment for three times this amount together with attorney fees and costs and injunctive relief against continuance of the restrictions is sought.

Trammell Statement on Mutual Suit

NEW YORK.—Commenting on the suit filed in Chicago Saturday, January 10, by the Mutual Broadcasting System against the National Broadcasting Company, Niles Trammell, President of the NBC, made the following statement:

"This suit is the culmination of a series of attacks that have been instigated against NBC and the Blue Network by Mutual since NBC refused to sell to it important parts of the Blue Network.

"It should now be revealed that about two years ago the dominant interests in Mutual, R. H. Macy & Company and the Chicago Tribune sought to purchase parts of the Blue Network from us, which would have destroyed the Blue as a coast to coast network. By such elimination of the Blue these interests sought to diminish rather than to increase network competition. There would have been three nation-wide networks instead of four as at present.

"We refused to dismember the Blue Network. Mutual began campaigns in Washington and elsewhere, urging the adoption by the FCC of new network regulations which would enable Mutual to achieve the end it sought. Meanwhile, Mutual also induced breaches of contract between our Blue Network and affiliated stations, a fact which we will prove in these court proceedings.

Unity Is Strength

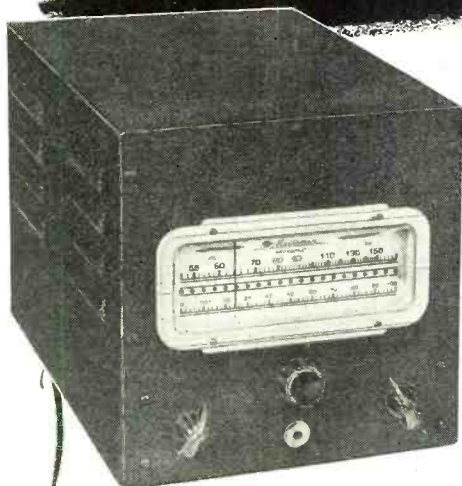
AT times like these the public mind is in an uncertain state. One class of people is going to spend freely, fearing for the future of money conditions. Another, and larger class, is going to be conservative and save wherever possible. In all probability, radio set sales are going to be hurt, but the public is going to demand that the already overworked servicemen keep their radios in first class repair.

We all know the trouble we have had in the past getting material and we realize that with our country actually at war, this condition is not going to improve. So the task ahead of us is a difficult one indeed, and our future depends upon how we handle it. We must play square with our customers, explain the conditions to them, make no promises that we cannot fulfill. We must value our time and sell it for enough to insure our continued existence in business and the maintenance of that business and of our equipment. We must receive enough compensation from our work to live the American way, but we must not take advantage of a war-minded public and charge unreasonably for our work. We're really not worried about many of our members being guilty of the latter.

More than ever, radio servicemen need organization. Organization to see that the servicing industry gets the rights due it as an essential industry in National Defense. Organization to safeguard the serviceman's interests in the necessities of war. Without organization, any group will be at a serious disadvantage during the years to come.

Above all else, let's all keep our heads, think carefully before making any important decisions and not be one of the many affected by war hysteria. We are all behind America and we believe we're not taking too much for granted in saying that we all stand ready to serve our country in whatever way we may be called to serve.—From the Danville Chapter RSA publication, "The Servicemen's Dirt."

High Fidelity P-A Tuner



Engineered for Highest Quality Reception

Meissner engineered and specially designed for highest quality reception from local or semi-distant powerful broadcast stations . . . provides the solution to many of the problems encountered by the modern Sound Engineer

where quality radio reproduction is required. Unusually noise-free T.R.F. circuit with band-pass transformers provide true high fidelity reproduction. Tunes from 535 to 1600 kc. to cover the regular broadcast band. Self-powered, operates on 110 volts, 50-60 cycles. Output connections provide impedances of 2,500 and 10,000 ohms; easily adapted for coupling into a 200 or 500 ohm line.

Model No. 10-1152 High Fidelity P-A Tuner Kit containing all necessary parts for construction (less tubes) including detailed instructions and pictorial diagrams—\$48.00 List. Meissner Kits are easy to build.

Write for New 1942 Catalog - Dept. RN

Meissner

MT. CARMEL, ILLINOIS

"PRECISION-BUILT PRODUCTS"

QRD? de Gy
(Continued from page 22)

unto itself a Secretary, Brother Mack Schaeffer, who has put more effort into the job than any one heretofore. What it'll get him we don't know but it got us a nicely mimeographed bulletin. Seein' as how they're looking for more members, we believe this broadside will do them more good than forty unpublicized smokers have done in the past. Incidentally, they're proud as peacocks over the exploit of their member, Brother George Newton, who was the op on the Robin Moor, the first American ship to be sunk by the Nazis. When questioned Brother Newton admitted as how he was the op on the Robin Moor and was also in charge of a boat with seven passengers in it which happened to be the first one to be picked up after 13 days in the lifeboat with very little to eat and only one glass of water per day. He sez, "Nearly lost two old people, aged 62, who were in the boat and believe it was only the fact that we gave them whiskey in their water, toward the last, that kept them going. We were given 20 minutes to unload by the submarine after which it fired a torpedo and 33 shells, which is contrary to what some of the papers said. They also gave us a little butter and some German canned 'bread' which consisted of potatoes and meat." Brother Schaeffer still can't savvy how come George held out on the whiskey so long. Or is that the truth and nothing but the truth swelpme'ord.

By the way, Dr. Lee DeForest, who outside of our President FDR, has had more newspaper and magazine space devoted to him and his inventions, is being commended and condemned in a recent issue of the Satevepost under the title "Magnificent Failure." This is the most true to life story which has ever been written about "Doc" and which we are most happy to see published. Although one can appreciate that this type of publicity cannot do Dr. DeForest's pride a bit of good, still we

feel that if the bigwigs in Washington will take notice of these articles some smart hombre amongst them will see to it that a laboratory be put at the disposal of this keen and brilliant mind. Ye Ed knows of the many practical ideas which Dr. DeForest has but to take out of the theoretical and place into the tangible practical field. His Terrain Altimeter is but one of these ideas which we

honestly believe would have averted the disaster which caused the deaths of Carole Lombard and twenty-one others when their plane crashed nose-on into a mountain. We hope a mere \$25,000 is placed at the Doctor's disposal to bring forth many more seeming miracles, the radio audion tube being one miracle which almost put the good Doctor behind the bars because it was so fantastic. So cheerio,

WINNERS IN THE RECENT CASH PRIZE CONTEST
Will Be Announced NEXT MONTH

STANDARD
with Experts

SUPER PRO and HQ-120-X

AN ENVIABLE record has been established by both the "HQ-120-X" and the "Super-Pro." They have been selected for service from Alaska to the antarctic and their outstanding performance is continually making new friends. It seems as though the more difficult the service the more likely you are to find a Hammarlund receiver doing the job. There's a reason for this too. Our receivers are built of parts which are made in our own factory where quality is more important than cost. Every "HQ" and "Super-Pro" has that built-in quality which can only be appreciated after you have had the pleasure of operating them. Try which ever falls into your price range and you will see why experts use Hammarlund receivers.

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Please send "HQ" booklet
 Please send "Super-Pro" booklet

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Address.....
City..... State.....



Canadian Office:
41 West Ave., No., Hamilton

HAMMARLUND

EXPORT DEPARTMENT, 100 VARICK ST., NEW YORK CITY

Doctor, good health and good luck.

Well, there seems to be all quiet on the union front. The ACA and the CTU-Mardiv both seem to find much to do so that argumentative bulletins attacking each other have completely disappeared. Or is this the American Way of cooperation between two hat-

ing rivals who have buried the hatchet for the duration? Life would be too smooth, too uneventful if this were the case. So we are keeping the old schnozzle to the ground and our fingers crossed. Peace, it's wonderful! But being one who believes that this is not the law of nature—that nothing

can remain stagnant—that there must be either a coalition or a rise and fall, we are watchfully waiting. A few months ago ye ed said . . . quote . . . Gentlemen of the Exalted Order of Brass Wrists, lend me thine ears. It would seem to this chair-side radiop

that something definite is about to pop loose, with the hand-writing on the wall becoming plainer every day. Our country is today confronted by hostile nations on our East and our West and hostile "citizens" from within. (We referred to Nazi, Fascist and Communist believers and/or sympathizers.) It is logical to assume that the first step of the proper law enforcement agencies will be to clear decks for action. And it is further logical to assume that subversives, their cohorts and followers will be gathered in this general sweeping process. "Birds of a feather . . ." is but too true. And although we hope and pray that the innocents will not suffer with the guilty, it is a foregone conclusion that many will be caught in the dragnet because of their past connections . . . un-

quote. Today we are in the midst of war and if ever we were right in the eyes of God, we are right in destroying those who mean us, our families, our homes and our country harm. Those of you who have had ideals, scruples or what-have-you against or opposite to those of this, our government, we say forget it for the duration and be thankful that you are even permitted to have thoughts. Here in America is this possible. Protect it, fight for it and cherish it. It's a top heritage we can't afford to lose. So with this for a thought we say cheerio, good luck and best 73 . . . ge . . . GY.

Remember Pearl Harbor



Official U. S. Navy Photographs

**Be prepared to meet calculated, vicious treachery.
Do your part; join your local Defense
radio communication net.**

YOUR services as a trained radio amateur are needed most on U.H.F. For your vital U.H.F. equipment, you will want to choose those tubes which are the national favorites, used by over half the amateurs on the ultra-highs. Hytron's HY75, HY114B, and HY615, probably already associated in your mind with top efficiency on U.H.F., will help you to provide reliable communication in emergencies.

A PROMISE

Can you depend upon Hytron for replacements of U.H.F.'s BIG THREE? Hytron has issued the following order to Hytronic Laboratories: "Delivery of the HY75, HY114B, and HY615 to the Army, the Navy, the United Nations, and Civilian Defense Communications, is mandatory." Production of all three tubes is increasing daily; there is no need for you to use second-best substitutes.

YOUR COOPERATION IS REQUESTED

order spares Before you take a tip from George Grammer to "keep a supply of spares on hand," give Hytron a reasonable amount of time to supply builders of initial equipment. Then insure yourself against accidents.

furnish priorities You amateurs who are being organized into emergency nets should urge your Defense officials to obtain priority ratings for your Hytron tubes. Such priorities supplied to your distributor will bring quicker delivery.



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MANUFACTURERS OF RADIO TUBES SINCE 1921

A DIVISION OF
HYTRON CORP.

**EXCLUSIVE
articles on
SOUND
NEXT MONTH!**

RADIO NEWS

Theory and Practice of Disc Recording

(Continued from page 19)

of the groove properly. Furthermore, the needle pressure should be as low as possible without taking the risk of improper tracking. The type of needle used for playing back the record should be chosen to match the radius of the cutting stylus. One precaution must be observed: **DO NOT USE NON-METALLIC** needles on instantaneous discs. These have a high coefficient of friction and will ruin the record after but a few playings. The material particles soon are ground into the record groove where they become deposited and act as an abrasive.

The effect of *dust* on a record is easily distinguished. A rapid increase in surface noise or "noise level" is heard if dust is permitted to settle within the grooves of the disc. Proper care of cut discs require that they be protected from dust by wrapping them in envelopes and by storing them in cool, dry places. Never use a brush to clean soft records. It is far better to clean them with a hard stream of cold water.

The third topic is that of "harmonic distortion." This is caused by a combination of faults in both equipment and in disc materials. Most recorders

are designed to cut from the outside-in on the disc. This is done so that the thread or "chip" will be thrown out of the way of the cutting stylus. To aid in this technique, the manufacturers have adopted a coating which is rather soft in texture and which, when cut, will have a tendency to shrink. This shrinking of the cut thread allows it to seek the inside of the record as it becomes shorter in length automatically. This offers convenience to the user but the results are impaired as far as quality of reproduction is concerned. If the coated surface is *too soft* the grooves will lose their shape after cutting has taken place. The effect will be a form of distortion called "harmonic distortion." The music will not sound natural and true and voices will take on an entirely different characteristic.

Another serious form of harmonic distortion is had when a record has been *overcut*. The volume output will be greater and the normal surface noise apparently lower, but the inability of the cutter and output tubes to handle the audio peaks will result in this form of distortion. Remember that the "normal cutting level" should not be interpreted as the range to employ in all cases. We must consider the instantaneous peaks when selecting the proper level. By making a study of test records cut at different

levels, we will soon find the "normal level" required for best results with a certain make of record disc and with a certain recorder mechanism.

Home recording technique permits the use of inexpensive discs. Naturally they need not be as accurately manufactured as those used by the more advanced recordist. High-quality discs such as those used in professional studios and at broadcast stations have a coating which is of far better characteristics than those used with the home recorders. The cut thread or chip is carried away from the cutting stylus by means of a stream of forced air. This removes dust particles from the surface of the disc at the same time. Others employ a suction system.

Some professional recordists have changed their equipment for outside-in recording. Frankly, this seems to be ill-founded. Possibly the change was made by considering that the finished disc took on a more finished appearance. The advantages of cutting from inside-out have never been overruled, and one cannot deny that this is the most satisfactory procedure to follow when cutting high quality discs. There is no thread problem and it permits the use of discs which do not rely upon shrinkage to keep the thread clear of the cutting mechanism.

(To be continued)

TRAIN AT HOME • LEARN RADIO *this easy way!*

GHIRARDI'S RADIO PHYSICS COURSE

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RADIO PHYSICS COURSE
BY ALFRED A. GHIRARDI

This 972-page volume gives you complete mastery of modern radio fundamentals.

Here is proof that you can cash in by training yourself at home in spare time by this quick, inexpensive method. S. M. Mutchmor, Director of Training, Canada's War Emergency Training Programme, writes: "We have just received six copies of Ghirardi's Radio Physics Course which we ordered. This is our second set. We find it excellent in training our radio Air Force trainees. . . . We are well pleased with your other books and can recommend their use to any school following the line of training such as we are in your country."

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Radio and the Victory Program

(Continued from page 11)

tion schedule concerns the tube. The situation has been effectively explained by one large manufacturer, who said that in 1941 they increased their output of glass receiving tubes by 17.7% and their output of metal receiving tubes by 18.8%. And in addition, inventory reserves of completed tubes were depleted by 24.4% as compared with 1940. The industry's problems according to this report may become serious, not only because of a lack of materials, but because of a lack

of adequate production facilities and trained personnel. When this report was issued, from 12 to 15% of the tube production was for the Victory program. In March this will become close to 30%.

There does not appear to be any serious shortage of materials for tubes, except nickel, and allocations are being made to meet current demands. As far as the steel is concerned, sufficient quantities of this metal are available for tube manufacture. This is true even though steel is on the restricted list of metals, too. In tube manufacture, the quantity of steel used is quite insignificant. For instance, out of an estimated steel pro-

duction of some 89 million tons, only 3,000 tons were used in tube production for shells and allied pieces. The weight of a metal shell, incidentally, is only 12 grams. Thus, as long as the supply of steel is allotted, tubes will be made, whether they be glass or metal, for steel is essential to both. If, of course, nickel is restricted, no tubes will be made either. However, that seems to be a remote possibility.

Tremendous demands for power tubes by the services is causing quite a strain on manufacturers. One company is building 357% more power tubes, 147% more cathode ray tubes and 256% more special purpose tubes than a year ago. In the latter part of 1941, 71% of the shipments were for the services, and every indication is that in 1942, shipments will be increased five and perhaps ten times. Thus shortages and delivery problems may occur in this department, rather than in the simple receiving tubes.

Standardization is still being studied and applied where practical. In the coming year, it will reach a new high in all types of parts, receivers and tubes. To effect economies in tubes, it is planned to make tubes that fit a multiplicity of applications, thus affording a degree of interchangeability.

Pooling of patents, resources, experience and technical skill, as recently initiated by the rubber, chemical and petroleum industries, may become a practice in radio too. Some companies have already indirectly applied this procedure in their subcontracting work. Others are certain to follow, and if not, may be forced to by the WPB, although it is hoped that this latter move will never come to pass.

Just how the Victory program will affect such development as television and frequency modulation is predicated on their accumulated value in the program. Thus far, it has been apparent that FM is becoming a vital factor in many mobile units. And cognizant, too, of its effective services to the police and utility companies, as well as to the public for air-raid signal transmissions in rural areas where the secondary service of AM transmitters is poor, authorities may put out the green light for continued development and manufacture. Air-raid demonstrations via television have demonstrated the intense usefulness of this medium. In a recent test course in New York City, officials reported that the wardens learned more from one evening's transmission than several nights of personal teaching. Other test programs covered air raid instructions to civilians. These, too, were received with great enthusiasm.

Thus it appears, as if two problem-children of radio may find their way to complete approval and acceptance because of the exigencies of the Victory program.

-30-

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READ RADIO NEWS!

Serviceman's Experiences

(Continued from page 23)

side where lots of kinds of sacrifice are a matter of choice." He blew a cloud of smoke toward the desk lamp. "By the way," he remarked, "Mrs. Johnson was in here yesterday telling me you were driving around during the air raid alarm we had last week."

I smiled and threw my left hand out sideways. "Everyone knew it was just a drill," I explained. "Why should I have stopped work?"

"Mrs. Johnson didn't like it," Al said, "and neither do I. What do you think those drills are for? It's one thing to have bravado, but it's another to get hurt and hold up three members of a hospital staff until your right arm grows in again!"

"Now, Al, that's going a little too far," I said. "After all, why should anyone have to—"

Al jumped up and threw his cigarette to the floor. I can't describe the expression he had, but it made me remember he had been overseas during the last war.

Did the boys in the Philippines or in Hawaii talk like that?" he asked.

"Did you talk like that when the Draft Board put you in III-a?"

I walked around him and picked up the list of calls for the day. All were within six blocks of the store. I picked up the tool-bag and walked to the door. Without looking at Al, I stopped to say, "I guess we won't have to take the truck out today."

"Good," he said.

I gritted my teeth, and—for the first time—walked to work. That tool-bag was heavy, too.

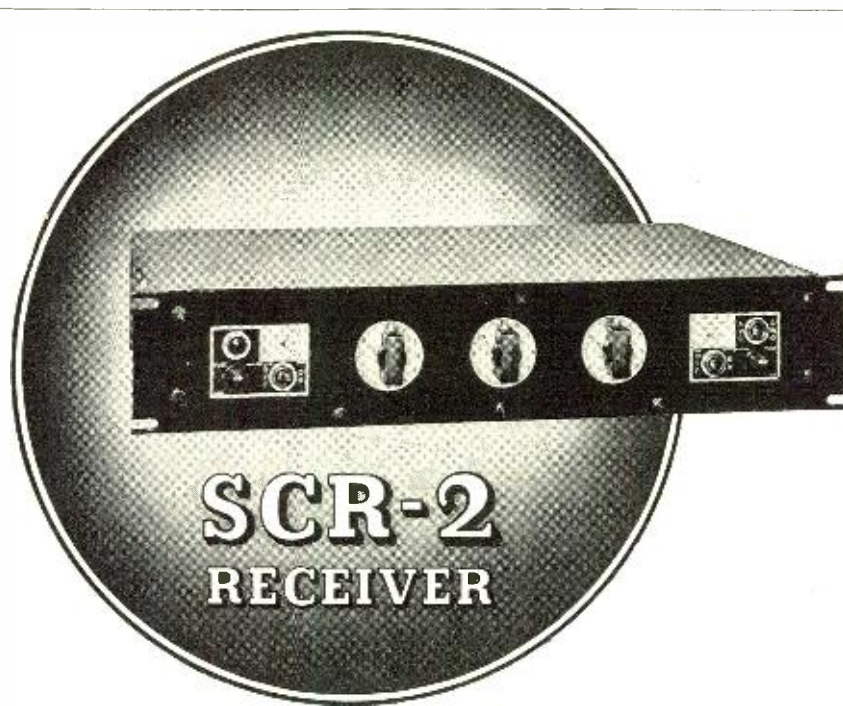
-30-

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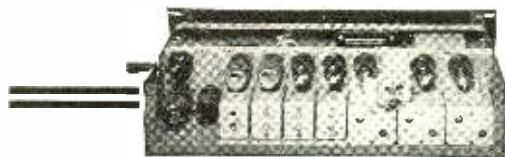
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Practical Radio Course

(Continued from page 29)

nized as excellent conductors, yet even they offer some resistance to current flow. This is important because it means that the resistance of an electrical circuit, as well as the applied electromotive force, influences the rate of current flow. That is, for a given applied e.m.f. more current will flow through a circuit of low resistance than through one offering higher resistance.

The basic unit of resistance is the "ohm" and this takes its place with the volt and the ampere as one of the most important of the fundamental electrical units. The ohm is the value of resistance through which an e.m.f. of 1 volt will drive a current of 1 ampere. Another unit, common in radio work, is the "megohm," equal to 1,000,000 ohms. Another variation is the "microhm," equal to 1/1,000,000th ohm.

Ohm's Law

It should be apparent from the foregoing descriptions and definitions that in electrical circuits there is close relationship between e.m.f., current and resistance. This relationship is summarized by Ohm's Law which

states: "The intensity of current (rate of current flow) in any circuit is equal to the electromotive force divided by the resistance of the circuit." This is more compactly expressed by the formula:

$$I = \frac{E}{R}$$

Here I = current in amperes
E = e.m.f. in volts
R = resistance in ohms

and by substituting actual values of e.m.f. and resistance for the electrical symbols of this formula the current flow in any circuit can be readily determined.

If any two of the three values are known for any circuit the third can be found by rearranging this formula. To find the e.m.f. required to drive a given current through a known resistance, the equation is:

$$E = I \times R$$

Or to find the resistance when the e.m.f. and current are known:

$$R = \frac{E}{I}$$

These formulas should be carefully memorized for they constitute a tool which the radio student will be called upon to use con-

stantly both in his studies and later actual radio work. There is one thing to remember in applying them, however. This is that because the values for actual radio circuits will frequently be in milliamperes rather than amperes, and megohms rather than ohms, it will be necessary to first convert these values into amperes and ohms before applying this formula. Thus 10 milliamperes would become .01 ampere, 2 megohms would become 2,000,000 ohms, etc.

Watts

Electric power is a term applied to the capacity of the electric current to perform work when made to flow through suitable apparatus, such as an electric motor or lamp. The unit of power is the "watt." One watt represents the power in a circuit when 1 ampere flows under pressure of 1 volt. The power in watts in a circuit is therefore determined by multiplying its volts by its amperes. Written as a formula, where W represents watts, it appears:

$$W = E \times I$$

It is an interesting fact, and a most useful one, that not only can this formula be added to the others given under the heading "Ohm's Law" above, but that from these others can be derived which enable us to calculate all of these four factors in a circuit if any two of them are known. Figure 1 gives the complete set of formulas employed in these calculations. The student will find it decidedly helpful to try out these formulas for himself by assuming a circuit in which certain values exist, such, for example, as E = 10 volts; I = 2 amperes; R = 5 ohms; and W = 20 watts. As a starter assume that I is an unknown value which is to be determined first from the known values of E and R, then from the values for W and R, and finally from those of W and E. Next assume that R is unknown and calculate it from the different pairs of known values corresponding with symbols shown in Figure 1.

Then repeat these operations to find E and W from the known combinations represented in this figure.

$$I = \frac{E}{R}$$

$$I = \frac{W}{E}$$

$$I = \sqrt{\frac{W}{R}}$$

$$R = \frac{E}{I}$$

$$R = \frac{W}{I^2}$$

$$R = \frac{E^2}{W}$$

$$E = IR$$

$$E = \frac{W}{I}$$

$$E = \sqrt{WR}$$

$$W = \frac{E^2}{R}$$

$$W = I^2R$$

$$W = \frac{E^2}{R}$$

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Fig. 1

It will be noticed that some of the formulas involving power introduce squaring and square root. The reason for this is that when the e.m.f. applied to a given circuit is, for example, tripled, the current will automatically triple. Therefore, the power, which is equal to the product of these two,

will be increased not three-fold, but *nine* times. It also follows that if the e.m.f. is reduced to one-third its original value, the current will also be reduced accordingly but the power will be $\frac{1}{3} \times \frac{1}{3}$ or $\frac{1}{9}$ of its original value.

In addition to the watt, larger and smaller derivatives are employed as units of power in different electrical applications. The kilowatt (1000 watts) is commonly used by power companies and also in radio, particularly in the terminology of radio transmitting equipment. In the radio laboratory the terms milliwatt and microwatt find wide usage as convenient means for expressing fractional values of one watt.

Voltage Drop: Potential Drop

When a source of e.m.f. is connected to a circuit the full voltage of this source is employed to force current through the circuit. If this circuit consists of two or more portions which are connected in series, the total applied e.m.f. will automatically distribute itself across these different parts in proportion to their resistance. Thus, in Figure 2, the voltage drop across the entire circuit will be 90 volts but that across each of the equal series resistors will be only 45 volts. This can be readily demonstrated by resorting to the formulae of Ohm's Law.

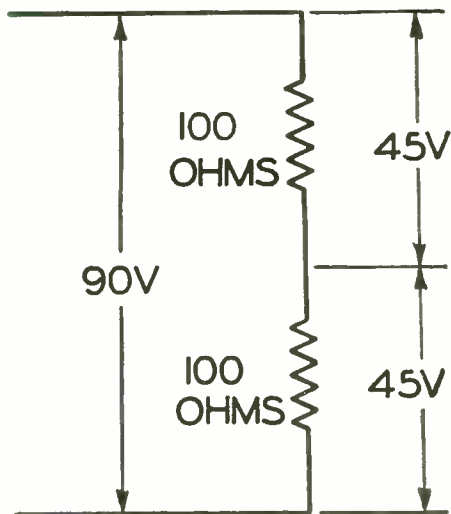


Fig. 2.

The current flowing through the entire circuit is:

$$I = \frac{E}{R} = \frac{90}{200} = .45 \text{ amp.}$$

Now with .45 ampere flowing through each of the two resistors the potential drop across each is obtained by:

$$E = I \times R = .45 \times 100 = 45 \text{ volts.}$$

These facts can be applied to excellent advantage when, for instance, it is desired to operate an electrical device from some source of voltage higher than that for which the device is rated, as when a vacuum tube with a filament rated for operation from a 5-volt source is to be operated from a 6-volt storage battery. In such a case it is only necessary to insert a dropping resistor of such value in series with the tube filament that a potential drop of 1 volt will exist across this resistor. The potential across the tube filament will then be the required 5 volts. The value of this resistor, assuming the filament is one rated for a current of .5 ampere, is figured thus:

The tube requires .5 ampere at 5 volts. Its resistance is therefore

$$R = \frac{E}{I} = \frac{5}{.5} = 10 \text{ ohms}$$

but the available e.m.f. from the battery is 6 volts, therefore, to permit a current flow of .5 ampere the total circuit resistance must be:

$$R = \frac{E}{I} = \frac{6}{.5} = 12 \text{ ohms}$$

With the total required resistance of 12 ohms, and filament resistance of 10 ohms it is apparent that the dropping resistor must be one of 12 - 10, or 2 ohms.

Such an application is shown schematically in Figure 3 (A). In (B) is shown a similar application where a resistor is inserted in the plate circuit of a vacuum tube to reduce the available 180 volt B-battery supply to the required value of 90 volts actually applied across the plate circuit of the tube.

Figure 3 (C) shows a very common application of this same principle, in which the

necessary negative grid bias for a vacuum tube is obtained by utilizing the potential drop developed across a small resistor inserted in series with the plate circuit of the tube. In a vacuum-tube circuit the plate current flow is said to be from the positive terminal of the e.m.f. source to the plate, thence through the conductive space within the tube to the cathode, and back to the negative terminal of the source. The most negative point in this circuit will, of course, be the negative terminal of the source.

Now, if a resistor is inserted between the cathode and this negative terminal as shown in Figure (C), a voltage drop will exist across this resistor because the tube's plate current will flow through it. Further, the upper end of this resistor will be positive in respect to its lower end, which means that the cathode is maintained at positive poten-

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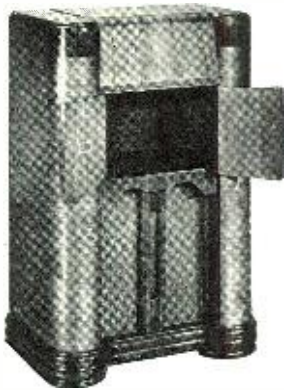
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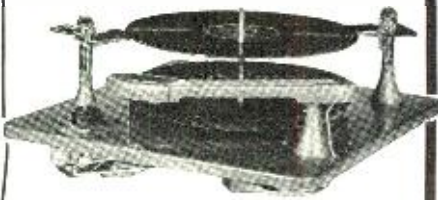
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tial in respect to the grid, which is connected to the lower end of this resistor. Thus the required negative bias voltage is applied to the grid (in respect to cathode). The value of this bias will depend on the amount of plate current flowing and the value of the biasing resistor.

We will later learn that the amount of bias voltage applied to the grid of a tube controls the value of plate current so that by increasing the bias the plate current is reduced. This method of biasing, therefore, tends to maintain plate current constant because any operating conditions which might tend to increase the plate current would result in increased voltage drop across the bias resistor. This in turn would apply a higher negative bias to the grid and thus bring the plate current back down to its normal level. This simple and fully automatic arrangement is extremely useful in preventing the overloading of vacuum-tube circuits and in generally stabilizing tube operation.

From the foregoing discussion it becomes apparent that the relationship of e.m.f., current and resistance is one of the utmost importance in all radio work. Thorough knowledge and understanding of this relationship is therefore absolutely essential to the student—a fact that cannot be too strongly stressed.

It is suggested that the student establish hypothetical problems for himself, involving the use of the various Ohm's Law formulas, and work them out as exercises designed to insure a full understanding of this relationship. The solutions of all such problems were to determine the e.m.f. required to force a certain current through a circuit of specified resistance, then, when the e.m.f. has been determined, work the problem again but this time on the basis of the e.m.f. and current being known and the resistance unknown. If the resistance value comes out the same as in the original problem, then the solution of that problem can be deemed to be correct.

(To be continued)

Radio in the Artillery

(Continued from page 8)

but especially so of team work training. At first the student is placed in a reduced distance net where he can see the other stations with which he is working. Traffic of the kind he will be called upon in war to transmit is given to him. After he has settled down and begins to get the feel of the work, the distances are increased until normal war time distances are being used. When he has obtained proficiency in team operation, he is then taken in the field under simulated battle conditions to learn how to work in fair weather or rain, day or night.

It must be obvious to everyone who reads the news, that the communication system of an army is its nerve center. In the artillery, communication is vital. A cannon is almost useless when the system, through which it is being directed, fails. In the fast moving action of today's fighting, the radio is the quickest, and often the only, means of communication that can be installed.

A soldier who is assigned as radio operator carries in his person a big responsibility. His success in always

establishing and maintaining communications allows his commander to use to the utmost the skill in battle possessed by the commander; while his failure in establishing communications may spell defeat, or at least deprive the troops for a time of the leadership of their commander.

Equipment

All Army radio equipment follows standard design and procedure, but it does have modifications and special adaptations because of the specialized requirements which it must meet. Field radio equipment must possess a certain degree of mobility and be capable of dependable operation regardless of weather and terrain conditions. Power sources and antenna systems present the greatest difficulties. Army radio sets use two methods of obtaining power. First, of course, is the use of batteries but this is only practicable for the very lowest power sets because of the short life of batteries which are light enough to be easily carried and the difficulty of obtaining replacements under field conditions. The second major source of power is the generator, either hand-operated or driven by a gasoline engine. This method is more favorable, but is characterized by greater size and weight.

The radio equipment of the higher echelons of the Army, which is operated and maintained by the Signal Corps, may closely resemble commercial installations in size and complexity, because of the long transmission ranges involved and the relative immobility of these higher headquarters. The radio equipment of the Field Artillery, however, must be adapted to rapid and easy movement because the Field Artillery seldom remains in one position for any great length of time.

For this reason the sets must be simple enough to be set up and taken down quickly and the power supply equipment must be compact and light enough to be easily transportable. Since these lower echelons are farther forward in battle, some consideration must be given to concealment of all elements of the radio sets, because if the enemy can locate our radio sets he has automatically located our command posts and can quickly silence the entire Artillery unit. Fortunately, however, these sets are not required to transmit as far as the sets of higher headquarters and can therefore use lower power and still obtain dependable communication.

Because the Field Artillery radio sets have requirements different from those of the higher headquarters, the sets themselves and their operation differ considerably from the sets operated by the Signal Corps. The bulk of the radio traffic consists of highly specialized transmissions relative to the handling of Field Artillery fire missions. For these reasons it has been found simpler to train Artillerymen to operate their own communication equipment than to have the Signal Corps provide this communication.

Therefore the Field Artillery School at Fort Sill, Oklahoma has three-month specialist courses for those officers and soldiers who will be concerned with the installation, operation and maintenance of communication in the Field Artillery. These courses go quite thoroughly into the theory and construction of the radio sets which will be used by these officers and men. They are trained in the use of voice procedure as well as the use of the International Morse code.

Many of the messages which are handled will be encoded or enciphered to obtain secrecy, but this, of course, will have no effect upon the manner in which they are transmitted except that cryptographed messages can normally be sent over the radio faster using continuous wave telegraphy than by using voice operation. Several of the sets can be used for either type of transmission but others are intended to be used for just one purpose and are designed to use only the type of transmission which is best adapted to that particular purpose.

Before considering the sets themselves it might be well to mention the requirements the Field Artillery imposes on its radio equipment. There are three primary conditions under which Field Artillery radios may be required to operate:

1. Operation from a moving vehicle for controlling and coordinating truck columns on the road and for providing a means of command for the highly mobile Anti-Aircraft and Anti-Tank defenses in the Field Artillery. A set for this purpose must be rugged, fairly powerful, and have a simple antenna system. Its power can be supplied from the vehicle and its weight is of secondary importance.

2. Operation while being carried on foot across country. Forward Observers and Liaison Officers will be forced to depend upon a set having this characteristic. It may be quite low powered because the normal transmission distances will be short but its power supply must be integral with the set. Its antenna should be simple and light in weight. The entire set must be an easy one-man load.

3. Operation from the vicinity of Headquarters which are relatively stable. These sets must have enough power to assure reliable communication and yet be light enough to be carried (in several loads, if necessary) on foot from the transportation to the point of operation. Their antenna systems need not be so simple and their power may be obtained from hand-operated generators.

The Field Artillery vehicular radio set is capable of dependable operation for short distances. It is quite heavy and is permanently mounted in the vehicle. Power is obtained from the 12-volt ignition system of the vehicle by means of a dynamotor. The antenna is a flexible steel rod fifteen feet high, mounted on a special insulated mounting on the side of the vehicle. Continuous Wave, Modulated

Continuous Wave or Voice transmissions are used. The receiver is a modern communications-type superheterodyne.

The transmitter uses five tubes and may be crystal controlled. This set utilizes voice operation when it is used in the Anti-Aircraft Anti-Tank warning service and the transmissions are short, brief warning messages. These messages are directed to the Anti-Aircraft and Anti-Tank elements of a unit and are useful to coordinate all of these activities when and where they are needed. The information transmitted is acted on so quickly that the enemy cannot change his method of attack in time to avoid the defenses against him and therefore clear-text transmissions may be safely used to obtain maximum speed. When the set is used for column control either clear-text or encoded messages are used depending upon whether or not the transmitted messages could be useful to the enemy.

The other mobile Field Artillery set is commonly called the "walkie-talkie." It is light in weight and is designed to be capable of operation while strapped on a man's back, but more satisfactory results can be obtained if it is operated from a suitable location on the ground. The power for the set is derived from a self-contained battery pack, attached to the bottom of the set. The antenna is a twelve section collapsible rod, mounted vertically on top of the set. When this set is used from a fixed location or set-up on the ground the antenna is fully extended, but when operated while strapped to a man's back the antenna is collapsed to one section. It may be operated from a moving vehicle by substituting a flexible steel antenna similar to the one used with the vehicular radio set. The set uses voice type transmission only and is capable of dependable operation over short range, which makes it very well suited for communication from the Forward Observers and Liaison Officers.

A saving in weight is accomplished by using a two-tube transceiver circuit, utilizing a superregenerative detector in the receiver. The set operates on u.h.f. Since it is used only to transmit fire missions which are acted upon immediately, this set can be used exclusively for voice transmission, making very little use of codes for obtaining secrecy.

The Field Artillery has four sets whose transmitters are powered from hand-operated generators and, therefore, must be set up on the ground to operate. These sets are used between Headquarters or other points which will be fixed for relatively long periods of time, considering the frequency with which modern-day Artillery displaces. Since these sets are operated from comparatively fixed locations, full advantage is taken of more elaborate antenna systems and antenna systems with directional characteristics. One of the above men-

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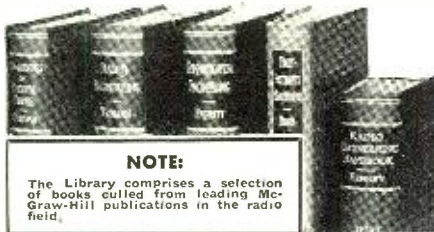
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tioned sets uses a loop antenna. Two of the sets use horizontal antennas which are strung between trees.

The fourth set is used for communication with airplanes and should not be directional, so it uses a sectional steel rod, erected vertically. The three sets, other than the one using the loop antenna, utilize a form of counterpoise system to obtain uniformly good ground characteristics over the varying types of terrain on which the Field Artillery operates. Each set covers part of the frequency band in the medium wave band. The set used for communication with airplanes uses continuous wave, tone modulated continuous wave or voice transmission; the others use continuous wave transmission.

The receivers are all battery operated. A minimum of two men is required to operate each of these sets; one to crank the hand-generator, the other to do the actual operating. The air-ground radio set can handle traffic relative to reconnaissance or observations of the enemy, or it may be used for fire missions when the observer in the airplane is directing the fire of the unit on such targets as he sees. When fire missions are being transmitted, speed is of paramount importance and no use is made of codes or ciphers to obtain secrecy; but when observed enemy information is being transmitted it will normally be encoded. The other three sets are used between headquarters for the handling of tactical messages and will normally use continuous wave transmissions which are made secret by the use of codes and ciphers.

As with any complex equipment, the results obtained from radio sets directly reflects the capability of the operating personnel. Since all Field Artillery radio equipment is necessarily low power, it should be carefully used and handled to obtain maximum results. Repairs, however, will occasionally be required and radio operators in the Field Artillery are trained to make minor repairs and make full use of field expedients to keep their sets in operation. Field repairs include replacement of defective tubes, batteries and broken parts, resoldering broken connections and other repairs which require no elaborate testing equipment.

The Field Artillery has only one piece of laboratory-type equipment to use in the maintenance of its sets. This is an extremely accurate heterodyne frequency meter which is used to accurately calibrate radio sets in the field. This is a very important piece of equipment because there will be a great many sets operating at the same time and to prevent mutual interference they must all operate, as nearly as possible, on the frequencies which have been assigned them. When more difficult repairs are necessary, the Field Artillery radio sets are serviced by the Signal Corps, which has the necessary facilities and stocks of parts.

Aviation Radio (Continued from page 28)

corroded. The question was: "What should be done?"

Equipment that has been in salt-water should be washed clean with good cold clear water. After a thorough washing, each individual part should be wiped as dry as possible and the whole unit placed in an oven and gradually dried out. A box containing two 75 watt bulbs makes a fine drier. When the equipment is dry, those corroded parts requiring scraping should be first washed with a solvent (Carbon-tet) and scraped with a tool commensurate with the size of the part being cleaned. The corrosion should be taken off by scraping as lightly as possible so as not to injure the metal beneath.

On metal supports (chassis separators, etc.) corrosion may be removed readily by using steel wool. When using steel wool, however, it should be borne in mind that just one strand of the material between socket connections provides a very nice path for current. For this reason its use is not encouraged around tube sockets or near terminal strips. Heavy sandpaper should never be used for removing corrosion from any part of a piece of equipment, because it tends to scratch.

Very little trouble is experienced with volume controls that have met a designer's specifications. Wear is inevitable in any control, however, which produces noise, intermittent operation, etc. Where long remote control cables are connected to the volume control shaft through a metal sleeve, it should be as tight as is permissible without introducing "side play" which always proves to be a "bugaboo" to good mechanical operation. When an excessive amount of extra cable is necessary in order to cope with structural bends within the aircraft, the clamps holding the cable should be mounted as close to the receiver and remote controls as possible to provide stable operation; leaving just enough slack to cope with vibration along the cable which may be carried to the receiver and remote control unit.

Even the best receivers, like a good dependable watch, require periodic service. Ease of inspection and possibility of replacing parts quickly and simply are qualities essential to radio equipment which today is nearly as vital to flight operations as the aircraft itself. Every component and each wire should be readily accessible and should be easily replaced. Frequency coil sections should be easily removed and tubes should be removed by first providing a minimum amount of paneling or metal covering. Sockets should be shockproof and each should be provided with a band for holding the tube in place.

Sets designed for Arctic service are treated a little differently than those

designed for use in the warmer regions. Now that receivers designed for aircraft must sometimes encounter extremes in temperature in both the low and high scales one will find a predominance of "world wide" units on the market. This is true of those sets manufactured within the last eighteen months.

In order to standardize design for mass production purposes, our authorities have taken it upon themselves to coordinate ideas on design of units for military aircraft. This will mean greater set output and fewer maintenance difficulties. Because standardized test equipment will also be manufactured for testing the new equipment, the aviation radio serviceman's job will entail no new research work or methods consequently reducing maintenance and installation time.

If an airplane can land and within a few minutes be on its way, the necessary maintenance work being performed by a technician skilled in the employment of the new instruments, it stands to reason that the time thus saved will subsequently be utilized to good advantage in many ways. This points toward efficient air combat. After all, speed is a very important factor in modern day air fighting; as is radio for directing and coordinating air combat. Without efficient air radio communication modern day combat's efficiency would be greatly lowered.

The RA-1 Aircraft receiver mentioned in the foregoing part of this column is an eight tube superhet whose frequency range is 150 to 15,000 kilocycles (Model RA-1B). The model RA-1J's frequency range is 150 to 20,000 kilocycles. The latter receiver being slightly different for the higher frequency accommodation. It is equipped so that direction finding is made a simple matter by adding a shielded loop, loop amplifier, and azimuth control.

RCA is now manufacturing the new AVR-100 and AVR-101 Receivers. These are among the smallest and the most powerful for their size ever designed for light aircraft. Each receiver is a complete five-tube superhet and are so small that they can be mounted readily in a standard 3" instrument hole on the aircraft's instrument panel. The AVR-100 covers the frequency range of 550 to 1500 kilocycles and the weather and beacon band from 195 to 504 kilocycles, while the AVR-101 covers the latter band only. Directional loops may be used with these receivers without using a separate matching kit. Either dry-battery pack power may be used or power obtained from companion transmitters power supply. (AVT100 or the AVT-111.)

A high-powered multi-channel aircraft transmitter having an output of 100 watts on any one of eight pre-tuned channels in either the domestic or foreign aviation bands is being manufactured by Bendix Radio Corporation. This transmitter has been

around the world with Howard Hughes and to the South Pole with Lincoln Ellsworth. Channel selection is accomplished by employing a motor-driven remotely controlled channel selector. It utilizes six tubes and one meter is utilized for tuning. The frequency range is 300 to 15,000 kilocycles. (Type TA-2).

As was predicted sometime ago by this writer, UHF aids to flying would be used more and more by the Airlines. It now appears that UHF will "be all out" now that most of the final testing of ranges, etc., has been completed. From current news releases the Airlines are contemplating on utilizing UHF exclusively for communication other than point to point. More about this later.

Keep 'em flying.

-30-

Economy Signal Tracer

(Continued from page 14)

through resonance. After the unit is performing properly, the dial should be calibrated using an accurate signal generator. Convenient points may be marked in pencil and when calibration is completed, inked in. The commonly used i.f. frequencies such as 175, 282.5, and 455 kc. should be marked for ease in setting.


If it is desired to build this unit without the output stage, in the interests of economy, a smaller power transformer such as the Thordarson T13R19 may be used. In this case it will be necessary to use a filter choke in place of the field coil such as a Thordarson T13C27.

Application

The technique of Signal Tracing has been covered many times. An excellent treatise on this subject was contained in the article "Easily Built Signal Tracer" in the December, 1941, issue of RADIO NEWS. In addition, several books have been written on this subject. It is only after the operation of a Signal Tracer is thoroughly learned that its great versatility can be appreciated. Intermittents are found easily by use of one of these instruments, simply by connecting the Tracer to the suspected portion of the set and waiting for a fade. In addition, a.v.c. voltages, oscillator output, and audio voltages may be measured by means of the V.T.V.M.

The actual gain of stages may be checked by means of the r.f. channel with the V.T.V.M. in the r.f. position. Shorted turns and open coils are found easily by this method. A.f.c. alignment may be checked by using the V.T.V.M. on each side of the discriminator transformer and the a.f.c. voltage developed measured with no current being drawn from the source. All-in-all, innumerable uses will be found for this instrument and its value grows appreciably the more it is used.

-30-




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Book Review (Continued from page 28)

are so closely allied with automatic record changers, a description of their mechanisms, their functioning and operation have been included in this book, together with the data concerning methods of recording, types of records, cutting needles, etc. The same is true of the electric phonograph. A description will be found in the text of the several types of pick-ups and needles, as well as their proper use and operation.

The latter portion of the book is devoted to the manufacturers' service data, which covers practically all the automatic record changers and recorders on the market at the time of writing. These data are more comprehensive than those pertaining to radio receivers, as notes on the functioning of the devices, their adjustments and care, have been supplied in most cases by the manufacturer.

Not only is the text section indexed, but an extensive cross-reference index indicates with a minimum of effort just which record changer or recorder is used with any particular radio-phonograph combination and where the data covering the changer or recorder can be found in the book. Also the record changers and recorders are listed under their own maker's name, as well as being indexed as mentioned above. The data have been arranged in the same way that has proved successful in Rider's Manuals.

"RADIO GOES TO WAR" by Charles J. Rolo, published by G. P. Putman and Sons, 2 W. 45th St., N. Y. 285 pages. Price \$2.75.

After an introductory chapter that takes the reader on a 24-hour tour of the international radio front, Mr. Rolo analyzes the strategy of war by radio and evaluates the power of this new instrument of conquest. Follows a chapter on the history of international broadcasting, covering its use by Leon Trotsky in the First World War, the experiments of Dr. Frank Conrad in the U. S. A., radio in the Spanish Civil War, Nazi Germany's offensives against Russia, Austria, and Czechoslovakia, and the attempts of the Axis to win over the Arab World.

The most notable development after war began in Europe was the German radio campaign against the British Isles. Prominent in this discussion is the amazing story of the fabulous Lord Haw-Haw—"World Radio Traitor No. 1."

General De Gaulle became the first Radio General of the Second World War when he broadcast the call to arms that rallied more than half of the French Empire, and brought a fighting France back into the struggle against Hitlerism.

A gripping chapter on secret stations in Europe is based on facts supplied by a former leader of the Austrian "Freedom" movement, who himself organized anti-Nazi broadcasts from mobile transmitters operating in Austria and Czechoslovakia.

Mr. Rolo concludes with several heartening chapters on the American situation.

"SERVICE NOTES on Record Players, Automatic Changers, Wireless Units and Home Recorders," compiled by M. N. Beitman, published by Supreme Publications, 328 South Jefferson St., Chicago, Ill. Contains 128 pages 8 1/2" by 11". Price \$1.50 This valuable manual for the radio serviceman includes information required to service most of the popular units now in use by the radio public. It gives specific information and detailed instructions for repairing hundreds of different machines used for the making and reproduction of records. Re-

orders and reproducers get out of order quite frequently. The many types of changer mechanisms require complete reference data if they are to be serviced intelligently. This manual has been designed to furnish information that will serve as a handy guide for taking care of this type of equipment.

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Poor Man's Recorder (Continued from page 27)

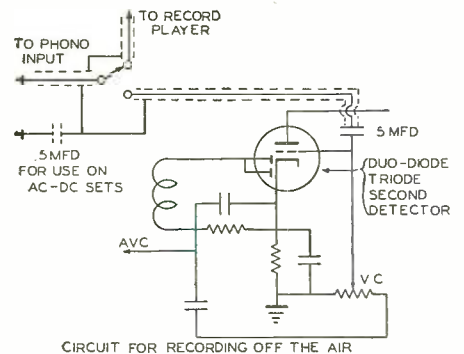
rately mounted and a 4-prong plug used for inter-connections.

Using an 8 ohm cutting head, such as in this unit, makes switching a simple matter. A single-pole-double-throw rotary switches from speaker to cutter. The crystal pickup is connected permanently to the phono input. The phono gain control can be left in an advanced position permanently, leaving the only control to manipulate the microphone gain control and the playback-record switch.

The assembly of this recorder does not require any particular precautions other than the use of good common sense. In assembling the parts of the amplifier, keep the input circuit at one end and the output circuit at the opposite end of the chassis. Never allow any of the leads carrying a.c., or the filter choke, to be placed near the input circuit. The phono lead which runs across most of the chassis has a shielded braid over it, as you will note in the photo. Use insulated tie points freely, and the unused contacts on the sockets to anchor fixed resistors and condensers.

The a.c. switch for the amplifier is part of the phono gain control potentiometer. Locate the socket so that the shortest path is provided for grid to plate coupling condensers.

It goes without saying that wiring should be done slowly and carefully. Solder all connections securely using



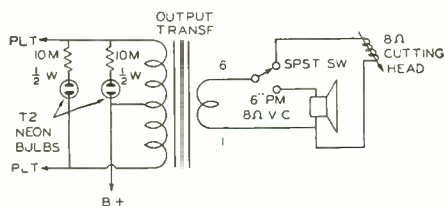
rosin-core solder only, never rosin paste or acid. A hot well-tinned soldering iron is essential. Apply the iron to the connection to be soldered, allowing the connection to become hot enough to flow the solder, and using only enough solder to make a good bond.

The basic recording unit is provided with six spiral springs. The springs are mounted 2 to a bolt, one on each side of the mounting board. This permits the unit to float above the board by a fraction of an inch and prevents

vibrations from getting into the amplifier and being amplified by a microphonic tube. Not shown in the diagram is a splice in the a.c. cord to the amplifier, to which the line to the recording motor is connected. The recording motor has its own switch.

The circuit for making records off the air, represents a method of connecting to the average superhet receiver. While it was not used in this recording unit, we offer it to those who might want it.

The neon bulbs are mounted to the case by means of clips especially designed for them and available at radio



parts suppliers. These clips each have two wiring tie points on them.

A few closing words regarding the adjustment and the operation of the recorder. This recorder cuts outside-in at 110 lines-per-inch. The feed screw mechanism is simple and requires no adjustment. The cutting head has two screws, accessible from the top, which regulates the height of the cutting head above the record blank and the pressure of the needle on the record blank. The head should be adjusted to ride as low as possible above the blank, and yet allow free movement of the needle for any irregularities on the blank. The depth of cut should be adjusted so a thread is cut which will have about the thickness of a human hair.

Remember that the cutting needle must be replaced occasionally, the frequency of replacement depending upon the quality of needle you purchase. A dull needle will result in excess noise, a poor cutting thread and a tendency to chatter as the record blank passes under it. For home recorders the playback needle may be almost any type. Its life will be rather long because there is very little wear on plastic recording blanks.

It takes a few trials before you become acquainted with the proper "level" for recording. It should be well above the normal noise level of the blank and yet not to the point of overcutting. Overcutting is evidenced by an echo effect in the playback. Extreme overcutting will result in the playback needle skipping a groove. The better the record blank you can afford to buy the better will be the quality of recordings. A higher priced blank is smoother and has much lower noise level.

As mentioned before this recorder lacks some of the refinements of a professional type unit, but you will have a lot of fun building and operating this unit and you will find that the quality is good, considering the price.

-30-

Defense and the Amateur

(Continued from page 31)

over. Such as are permitted to operate will do so as units of authorized nets. Once the net is authorized, then its individual members will receive their authorization.

The recommended procedure is to take the matter up with your local defense authorities and through them, or with their permission, with the county or other sectional officials. Where plans have not already been laid for a communications net it is a common practice for defense officials to appoint a ham or a committee of hams to make recommendations and draw up an organization on paper. When this has been done it will be the time for this official to take up with the Defense Communication Board in Washington the matter of obtaining authorization to put the proposed plan into effect and licenses for you and the other participating amateurs.

What Band for Local Defense?

MORE and more the opinion is growing that the 2½-meter band represents the most logical one for local defense communication operations. The maximum distances covered by transmitters operating on these frequencies are short enough to make reception impossible in enemy countries, or even in enemy submarines or other water craft more than a few miles off our shores. Receivers carried by enemy planes might be able to pick up our signals at somewhat greater distances but when they came within suitable range to do this they would be getting into the range of our interceptor forces and within a matter of moments would have far more important things to do than to eavesdrop on our local defense communication nets.

To a lesser degree this same would hold true for 5-meter operation but we know that under favorable conditions such as occur frequently during the summer months, the 5-meter transmission range extends to several hundred miles and on occasion even to thousands of miles. The lower frequency bands are, of course, hopeless from this standpoint because of their DX ranges.

At this writing it appears definite that the government is again about to authorize ham operations for defense but indications are that activities will be limited to 2½ and 5 meters, with some operation on 80 meters for special purposes. Pure logic seems to indicate that the 80-meter service will be extremely limited, for the above reason.

There has been some talk to the effect that enemy bombers might be able to use even 2½-meter amateur signals as beacons to guide them to their desired destinations. The danger of this seems negligible. They could use our broadcast stations far more advantageously for this purpose while far

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out to sea. By the time their presence was detected, the alarm given and the broadcast stations silenced, their navigators would have their calculations so complete that little further would be gained if they were, on approaching the coast, able to hear the signals of some 2½-meter net. But even aside from this, there is a very great question as to whether the signal from a typical "wobulated oscillator" transmitter on 2½ meters would be of any use to them for direction-finding purposes. It is indeed far-fetched to suppose that our enemies would equip their planes with 2½-meter rigs capable of use as direction finders when there are any number of other types of more powerful transmitters operating on lower frequencies which they could use as beacons. Such, for instance, as the various police and other fixed services.

From the standpoints of simplicity, economy, portability and flexibility, 2½-meter equipment is preeminent. Rigs designed for 1¼-meter operation might be even better in some of these respects but would have the drawback of greater technical complications. Moreover, there is little if any 1¼-meter equipment available commercially whereas there are several 2½-meter outfits available in radio stores—some of them designed expressly for this very emergency service. Equipment for 5 meters is complicated by the requirements for frequency stability which means more tubes and more power, therefore reduced portability, not to mention increased cost. Further, a 5-meter antenna must be double the size of similar types for 2½ meters.

Probably the greater part of the portable amateur equipment in existence today is for 2½ meters, therefore in many communities there is already a nucleus for a 2½-meter net. In some there may be more 5-meter portable equipment and in these probably rare instances it may be more practical to establish the defense net on 5 rather than on 2½. Even in such cases, however, there is food for thought concerning the advisability of switching over to 2½ to gain the advantages of greater compactness of both receiving and transmitting equipment (or transceivers) and antennas.

For purposes of illustration, suppose we assume a situation where in a certain community there are ten hams who desire to organize for local defense work. One of these has a 100-watt, 5-meter transmitter in his shack, two others have 5-meter mobile rigs. The other seven have no ultra-high frequency equipment. Considered dispassionately, what would be their logical move?

In the first place the 100-watt transmitter could be counted out for emergency service unless provided with some source of supply other than the electric light lines. In case of an actual air raid these lines may be damaged—or if they are not, it is conceivable that they may be cut off to en-

force instant blackout. This rig would therefore need a husky emergency generator and a gas engine or other power to drive it. With such it would probably constitute a logical fixed control station; without it, it would be too undependable to be considered in an emergency role.

To make the two mobile 5-meter outfits most useful would require that the seven hams without u.h.f. equipment equip themselves for 5 meter operation. Superregenerative receivers would serve their purposes, therefore the cost of the receiver equipment need be no higher than for 2½ meters. Moreover, they could build up combination transmitter-receivers in which the audio tubes could serve both as modulators and receiver amplifiers. Even in this case, however, the transmitter portion would have to be capable of putting out a stable signal and this would mean at least one if not two more tubes than would be needed for a 2½-meter modulated oscillator. In turn this would call for a power supply capable of higher plate current. Multiply these extras by seven and the figure would probably come out considerably higher than the cost of converting the present 5-meter rigs to 2½.

Even the high-power fixed station (if it has emergency supply) could be converted to 2½ without too much difficulty or expense. Changing a push-pull final over to push-push would provide a simple means for doubling to 2½ in this stage and would perhaps involve no more than changing a few wires. Or a 2½-meter final-doubler could be built up and driven from the reduced output of the 5-meter final.

It would seem that, in consideration of all the circumstances, the best bet here would be to organize a 2½-meter net. The overall cost to the hams would be less, they would be unified as a single operating group, their equipment would be more convenient for portable work and for given power input would probably be just about as effective for the desired purpose as would 5-meter equipment.

2½-Meter "Q" Antenna Suggestions

THERE are many hams who swear by the "Q" because it presents a well balanced load, is easy to adjust and seems to have the highly desirable habit of loading up the transmitter very effectively.

"Q's" for the ultra high frequencies usually employ metal tubing not only for the matching bars but also for the two radiator sections. When such an antenna is supported by the matching bars the radiator is self-supporting and therefore well out in the clear. The only drawback to this is the complication involved in attempting to mount the unit solidly. The standard insulating spacer bars do not have mounting holes in them. Their clamping screws can be removed and the screws on stand-off insulators made to serve both for mounting and for tightening the clamps, but this necessitates special over-length screws to replace

those normally furnished with standard stand-off insulator. More important, it becomes essential that the stand-off insulators be very precisely placed to provide exactly the required spacing between the Q-bars.

These difficulties were overcome by the simple mounting method illustrated in Figures 1, 2 and 3 which show the details of a 2½-meter Johnson Q mounted on a board and ready to be mounted on its mast. This method has several advantages in that (1) the Q is assembled and the bar-spacing adjusted before mounting on its board; (2) the placement of the stand-off insulators is simplified, in fact the spacing of the bars can be altered at any time without dismantling the antenna from the board should such readjustment become desirable; (3) the weight and swing of the feeders place no strain on the antenna itself, and (4) the entire assembly is sturdy enough to withstand plenty of wind.

A detailed description is not needed as the photos show most of the details. The complete assembly as shown in Figure 1 consists of the Q, a 32" x 3½" x 1" board, 6 standard stand-off insulators and four small brass plates 2" long by ½" wide and about 1/16" thick (from Woolworth's). These come with two holes in each spaced 1½" apart.

In assembling the Q the spacer-insulator at the two ends are placed with the porcelain cleats underneath the bars (see Figure 1) so that the lower ends of their clamping screws may be used for mounting. The details of the mounting assembly, utilizing the stand-off insulators and brass plates, are clear from Figure 2 and Figure 3. The recommended procedure is to mount one pair of stand-off insulators at the end of the board as in Figure 2, attach the brass plates to these, slip the clamping screws of the outer spreader-insulator through the other holes in the plates and turn on the nuts. Next determine the correct position for the pair of mounting insulators at the other end of the Q section (Figure 3) by attaching the plates to the clamping screws then to the stand-off insulators and marking the positions of the mounting holes in the bases of the stand-offs.

It should be noted that the stand-off insulators at both ends are placed inside of the spacer-insulators. This prevents the antenna from being pulled in either direction. Also by spacing the two stand-offs of each pair wider than the spacing between the Q-bars the possibility of sideways movement of the antenna is ruled out. It will be found that there is slight play here before all nuts are tightened. This is sufficient to permit readjustment of the spacing of the Q-bars at a later date if desired.

The final step is to mount the third pair of stand-offs at the free end of the board (spacing them to correspond with the feeder spacing used) and connect these to the ends of the Q-bars. Later, when the antenna assembly is

mounted on its pole it is only necessary to connect the feeders to these stand-off terminals. Soldering is made unnecessary if, after connecting the feeders, the individual studs are wrapped first with tin-foil, then with a liberal application of friction tape. This is a lot simpler than running a soldering-iron connection to the roof—and it will keep the joints clean and bright indefinitely. A wise precaution is to here employ stand-off insulators of the type that have a metal apron over the base. This will avoid the possibility of the strain of the feeders cracking the porcelain at the mounting holes.

Where the radiator is to be vertical this whole assembly is so mounted on the mast that the mounting board becomes a cross-arm at the tip of the mast. Similar antennas for other frequencies which require the radiators to be horizontal would have the long dimension of the mounting board parallel that of the mast.

In cold winter weather there are very definite advantages in being able to do most of the antenna assembly work indoors—with only the bolting to the mast and attachment of the feeders to be done out in the cold.

-30-

The Serviceman Reaches War Age

(Continued from page 15)

ters, practical electronics, and other fields closely associated with radio, since they may very likely be called upon to make repairs and tests on equipment in those allied fields. They should likewise prepare themselves to make repairs on household appliances and other light electrical machinery. Now is the time to study hard and long—to burn the midnight oil in an all-out effort to acquire every helpful skill.

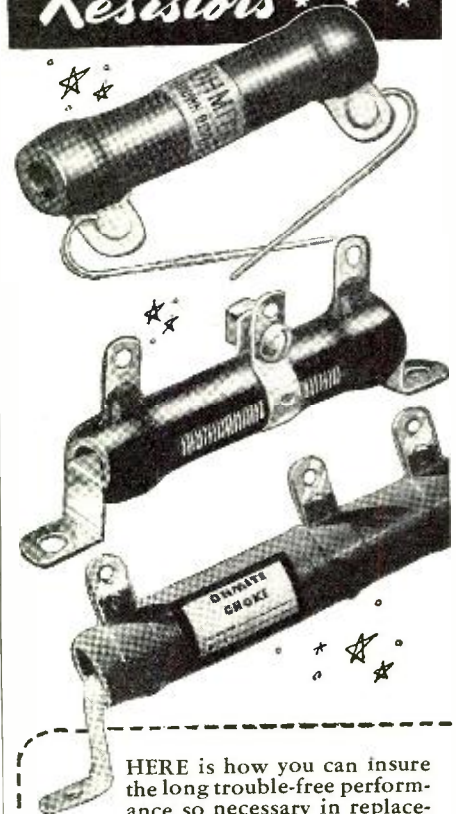
The radio serviceman will do well to perfect his mechanical dexterity, in order that he may be able to make actual repairs on damaged radio sets. Indeed, war-time conservation demands that parts be replaced only when they cannot possibly be repaired. Expert patching, tinkering, and restoring will increase as an art as the supply of exact duplicate replacements grows slimmer.

If our towns are ever subjected to bombing attacks, the serviceman will certainly find plenty of challenging repair work to do. There will be sets with their very "innards" crushed out, but which a clever radio mechanic might still restore to operating condition. After a damaging air raid, civilian radio listening facilities must be restored as quickly as humanly possible.

Attention to Public Relations

The serviceman must give due cognizance at this time to his relation to the community. The public must know who he is, how reliable he is, and

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where he may be found. He must sell himself—and thoroughly. He should be as well known a community gentleman and worker as the neighborhood physician. To this end, he must employ the most effective advertising media within his means.

Each serviceman should make it a point to call at each home in his immediate community and line up as many sets as possible for his regular surveillance under some mutually equitable plan of reimbursement. The owners of these sets must be sold on the necessity in war time of keeping their radios in peak condition. Each serviceman should stress to prospects in his community that it is *he* who should be called for radio service.

Upon the serviceman's shoulders rests the burden of educating the public to the importance of the American home radio in this war. Whether he does this by means of visits to homes for the purpose, through newspaper advertisements paid for by himself or by a group of local servicemen, by distributed literature, or through still other channels, will depend upon his personal finances and to some extent upon his inclinations, energy, and ingenuity as well. Whatever the method employed, he must drive home to his customers, potential as well as actual, the need of keeping their radios going—and of retaining him for the job.

The battery set now assumes a role of new importance, and the serviceman should be able to sell a number of these receivers if he is on his toes. His prospects should be convinced that when air raids drive families into shelters, or "blacks out" house power, there is nothing like a battery portable for "keeping in touch." However, many persons do not yet own these sets, and the serviceman must sell them the idea. While about it, he must also sell the idea of keeping on hand at least two sets of replacement batteries and a complete set of replacement tubes for each home radio.

Radio Service Reserve

Where boys under military age and women are available for apprentice training in set repairing, the established serviceman should, if he has the necessary time, instruct these persons. This is a civic contribution. By training capable understudies, an adequate reserve corps will be built up to take over in the event that our servicemen are called to arms.

The task of apprentice training might well be delegated to the local servicemen's association. By dividing the teaching labor among the members of an educational committee, the strain on an otherwise small group of conscientious men will thus be alleviated.

Servicemen, Unite!

It has truly been said, *In union there is strength.* Typical of our reborn national unity against a common enemy should be a new state of cooperative action on the part of ra-

dio servicemen. Servicemen should promptly lay aside any personal animosities and strive to aid each other in meeting the present situation. This is not the time for petty wrangling. There will be increasingly more work to be done, and there will be less men than formerly to do the job.

Servicemen in every town should form an association to work for the mutual benefit. They should get together at the meetings and determine how their energies may best be directed in the public interest and to their business advantage. If necessary, they might even divide the town into suitable working territories to prevent future business conflicts.

At least two servicemen in each town should maintain various apparatus and standards for calibrating test equipment; and they should not grudgingly withhold this apparatus from their professional brethren, but should readily make calibrations for other servicemen at a reasonable price. Factories will be less able to furnish these checkups as their own war work grows heavier, and it would be capital for the servicemen in each locality to take care of this situation themselves.

Must Know Defense Rules

In his movements, the serviceman must know and keep in strict conformity with local safety rules. He must observe every air-raid and blackout regulation and must under no circumstances allow the pursuit of his business ever to lessen his concern for the safety of his fellow citizens.

The war-time serviceman will enter many homes and see many people. He will hear many conversations; will engage in some. As an itinerant in the home, his views on the general national situation may be solicited by anxious and disturbed families. But he will refrain from being a war-rumor monger. Indeed, his example of optimism will buoy his own business and the morale of his community as well.

Keep those radios going, boys!

—30—

Manufacturer's Literature

(Continued from page 32)

helpful information on the wide range of *Ohmite* stock types and sizes—simplifies selection. There are close control vitreous enameled Rheostats ranging from 25 watts to 1000 watts—Dividohm Adjustable Resistors from 10 watts to 200 watts, and Fixed Resistors from 1 watt to 200 watts—all in many resistance values. Two types of Tap Switches and a wide variety of Power Line and R.F. Plate Chokes are listed. There are also many other items of general interest.

A free copy of the new Catalog 18 may be obtained by writing to the *Ohmite Manufacturing Company*, Dept. 5M, 4835 Flournoy Street, Chicago, Illinois.

—30—

What's New in Radio

(Continued from page 34)

magnet structure and acoustic network, offering outstanding performance characteristics. The salt-shaker type is dictated by these two features, and to these Turner has added style and streamlining.

Modern engineering has extended the high frequency range, and the extreme lows have been raised 2 to 4 decibels, to compensate for over-all deficiencies in loud speaker systems. The unique diaphragm structure results in extremely low harmonic and phase distortion, without sacrificing high output



level. Turner 211 is equipped with tilting head, balanced line output connection and 25 feet of heavy duty cable. It is finished in rich satin chrome. Further information may be had by writing The Turner Co., Cedar Rapids, Iowa.

New Display Card on Shure "Hi-Lo" Pickup

Shure Brothers, Chicago, have released an attractive new display card and streamer on the Shure "Hi-Lo" 1-ounce Crystal Phonograph Pickup—for Jobbers' counters and windows.

In colorful brown, gray and black, with a large, striking photo of the pickup, these display pieces tell the "Hi-Lo" story at a



glance. They point out the combination of high-voltage and low pressure (1.4 volts output at 1000 c.p.s. with 1-ounce needle pressure) and the low cost (\$6.50 list with permanent sapphire point needle).

Such modern, eye-catching displays, with their strong sales appeals, will stimulate pickup replacement business, say the makers. They are available at Shure Jobbers.

TWO outstanding Signal Corps officers have been promoted to the rank of Brigadier General. Col. James A. Code, Jr., assistant Chief Signal Officer, and Col. Roger B. Colton, in charge of the Materiel Branch, were nominated for the higher rank by President Roosevelt. Their new rank will be more in keeping

with the importance of their jobs in the Signal Corps—which has been doubled in size.

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Letters

(Continued from page 22)

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F. M. LANTER, Chief
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Civil Aeronautics Administration
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Administrator of Civil
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Department of Commerce
Civil Aeronautics Administration
Washington, D. C.

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OF

RADIO NEWS

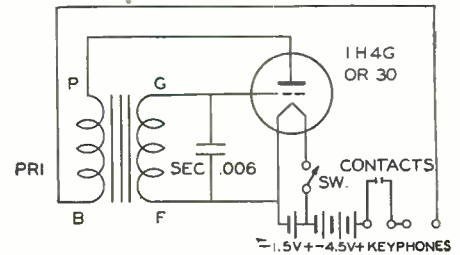
Code Machine

(Continued from page 25)

face should be smooth and polished to permit smooth sliding of the tapes. Of course, this and the contact arm posts are screwed to the machine face with proper circuit connections being made as indicated in the oscillator schematic.

Making the Tapes

For those who prefer, spools and tapes may be purchased ready-made. The several manufacturers of code machines maintain a regular service in tapes. They are available in a great range of text matter from code groups to plain language, and spaced for different speeds. Individual tapes, good



for many hours of practice, cost about a dollar apiece. Unless one is an indefatigable "build-it-yourself" enthusiast, this solution is recommended. However, we will proceed to show how you may make your own tapes.

Old piano-rolls will provide the best

of the... island of Luzon, returned to the at... this in... failure... navy to... the Jan... maring... Dec. 7... or derc... Secret... Honolulu... investi... has ack... and navy... the follow... 1. The... killed... casual... ed, and... 2. Six... battles... battles... and put... an uns... were... some... 3. B... sever... having... and on... The... the board... tomorrow... proceed... to cond... board... not in... The... Roberts... absence... Stone... ap... Word that the American Pacific... was searching for the Japane... WE received

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Use of equalizers in P.A. and recording is explained as well as the use of self-excited dynamic speakers to replace P.M.'s. These are just a few of the valuable special articles for radio-men in the fact-filled, picture-packed April issue.

APRIL ISSUE

**RADIO
NEWS**

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source for the paper required for the tapes. Ordinary paper which is not flexible will not do. A linen paper with the durability and other characteristics of piano-rolls will serve best. Simply cut a strip about 11/16" wide from the whole length of the unperforated side of the roll. If it is not possible to obtain a piano roll, we suggest that you purchase a blank tape from a machine manufacturer.

You will probably want several blanks in order to provide yourself

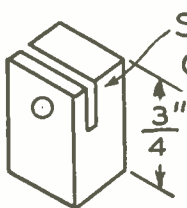
Therefore make up some seventy or eighty code groups, of five letters each.

Keep a copy of these even after you have transferred them to the tape, for checking purposes after practice. Of course, it is advisable to include numerals and punctuation marks, and special signals in your copy.

With your code groups ready draw the corresponding dots and dashes, or dits and dahs, on the paper in pencil. An ordinary sharp punch may be used for cutting the dots; a sharp penknife

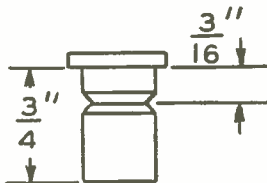


TAPE
LETTERS READ IN OPPOSITE DIRECTIONS



HOLDING POST

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GUIDE POST

with different types of text matter. The next step is that of composing the text. Of course, this will vary depending upon whether you are a beginner or an advanced student. While the text matter may be the same in either case, beginner's tapes should be more widely spaced as to the placement of the code characters. In beginners' tapes there should be about 1 1/2" between letters; half of this will do for all other speeds up to as fast as you can possibly go.

The disadvantage of plain language tapes for practice is that you soon get to know the text matter; hence, there is no point in copying further, and the tape is then useless. However, code groups are far from easily memorized. Even if you memorize the characters, they will sound different at accelerated speeds and so throw you off the scent.

for the dashes, which may be 3/8" long. Note: when you have cut one side of the tape with the characters reading from left to right turn the tape upside down and start incribing and cutting from the other end so that the second, or lower line, reads from right to left also, but opposite to the upper line.

While still more details for the construction of this machine may be desirable, the author subscribes to the pedagogic ideal expressed in the thought that "seeing is worth a thousand words." The pointers incorporated in this article provide the highlights; and examination of a commercial code machine in operation at your radio dealer's will furnish the rest. You will surely get some ideas of your own.

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War Time Radio Service Problems

(Continued from page 21)

pairs, have them made rather than buy new equipment. I doubt sincerely whether even the test instrument manufacturers would disagree with this statement, because they have all they can do to supply the government and those civilian servicemen who must buy new equipment. Remember that test instrument repairs should be made only by authorized factory repair stations, or by the original test instrument manufacturer. If you need new types of test equipment, remember that there are many servicemen who are entering the armed forces and

who would be glad to sell their equipment. Such test equipment, if allowed to lay idle, is of no value to our country or the individual owner. It is much better that it be sold to an active user so that materials can be saved toward the manufacture of more war equipment.

Along this line, it is very important that we change our ideas about the relative value of things. We must conserve, we must do without the new and the shiny if we can do as good a job with what we already have. We must all cultivate the proverbial virtue of the New Englander who never gets what he doesn't need, and more often than not "makes out" with what he has.

The Editors of RADIO NEWS have asked me to comment upon the angle

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of radio servicemen making test equipment which it is difficult to obtain, but which is needed in daily work. I've had some experience in the test equipment game, and after considering all the conditions, I can not help but feel that a serious attempt should be made by the serviceman to obtain used commercially-built test equipment before he goes through all the trials of designing and building his own tester. This comment is not meant in any way to belittle home- or shop-built equipment, but if new test equipment of the type desired is not available, the next best thing is to buy a used unit. Local service organizations should post a list of such available equipment at each meeting. This can be a valuable service to the individual member. If there are sufficient calls for the service, I am sure that the Editors of RADIO NEWS will be glad to devote advertising space at reasonable rates to those servicemen who have answered the call to arms, and who will have no further use for their equipment for the duration.

When you build your own equipment, you are using valuable repair time and valuable new materials. Conserve when possible!

Of course, there are many instances where even used equipment of the type desired is not available. Here is where the ingenuity of the serviceman can be used to full advantage in fabricating his own equipment. RADIO NEWS has in the past, and will in the future, offer test equipment constructional articles which will be of real value to servicemen—readers.

The second part of this article, in the next issue of RADIO NEWS, will give a number of specific answers to the problems confronting the radio serviceman regarding the third radio servicing essential—that of repair parts and material.

Just a hint! Stock up on tubes and parts now. Prices are going up and the supply is going down. Don't get caught with empty stock shelves. Watch out particularly for speaker replacements.

Finally, here are six things every radio serviceman can do to help us keep our liberty:

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member the words of that famous American patriot who cried, "We must hang together, gentlemen, or assuredly we will hang separately!"

5. Conserve. Conserve waste paper and all types of metal. Sell it to your local junk man and use the proceeds to buy Defense Stamps. Make a game of it. See how soon you can get enough stamps together to exchange for a Bond, by turning all the unused and unwanted things you have into cash. You will be helping your country and you will be assuring yourself of a future income.

6. Keep your eyes and ears open and your mouth shut. Report to your local FBI district office, or to "Federal Bureau of Investigation, Washington, D. C." anything which seems "out of order" to you. Discourage your friends who are in government work from "spilling" anything which could be of the least possible use to our enemies. Facts, figures, shipments, dates, conditions, etc., pertaining to National *Offense* work are nobody's business except Uncle Sam's. Remember that Hitler's boast was that the United States would be an "inside job." A chance remark, overheard and reported in time, may be the missing link in a chain of evidence which will result in nabbing another spy on the fly. In these times, any man who isn't your country's friend is your personal enemy. The hunting season on spies and saboteurs is never closed. Like rats and vermin, there's only one way to control them—by extermination!

Keep the *flame of vengeance* burning brightly in your heart. Adopt, if you have not already, the attitude of the Southern Senator to whom it was suggested that it would be better to write a mild declaration of war against Japan, because the suggested one might "hurt their feelings."

"Hurt their feelings!" he roared. "Hell! I want to kill them!"

-30-

Hi-Fi Receiver

(Continued from page 18)

and low costs.

The i.f. amplifier could not be pulled out of any junk box. The demand for both high fidelity and communication selectivity made variable selectivity essential. Hence a good part of the available bankroll was sunk into a set of *Hammarlund* VF transformers like those used in the Super-Pro. The selectivity is continuously variable from a bandwidth of something under 5 kc. to over 20 kc. Because the gain varies with the selectivity and is lowest at the point of maximum selectivity the i.f. amplifier needs plenty of hop to spare and therefore the two stages are run at practically maximum gain. Despite this there is not the slightest sign of instability, a boast I can make because of the rather heroic measures taken to insure it. Chokes are used in the converter and 2nd i.f. plates

and all other elements amply decoupled with resistors. Plate and grid leads are shielded. It is somewhat more difficult to get a neat wiring job done because of the cathode bypassing but the result is well worth it.

The selectivity of the receiver is adequate for almost all phone work; and in the broad position passes a band more than 20 kc. wide. We do very little c. w. work and that little is competently handled 90 percent of the time with the i.f. sharp and the 1000 cycle filter in.

AVC is applied to the converter and the 1st i.f. stages. The 2nd i.f. is run without AVC but with a separate control in order to give a good swing on the S meter. A single pole, three position switch is incorporated to adjust the AVC circuit. In the first position, the AVC is on and very rapid for communication work. In the second position the AVC is on but much slower so that the low audio notes are not cut off. The last position shorts the AVC out entirely. A 0-1 milliammeter in the plate circuit of the first i.f. serves as the tuning meter. It is shunted by a 10 ohm rheostat for zeroing, with the control on the panel for ready adjustment.

Designing the front end was the greatest problem and one which took a good deal of looking around and more sighing wistfully for enough money to put together a really good tuner. Eventually however we were fortunate to make a trade for a used *Meissner* five band tuner, of the original model put out some 5 years ago. There were several things that needed readjusting. It had too much backlash, and the dial didn't have calibrated bandspread.

The backlash, we found, was due to the fact that the dial was supported on the chassis in slots instead of holes. The result was that a loosening of the screws caused the supports to sag, separating the gear train. This was corrected by putting a bracket on the assembly at the rear (visible in the chassis view) in such a way that it couldn't slip in the slots and therefore the gear train was snug. This reduced the backlash to less than one point on the second hand scale, not enough to be a nuisance.

The lack of calibrated bandspread was a more difficult matter to remedy. We racked our heads over it for weeks but finally came up with a solution that involved no extra parts and no extra money. This dial has a "second-hand" type of mechanical bandspread with a 0-100 scale operating off a quarter inch shaft. The celluloid dial scale was removed and a fan shaped window was cut at the bottom, following the decorative lines already there.

A metal pointer was glued to the rear of the scale bridging the opening in the middle. Then a 4 inch bristol board circle, with five concentric circles, 1/4" apart, drawn on it, was mounted on a 1/4" shaft coupling with cement. This was mounted on the shaft that operated the second hand,

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and carefully calibrated. In the finished dial the scale revolves behind the main dial, part of it appearing through the fan shaped window. The front photo shows the finished appearance. Thus we have the main scales which are nice and big; a 0-100 bandspread logging scale, and a calibrated scale for 5 ham and SW bands. Since the oscillator is voltage-stabilized and air trimmers are used throughout, there is very little drift after the initial warm-up and hence the calibrations hold very nicely over long periods.

We were still not satisfied. The thing worked alright but it didn't look like the new receivers. So we tossed the old pie crust escutcheon in the bin and made a new one out of a piece of oblong masonite painted black. The result looked more like something modern. The escutcheon also contains two meters. At present one is a dummy; but eventually we mean to add a volume expander and compressor and a recorder and then we shall have a V.T.V.M. across the voice coil as a volume level indicator. Finally, to finish the job of modernizing the tuner, we took off the two old knobs and replaced them with one large knob on the slow speed shaft. It can be spun very rapidly and the action is very smooth and comparable to flywheel tuning.

Some slight changes were made in the electrical hookup of the tuner. An 1851 was put in as the r.f. and the AVC was taken off in the interest of keeping the signal to noise ratio as good as possible. However, a control was included to vary the gain of this stage when necessary. A VR150 voltage regulator on the power supply chassis stabilizes the oscillator voltage.

Instead of a costly and rather unsightly (for the living room) metal cabinet, I made a wooden one of tulip wood to match the panelling in the study. The panel was decorated with a set of knurled knobs and carefully inked-in labels added. White spots were put on the knobs by drilling a slight depression with a 1/8" drill and filling it with Chinese white. There are three jacks. One is a phono-mike jack so wired that when a plug is put in, the radio channel is broken. Thus it is not necessary to tune to a dead spot before using the phonograph. The second jack is for phones. The third jack is for the speaker which is a considerable distance from the receiving position. When the speaker is removed, an 8 ohm 10 watt resistor is shunted across the voice coil to keep a load on the output tubes.

The power supply is on a separate chassis and is hidden in a bookshelf. Since it is out of the receiver cabinet there is less heating and therefore less drift. Both chassis, incidentally, were improvised out of salvaged BC chassis. Also many other parts were salvaged, carefully chosen and tested, among them tubes, tube shields, resistors, some condensers, etc.

A few words about performance. The tone is definitely superior. I have

heard better but not for less than 5 or 6 times the cost. Voices are very natural and at low volume levels we often are fooled into the belief that visitors have come into the next room. As for "station getability," we don't think there are more than two or three commercial receivers that are better. For instance, during the time Admiral Byrd was at the South Pole we heard the base stations whenever anyone in our region was hearing them and a lot of the boys were using two stage preselectors and hearing less. No noise limiter is used because we are way out in the woods and there isn't ever enough interference to bother us. There are some improvements we shall put in when the Family Priorities permit. Perhaps a variable crystal filter; a 6SA7 instead of the 6L7, and a volume expander and compressor. In the meantime we're well satisfied.

-30-

Radio Operators Sought for Federal Work

WAR DEPARTMENT, Federal Communications Commission, Civil Aeronautics Administration, Coast and Geodetic Survey, and other Government agencies are needing radio operators. Persons are needed to stand regular watch for the transmission and reception of radio messages and other communications. In some cases operators will be responsible for the maintenance and operation of a radio station and its equipment. In others they may have to transmit messages by teletype as well as in code.

To fill the jobs, which pay \$1,620 and \$1,800 a year, an examination was recently announced by the Civil Service Commission. Because of the large number of vacancies which exist applications will be accepted at the Commission's Washington office until further notice.

While no paid experience is required, applicants for these positions must show that they are able to transmit and receive messages by radio-telegraph at a rate of 20 words a minute, transmitting either by hand or bug. For some positions persons are needed who can operate a regular typewriter at 40 words per minute, or a teletypewriter at 35 words per minute. The age limits are 18 to 55. Persons are to be rated on their experience or training and fitness to perform the work.

Operators who are interested in this work and who would be available for Government employment are urged to secure the proper application forms from the Commission's representative at first- or second-class post offices, or direct from the Commission in Washington.

HOWARD HUGHES, one of the bright young men of radio, made a hard decision last month. Because he is swamped with defense work, his Hughes Tool Co. found itself unable to keep up with both its television and FM activities. He elected to stick to television and requested the FCC to cancel the construction permits he had obtained for FM Station K45SF, in San Francisco, and K49LA, in Los Angeles. The FCC complied and announced that the 44,500 and 44,900 frequencies in San Francisco and Los Angeles were open to new applicants.

-30-

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"Overnight we have become a united people, an awakened people—wide awake to the stark truth that the very existence of the Nation and the lives, liberties, and fortunes of all of us are being put to a supreme test. In this hour of crisis Americans are working together, as never before in our history, toward a victory that will make certain that international treachery and attack without warning shall never endanger us again. It goes without saying that materials and money will be produced and expended in vast quantities before that victory is assured.

"The present machinery for raising a substantial portion of the money to be expended—i. e., the Defense Savings Program—already has enabled the American people to contribute over two billion dollars to the production of war materials and at the same time to add to their own personal security. The immediate need is to extend that machinery, so that everyone may purchase Defense Savings Bonds and Stamps, regularly and conveniently, to the best of their abilities.

"A large number of American business concerns have instituted and are administering with the cooperation of their employees, a payroll allotment plan whereby each employee may voluntarily direct a portion of his pay to be set aside and accumulated for the purchase of Defense Savings Bonds.

"The Treasury Department now asks that every American business concern institute similar machinery, where practicable, as one of its principal contributions to the war effort.

"The payroll allotment plan for the purchase of Defense Savings Bonds provides an effective way for you and your employees to march together against a common enemy—an enemy which seeks to destroy free enterprise throughout the world.

"Although this is your and your employees' plan when it is put into effect, the Treasury Department is ready to give every assistance. There are local Defense Savings Committees in the forty-eight states. Experienced men on those committees are ready to help you in instituting and encouraging participation in the plan. You are not only invited, but urged to call on them for help.

Very truly yours,
 H. Morgenthau, Jr.,
 Secretary of the Treasury."

The National Office of RSA has assured the Treasury Department that RSA members will give assistance in promoting the sale of Defense Savings Bonds and Stamps. We will send you a folder, "Six Ways for American Business to Cooperate in the Sale of Defense Savings Bonds and Stamps," upon request to the RSA National Office.

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Come to Radolek—Public Address Headquarters—where you get more for your money in Performance, Styling, Dependability and Reserve Power. Radolek Deluxe PA Sound Systems, in 15, 30, 50 and 100 watt sizes, incorporate every desirable feature—multiple input channels, built-in input and mixer controls, AVC, "feedback" tone control circuit, output impedance selection, electronic mixing system—all engineered for plus performance. Models for permanent, portable or mobile use. Wide choice of microphones, speakers and related apparatus.

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Contains hundreds of up-to-the-minute service items, test equipment, sound apparatus, etc. at lowest prices. Indispensable to every serviceman, dealer and sound engineer. Radolek gives you what you want when you need it. Send for your copy of this great new Radolek catalog today!

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**PLUG-IN
ELECTROLYTICS**



**STANDARD PLUG-IN
ELECTROLYTICS**

TYPE AEP-450-450 v. D.C.W.
SINGLE SECTION:
 10, 20, 40 and 80 mfd. 1 1/2" dia. x
 2 1/2" and 4 1/4" tall.
DOUBLE SECTION:
 10-10 and 20-20 mfd. 1 1/2" dia. x
 2 1/2" and 3" tall.
TRIPLE SECTION:
 10-10-10 mfd. 1 1/2" dia. x 2 1/2" tall.
TYPE AEP-45025:
 10 x 10 x 450-20 x 25. 1 1/2" dia. x
 2 1/2" tall.

Want to keep well ahead of the crowd? Well, here's a hot tip: Begin using these handy plug-in electrolytics for those radio, sound-system and electronic assemblies you're building or servicing. Aerovox Plug-Ins (electrolytic and paper types) are the coming thing for equipment in constant use. Octal base fits standard octal socket (or UX for oil-filled paper plug-ins). Tested and replaced in a jiffy. Handle like another tube. Especially popular in aircraft and police radio work, in sound systems, in electronic equipment and instruments in constant service.

Ask Your Jobber . . .

He'll gladly show you these latest Aerovox Plug-Ins. Better still, try them in that assembly you're putting together. Ask for latest catalog—or write us direct.



For the Record
(Continued from page 4)

prised if ALL amateur activity reached the point where no further transmissions would be permitted "for the duration."

This should present no overwhelming hardship to the average individual. It will offer the opportunity to do a bit of house cleaning and to construct needed test equipment, monitors, new gear and speech amplifiers. IF parts become scarce—there is the old reliable junk box handy. It is amazing to discover the great number of parts that are well suited for the construction of up-to-date gear that may be taken from this reserve. For example: many a modulation transformer may be used "in reverse" to match tubes of late design. We know of several instances where such items have been discarded because the owner thought the impedance match to be too far removed from the ideal ratios.

Hundreds of speech amplifiers may be rebuilt with little effort. By incorporating new circuits, greater economy and better performance will be enjoyed. Get rid of those low-frequency "bassy" units and re-design the equipment to include only normal voice frequencies! Add on a peak-limiter to the rig, and provide simpler switching arrangements! Install safety relays or other protective devices while you have the time available! We will print many articles in the near future which will aid in bettering existing equipment.

THE April issue of RADIO NEWS will feature articles written by top men in the Audio and Electronic fields. This issue will present the important part that PA equipment is playing in our war effort. Plenty of opportunity here for the wide-awake radioman to increase his earnings! Many outstanding Sound articles have been written especially for this important issue. Don't fail to get your copy!

We have engaged two new authors that are preparing articles on the theory and applications of various Electronic items, and another to present valuable data on the subject of Sound products. We are sure that these new features will be most welcome by our readers. The radio serviceman has overlooked the opportunities for earning more money by selling and maintaining many items used in Industrial applications. These articles will tell how such units can be serviced and sold.

DON'T be bashful about writing to us—giving your ideas and reactions to articles that appear in RADIO NEWS. We are always glad to hear from you. Those of you that are at training centers will find special interest in topics that deal with activities in other branches of the service. We'll try and publish some of these letters in the near future. 73, O.R.

Notice! to CASH PRIZE Contestants.

Manuscripts are still arriving that were postmarked before closing this issue.

**PRIZE WINNERS
Will Be Announced
NEXT MONTH**

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- ★ D.C. Current Ranges: 0-200 microamperes; 0-2-20-200 Milliampers, using wire-wound shunts.
- ★ 3 Output Meter Ranges: Same as A.C. Voltage Ranges.
- ★ 3 Decibel Ranges: From -2 to -58 D.B., based on .006 watt in 500 ohms.

Model 1220 comes complete with cover, self-contained battery, test leads and instructions. **ONLY \$11.50**

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Instantaneous snap switches reduce actual testing time to absolute minimum.
Tests all tubes 1.4 to 117 volts.

Sockets for all tubes—
No adapters.

SPECIFICATIONS:

- ★ Tests all tubes, 1.4 to 117 volts, including 4, 5, 6, 7, 7L, octals, octals, Bantam Jr., Peanut, single ended, floating filament, Mercury Vapor Rectifiers, the new S series, in fact every tube designed to date.
 - ★ Spare socket included on front panel for any future tubes.
 - ★ Tests by the well-established emission method for tube quality, directly read on the GOOD 7 BAD scale of the meter.
 - ★ Jewel protected neon.
 - ★ Tests shorts and leakages up to 2 megohms in all tubes.
 - ★ Tests leakages and shorts in all elements AGAINST all elements in all tubes.
 - ★ Tests BOTH plates in rectifiers.
 - ★ Tests individual sections such as diodes, triodes, pentodes, etc., in multi-purpose tubes.
 - ★ Latest type voltage regulator.
 - ★ Features an attractive etched aluminum panel.
 - ★ Works on 90 to 125 volts 60 cycles A.C.
- Model 1240 comes complete with instructions and tabular data for every known type of receiving tube. Shipping weight 12 pounds. Size 6" x 7 1/2" x 10 3/4".
Our Net Price **\$14.85**
COMPLETE WITH PORTABLE COVER

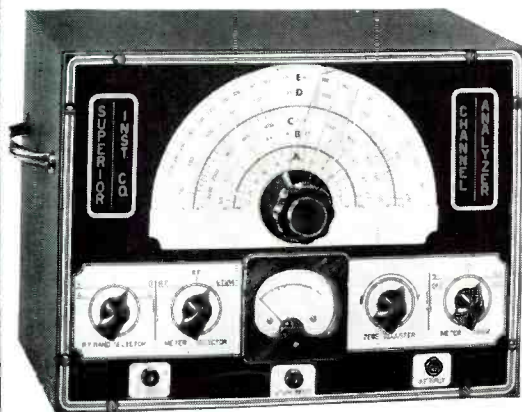


THE NEW CHANNEL-ANALYZER

FOLLOWS THE SIGNAL

FROM ANTENNA TO SPEAKER OF ANY SET

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



THE CHANNEL-ANALYZER WILL

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

The Superior Channel-Analyzer comes housed in shielded cabinet and features an attractive etched aluminum panel. Supplied complete with tubes, three specially engineered shielded input cables, each identified as to its purpose. Also full operating instructions. Size 13 1/2" x 10 1/2" x 6". Shipping weight 13 pounds. **ONLY \$21.75**

MODEL 1230 SIGNAL GENERATOR

WITH FIVE STEPS OF SINE-WAVE AUDIO

SPECIFICATIONS:



1. Combination R.F. and A.F. Signal Generator, R.F.—100 K.C. to 90 Megacycles, A.F.—200 to 7500 cycles; Sine-Wave—WITH OUTPUT OF OVER 1 VOLT. All direct reading, all by front panel switch manipulation.
2. R.F. and A.F. output independently obtainable, a tone or with A.F. (any frequency) modulating R.F.
3. Latest design full-range attenuator used for controlling either the pure or modulated R.F.
4. Accuracy is within 1% on I.F. and broadcast bands; 2% on higher frequencies.
5. Giant dial etched directly on front panel, using a new mechanically perfected drive for perfect vernier control.
6. Operates on 90 to 130 V. A.C. or D.C. (any frequency).

The Model 1230 comes complete with tubes, shielded cables, molded carrying handle and instructions. Size 14" x 6" x 11". Shipping weight 15 pounds. **ONLY \$14.85**

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From the Earth to the Moon—that's the distance that the 80,000,000 metal tubes manufactured since 1935 would reach, placed fifteen feet apart!



Proved by ACCEPTANCE... Proved by PERFORMANCE!
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ACCEPTANCE! In a little over six years, more than 80,000,000—yes, 80 million—RCA Metal Receiving Tubes have been used by the Industry in over 300 electronic applications. And today, RCA is turning out *more metal tubes than ever before*—for 1941 production outstripped all previous records!

ACCEPTANCE! Of the six largest-selling receiving tube types throughout the entire Industry... four are metal types—

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PERFORMANCE—and performance alone—is the cause of such leadership. Metal tubes permit the designer to turn out better equipment... more efficient, more dependable! For six years, the majority of important receiving-tube improvements has appeared *first* in metal types—and many advantages still appear *only* in metal types!



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- Higher Getter Efficiency
- Simple, Efficient Grounding
- Single-ended Construction
- Large Pin-Contact Area
- Lower Socket Costs
- More Rugged Construction



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