

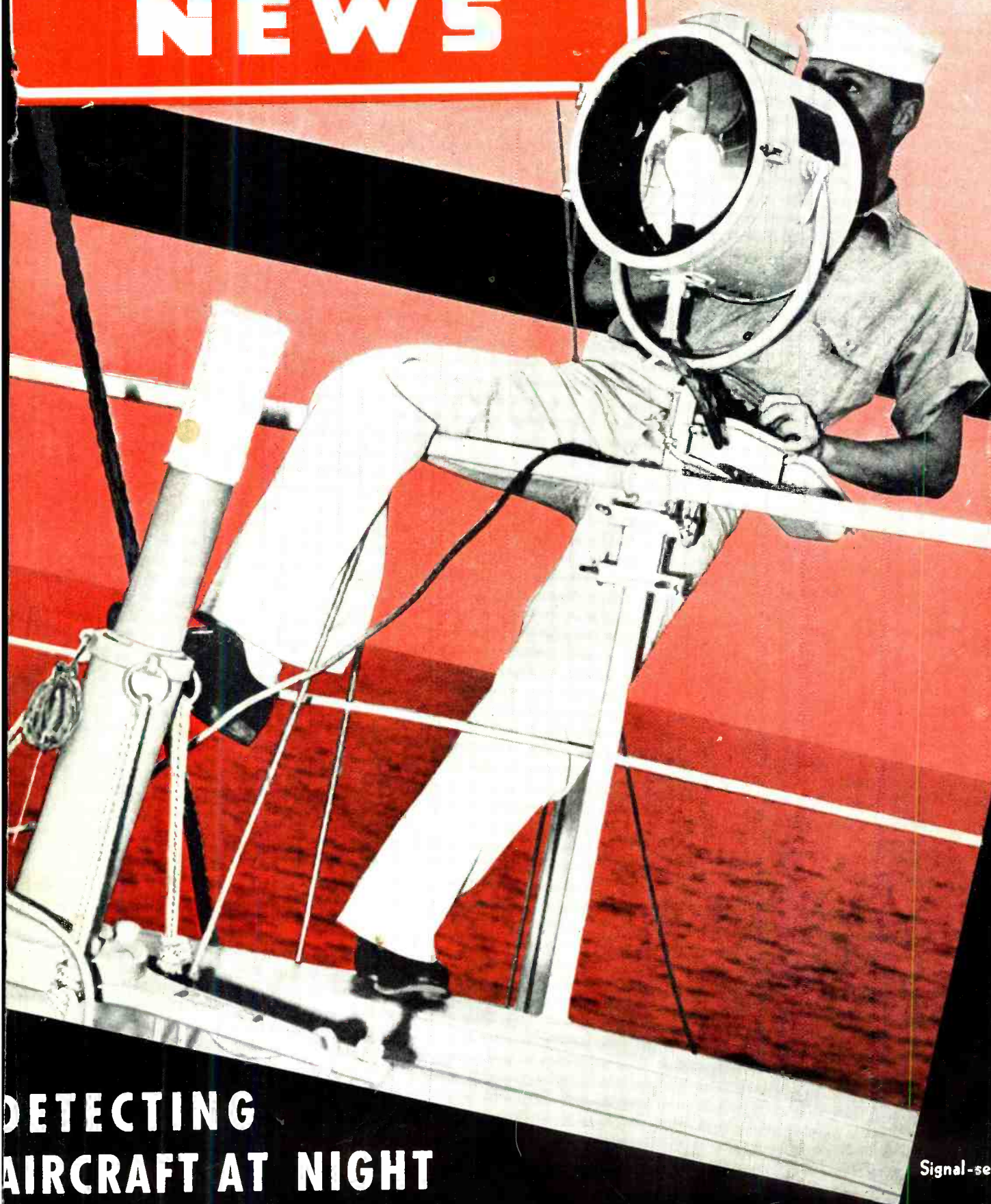
RADIO NEWS

FEBRUARY

1942

25c

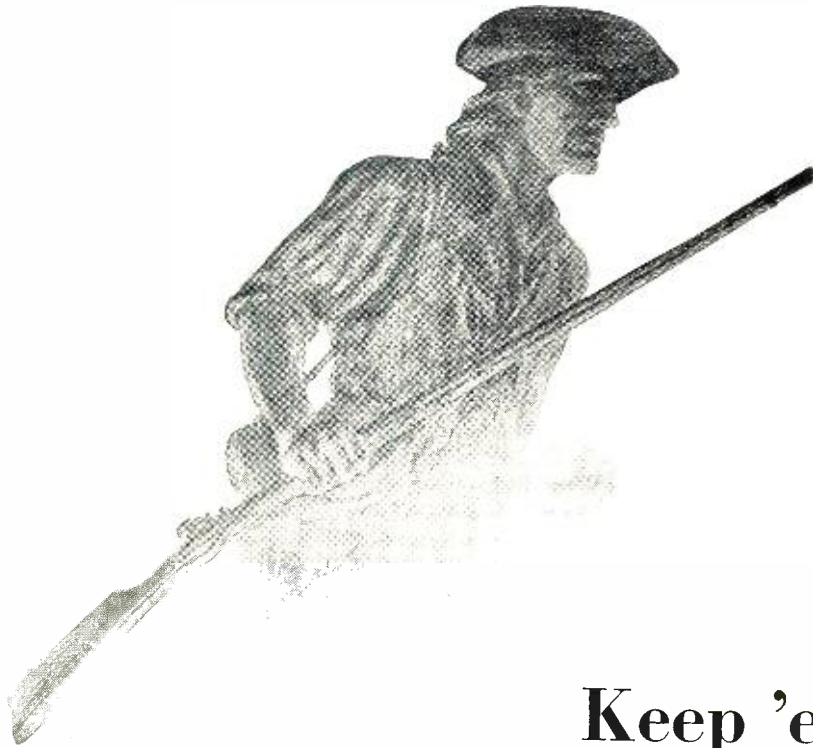
In Canada 30c



DETECTING
AIRCRAFT AT NIGHT

Signal-searchlight

★ Defense and Industry News ★ Low-cost Receiver ★



Keep 'em listening...

A goal for radio's Minute Men

In these days of material shortages and production restrictions, the radio service engineer has his big opportunity to "keep 'em listening," no matter what the obstacles.

It is a time when ingenuity counts—a time to make good use of experience—a time, more than ever, to depend upon Mallory.

Mallory Approved Precision Products give you reliable quality that represents the finest in progressive design, the quickest applications in replacement work and the greatest economy in your own inventories. And what's more, there's friendly technical help that's yours — free for the asking.

Mallory is doing everything within its power to keep you adequately supplied with time proven standardized replacement parts. Where critical materials are pre-empted by wartime production, Mallory engineers are working for adequate substitutes; striving to anticipate your needs; keeping up their record of realistic help to you.

Yes, you can depend on Mallory and Mallory Distributors to help you "keep 'em listening."

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P. R. MALLORY & CO. Inc.
MALLORY
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The image shows several Mallory electronic components: a vacuum tube on the left, a cylindrical component in the top left, a vacuum tube in the top center, a vacuum tube in the top right, a vacuum tube in the middle right, and a box of Mallory products in the bottom center. The box is labeled 'MALLORY' and 'APPROVED PRECISION PRODUCTS'.



J. E. SMITH, President, National Radio Institute
Established 27 years

He has directed the training of more men for the Radio industry than anyone else.

Be a RADIO Technician

Many make **\$30 \$40 \$50** a week

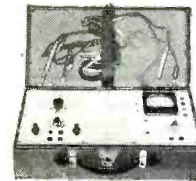
I Train *Beginners* at Home for Good Spare Time and Full Time Radio Jobs

Here is a quick way to more pay. Radio offers a way to make \$5, \$10 a week extra in spare time a few months from now, plus the opportunity for a permanent job in the growing Radio industry. There is an increasing demand for full time Radio Technicians and Radio operators. Many make \$30, \$40, \$50 a week. On top of increasing civilian interest in Radio, the Radio industry is rushing to fill hundreds of millions of dollars worth of Government Orders. Clip the coupon below and mail it. Find out how I train you for these opportunities.

Beginners Quickly Learn to Earn \$5, \$10 a Week Extra in Spare Time

Nearly every neighborhood offers opportunities for a good part time Radio Technician to make extra money fixing Radio sets. I give you special training to show you how to start casing in on these opportunities early. You get Radio parts and instructions for building test equipment for conducting experiments which give you valuable practical experience.

You Also Get This Professional Servicing Instrument



This instrument makes practically any test you will be called upon to make in Radio service work on both spare time and full time jobs. It can be used on the test bench, or carried along when out on call. It measures A.C. and D.C. voltages and currents; tests resistances; has a multiband oscillator for aligning any set, old or new. You get this instrument to keep as part of your N. R. I. course.

EXTRA PAY IN ARMY, NAVY, TOO

Every man likely to go into military service, every soldier, sailor, marine should mail the Coupon Now! Learning Radio helps men get extra rank, extra prestige, more interesting duty at pay up to 6 times a private's base pay. Also prepares for good Radio jobs after service ends. IT'S SMART TO TRAIN FOR RADIO NOW!



Set Servicing pays many N. R. I. trained Radio Technicians \$30, \$40, \$50 a week. Others hold their regular jobs and make \$5 to \$10 extra a week in spare time.

Broadcasting Stations employ N. R. I. trained Radio Technicians as operators, installers, maintenance men and in other capacities and pay well.



Loudspeaker System building, installing, servicing and operating is another growing field for N. R. I. trained Radio Technicians.

Jobs Like These Go to Men Who Know Radio

The 882 broadcasting stations in the U. S. employ thousands of Radio Technicians with average pay among the country's best paid industries. Repairing, selling, servicing, installing home and auto Radio receivers (there are more than 50,000,000 in use) gives good jobs to thousands. Many N. R. I. trained Radio Technicians take advantage of the opportunities to have their own full time or spare time service or retail Radio businesses. Think of the many good jobs in connection with Aviation, Commercial, Police Radio and Public Address Systems. N. R. I. gives you the required knowledge of Radio for these jobs. N. R. I. trains you to be ready when Television opens jobs in the future. Yes, N. R. I. trained Radio Technicians make good money because they use their heads as well as their hands. They are THOROUGHLY TRAINED. Many N. R. I. trained men hold their regular jobs, and make extra money fixing Radio sets in spare time.

I Train Men to be Radio Operators Too

Yes, N. R. I. trained men pass Government Radio-telegraph license examinations. We teach not only all required knowledge of Radio principles, but also have a modern Code Course—can supply all instruments and code practice exercises for gaining commercial sending and receiving speeds. Read about our Special Code Course in "Rich Rewards in Radio." Government Departments, Commercial Aviation and shipping companies employ a large number of Radio Operators and the number of jobs is increasing.

Find Out How N. R. I. Teaches You Radio and Television

Act today. Mail coupon now for Sample Lesson and 64-page book. They're FREE. They point out Radio's spare time and full time opportunities and those coming in Television; tells about my course in Radio and Television; shows more than 100 letters from men I trained, telling what they are doing and earning. Find out what Radio offers you. Mail coupon in envelope or paste on penny postcard—NOW!

THIS FREE BOOK HAS HELPED HUNDREDS OF MEN MAKE MORE MONEY

Rich Rewards in Radio

Good for Both 64 PAGE BOOK SAMPLE LESSON Free

I Trained These Men

\$10 a Week Extra in Spare Time
"I repaired some Radio sets when I was on my tenth lesson. I really don't see how you can give so much for such a small amount of money. I made \$600 in a year and a half, and I have made an average of \$10 a week—just spare time." JOHN JERRY, 1729 Penn St., Denver, Colorado.

Makes \$50 a Week
"I am making \$50 a week after all expenses are paid, and I am getting all the Radio work I can take care of. Thanks to N. R. I." H. W. SPANGLER, 126 1/2 S. Gay St., Knoxville, Tenn.

Operates Public Address System
"I have a position with the Los Angeles Civil Service operating the Public Address System in the City Hall Council. My salary is \$170 a month." R. H. ROOD, R. 136, City Hall, Los Angeles, Calif.

Sample Lesson Free

I want to prove our Course gives practical, money-making information; that it is easy to understand—what you need to master Radio. My sample lesson text, "Radio Receiver Troubles—Their Cause and Remedy," covers a long list of Radio receiver troubles in A.C., D.C., battery, universal, auto, T.R.F., super-heterodyne, all-wave, and other types of sets. And a cross reference system gives you the probable cause and a quick way to locate and remedy these set troubles. A special section is devoted to receiver check-up, alignment, balancing, neutralizing, testing.

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

Radio is already one of the country's large industries even though it is still young and growing. The arrival of Television, the use of Radio principles in industry, Frequency Modulation are but a few of many recent Radio Developments. More than 28,000,000 homes have one or more Radios. There are more Radios than telephones. Every year millions of Radios go out of date and are replaced. Millions more need new tubes, repairs, etc. Over 5,000,000 auto Radios are in use and thousands more are being sold every day. In every branch, Radio is offering opportunities for which I give you the required knowledge of Radio at home in your spare time. Yes, the few hundred \$30, \$40, \$50 a week jobs of 20 years ago have grown to thousands.

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

- Without obligating me, mail your Sample Lesson and 64-page Book FREE. I am particularly interested in the branch of Radio checked below. (No salesman will call. Write plainly.)
- Radio Service Business of My Own
 - Service Technician for Radio Stores and Factories
 - Spare Time Radio Servicing
 - Auto Radio Technician
 - Aviation Radio
 - Operating Broadcasting Stations
 - Army, Navy Radio Jobs
 - Operating Police Radio Stations
 - Operating Ship and Harbor Radio
- (If you have not decided which branch you prefer—mail coupon for facts to help you decide.)

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by **THE EDITOR**

**YOUR RESPONSIBILITY
and OURS**

THE most natural thing to do when some one takes a sock at you is to *strike back*. Such has been the reaction resulting from the bombing of Pearl Harbor. We have been receiving a great many letters and phone calls from our readers all asking the same question: "What can we radio-men do to help?" At the present time the answer is: to either join the many branches of our armed forces, or to sit tight if you are engaged in any type of radio work.

There is an urgent demand for *all radiomen*, not only for communications, but for Industry as well. You do not have to be an expert in your radio vocation to qualify for one of the many jobs available but the opportunity for advancement becomes greater as you become capable of increasing your value to Uncle Sam. You radio servicemen have a golden opportunity to render a great service to the public, and at the same time, to increase your revenue.

What then, is **YOUR RESPONSIBILITY**? It is this: To make every moment count in the course of daily routine work by increasing the tempo of your activities so that you will accomplish *more work* in a given amount of time. Secondly—to *study* during your spare time in order to become proficient in the undertaking of any new technique that might result from War-time production of new radio equipment, parts, servicing procedure, and substitutions. Third—you may be called upon to serve as a radio instructor if you can qualify. This will be, in some cases, a part time job and one which will enable you to render a great service to our Government. Fourth—if you are a licensed Ham you should devote much time to the study and construction of ultra-high-frequency emergency gear. This refers to equipment designed for 2½ meters in particular. As an amateur—you should register with Civic authorities in your community and offer your services and equipment whenever and wherever needed in times of emergency. Finally—you should *not* be a "rumor-spreader." Concentrate on your job and do your work to the best of your ability at all times. Do not discuss the War in detail with the customers on which you call to service a receiver. Keep your eyes and ears

(Continued on page 52)



Vol. 27

No. 2

Trade-Mark Registered

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

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for February, 1942

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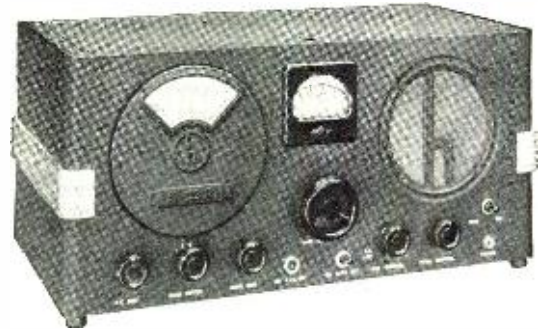
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Davega Promises Immediate Delivery of these famous Receivers!

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



dial for the 16, 20, 40, and 80 meter amateur bands provides frequency meter tuning. **\$109.50**

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

HALLICRAFTERS SKY CHAMPION

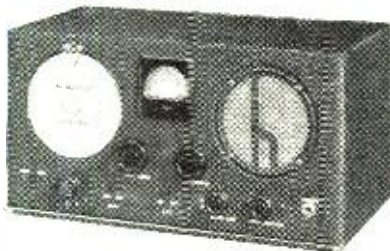


\$54⁵⁰

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-Vibra-pack, DC operation socket

HALLICRAFTERS S-19R

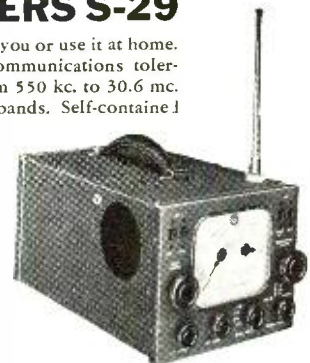
Continuous coverage 550 kc. to 44 mc., four bands, electrical bandspread, built-in 5" Dynamic Speaker, six tubes, built-in line filter.



\$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

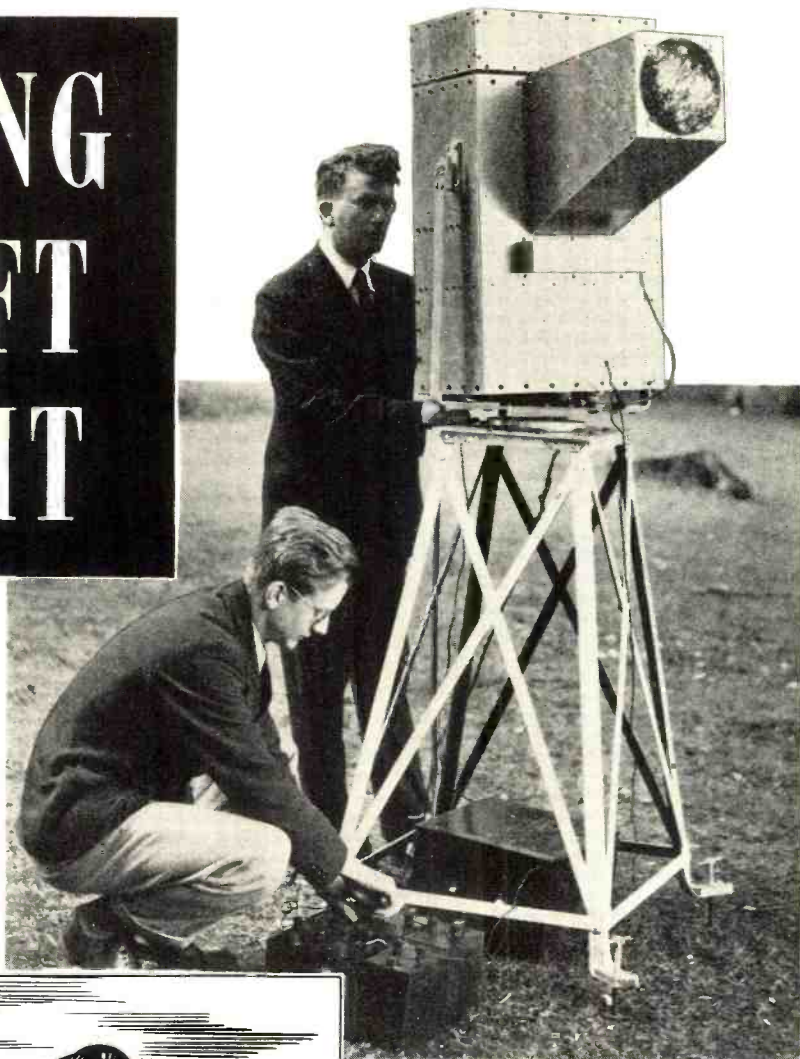
AMATEUR DIVISION
63 CORTLANDT STREET
NEW YORK, N. Y.

DAVEGA

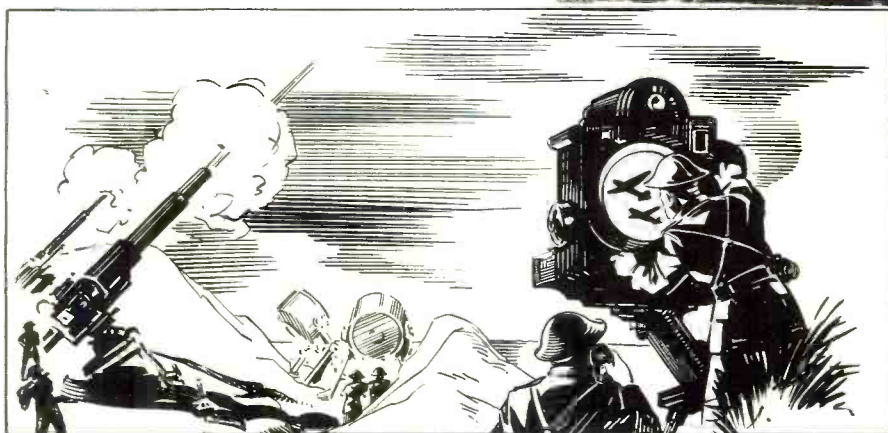
DETECTING AIRCRAFT AT NIGHT

by HERBERT ROSEN

Combining both Noctovision and Television—the Noctovisor detects planes at night and thru fog.



Here is a view of J. L. Baird's fog-piercing "eye" in action.



Artist's conception of the war set-up on the field of combat.

THE great steps of progress which have been made in the past few months in the anti-aircraft field in Great Britain are indeed amazing. The latest inventions in this field have made it difficult, in these recent months, for the Germans to bomb England as fiercely as they did at the beginning of the Blitzkrieg, and, on the other hand, has minimized the amount of damage done to England in general.

Improvements are being made from day to day, and eventually the mechanisms will reach such a high degree of perfection, that the Germans will confront great difficulty in even

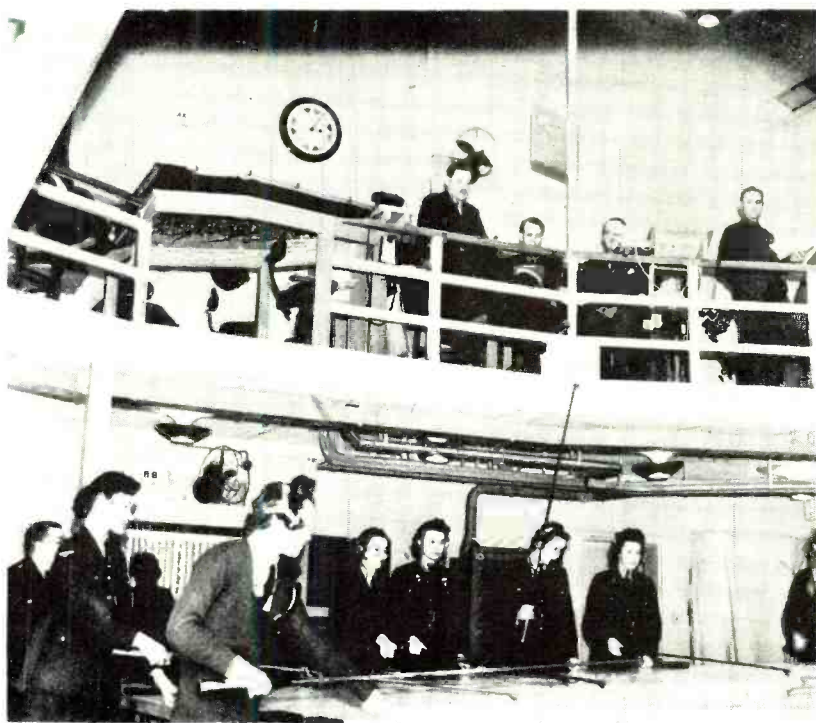
reaching the coast of England. In this respect we can say that we are all looking forward eagerly to the day, which is very near, when the Allies will "dominate the Air." Quietly and without ostentation progress has been made within the past few months towards solving the critical problem of national defense. The experts are confident that the solution which has been found is without precedent, and a new phase of high efficiency in national defense has definitely begun. Without giving away any military secrets, we can tell you the basic idea of this invention.

This amazing new discovery is com-

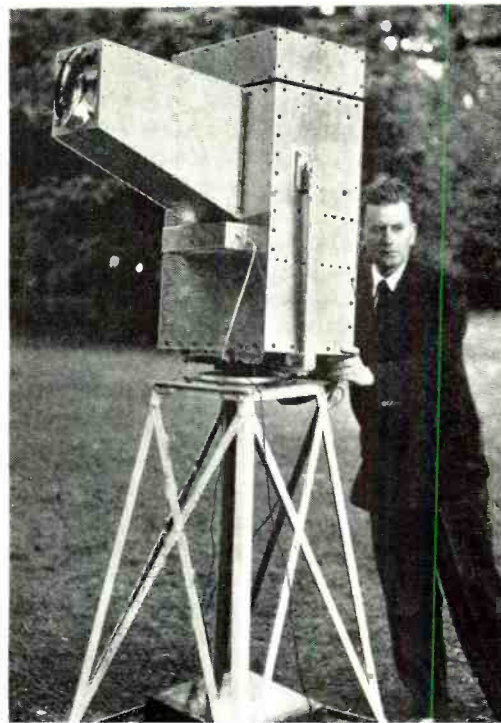
posed of a combination of the new twin-sciences—*Television* and *Noctovision*. Television, today is as familiar to everybody as the electric bulb and needs no explanation, but—what is Noctovision? This is, no doubt, not only a new science, but also a new word to many people.

The Invisible Ray

Noctovision is *vision in darkness* brought about by the invisible infra red ray which is transformed by means of a modified television apparatus into a visible ray. Simply explained, the apparatus itself is essentially a television transmitter and receiver mechanically coupled together, and constructed to be sensitive to invisible infra-red rays in place of light. The lens of the "Noctovisor" casts a little invisible image formed by the infra red rays upon the exploring disc of a transmitting "Televisor," similar to a cinematograph picture, and this mechanically-coupled receiving appara-



R.A.F. Officers and girls of the Women's Auxiliary plot enemy craft.



A side view of the Noctovisor of J. L. Baird.

tus simultaneously reproduces and makes visible this image, which is then transmitted back to the screen at defense headquarters.

One may be led to believe that this invention is a recent one, but it is not. Actually, it is about fifteen years old, and the inventor is *John L. Baird*, the great British television inventor. *Mr. Baird* demonstrated Noctovision for the first time to the Members of the *British Royal Institution* in December, 1926. Since then it has been developed in secret. At one of the next experiments, one year later, for the "British Association for the Advancement of Science," the gentlemen were sitting in a pitch dark room in Leeds before the Noctovision transmitter. Much

to their sincere amazement, they were one by one recognized by their colleagues who were present before the receiver at the Baird Laboratories in London. And from then on *Mr. Baird* has improved this device until it reached the high level of perfection at which it is today.

The Functions of the Apparatus

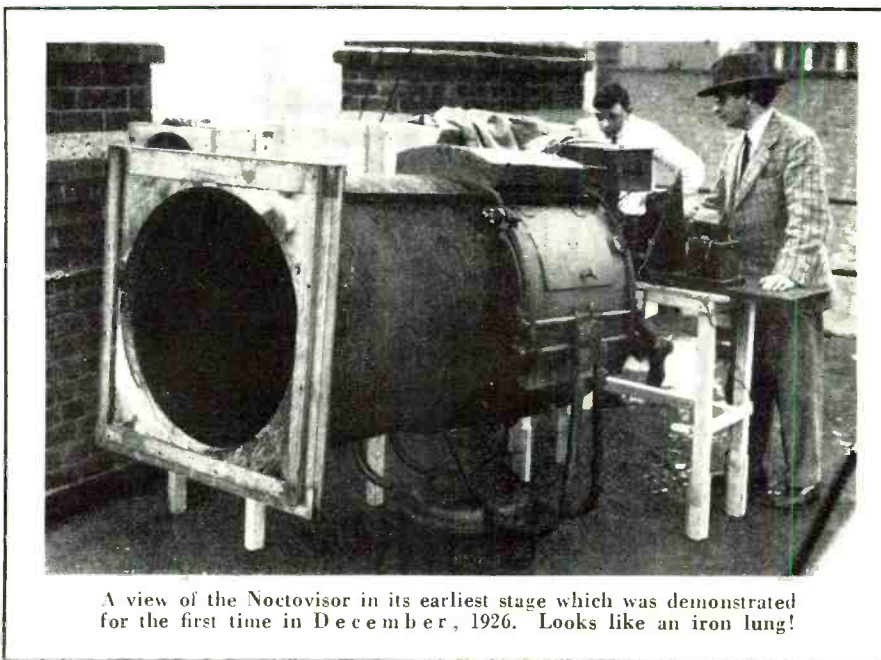
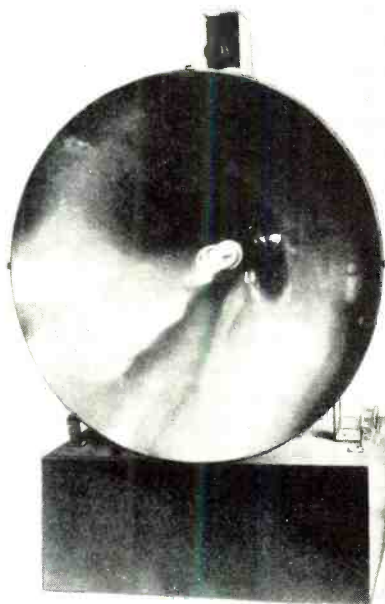
The apparatus today resembles a gigantic camera made of aluminum. A lens of about eight inches in diameter is attached to the end of a cone protruding from the front of the aluminum box. This box with its lens swings on universal pivots so that it can be directed to any degree. It is, in fact, a kind of camera obscura,

differing from an ordinary camera obscura only in that this one renders visible not ordinary rays of light, but the infra red rays, those invisible rays which occupy that part of the spectrum *beneath* the visible red. Infra red rays have the power of penetrating fog and a number of substances which are opaque to ordinary light. Among them is ebonite, which, while opaque to ordinary light, is semi-transparent to these invisible red rays.

The Noctovisor shows on a little screen, resembling the ground glass screen of an ordinary camera, whatever object is in the focus of the lens. This image, it must be remembered, is

(Continued on page 46)

The heart of the obstacle detector.



A view of the Noctovisor in its earliest stage which was demonstrated for the first time in December, 1926. Looks like an iron lung!

AIRCRAFT RADIO LABS.



Present home of the famous Aircraft Radio Laboratory located at Wright Field in Dayton, Ohio.

by **Lieut. Col. JOHN H. GARDNER**

The Aircraft Radio Laboratory is responsible for the research, development, engineering, and inspection for equipment required in the field by the Army Air Corps.



LIEUT. COL. GARDNER

THE *Aircraft Radio Laboratory* is located at Wright Field, Dayton, Ohio. Wright Field is the home of the Materiel Division of the *Army Air Corps*, and there are concentrated all of the experimental laboratories which are making such tremendous advances in the development of aircraft and aircraft accessories.

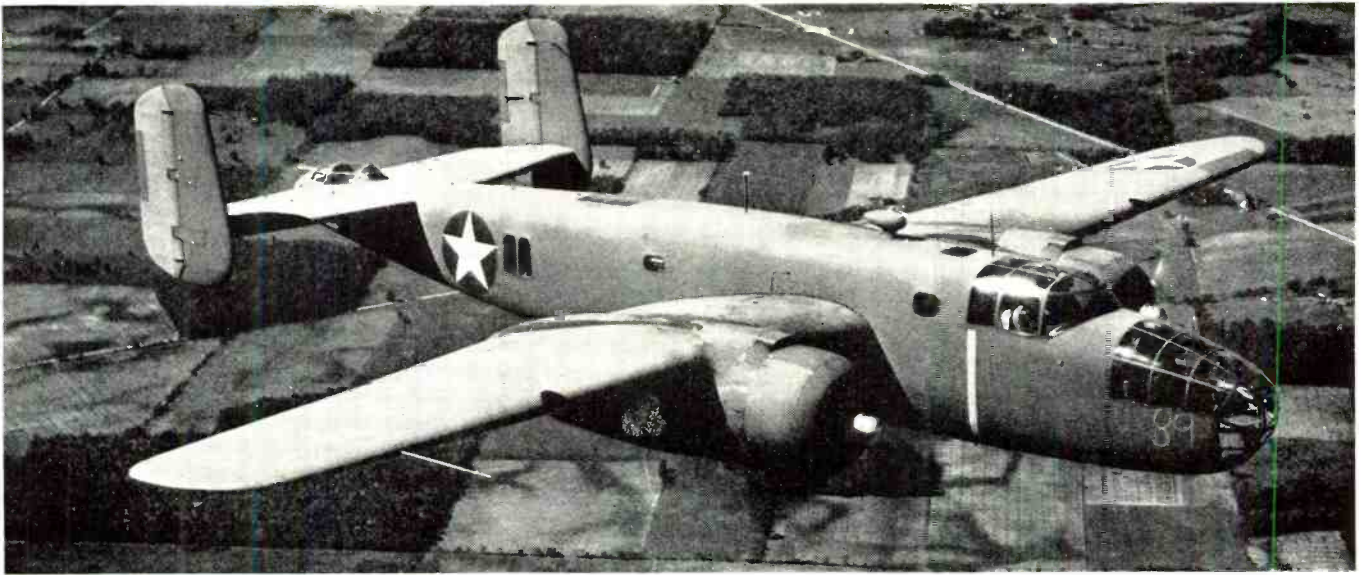
Originally established at McCook Field in Dayton shortly after the World War with one officer and a few civilian engineers, the *Aircraft Radio Laboratory* was moved to Wright Field when McCook Field was abandoned and has grown steadily as the

radio art has progressed until now there are more than a score of officers and hundreds of radio engineers, physicists, mechanics, machinists, draftsmen and other specialists so necessary in any research laboratory, working continuously on the research and development of new and improved applications of radio to military aircraft.

From a small brick and wood structure some forty feet square, the physical facilities have grown to include a construction program which will shortly provide tens of thousands of square feet of laboratories, shops and

hangars, provided with the latest and most up to date laboratory apparatus.

The *Signal Corps* is the agency of the *War Department* charged with the development, design, procurement and supply of all radio equipment for the *United States Army*, including radio for the *Air Corps*. The *Aircraft Radio Laboratory* is the agency of the Chief Signal Officer responsible for research, development, engineering, and inspection required in the radio field incident to design, supply, and installation of radio equipment on aircraft for communication and navigation. For this reason the Director of



Medium Bomber in flight. Note the radio antennae placed above and below the fuselage.

the *Aircraft Radio Laboratory* is a *Signal Corps* officer who carries out the directives of the Chief Signal Officer as laid down in the development program for new and improved aircraft radio equipment. The majority of the officers on duty at the Laboratory are *Signal Corps* officers with special training and experience in aircraft radio communication equipment. All funds for both personnel and development work are supplied by the Chief Signal Officer.

It is obvious that to develop aircraft radio equipment suitable for military use consideration must be given in its design to the conditions under which it must operate, such as space limitations, power supply, variations in temperature encountered in operations in any climate from the equator to Point Barrow in Alaska, and in pressure from sea level to the stratosphere. Finally, it must be so designed and installed that the pilot or radio operator can use it with the maximum of ease and the minimum of discomfort and fatigue.

In order to assist in meeting these requirements, the staff of the *Aircraft Radio Laboratory* includes a number of *Air Corps* officers who have had years of experience in flying all types of military aircraft and who have specialized in communications. Certain airplanes are permanently assigned to the *Laboratory* for preliminary flight testing of models of equipment in varying states of development, and in addition, the newest types of airplanes are assigned to the *Laboratory* as needed to flight test production models, and determine final requirements for wiring, antenna and all the other myriad details required to insure a trouble free installation.

The closest coordination is maintained with the other experimental laboratories of the Materiel Division to insure that the development of radio equipment fits in with the development of new types of airplanes

(Continued on page 56)



View of the Flying Radio Laboratory, used by the Aircraft Radio Lab.

Interior of the Flying Radio Laboratory. Note the PA System speakers.



Receiver Oscillation

by JOHN KEATING

The following analysis on the subject of receiver oscillation should clarify many points.

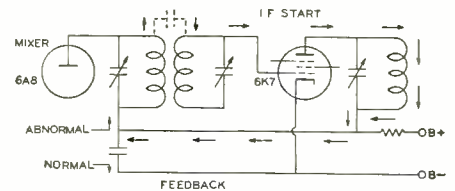
IT is well known that when the plate circuit of a vacuum tube reacts upon the grid, the effect produced is *oscillation*. In the oscillator of a superheterodyne the plate circuit may be as shown as in the sketch. The first example shows a tuned-grid, tuned-plate type of circuit, which is seldom used except in transmitters. The second is the conventional feed-back circuit, sometimes used in regenerative sets of the one stage r.f. variety. The third is the electron coupled type which is very stable, but very likely to produce harmonics. (Fig. 1-2-3.)

It has been shown why a circuit will oscillate, and now let us consider how the r.f. amplifier or the i.f. amplifier or even the audio end of the receiver may break into unwanted oscillation. If we take an ordinary r.f. amplifier, such as that used at the antenna input of a small receiver, the commonest cause of uncontrolled oscillation will be an *open* condenser from screen to chassis.

This may be checked quickly, by bridging the open condenser with a good one. The condenser may be only partially open, in which case the oscillation will occur towards the low

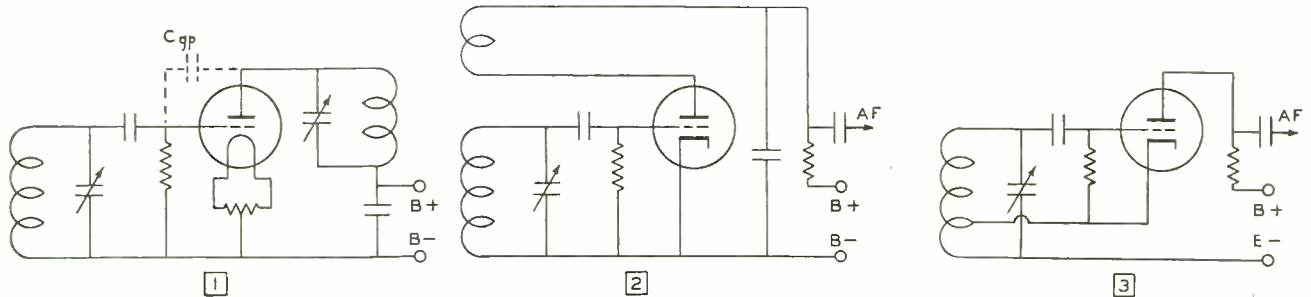
detector tube. If the mica condenser from plate to chassis or cathode is open or not heavy enough for its job, the plate will feed back to the input.

In receivers employing metal tubes, the r.f. or i.f. circuits may oscillate due to an open condenser in the plate circuit. If two plate circuits operating on the same lead to the power supply are not by-passed, energy will be fed back as shown in the sketch, causing oscillation. The circuits need not be operating on the same fre-



quency to become unstable, since, in the case of an i.f. stage feed-back may take place through the i.f. transformer.

In the sketch a mixer and i.f. stage are depicted, and it is evident that the 6K7 plate will affect the 6A8, as a



In the first instance the feed-back was achieved by the coupling between the grid and plate, as a result of their capacity. Notice that both circuits have a high series impedance, which forces the energy to be reflected from plate to grid. The second example uses electro-magnetic coupling between grid and plate. The third uses the electron stream within the tube as a coupler, since the plate current modulates the grid when it passes through L.

Obviously, it is similar to the Heising or plate modulation circuit in that it makes use of a coupling impedance, in this case L, and the variation in either grid coil current or plate current will affect the one or other of the two currents.

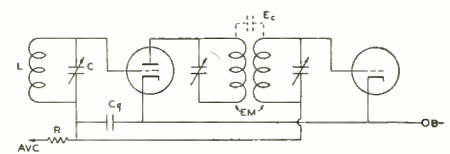
frequency end of the dial, near 600 kc. in broadcast receivers. When the condenser opens the grid (control 1) to plate capacity is increased, and the gain of the tube does the rest.

Another very frequent cause of oscillation in this circuit is coupling between the plate and grid due to an unshielded grid wire where it runs to the top of the tuning condenser, especially if T is unshielded or the tube does not have a shield, which is the case in cheap midget sets. Sometimes, this is intentional and oscillation is actually wanted, to increase selectivity.

Usually, under such conditions, the loading effect of the antenna will cut down the regeneration. If a stage of r.f., such as this one, is "hopped up,"

result of the series resistance of the plate lead going to the B voltage. The condition is aggravated if a series resistor, which is quite commonly used at this point, adds to the plate lead resistance. It is, as in the previous example of electron-coupling, the third form of oscillator, a kind of Heising or plate circuit modulated affair.

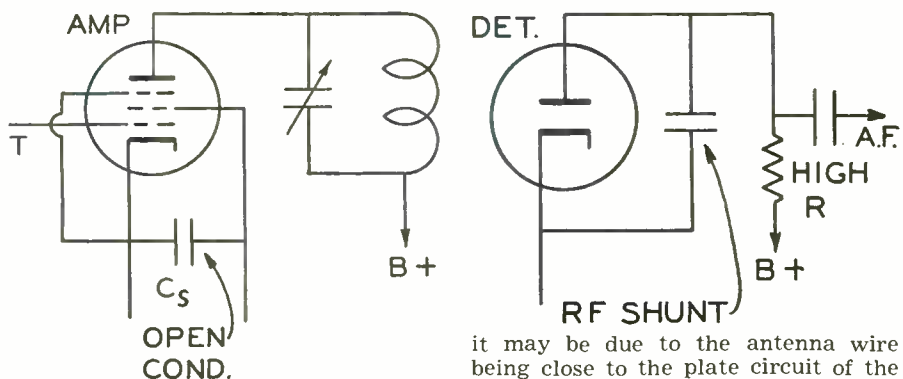
Another very common cause of os-



cillation in modern sets is the open condenser of the a.v.c. network. The condenser used to by-pass the grid return of the mixer to ground, together with the grid return of the i.f. is usually the offender.

This results in the grids of the tubes being very much above ground potential and being, in effect, "free." There may be squealing and a loss of sensitivity, despite the regeneration, and the gain will be much less towards the low end of the tuning dial, since the reactance of stray shunt-to-ground capacity of the wiring will be higher at 660 kc. than at 1,200 kc. If the plate and screen filters are in poor condition the effect will be far worse,

(Continued on page 66)



it may be due to the antenna wire being close to the plate circuit of the

Weightless Power Supplies

by **FRED SHUNAMAN**

The voltage-doubler plate supply finds many applications other than in radio receivers.

VOLTAGE-DOUBLING circuits have a number of applications wherever moderate currents at voltages well above 110 are needed, and where considerations of weight, space or convenience suggest eliminating the power transformer. Many uses will suggest themselves to the experimenter, such as powering small amplifiers, receivers, test instruments, etc. For the low-power carry-around amplifier so commonly used by shop-window demonstrators, this circuit offers a real saving in weight and space. Yet the voltage-doubler has long been the orphan among rectifier circuits, partly because of mere habit—we feel that what cannot be done well with 110 volts needs 250, and partly because of unfamiliarity; a feeling that it is a trick circuit and must therefore be tricky and undependable in operation.

This is not the case, as the following will show. A voltage doubler will deliver between 180 and 250 volts with fair to excellent regulation, and (when used with large rectifier tubes) requires only a filament transformer with two windings, 30 watts rating. Used with the smaller voltage-doubling tubes, of which the 25Z5 is one type, only a resistance cord is necessary. The large power supply shown here was used to feed an amplifier drawing more than 100 mils at 200 volts, with excellent filtering.

To understand how this circuit works (and how it may be possible to get more than 220 volts by "doubling" 110), let us see what really happens in a so-called 110-volt circuit. Taking one wire as a reference point and measuring the voltage between it and the other wire during one cycle (1/60 second) we find that during the first quarter of the cycle the voltage in our wire rises to about 155 volts positive. As soon as it reaches this peak it starts to fall again and at the end of the second quarter is back where it started.

Now our wire starts going negative, and at the end of the third quarter is 155 volts negative with respect to the reference wire. During the fourth quarter the voltage rises again until at the end of the cycle the two wires are the same voltage and the process starts all over again. *The only time the line voltage is 110 is the instant the voltage is rising and falling past the 110-volt point.* But, since an a.c. line whose voltage varies between zero and 155 volts will do the same amount of work as a d.c. line of 110 volts, so it is said to have an "effective" voltage of 110, and for most practical purposes this is as good a measure as we need.

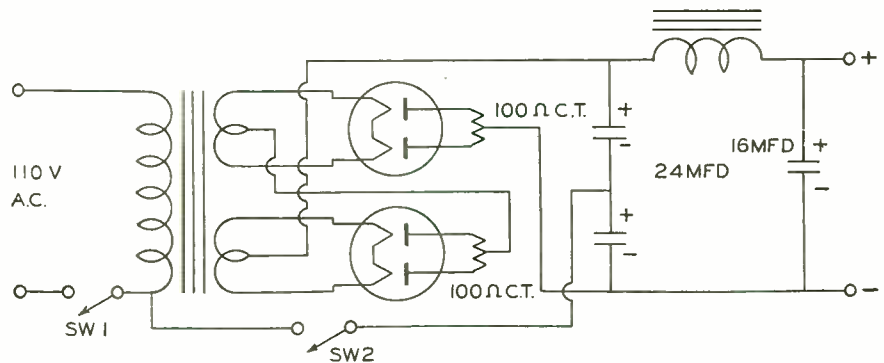
In this case, however, we are interested in the *actual* voltage of the line, and we can see that there is a dif-

ference of more than 300 volts between the most positive and most negative instant of one wire. If we could only anchor the other wire to mid-tap in our circuit and switch the first wire to the positive and negative ends at the right instants, we might be able to use the greater part of this 300 volts.

Rectifier tubes can be used as switches and will do the rapid attaching and disengaging without fuss or hesitation. But the line reaches its maximum voltage in each direction only for an instant, and we must have

tubes so that the other wire will deliver current to one condenser when it is positive, and to the other when it is negative, with respect to the center-tap. The condensers cannot discharge back through the rectifiers, so we have a voltage of more than 300 across the two of them.

Now we have a 300-volt supply—or have we? The answer is: we have, as long as we draw no current from it. Unfortunately, we will probably want to use our power pack. If the outside terminals are attached to a load the charge will drain off rapidly

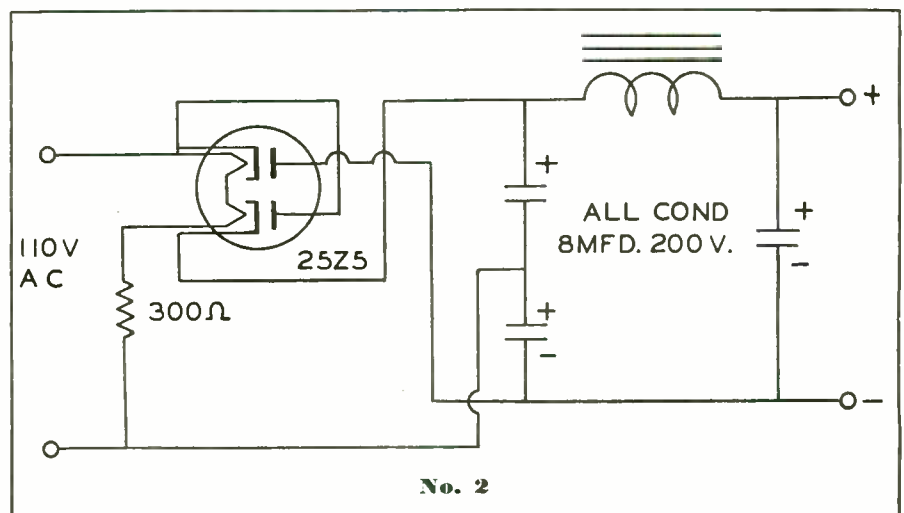


No. 1

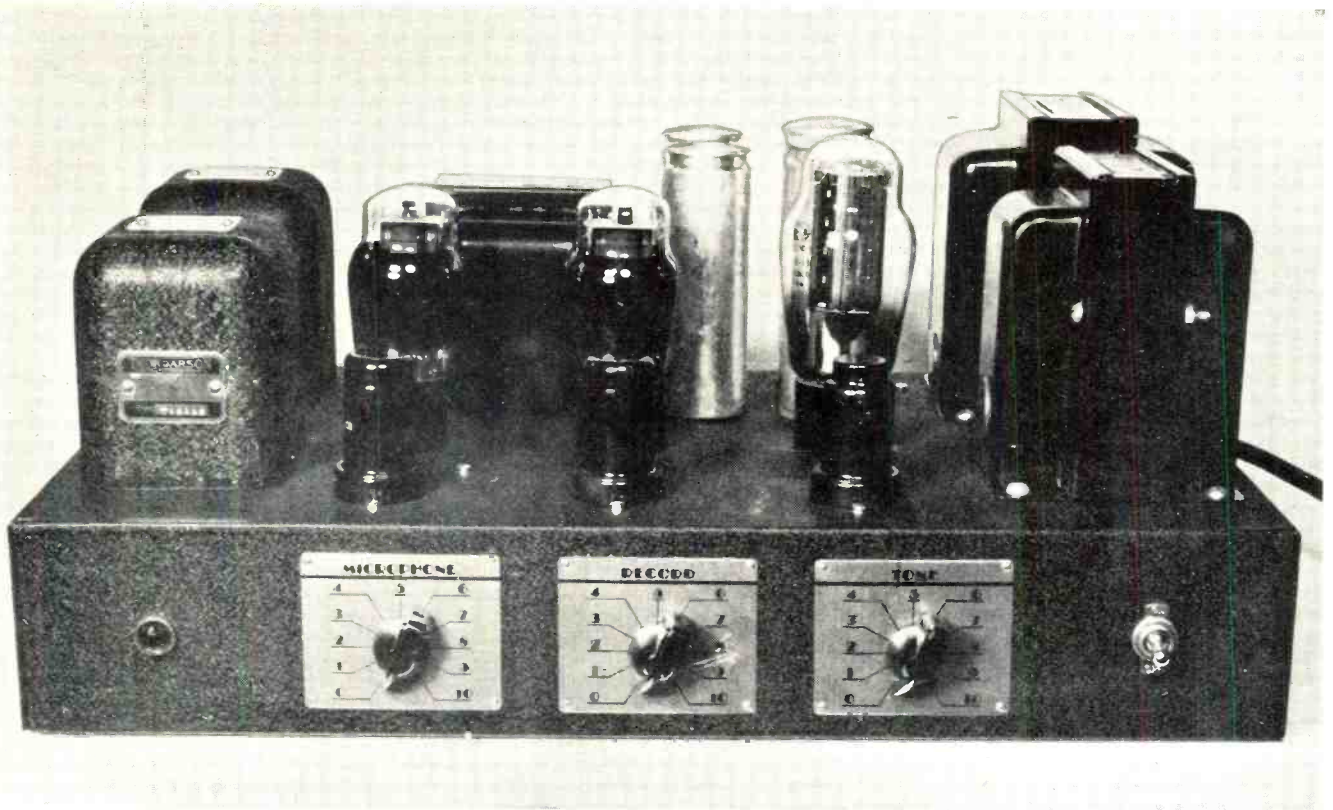
continuous direct current of steady voltage. Here is where that useful device, the condenser, shines. It knows nothing about "effective" voltages—understands only peaks. If 155 volts is applied to it, it charges up to 155 volts. So all we have to do is connect two condensers together, fasten one wire of our a.c. line to the mid-tap and arrange our rectifier

and the voltage of our supply will fall to zero. Unless the load is very heavy, however, the voltage should not drop very much in the sixtieth of a second before the condenser is recharged from the line.

Thus the steady voltage delivered by this type of supply depends on the load, the size of the condensers and
(Continued on page 66)



No. 2



There is no crowding of parts on this amplifier chassis. High-grade transformers aid overall fidelity.

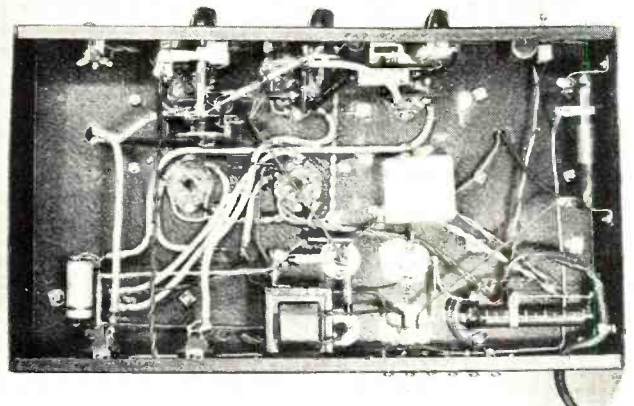
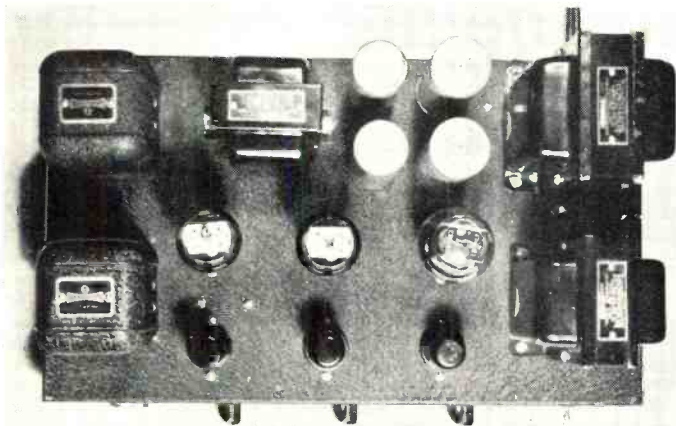
A FLEXIBLE AMPLIFIER

by **LLOYD MOORE**

*Careful design and layout always result in efficiency.
A host of applications will be found for an amplifier
of this type. It will serve for recording admirably.*

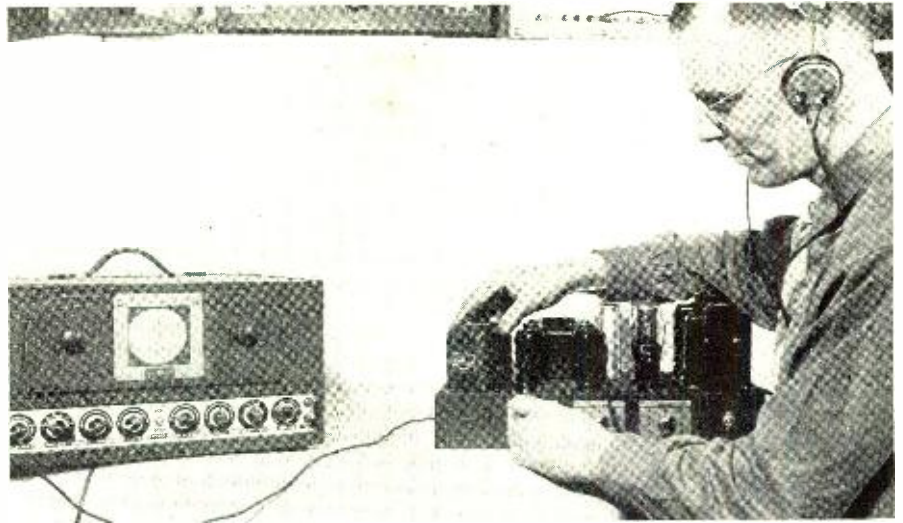
Top view shows where to mount the parts for best results. Power supply kept away from the inputs.

Bottom view shows the simplicity of the wiring when done properly. Note the extensive shielding.



OFTEN times one is called upon to furnish a particular type of amplifier to do a certain type of work. The amplifier described here-with was built for a particular job however many of its features make it useful for other applications as well. In building this amplifier the following conditions had to be met and solved with as little expense as possible. The output needed was from five to ten watts. The tone quality had to be above reproach. The microphone cable had to be one hundred feet long through a maze of previously installed a.c. wires and signal systems. Lastly the output must be humfree at all volume levels. The hum was easy enough to eliminate on the phono pickup channel, but the microphone end presented several problems that were solved by experiment.

In considering these requirements one by one, we began in the output stage where two 6V6 tubes were used in conjunction with a transformer equipped with a feed-back winding. These tubes gave all the power necessary and, when used with the proper transformers, input and output, the quality was excellent. Take the usual precaution to see that the feedback winding is not reversed, which will cause oscillation and very poor quality. Triode power tubes could have been used in the last stage with good results, except that extra care must be taken to keep out a slight ripple



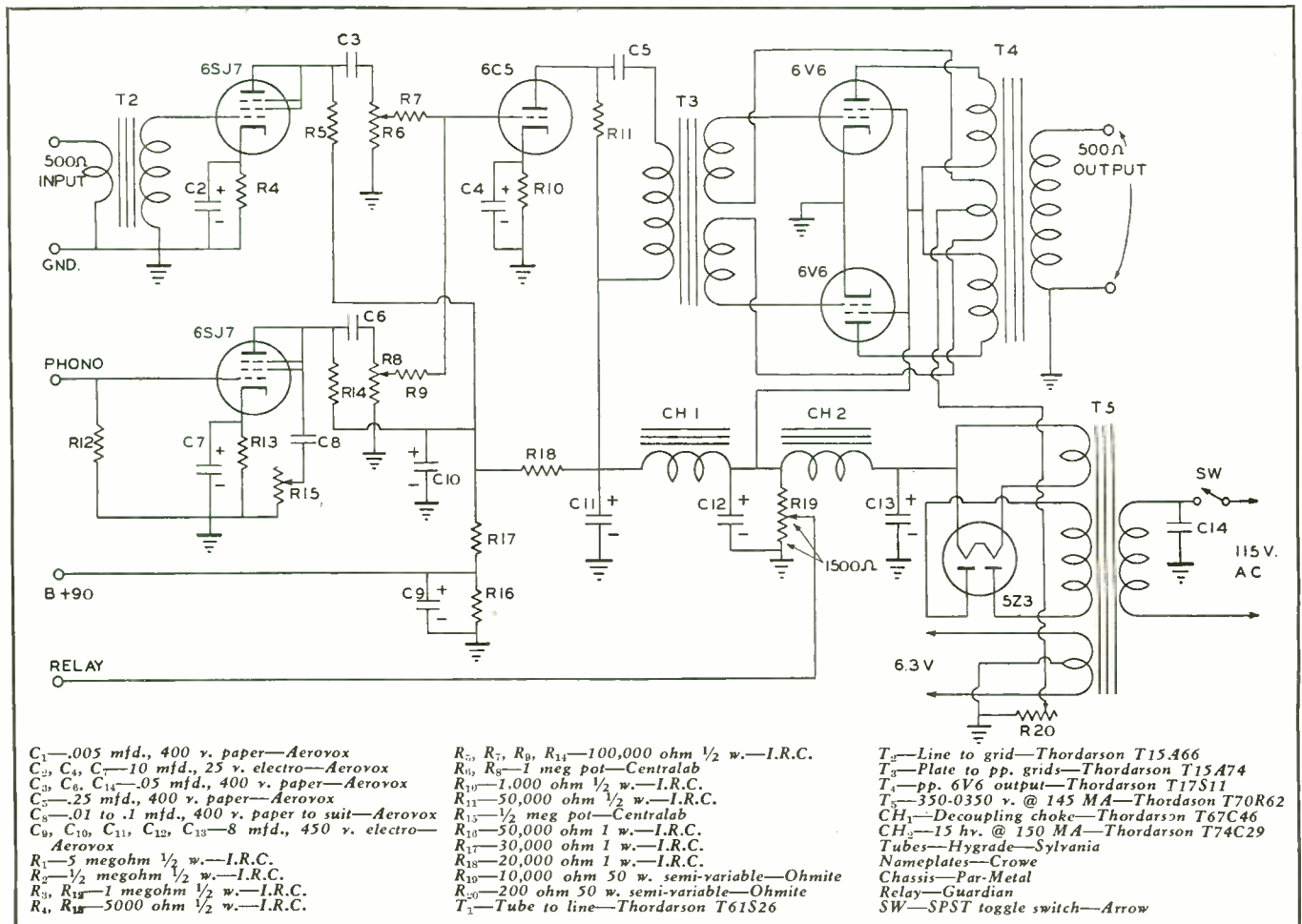
The author checks the completed amplifier with an oscilloscope.

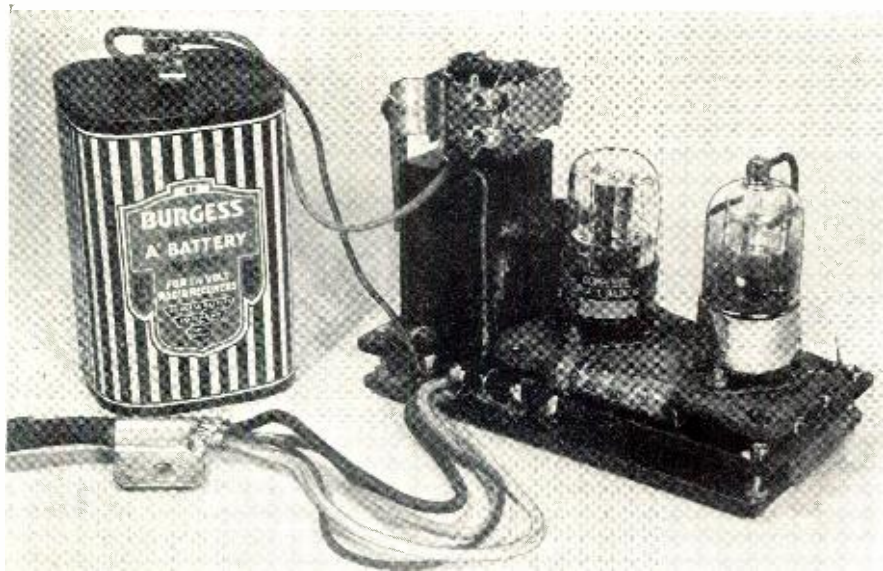
hum from being heard in the speaker. The hum level of this amplifier was so low that a person two feet away from a speaker could not tell if the amplifier was off or on when the controls were turned down.

The circuit was divided just before the driver stage for two reasons. In the operation of this amplifier it is expected that an operator might forget to turn the tone control from bass to treble when shifting from music to microphone channel. With the driver tube acting as the mixer it is

possible to put the tone control on the record channel amplifier tube only. For handling by inexperienced persons this feature has proven itself well worth while. No chance trying to use the mike with the tone control turned down deep till the voice sounds mushy.

The other feature is the elimination of crosstalk, hum or other noise from one circuit interfering with the other channel not in use. The phonograph input was from a high impedance magnetic unit, through a scratch fil-





View of the preamplifier removed from the case shows relay mounting.

ter. All leads were shielded. Tone control was a variable resistance and series condenser across the plate of the triode-coupled 6S57 tube.

The microphone input to the main amplifier is 500 ohms. It is necessary to use a well designed 500 ohm input transformer here or trouble from hum pickup will be experienced. Even with a good transformer it will be necessary to experiment with the mounting position of the transformer with the transformer connected in the circuit and the amplifier turned on.

In designing the microphone circuit it was decided to use a three-wire cable running through the building to connect the mike preamp to the main amplifier. In this case there was already a three-wire shielded cable through the building that had been used as a carbon mike cable which saved installation of a new one. For simplicity it was decided to use the 1.4 v. type tubes in the preamplifier. The crystal mike, preamp and "A" battery were all built into a unit that had been formerly used as a condenser mike case. If desired the mike preamp may be built-in the microphone stand base. This helps to provide stability and at the same time makes the assembly less conspicuous.

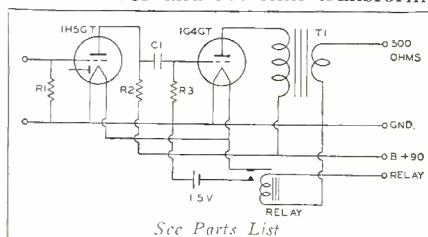
A relay is used to turn the filaments on in the preamplifier whenever the main amplifier is turned on. This saves any chance of the preamp being left on and running down the battery. The relay was operated from current taken off a bleeder in the main amplifier. This was carried to the preamp by one of the three wires in the cable. The B plus voltage was carried through the second wire and the 500-ohm mike line on the third. The outside shield acted as a ground return for all three. Jones plugs were used for all mike line connections.

In constructing this layout it is well to start with the main amplifier. A chassis must be used that is large enough to permit the mounting of all

parts without crowding that might cause hum from inductive pickup. The two main offenders here being the power transformer and the first choke.

A 10" x 17" x 3" chassis is a suitable size to fit these requirements. The power transformer and first choke must be mounted as shown in the photograph. The filter condensers are placed between the power transformer and the output transformer. This is a convenient location and also spaces the output transformer far enough from the power transformer so there is no hum pickup. Even the output transformer itself will pick up hum if it is not at the proper distance or angle from the power transformer.

The driver and 500-ohm transform-



ers are at the other end of the chassis giving minimum hum pickup. They are rotated and tilted with their leads connected while the amplifier is turned on to determine the position giving no hum pickup or at least the smallest amount of pickup possible. They should then be fastened in their exact location regardless of the final appearance. The rectifier, power, driver and amplifier tubes are arranged as shown in the top photo.

In wiring the amplifier use shielded wire for all circuits carrying signal (audio) voltage. Also the feedback wires connecting the output transformer with the secondary of the driver transformer are also shielded to prevent any chance of oscillation. A small tin shield was built over the socket of the 5Z3 rectifier tube which seems to stop the hum radiated from the high voltage wires at the base of

the tube. It is well not to try cabling the wiring of the set unless the constructor is experienced, because improperly done, this may lead to trouble from hum, feedback and other circuit noises.

It will be noticed that the volume control on the mike input is set back from the front of the chassis and a switch has been placed near the shaft of this control. A set screw in a collar on the shaft opens this switch as soon as the mike is turned on. This switch is used to control a loud speaker located about ten feet from the microphone. With this device music from the phono channel may be supplied until the microphone is turned up then the change from music to speech is made without any fear that this speaker will cause feedback.

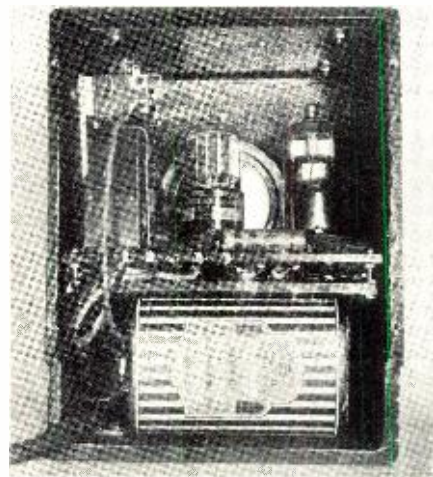
The output of the amplifier goes to all other speakers save the one in the room in which the mike is located. This makes for smooth operation even in inexperienced hands.

The phonograph input is conventional. A magnetic pickup was used through a scratch filter. The tone control was connected to the plate of the 6SJ7 tube used as a phono amplifier tube. This control was made to cut out the highs as it was advanced. This prevents the tone control being used as a volume control.

The microphone unit was constructed to fit an old condenser microphone case, but any shielded box would have done as well. The preamp itself was built on a piece of ¼ inch bakelite. The sockets were mounted on sponge rubber to prevent any chance of microphonics from the tubes themselves. Flexible cable to connect them in the circuit was made by threading dial cable through insulation from hookup wire. Merely solder a piece of a strand of dial cable to a piece of pushback and pull it through the insulation, leaving the dial cable in the insulation to be used as the flexible cable.

The plate to 500-ohm line transformer is fastened to one end of the bakelite and the relay is fastened to the top of this. The "A" battery is placed
(Continued on page 65)

Preamplifier and mike fit into case.



MUCH has happened since the appearance of my last column. Today we are at war. As such, many decisions will be made by those in authority, which, under normal circumstances, would never be dreamed of. Things that might be considered laughable in normal times, now become full-fledged facts. The minds of people are focused upon their present status, and possibilities of the future. This, as it applies to the radio repairing industry, presents a pretty confused situation.

A great deal has been said about the status of the radio repairing industry, and, develop what may, one prime requisite exists—namely, that *those in the industry must make every effort to maintain a clear head* and to think rational thoughts. As yet there seems to be nothing definite concerning the status of civilian radios, which naturally reflects upon the future of the repairman. As to this future, there are two views which are of concern. One relates to the man continuing in the repair field; and the second, to the possibility of his being called upon for military service. Let's consider these separately.

Concerning the repair field, there is no doubt in our mind—and this is concurred with by a number of other people—*properly operating radio receivers are vital to the welfare of the people, consequently, to national defense.* Under the circumstances, there may be numerous delays before some definite status is established for all that is involved in the repairing field, but it seems inevitable that recognition be given to the need for proper repair of America's civilian radio receivers. Whether or not this is going to embrace all of the receivers now in the field, which means those in the home and those in automobiles, is a matter of conjecture. Frankly, we cannot see how or why it will be vital to keep in repair *all* of the receivers which may be possessed by an individual family.

It seems most logical that considering the shortage of supplies and the fact that there cannot help but be allocations of materials, the government may say they are interested in but one receiver in a home.

Based upon an approximation made in 1938 by the Relief Authorities, there are approximately 3.9, or roughly, 4 persons in a family. This means that considering the population of the United States, there are about 30,000,000 families. This also means that of the 50 or so million receivers which are supposedly in the hands of the population, at best only about 30 million would be of interest to the government—that is, as far as maintenance is concerned. Whether or not every family in the nation does own a radio receiver is problematical, so that it would seem that some requisitioning or distribution of receivers in accordance with electrical facilities of families may take place. But even if such is done, it still limits receivers in

AS I SEE IT!

by **JOHN RIDER**

Properly operating radio receivers are vital to the welfare of the people, consequently to Defense.

the home to about 30 million. Obviously, this means some curtailment in the amount of work which would be placed in the hands of servicemen. based upon the existing 50 odd million sets.

However, this is not as drastic as it may seem from the percentage view. The reason is nothing more than the fact that on the average, we doubt seriously if more than 12 million receivers have been serviced during any one year in the past, perhaps even the most productive of years. Under the circumstances, it is reasonably safe to conclude that the *present state of busy activity in the service shop will continue.*

Concerning the future status of the repairing industry, there is no doubt about the fact that men will leave it for service in the armed forces of the nation. This presents the possibility—and it is not as ridiculous as it may sound—that women may find their place in repair shops; not necessarily as those who would do the analysis upon a receiver, but rather those who would make the actual replacement of a part. Thus in a shop where today there may be 2 or 3 or more men, all of whom do analysis as well as repair, there may be just one man whose job would be the analysis of the defect and the actual repair would be made by women helpers.

This matter of women in the radio industry is nothing new, for in many cases women are preponderant in assembly plants. In fact, it has been proved conclusively that women possess greater manual dexterity, and are

far more adept at handling small parts than the average man. It has been shown that it is not a difficult matter to teach women industrial processes such as soldering, wiring, and the handling of such units as would normally be worked with in making repairs upon radio receivers.

It may be of interest to state that several movements are now afoot to teach those women who have been displaced from jobs in factories where non-essential products were being made, the industrial processes found in radio unit production operations. This is being discussed with various Boards of Education in different cities and there is every likelihood that it shall become a reality, if only because radio plants anticipate a shortage of man power and woman will be used. . . . There is no fundamental reason why this movement cannot spread into the radio repair shops just as readily. In plain talk, this means a substitution of women for men wherever possible, not necessarily the elimination of the industry or the individual business. *The NYA is one organization that has pioneered in the training of women in radio.* EDITOR.

We have talked in the past about possible difficulties in the effort to secure new replacements of old test equipment. From what facts we can gather, the present wells of supply which still exist, will most certainly dry up and there will be no sales of new apparatus. This you can understand is a necessary condition in order that sufficient production facilities be available for defense equipment. And in connection with such defense requirements, most people seem to forget that military equipment also requires servicing, hence it is necessary to produce test equipment for such uses and they have preference over civilian communication test equipment. Naturally, we cannot speak officially, but it is reasonable to expect that before 1942 is over, the majority of test equipment manufacturers not now engaged in the production of test equipment for various armed forces will be so occupied.

Such a state may not necessarily create a shortage of test apparatus needed by those who do commercial radio repairing, for there may be made available for sales equipment to those who may need it, the unit no longer used by those men who may have been

(Continued on page 60)



"I don't want to mention names—but there's a rookie present that I suspect!"



SERVICEMAN'S EXPERIENCES

by LEE SHELDON

“YOU know what they ought to do?” I asked my partner one day last week. “They should manufacture metal tubes so that servicemen wouldn’t have to take them from the sockets to find out what type they were.”

Al turned from the workbench and looked at me with his routine triple threat—set jaw, pursed lips, lowered lids—and replied: “Yeh—and they should invent an umbrella for use during brainstorm!”

“No kidding,” I insisted, choosing to ignore his coarse manner and unappreciative attitude, which I have become used to. “It could be done very easily. If each type were a different size, a serviceman could, by ringing any of them with a mallet, know which was which. A 6N7, for instance, would probably give off the pitch of middle C, and a 6H6 might possibly be tuned to B flat. That way, no one would burn his hands.”

Al suddenly raised his eyebrows and gave me a phoney smile.

“You’re suggesting,” he said, “that every repairman carry a tuning-fork. Just think—88 types could be identified simply by walking into the customer’s house with a piano!”

I had him there. “No one needs a piano,” I pointed out. “Servicemen aren’t supposed to be tone deaf. Honestly, now—don’t you think the idea has merit?”

“More madcap than ascap,” he snarled.

“Why do you always discourage me?” I asked, plaintively. “Don’t you know the art would never progress unless we made suggestions? The whole history of radio—”

“Look,” he interrupted, tapping my chest with a pair of diagonals. “whenever business gets slow, you fill in your time with a bunch of impertinent words. Instead of scouting around for new work, you stall with abstractions. There are two things an ‘outside’ man should do during his spare time: first, find new work; second, create good will.”

“It doesn’t work,” I told him. “Those forced draft jobs never pay for themselves. When I ask a man if he needs work on his set, he holds the psychological advantage. It’s better to wait for him to ask *us* to do the work, at a time he has the money handy. Otherwise, he just tells me not to bother with the repair if it costs more than two dollars.”

“That’s where your salesmanship comes in,” Al replied. “I’ll bet that right now, if you asked the first three

persons you met if they wanted work done on their sets, at least one of them would say ‘yes,’ and that you would have an opportunity to make good will. But you won’t—you’re too scared!”

“That’s a challenge,” I declared, “and I’ll do it just to prove you’re wrong!” I picked up my toolbag and started for the truck.

“Hooray—I’ve got him rolling,” Al said, in impolite third person, “the only serviceman in history determined to make a failure of his next call!”

Naturally, I was piqued, so I stopped off at Pete’s restaurant to simmer down a bit. Halfway through my coffee, I noticed the man sitting next to me at the counter. He was eating a doughnut very slowly. I appraised him, as one would the subject of a test case in Physiology II: clothes, a bit loud, but expensive; wavy hair, no hat; good-looking, with a pleasant manner; vulnerability, fair. I swung around on my stool and cleared my throat.

“Have you,” I inquired, “a radio in need of repair?”

“I have,” he replied, halting his doughnut in mid-air.

“Do you want me to fix it for you?” I asked. Although I felt the danger of a successful contact, I meant to keep the test fair.

“I should be delighted,” he said.

“When?” I asked, feeling a strange destiny shaping my ends, despite my rough-hewing.

“Soon as I straighten out this doughnut,” he said.

Well, before I realized what had happened, I was in his apartment. Smythe—the customer—was flopped across an easy chair, and I was examining his *a.c.-d.c.* midget. At the same time I, was searching my mind for a way to spoil the job legitimately.



“If you mean those *old* aluminum cans—I gave them to the Boy Scouts!”

“This thing needs a new rectifier tube and an electrolytic condenser,” I finally announced, “but it isn’t worth fixing—it’s a piece of junk!”

“I think a great deal of that set,” he replied, mildly, “for it is a present from a very dear friend in the Theater. I am, unfortunately, an actor—one who hasn’t worked for more than a month. Because of this circumstance, I both need the set and find myself unable to pay for its repair.”

“I thought so!” I told him, sniffing. Smythe looked at me squarely. “You needn’t rub it in,” he said. “I wouldn’t have had the nerve to ask anyone to look at the set without being able to pay him, but since you suggested it, I couldn’t resist. I *do* feel greatly encouraged by music while I’m waiting for a call, but I wanted you to know I was broke before you got too far into the job.”

“You mean,” I asked, hopefully, “that if I can’t handle it for two dollars, I should leave it alone?”

He thought for a moment. “I can pay you two dollars,” he agreed, as some of his stage presence left him. At any rate, he was honest.

“Tell you what I’ll do,” I offered. “I’ll run back to the shop and hunt in our junkbox for a used tube and a cheap condenser. Of course, we won’t guarantee the work, and the condenser will sorta hang out the back of the box—but you’ll have music.”

Smythe dropped back into his chair despondently. “Go ahead,” he ordered, without looking up. “do whatever you can for two dollars.”

When I came back into the shop and told Al what had happened, he put in a new tube and the best condenser in stock. I tried to explain that we’d lose money, but he paid no attention.

“C’mon,” he said, reaching for his coat. “I’ll go back with you and show you something you don’t know.”

Smythe, without moving from his chair, yelled for us to enter.

“Good afternoon,” Al said cheerfully, plugging the set in and unrolling the short antenna. The music came up, and it sounded fine.

“It’s a nifty little set,” he continued briskly, “and it deserves the best of attention. We did our regular job on it—no second-rate stuff. Like it?”

Smythe put his feet on the floor. “Yes, I do,” he replied, puzzled, “but didn’t this fellow tell you that—”

“I know all about it,” Al said reassuringly. “Tell me—where did you do your last acting?”

(Continued on page 43)

NOW that we are in the second World war right up to the hilt, it is past the time when re-cremations, or "I told you so's" are of much value. There were those among us who felt that our participation was inevitable, and there were those well-meaning among us who felt that we could tight-rope walk across the roaring flames beneath us. The general feeling of many citizens was that we *might* "get in it" sometime in the future, but it was a "*mañana*" feeling which resulted in but half-measures of national defense.

All this, thank God, is water over the dam. We stand to-day a united nation with one fixed purpose—that of beating the everlasting hell out of any nation or group of nations who would threaten us with serfdom under a tyrannical system, the like of which the world has never known.

We have as citizens of these United States many privileges. They include liberty of person, liberty of thought, liberty of word, equality of man . . . all matters which we held all too cheaply but a few scant weeks ago. Now we have another privilege . . . that of repaying, in wealth or service, our debt to our country.

As radio service men, we *must* do our part to see that our country maintains its vital radio communications. Some of us will find our niche in the armed forces. Others of us will be working with all our hearts in defense industries, so that vital war material is furnished in ever-increasing quantities to our front lines. The remainder of us will continue in our present jobs so that our people will still have various civilian means of communication held open.

However, we can all be "heroes"—no matter what job we do—so long as we dedicate ourselves to the sole purpose of winning the war in so far as our individual efforts can assist.

As in the past, I address my remarks particularly to that large group of radio men who perform the function of radio servicing. To you, the country looks for an uninterrupted program of keeping every possible radio receiver in tip-top operating condition. Your job will not be easy. Replacement parts will be hard to get. You may have other civilian defense duties which will demand part of your time. You may have to work long hours—seven days a week—365 days a year—to "keep 'em perkin'!" *This is your job . . . your gun crew position! You must not fail this trust!*

Sharp practices, laziness, technical ignorance, and a "business as usual" feeling *must* be brushed aside. When you finish the job of repair you have at the moment, you must turn to the next, or *immediately* seek others so that your time is *fully* employed. Every day, members of your group are being called to the colors so that their technical ability can be used to the best advantage in our armed forces. Take heed! The day may soon come

Radio Servicemen Can Help Win the War!

by SAMUEL MILBOURNE

*Your radio shop is a miniature arsenal of
Democracy. You help maintain public morale.*



when you will have so much to do that you will have to turn customers away.

Thousands of set owners may be without the use of a vital thing in their lives. Why? I'll tell you why . . . because you failed to take advantage of every moment when there was sufficient technical skill to go around. I'm not talking through my hat . . . if the facts were wired for sound, they could not be more easily comprehended.

You *must* charge fair prices—fair to your customer *and* fair to yourself. A minimum charge of \$1 or \$1.50 is absolutely necessary to conserve your time for those who really desire that their radios be repaired. You must charge an equitable price which will compensate you for those long hours of service.

You *must* use every spare moment to *study*, as you have never studied before, to the end that you can get out an ever-increasing number of radio repairs each day. Your shop is a miniature arsenal of democracy. You are maintaining the nation's *Number One Morale system*.

So, don't make the mistake of thinking that your job as a radio service man is of little value in this all-out effort against treachery and oppres-

sion. It is important—for as I have pointed out in previous issues of RADIO NEWS, radio is the most vital method of keeping up civilian morale. Dig up those back issues of RADIO NEWS. Read the November 1941 article—"A Challenge and A Reward."

"The *Challenge*? The challenge to every radio service man will be his *duty to his country* to see that every possible radio receiver in his trade territory is in working condition and that it is *kept* in working condition.

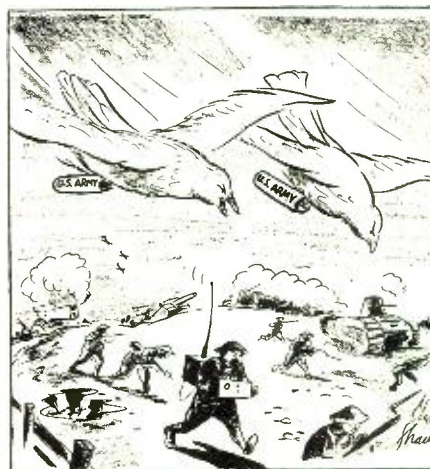
"The *Reward*? The reward will be the satisfaction of knowing that he is 'doing his part' to help us stay a free people, plus the very definite personal monetary reward of increased profits through more radio repairs."

What do you think did more to crowd our recruiting stations the very day after the first stab in the back? Radio did that job by bringing the news into 95% of the homes of the country within a matter of minutes after it was first received. Most of the nation's receivers were in proper operating condition to receive those news flashes because of your technical ability to "keep 'em perkin'!" Radio brought to us the words of our Commander-in-Chief as he asked Congress for a declaration of a state of war against Japan. Later, radio brought us the historic event when Congress heard his request for the same declaration against Germany and Italy. Radio continues to report our military successes and our defeats. Nothing is withheld from us, because American radio is *free* and through God's help we will keep it and our other freedoms untarnished by alien hands.

So—once more, the American radio service man has a real job in this war, and this job should not be minimized.

For those who feel like getting into the fight directly, I need hardly state that every branch of the service needs trained radio men *now*, and they will continue to need them in greater and greater numbers. For those who can qualify, there are Civil Service jobs awaiting them in *National Offense*.

(Continued on page 44)



"Some silly fad—It will never last!"



Build This MODERN TUBE TESTER

by

ROBERT B. BOCKSTIEGEL

Radio Instructor, Scott Field

This tube tester is tops for the radio serviceman. It will check all existing types.

Ready for operation either in the service shop or at the customers home.

D OUBTLESSLY many Servicemen and Experimenters like myself have wanted a reliable tube tester, but could not afford buying a commercial unit because of the price required to obtain one that will not become an antique piece of equipment in a relatively short time.

After the study of many testers, it was decided to design a simple emission type tube tester that would meet the following requirements:

1—Tests all types of 4, 5, 6, 7S, 7L, octal, loktal, and Bantam Jr. tubes. In fact, all old as well as new type tubes without use of adapters.

2—Filament voltages for all tubes from 1.5 to 115 volts.

3—"Free Floating" switching system which reconnects all sockets for all present and possible future tubes.

4—Tests individual sections of multipurpose tubes besides both plates in rectifiers.

5—Neon test for open filaments, shorts and leakages, between all elements.

6—Direct reading meter: GOOD?—BAD. For customer information.

7—Compact, portable and professional in appearance.

8—Tests all pilot lamps.

All of these features have been incorporated in the tester here described.

The original instrument was built on a 9" x 13" aluminum panel although a suitable panel could be made from sheet metal or masonite. All holes were punched or drilled as illustrated in Fig. 1, and all parts placed in position before wiring is attempted.

Single-deck construction was used to simplify wiring. Limiting the depth to 2½" permitted the use of a flat portable case.

The tube sockets seen at the top are, left to right: four, five, six, Bantam Jr., combination seven large, and small with pilot lamp socket in the center, octal and loktal.

The three controls below the meter are, left to right: Sw. A or the filament voltage selector, Control B or the variable shunt resistor across the milliammeter, Sw. C or the filament switch which connects the filament voltage to one of the proper filament

connections on the tube under test.

Between Sw. A and control B is the Jewel protected pilot lamp. Between Control B and Sw. C is the jewel protected neon lamp which is removable from the top.

The bottom of the panel consists of a row of ten S.P.D.T. switches, with a dead center or off positions in the middle. These switches are numbered from 1 to 10 with a "push to test" button between 5 and 6.

The a.c. switch or Sw. 11 is on the left hand side of the panel, and the a.c. cord is brought out right above it.

To the right of the tester, directly above switch No. 10 is switch No. 12, a S.P.D.T. toggle switch, which in the *up* position puts the meter in the circuit for the quality test, but when in the *down* position places the neon bulb in the circuit for the short or leakage test.

The grid cap is brought out through an insulated pin jack to the right of the meter and is adaptable to either metal or glass type tubes.

Care must be taken in wiring, that all connections are securely soldered

and well insulated. Jumbo spaghetti was used throughout the original instrument to cover connections. Colored wires simplify tracing and add to the appearance of the job.

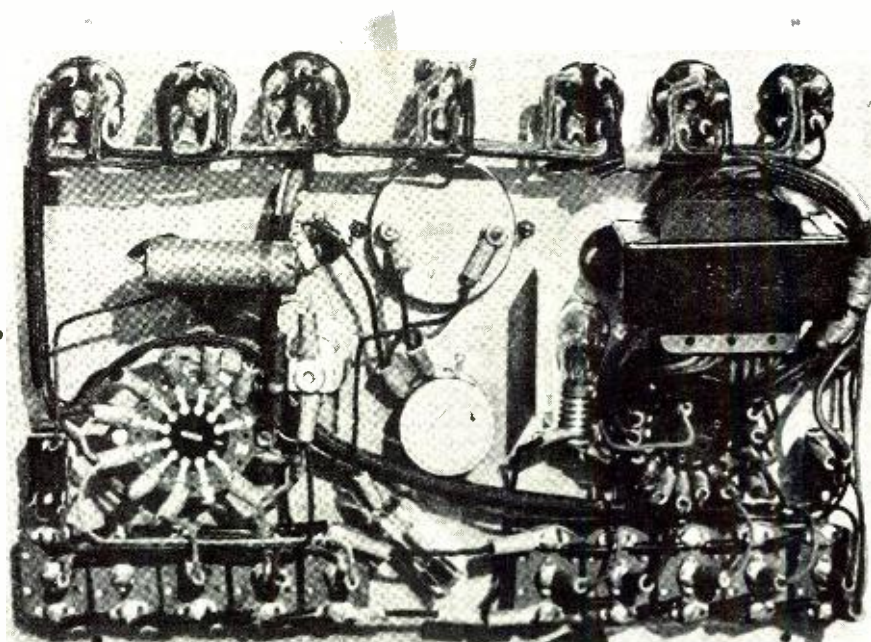
In the circuit diagram the socket wiring was omitted for clarity on the diagram. The standard R.M.A. system of numbering is used on the tube sockets and also on switches 1 to 8 of the bottom row of toggle switches. The grid cap is connected to Sw. 10 and also to the tenth position of switch C making possible the application of filament voltages even in the grid cap if such a case should ever arise. Switch No. 9 is left disconnected but has been added as a provision for the future when a 9-pin tube may appear.

Switch No. 12 is the quality-leakage switch which in its down position entirely disconnects the meter, and the neon lamp is brought into the circuit through a 0.5 mfd. condenser in series with the 110 volt line. A 150,000 ohm resistor is used across the neon bulb to prevent it from glowing from normal leakage in certain type tubes.

The meter is a 0-10 milliammeter to which a home made GOOD ? BAD scale has been added. The meter is shunted by a 300 ohm wire-wound rheostat which determines the amount of meter deflection. This shunt is control B on the front panel and the setting of which varies with the type of tube to be tested.

The adjustable 75 ohm wire wound resistor is connected in series with the meter and the usual 30 volt tap on the transformer to prevent damage to meter when mercury vapor tubes are tested. The "push to test" button was added as a protection to both the tube and the meter.

CAUTION: Do not hold button down over 2 or 3 seconds as it may injure the tube. The button also protects the meter as it may be quickly released in case the meter is overloaded and prevent serious damage to the meter. The series resistor is ad-



Rear view of the tube tester shows how to place parts for wiring.

justed by experimenting with a mercury vapor tube in the tester. The resistance required in the original unit was about 60 ohms.

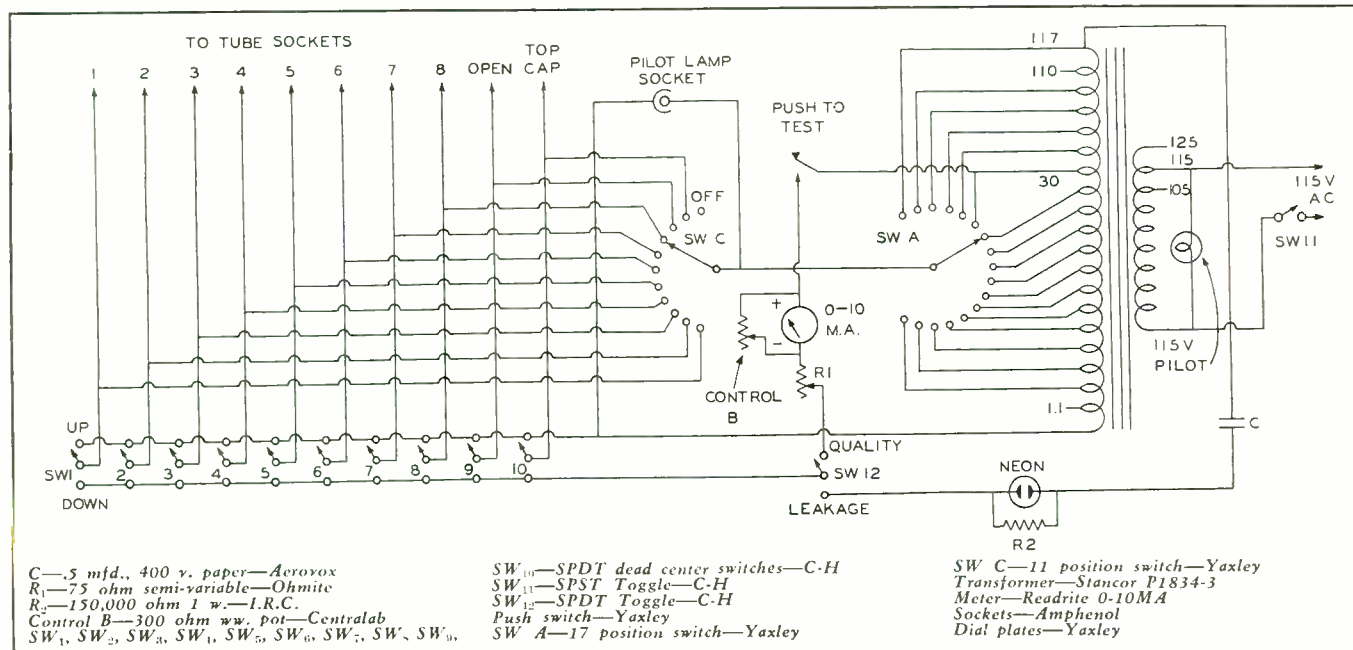
Assuming all ten lower switches in their center off position, let us take a tube, for example, a type 57 tube. Set selector switch A at 2.5 volts; since pins 1 and 6 are filament terminals, put sw. C on No. 1 and throw sw. 6 up. The grids and plate are then tied together by throwing the switches down which correspond to their pin numbers, namely: 2, 3, 4, and the top cap which is sw. 10.

Control B should be set to a predetermined setting which incidentally compares well with commercial testers of this type. When all settings are completed, turn the a.c. switch on, press the "push to test" button and observe the meter. If we want to

know if there is any cathode leakage we place sw. 5 in the center off position and again observe the meter.

To check an open, or burned-out filament, throw sw. 12 down and sw. 1 down. The neon light will not light if the filament is open. The same test may be used to check for shorts between any elements when the tube is hot or cold. The tube must be hot to check a leakage, but in case a cold short is to be checked, turn sw. C to its off position, which disconnects one side of the filament.

The plates of a rectifier such as an '80, for example, may be tested, one plate at a time or both together. If desired tubes such as 12A7's, 6A6's, etc., can be tested, one section at a time by leaving the switches corresponding to the connections of the elements not to be tested in the off posi-

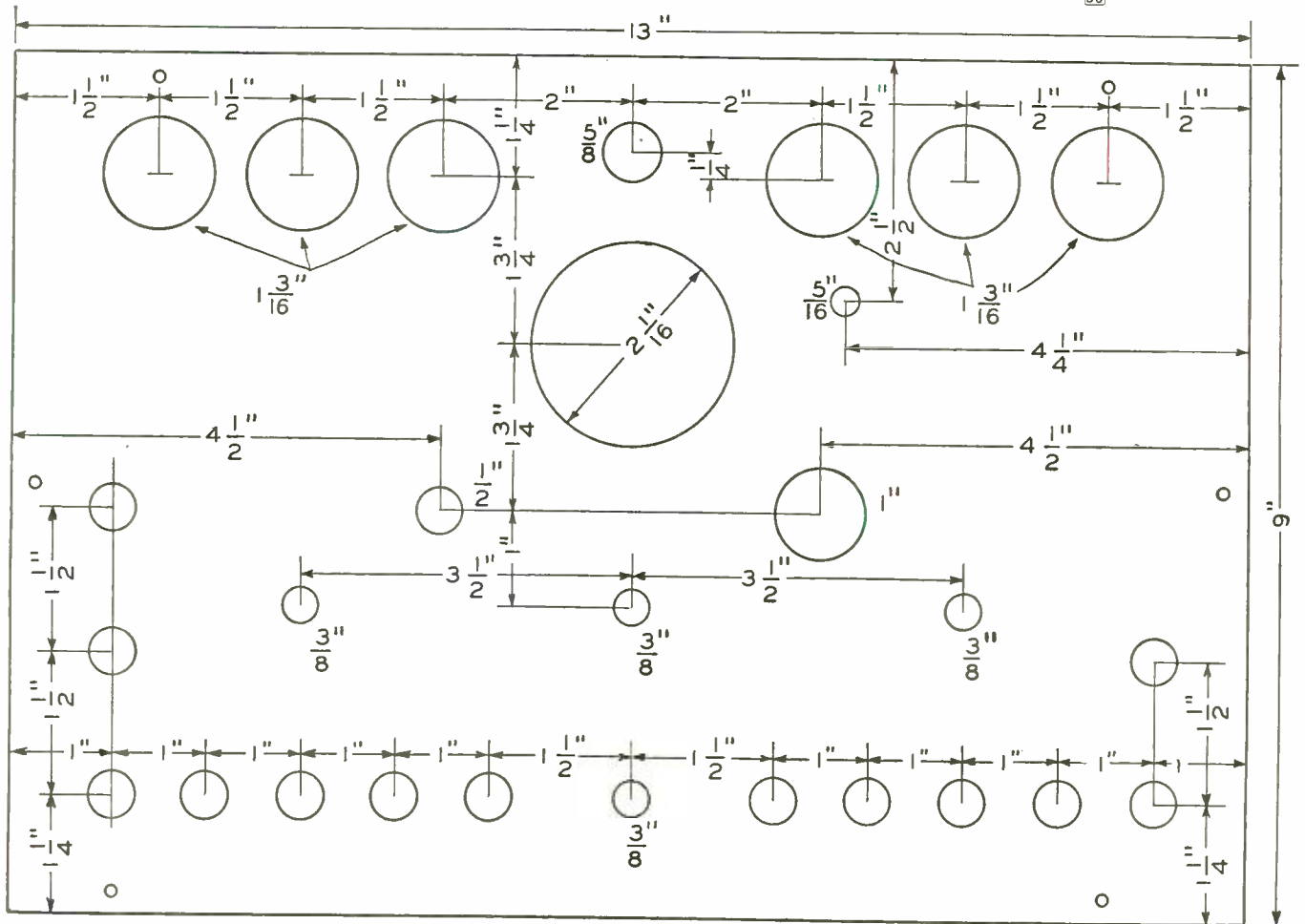


tion. This precaution must be observed. Although no provision has been made on this tester for a "line voltage control," it has been observed that varying line voltages have such a

small effect on the readings obtained that a control has proven unnecessary. Some method of line voltage control could be incorporated by the builder. This may be added if desired.

To check a pilot lamp-set sw. A to the proper voltage and insert the lamp in the pilot lamp socket in the center of the seven prong tube socket.

-30-



This layout drawing will help the builder to achieve neatness on the panel.

Technical Book and Bulletin Review

"PRINCIPLES OF ELECTRON TUBES" by Herbert J. Reich, professor of Electrical Engineering, University of Illinois. Published by McGraw-Hill Book Company, 330 West 42nd Street, New York City. Price, \$3.50. 386 pages, 6x9. Essentially an abridgment of the author's well-known *Theory and Application of Electron Tubes*, the present volume is designed to meet the need for a text suitable for courses offered primarily for students who do not intend to specialize in communication. In the abridged edition some of the material has been deleted and the rest has been modified sufficiently to give unity and coherence. New material includes a brief treatment of electron dynamics and an

introductory treatment of frequency modulation. This book is very timely for either reference by the engineer or as a study guide for the radio student. Much of the information contained within its contents is especially valuable to those engaged in the study of Electronics. It is well written and should be included in every radio library.

"FIRST RADIO BOOK FOR BOYS," written by Alfred Morgan, published by D. Appleton-Century Company, New York and London, 192 pages, illustrated, price \$2.00. All the radio apparatus for which plans and instructions are given in this book has been built by twelve-year-old boys. Thus the book is one of the best and most practical for young people who wish a sound introduction to the fascinating science of radio.

It is the author's purpose to describe in detail the construction of several radio receivers which are as simple as it is possible to make them. If a boy can solder and is a careful workman, he can, by following the directions in this book, build simple sets and get excellent results from them. The instructions are given in such a way that they can be followed easily step by step, after first assembling the material that will be needed from the list that precedes the instructions for each set. With the aid of Mr. Morgan's illustrations and schematic drawings, a boy

will have little chance of making a mistake. After a general discussion of radio and the parts used to build apparatus, Mr. Morgan tells how to build simple crystal sets, then one-tube receivers, amplifiers, two-tube receivers, and finally how to get a radio license for sending and how to build a simple phonograph oscillator.

"MALLORY RADIO SERVICE ENCYCLOPEDIA," 4th Edition, is now being distributed to servicemen and dealers throughout the country.

The new book is considerably larger than the former editions and lists recommended replacements by model number for over 20,000 radio receivers. Original part numbers for condensers, controls and vibrators is one of the new features. The fourth M.Y.E. also lists the complete tube complement and number of tubes for each model. I.F. peaks are also noted if the receiver is a superheterodyne. Reference to *Rider's Manuals* is given for each model so that the serviceman can see the complete set schematic, if necessary.

The present size of the M.Y.E. prohibits the inclusion of technical information which will be published, as in the past, in separate supplemental form. The book may be obtained from any Mallory distributor at 95c per copy net.

(Continued on page 48)

WHAT are the serviceman, experimenter and amateur to do for radio parts if the present emergency sharpens its teeth still further? The answer is simple—radio men will build their own. Even if conditions grow just a *little* worse, we

Homemade Parts for Radio Construction

by RUFUS P. TURNER, W1AY

Parts jobbers are still able to supply most items needed for constructing radio equipment.

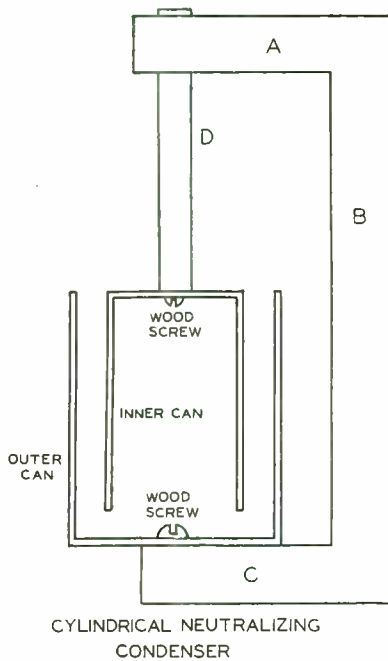


Fig. 1-A

believe that most of the boys will still roll their own in order to give the Government priority on factory-built materials. It is the aim of this series of articles to show radio men how they can, with ordinary tools, build workable radio parts at home as a last and final resort.

Part I, in the November issue, discussed principally the use of tin plate from discarded tin cans in the construction of shields, chassis, flatwise-wound transmitting coils, and variable condensers. The present article, and those which are to follow, will show still other practical substitutions for factory-built materials.

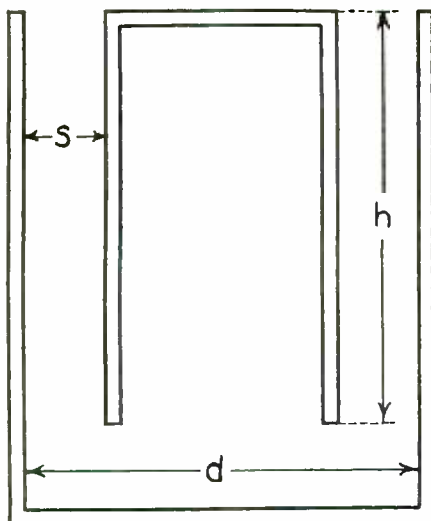


Fig. 1-B

The construction of only two types of variable condenser was discussed in Part I—the plate and disc varieties. And since some experimenters are interested in other easily-built designs, attention will be paid here to the latter.

Cylindrical and Other Movable-Plate Condensers

A very popular design for neutralizing condensers in particular is the concentric-cylinder type which may easily be built from two tin cans and waterproofed wood insulation, as shown in Figure 1-A. The two cans are chosen such that one is from one-eighth inch to one-half inch smaller in diameter than the other, depending upon the voltage spacing desired, and they are trimmed to the same height. The dimensions of the supporting wood frame will depend upon the size of the cans. The vertical support, B, must be at least twice as high as the inner can, in order to permit the latter to move throughout its entire

length in and out of the outer can. Note that the horizontal top piece, A, and the base, C, are cut at short as practicable to place as little of the wood dielectric in contact with the condenser plates as possible.

The position of the inner can, moving lengthwise within the outer can to vary the condenser capacity, may be made stationary at any desired setting between minimum and maximum capacity. The inner can is secured to the sliding rod (or screw), D. It is entirely possible to use a wooden dowel for part B, making the clearance hole in A sufficiently close-fitting to hold the rod in grip, still not obstruct its free sliding motion. For rotary adjustment, a threaded metal rod or wooden dowel is satisfactory if the builder has available either the threaded rod or the necessary tools for threading a plain rod.

The maximum capacity of the cylindrical condenser may be calculated with sufficient accuracy for most purposes from the dimensions, as shown

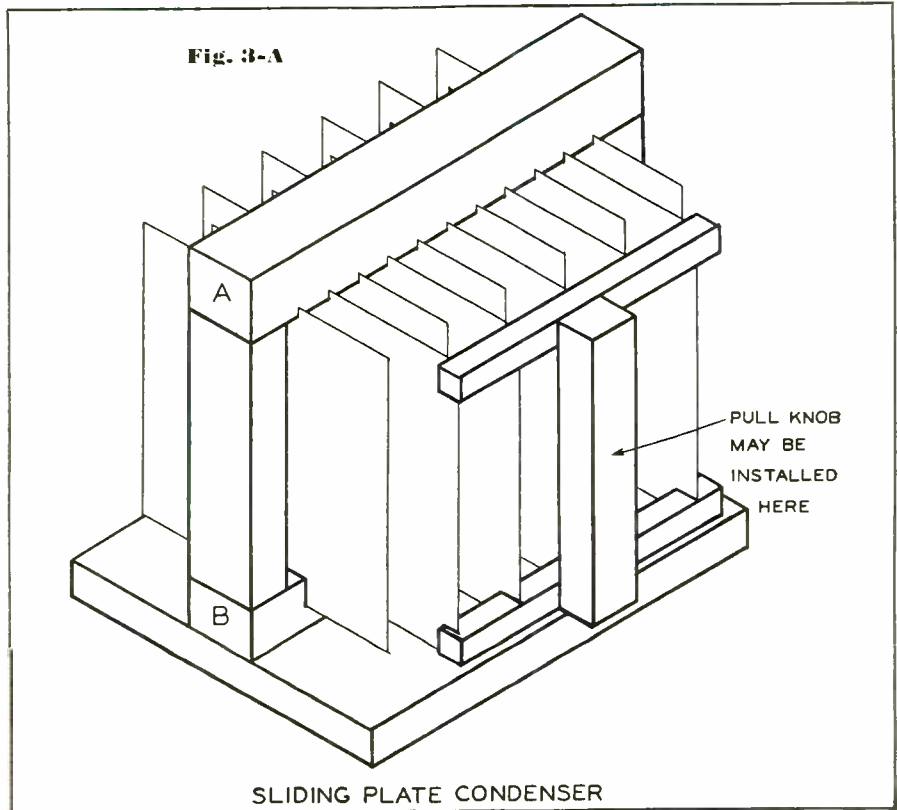
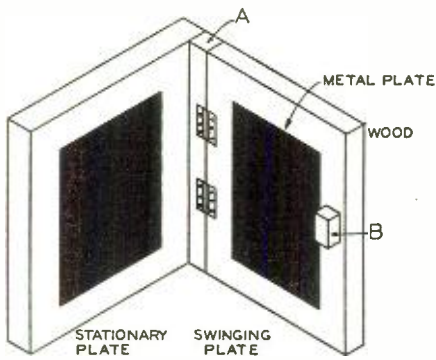
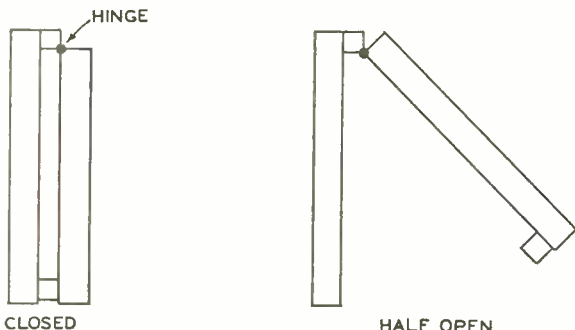


Fig. 3-A



BOOK TYPE VARIABLE CONDENSER

Fig. 2-A



TOP VIEWS OF BOOK TYPE CONDENSER

Fig. 2-B

in Figure 1-B, by means of the following equation:

$$C = \frac{0.07 d h}{s} - 5$$

Where C is the capacity in microfarads,

d, the diameter of the outer can (inches),

h, the total length of the inner can that is enclosed within the outer can (inches),

s, the separation between the two cans (inches).

This equation does not take into account the small capacity between the bottoms of the cans. However, the bottom areas are an appreciable distance apart and this additional capacity will be of little consequence.

Another variable condenser that was popular among the old-timers who built their own parts before the First World War, and even appeared as late as 1927 in some factory-built receivers, is shown in Figure 2-A. This is the once well-known *book* or *barn-door* tank-tuning condenser. Two flat plates, one stationary and the other swinging, are employed in this condenser. The farther the movable plate swings open, the smaller will be the capacity.

The plates may be flattened tin, or any other available sheet metal, tacked or screwed to bakelite or impregnated-wood plates. The construction is shown in detail in the top views in Figure 2-B. The movable plate is hinged to the long strip, A, and is itself

provided with a block, B, these two members serving to prevent a short-circuit of the plates. Various schemes may be devised by the ingenious builder for holding the swinging plate rigidly at any setting. 2-C shows the arrangement used in the 1926 *Crosley* receivers for tuning a book-type condenser with a standard dial. The job is done by a small cam attached to the dial shaft, this cam moving the swinging plate as the dial is rotated. A spring holds the swinging plate against the cam, preventing involuntary closure.

The swinging-plate condenser is somewhat restricted in application because it is bulky and, as a two-plate unit, it does not afford a large maximum capacity except in impractical sizes.

Still another easily-built transmitter tuning condenser which saw wide use in past years, still gives good account of itself and may readily be built from well-flattened tin-can stock, is the sliding-plate type shown in Figure 3. One set of inter-connected plates in this condenser slides in and out of mesh with the other stationary set.

The entire condenser is set up in an impregnated wood frame as shown in the illustrations. The movable plates slide in deep-cut grooves in the cross beams, A and B, and "family" plates in both groups are interconnected with a single transverse wire or narrow sheet metal strip soldered to the plates.

An adjusting knob of the drawer-pull type may be attached as shown in Figure 3-A. If very high voltages are involved, the condenser may be adjusted at a safe distance by means of an insulated rod, such as a wooden dowel, which replaces the adjusting knob.

The sliding-plate condenser is easily built from scrap metal and treated wood and may be designed to accommodate any capacity and voltage requirement. It is not entirely displeasing in appearance and it fits trimly into a high-powered transmitter. With a little care, this type condenser may be made surprisingly rugged and stable, although built of salvaged materials.

The maximum capacity of the sliding-plate condenser may be determined from the condenser dimensions according to the equation:

$$C = \frac{0.02235 A (n-1)}{d} - 5$$

Where C is the maximum capacity in micro-

farads.

A, the area of one side of one plate (sq. ins.),

n, the total number of plates,

d, the separation of the plates (ins.).

Insulations Substitutes

Various familiar high-efficiency insulating materials which have become quite commonplace in recent years are apt to grow more precious as the emergency situation becomes more grave. Here too, the serviceman and amateur may readily make substitutions for these materials and occasion himself little inconvenience thereby. The sacrifice of a few points in Q-value may be charged up as one of his sacrifices in the interest of national defense.

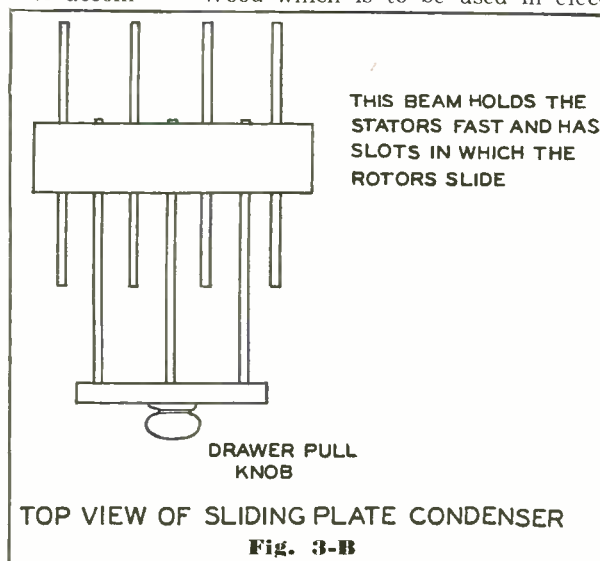
We have already pointed out that wood is immensely useful as a solid insulating substance. Indeed, maple is widely used in normal times as an insulator. Wood is a particularly invaluable substitute when it is treated with some sort of dielectric waterproofing compound. Wood is easily machined and therefore comfortably worked with common tools.

Various parts, such as emergency variable condenser ends, stator bars, panels, racks, antenna insulators, coil bases, tube sockets, mounting boards, and so on, may be made of wood simply by copying the manufactured article which generally comes in bakelite, masonite, ceramics, or polystyrene.

The author tested several 1" x 1/2" x 1/2" samples of common woods—maple, fir, white pine, and hard pine, picked up at random in a carpenter shop, and found the insulation resistance of each untreated sample to be some distance beyond 100,000 megohms at 500 volts d.c.

For most radio and electrical uses, it will be desirable to employ a good hardwood like maple or oak, but these are not readily obtainable at this time and the experimenter is apt to be forced to get along with one of the softer species. The hardest wood that can be had is preferable in any case.

Wood which is to be used in elec-



TOP VIEW OF SLIDING PLATE CONDENSER

Fig. 3-B

trical circuits should be treated first by drying it out thoroughly, but not too rapidly, in a slow oven, to drive out all moisture, and then immediately boiling it in wax or giving it several coats of good-grade varnish or shellac for waterproofing. Wooden antenna insulators should be soaked continuously for several weeks in light oil.

High-frequency terminals which pass through wood insulation should be separated by as great a distance as the layout and efficient design permit. The higher the frequency, the greater should be this separation.

The radio man who is handy with tools can make wooden antenna insulators, insulating bushings, feed-through insulators, tuning knobs, terminal strips, and many other similar parts. In short, any of the parts now made of fancy insulating materials may be duplicated in moisture-proofed wood with a little care and the proper tools.

Good substitutes for certain insulating preparations are beeswax, paraffin, and collodion. Parts made of wood, cardboard, and paper may be treated successfully with these three compounds which tend to render the base moisture-proof, to raise its insulation resistance and its dielectric constant.

Collodion, obtained from the corner drug store, may be applied with a brush and it dries rapidly in air, while the waxes must be "boiled" into the material which is to be waterproofed.

Beeswax is in demand. It is a good electrical insulator and because it enjoys somewhat of a wide popularity for this purpose, it is apt to be among the restricted materials. Paraffin, while possessing high insulation resistance and excellent moisture resistance, is produced in several grades; and the poorer grades, commonly used for sealing home-made jellies, contain a small amount of moisture. The presence of moisture in paraffin may be detected by sharp sputtering as the paraffin melts.

Radio coils may be treated with either of these three substances. A combination of beeswax and paraffin has been used extensively for this purpose. Collodion, aside from being handy for painting wounds (and for such purposes is generally dispensed by your pharmacist), is a very useful coil dope which may be used when and if the emergency does a vanishing act on liquid victron, polystyrene varnish, and similar coil dopes. It penetrates deeply, dries lightning-fast with a transparent glass-like hardness, and a ten-cent bottle goes a long way.

Cardboard tubing is particularly servicable for coil forms, especially so when it has been treated with one of the insulating substitutes just described. Paper is highly absorbent and will soak up more than its share of impregnant. Such tubing may be obtained in diameters ranging from 1½ inches to more than six inches.

Common sources are sanitary-tissue rolls, kitchen cleanser cans, oatmeal "boxes," mailing tubes, linoleum tubes, and the like.

In the absence of special bakelite, ceramic, and polystyrene coil forms, satisfactory substitutes may be made from discarded tube bases, obtaining any desired number of terminals from four to eight. Tubes are discarded annually by the bushel by radio stores, shops, and laboratories, and it should

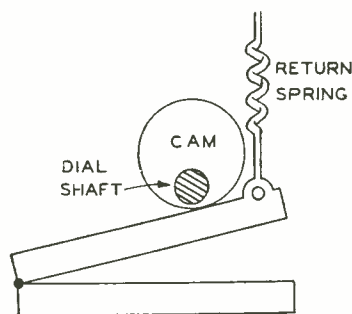
sub panel type of construction was carried out on a metal sub-base.

The wooden breadboard is still useful for mounting radio parts if nothing better is to be obtained. There is much to be said for it in connection with experimental work. The wooden breadboard machines easily; parts are quickly fastened down with ordinary wood screws, reducing hole-drilling labor, and all components are immediately accessible.

There are no rules for the building of a breadboard base.

The material is cut to suit the dimensions of the set under construction and it is treated in the same manner as any other wood insulator. There are no particular kinks necessary in building on the breadboard, except perhaps that with some layouts the common "ground" is apt to present a problem. Even then, it is usually only necessary to provide a heavy bus bar to which all stage grounds and the B-minus lead are connected; or, better still, to return all "grounds" to one screw terminal near the center of the board whenever possible. Another widely practiced kink for grounding on a wooden base consists in tacking or screwing a thin sheet of tin plate or other available sheet metal to the wooden base and returning all grounds to soldered connections or lugs on this sheet.

Wood as a radio panel material is not new, not even in this day of substitutions. It has been used for years by the none too "pure in pocket" amateur. Plywood has notably outstanding virtues as a panel material, although the tougher varieties are not so easily machined. The better grades
(Continued on page 35)



METHOD OF TUNING BOOK TYPE CONDENSER WITH STANDARD DIAL

Fig. 2-E

be no problem for any experimenter to obtain bases for his plug-in receiver and transmitter exciter coils.

Substitute Foundation Units

The *breadboard*, so familiar in ham jargon, received its name originally from the fact that actual breadboards, or reasonable facsimiles thereof, were once used for mounting receiver and transmitter parts. This was prior to the great day of the metal chassis, but the name stuck—even when the

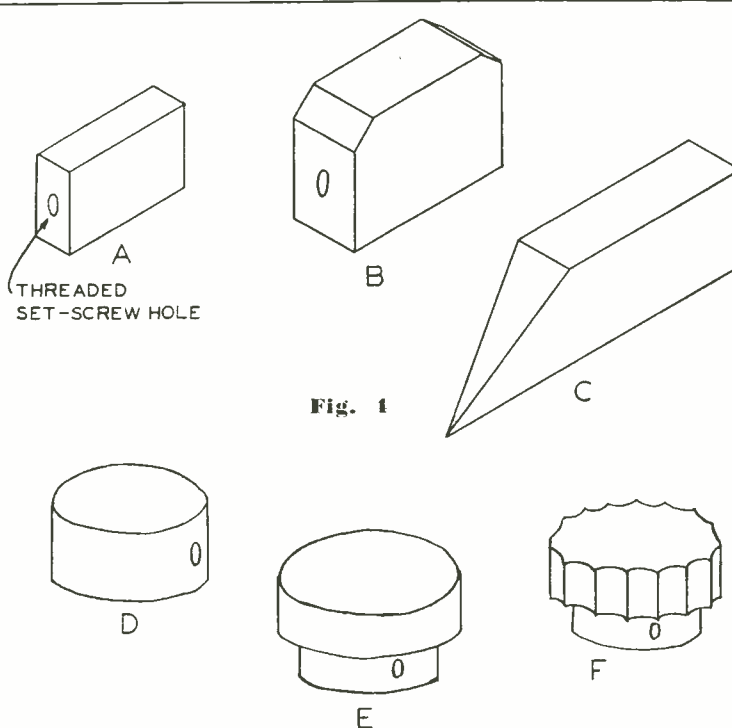


Fig. 1

VARIOUS TYPES OF FINGER GRIP KNOBS MADE OF HARDWOOD

SERVICE HINTS

HERE'S a money-making idea that was originally worked out by an upstate New York radio station and literally fell into the lap of a radio service man; but one that can be twisted right around by any other service man and made his idea, to be broached to a radio station.

The station engineer had the idea that all the complaints coming in should be tended to. Ignoring them, he theorized, was losing good-will for the station; good-will that, translated into the dollars and cents of smaller audiences and lower rates and less advertising, meant a smaller salary for him, so to speak.

He proposed to his boss that they hire a service man on a per-call fee basis to chase up each complaint about poor reception.

The rule was that the service man was not to be out to make business for himself. (However, of course, this was practically unavoidable.) He was to look over each set, see what was wrong and merely diagnose and advise treatment. If it was some very minor adjustment, he was allowed to make it—at NO cost to the listener.

The service man found, incidentally, that most complaints resulted from things very easily fixed—ignorance about tuning, badly-lined up buttons, etc.

On others, he simply told the people what was wrong and explained how important it was (or wasn't) and suggested the remedy.

Much of the success the service man had was due to the fact he rigidly adhered to the rules. And that he proved willing to be friendly in his relations with listeners, patient in his explanations. On the other hand, he couldn't help but get business from it. After he called, when the people decided they needed and wanted something done, in most cases it meant a job for him, unless they knew of some other dealer, which is not generally the case.

The station reported many compliments for them and for the service man, proving their engineer's hunch was good.

Used in the plan was a system of three-sheet filing by the station. One was kept by the engineer in a book; another went to the front office, and the third went to the service man. After his call, the service man returned his, with notations; his notes were copied off onto the engineer's permanent file.

ALBUQUERQUE RADIO SERVICE, 3016 East Central Ave., Albuquerque, N. M., sold 50 *Wilcox-Gay Records* during the past year, but it

took six months to make the first sale, according to J. C. (Jack) Ream, senior partner in the firm. Five other sales followed immediately.

The *Recordio* was added to the company's radio stock only incidentally, when a sample was left for a few days by a salesman for the manufacturer. Jack Ream and Tom Ewing decided to make the most of it as a publicity feature. They interested a number of musicians, teachers and vocalists in attending a demonstration. Recordings were made. Later, when it was decided to stock the *Recordio*, recordings were made of important concert programs at every opportunity, without charge. Business cards were passed out freely after the concerts, when the artists were listening to their recordings as played back to them.

Teachers were invited to bring their pupils into the service company's recording studio for individual recordings of short songs, recitations and statements. A nominal price was set. Children romped into their homes with a tremendous novelty. Before long they came back with their parents, who bought *Recordios*. Last January 17 sales were made—the month after Christmas. Getting out in public and rendering free service is what did the business, Mr. Ream says.

SAM'S RADIO SERVICE, 208 North Third St., Albuquerque, New Mexico, has built up a large business in automobile radio work through the use of billboards, supplemented by telephone directory display advertising.

The billboards are not leased, but built and owned on spots leased from land owners, according to Samuel Remillard, Jr., proprietor of the *Service*. Four large boards, 12 x 24 feet, and several small boards, 6 x 10 feet, are placed several miles outside the approaches to the city, usually at turns where motorists have to slow up.

Mr. Remillard says that these signs not only bring tourists, but a great many local people. Radio sets in automobiles get a lot of vibration and require considerable servicing, he says, and it is surprising how much of that business there is if you can attract it.

Between the billboards and the telephone directory, *Sam's Radio Service* has not had to do any other advertising to get plenty of business, and Mr. Remillard is only wishing that he could get enough skilled help to handle the volume of work that comes in. Getting delivery on parts is beginning to be a problem, Mr. Remillard said.

-30-

ALTHOUGH the average radio owner knows little about how his set operates, he is intelligent enough

to recognize partly-worn or inefficient parts when they are called to his attention by a serviceman, according to R. R. Foster, proprietor of the *Acme Radio Service Laboratory, Inc.*, 3827 N. Illinois St., Indianapolis, Ind.

"I can and do increase the sale of replacement parts by getting the radio owner into my shop and letting him see with his own eyes how various parts in his set have become worn," Foster relates. "I usually can make a person realize that, although his radio will continue to operate with the old parts, the set's value to him will be increased many times if he will spend a little money to put in parts that will give 100 per cent efficiency."

Some common troubles which Foster says he points out are spurting out of electrolytic condensers, the sensitivity of the set, hum-levels, speaker jingles and flabby or hard speakers.

"When a person actually can be shown the things that are wrong with his radio, he feels more like buying the new parts than he would if the troubles were intangible and made no sense whatever to him," Foster believes.

-30-

CASH PRIZE CONTEST

THERE is still time to enter your favorite piece of radio equipment in the big RADIO NEWS Cash Prize Contest. Due to the war it will be more essential than ever to construct your own equipment to conserve parts for National Defense. Parts taken from defunct broadcast receivers can even be used to conserve parts for more urgent demands. More than ever before, now is the time for you to do all you can to help the defense effort by describing your home built equipment for the benefit of others, and at the same time receiving a cash award for your effort.

There is no limit to the number of articles that may be submitted by any one individual. By doing so you increase your chances of winning. Get busy and start writing that article NOW. Full details of the contest will be found on page 26 of the December, 1941, issue of RADIO NEWS. The Contest closes February 1, 1942, so HURRY!

IN military, naval, or intercontinent commercial aircraft communications, the necessity of covering an unusually wide range of frequencies demands a multiband tunable receiver. Particularly in the high frequency spectrum the problem of stability and calibration accuracy becomes acute. To receive off-schedule communications without hunting continuously for a signal is essential to satisfactory operations, and places tremendous requirements on the receiving equipment. Today, American radio engineers employing modern methods coupled with accurate assembly and painstaking testing have produced equipment which stands second to none in dependability.

Many considerations concerning aircraft receiver design have been promulgated. Taking *Bendix Radio's* RA-1 Aircraft Receiver as one of the feats of modern radio engineering for example, an inspection of the unit reveals sturdy components securely mounted on a strong gas-welded aluminum chassis with short well-supported interconnections. A cast aluminum frame houses the main tuning condenser and it's associated drive mechanism. Close tolerances and spring-loaded gears hold back-lash to a new minimum. Of course, absolute mechanical rigidity is indispensable, especially where an immense amount of vibration is encountered such as is found in all aircraft.

Sometime ago, *RADIO NEWS* carried an article describing German aircraft radio equipment found in one of Germany's best air fighters. One glance at this equipment will tell the modern radio technician that even though there is a material shortage in Germany, good old "Yankee ingenuity" is lacking. That's an ingredient which goes far to make up a large part of our present day engineering successes.

It is known that the extremes of temperature and humidity encountered by aircraft operations magnify their normally troublesome effects. Stability and uniform operation are difficult to maintain but their value is priceless. All tuning and trimming condensers in our exemplary receiver mentioned above are custom-built of Invar, the alloy that neither expands nor contracts with temperature changes. Bypass condensers are sealed in oil. The output transformer is sealed in vacuum.

Coils are wound rigidly on non-hygroscopic forms and boiled in a special compound to drive inherent moisture from the wire insulation. All components and materials were carefully selected and specially treated to withstand the damaging action of salt-laden moisture. Every soldered connection throughout the receiver is first thoroughly cleaned and then given a protective non-corrosive coating. Thus, by solving individually these and many similar problems, our American engineers have produced a receiver capable of dependable performance under the most severe conditions possible.



by CHARLES J. SCHAUERS

Before a receiver is actually sold to the naval, military, or commercial aviation services, certain specifications that have been drafted by their engineers must be met by the manufacturer. These specifications are usually submitted to the manufacturer prior to actual model construction which usually consumes much time. However, during the course of testing the finished model the manufacturer may submit his recommendations for likely changes that either concern economy, efficiency, simplicity of construction and/or operation, etc.

Those engineers who promulgated the specifications initially have analyzed each likely problem that may arise; sometimes model equipment is constructed in the requisitioning agency's own laboratories and after exhaustive tests are made and final plans are submitted to the manufacturer the real burdensome task of setting up assembly equipment.

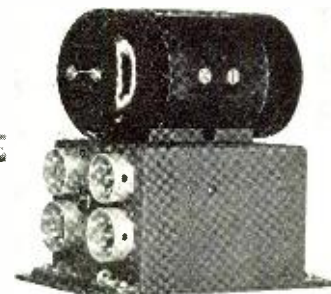
When a receiver is designed by a group of engineers, the considerations involved are numerous. A receiver designed for service in the Continental United States may not serve well in South America, so for this reason many precautionary measures are taken which will suit the receiver for "world-wide service." Too, we must remember that operations aboard aircraft are most exacting and very hard on any piece of electrical equipment. When designing a receiver for aircraft communications, engineers of course remember the tremendous beating that such equipment must take and still be dependable.

It is well to consider here, just a few of the considerations involved.

Dials coupled to the tuning apparatus on the receiver proper must be easy to read, easily operated and calibrated accurately. Many diversified tuning mechanisms have appeared on

(Continued on page 43)

Bendix Aircraft Radio Receiver with remote-control and power supply.



LOW-COST RECEIVER

by GLENN ELLSWORTH

This receiver uses only three tubes but it gives a good account of itself by taking advantage of regeneration and other aids.

I HAVE built many receivers for my own entertainment. However, this little three tube job fills the bill for just about any application. The price of the parts is well within the reach of any person, it fills a long felt want in that it will pump a speaker, not only on the broadcast band but even on 19 meters as well as to pull in the hams, aviation, police and other commercial code and voice stations at good volume.

The receiver described has other advantages too. It will make an ideal set to have at the summer camp or the hunting lodge, an asset on many a motoring trip, while the young man or woman will like to set one in his or her room for their personal entertainment while the folks are interested in other programs from the family receiver.

The 3-tuber has been in operation for three weeks while it has been undergoing coil fitting experiments and, during that time, stations from South American countries, GSB, GSC and GSD of England, stations from every part of Canada and the U.S., Berlin and many others have all been logged on the speaker.

Incorporated in this set are: smooth control of regeneration, radio frequency gain control, a small condenser (Variable) shunting the r.f. tuning unit, and an r.f. screen-grid voltage control which acts as a vernier on regeneration when pulling through those stations with weak signals.

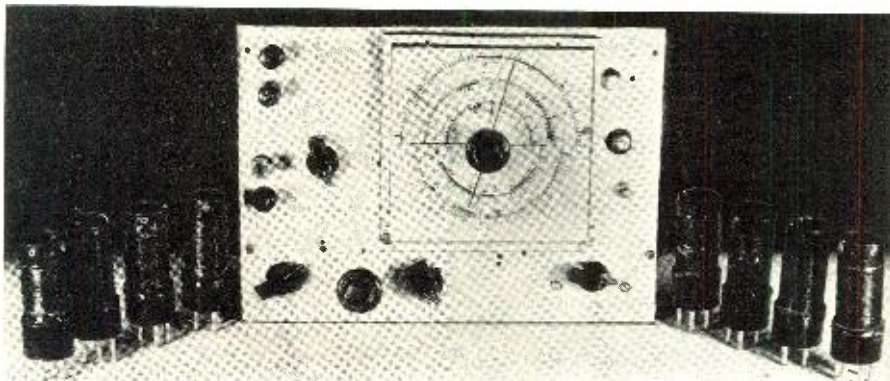
In this set all parts are taken from *junk radio receivers* of ancient vintage excepting the isolantite sockets, vernier condenser for the antenna circuits, tubes and batteries.

The coil forms (Bakelite) were acquired from an old *Atwater Kent* using the binocular type of inductance. Aluminum for the panel and sub panel were furnished by an old car body and so on.

I am familiar with the American ingenuity and will not try and describe the best arrangement for the various parts of the sub-panel for each person will have ideas of his own regarding this matter. I would say though, this is the arrangement of this particular receiver.

A suggestion might not be amiss regarding the mounting of the isolantite sockets. In the receiver described, they were mounted through the sub-panel by laying out a circle of the proper size on the sub panel and then going the rounds with a small drill, placing the holes as close together as possible without having one run into another. After this, the center section was removed and the holes dressed to fit the sockets with a rat-

Front view of receiver and coils. The dial is calibrated after the set is completely tested. It is large enough to be read easily.



tail file. Remove all remaining burrs.

The sockets supporting the coils were set on the supports furnished thus setting them up about an inch above the sub-panel.

The set works best if the filament and screen grid leads are kept under the sub panel along with the by-pass and coupling condensers leaving the radio frequency conductors above this panel and making all leads as short as possible. It is well to keep the grid and plate leads well separated.

Now for a little timely advice on the preparation of the material used for the inductance units of the receiver. This is where the 2½" x 1" (outside diameter) sections of tubing come in. The specified length is more for the looks of the completed coils than for the ultimate efficiency and instead of using sections of the above length they might be shortened a half inch per coil with some of the higher frequency tuning units, wound on the tube bases alone. However with the tubing of the length stated (2½" long) the coils can be changed in the receiver nicely without getting the hands down among the wiring.

The first operation is to remove the glass from the tube bases and scrape the cement from the inside of each

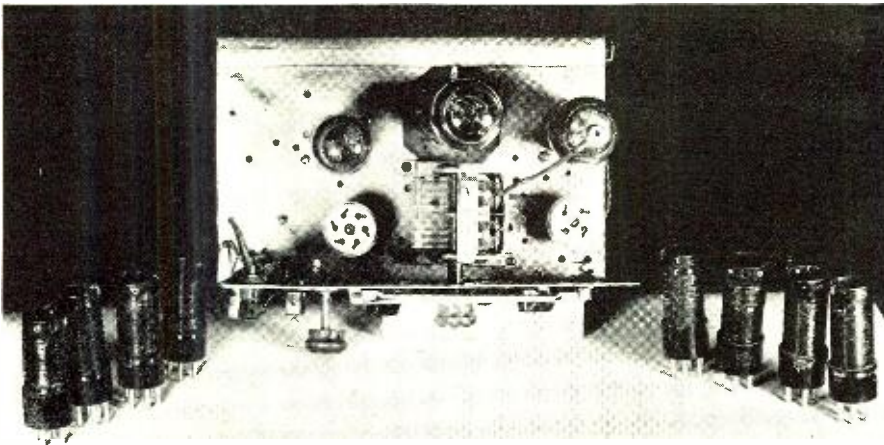
one. Follow this by using a little *Duco* cement (or equivalent) around one end and up on the tubing for about a quarter of an inch. Slide the tubing into the respective bases and you have your forms ready to wind.

Referring to the coil drawing we find that the radio frequency grid coil and the antenna coil are wound on the same form with L-2, the upper inductance and L-1 the lower, each set spaced and wound as set forth in the table carrying the coil data.

In winding the various coils it is best to start at the upper, or top, of the grid coil.

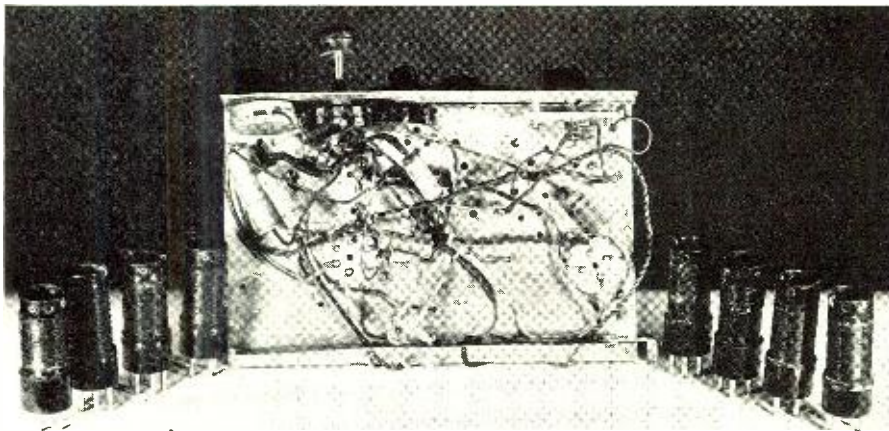
Be sure the solder has been thoroughly shaken from the socket prongs so that the wire may be threaded through. It is not a difficult matter to hold the wire tight after the desired number of turns have been wound. And, with the unit held in the left hand, drill the next hole.

This will have to come as close to the bottom of the winding as possible for the space between many of these coils is very slight. With the drilling of this last hole, the wire should be measured for the approximate position where it will be soldered in the socket prong, and cleaned with a piece of sand paper. Thread the wire



Looking down on the receiver. Note the coil socket positions. The two-gang tuning condenser mounts for accessibility and short leads.

Bottom view of the chassis. Point-to-point wiring is recommended for best performance of the various radio-frequency circuits.



through the bottom hole of the form, bring out the top and hold it snugly at all times. Run another section of a slightly heavier wire up through the socket prong. Make a loop that will pull downward through the prong and, threading the wire of the coil through this loop, draw it gently downward until the brightened section of wire comes through the prong and then solder. This same method can be used for each of the windings and saves much time. When winding, be sure

and leave enough space above the detector grid coil to accommodate the tickler.

Referring to the special wire as noted in the coil data. Various sizes had been tried but as those available were small and not wishing to make an extra trip to purchase a larger size, we hit upon the idea of making a wire combination that has helped tremendously, not only in this receiver, but in others built by other enthusiasts of our acquaintance.

Six strands of No. 28 Enamel were twisted together so they formed a single cable and this appears to be the best form and size wire for the grid coil (L-2 & L-4) that we have been able to find.

Probably it will be better to start with the coil for the broadcast band for many, who will want to build the set, have had experience with receivers on this band and will know about how they should work.

With the receiver hooked up, but without the tubes in their sockets, turn on the filament voltage. Solder wires to the base and center connections of a 2 volt flashlight bulb. Insert the bare ends into the filament receptacles of the tube sockets. If the 2 volt bulb lights up to *normal* brilliancy you can be reasonably sure there are no shorts between filament and B positive while, if the bulb burns out, it is a sure indication there is a short. Of course, the broadcast coils should be in place at the time this test is made, otherwise a short might not show, too the above method is much cheaper than taking a chance with 3 perfectly good tubes.

With set of coils plugged in and batteries hooked up. Try for regeneration at high and low frequency ends of the band, in other words with the variable tuning unit rotor plates in full mesh (low frequency end of band) and with them entirely out of mesh (high frequency end of band).

If regeneration is accomplished *smoothly* in both positions the coil is O.K. but if there is no regeneration on the L.F. end add turns to the tickler after first trying higher a plate voltage on the detector.

If uncontrollable oscillation appears all along the bands, remove turns from tickler, lower detector voltage or space tickler slightly farther from the grid coil.

If there is no regeneration, reverse the tickler connections.

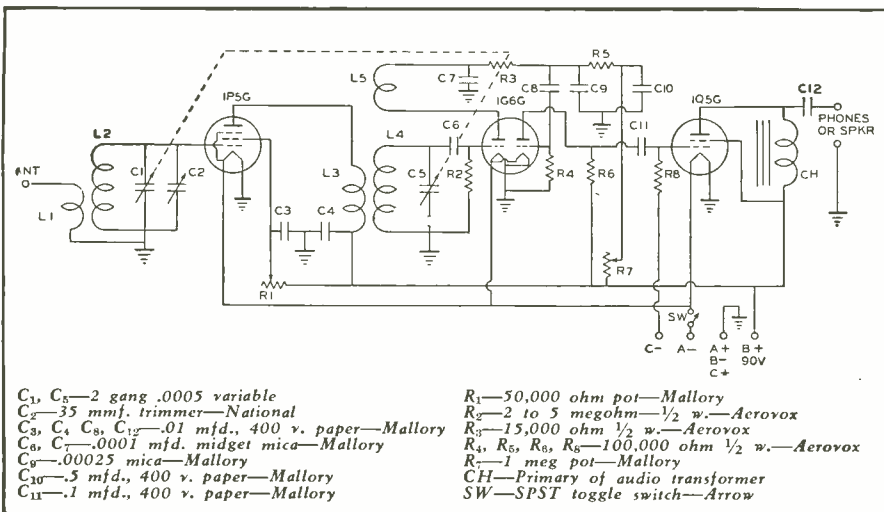
If, at the low-frequency end a kind of rumble occurs sounding much the same as an open grid circuit, add a couple of turns to the tickler coil and try again.

After one set of coils are fitted it is a good idea to try various grid leaks to determine which gives the best performance.

Sizzling in the speaker or phones will probably denote one or more of the batteries (A, B, or C) being low in voltage.

To find out if the radio-frequency end of the receiver is functioning: Note carefully—remove ground, take antenna from ant. post and fasten temporarily to the plate terminal of the r.f. socket after removing the r.f. tube from socket. If there is a decline in signal strength it will indicate that the radio-frequency amplifier is performing as it should while if there is a perceptible increase in signal strength with the r.f. unit removed from the circuit it will show that the tube is defective or that a

(Continued on page 57)



PRACTICAL RADIO COURSE

by ALFRED A. GHIRARDI

This exclusive course has been designed especially to guide the beginner in radio.

Part I—Electricity and the Electron Theory

IF ONE is to develop a real understanding of radio he must first understand electricity. It is not enough to consider electricity as "juice" and let it go at that. This may be enough for the student electrician whose job it will be to wire house lighting circuits and doorbells, but it is not sufficient for a student who is to deal understandingly with the complex principles and practices of radio and electronics.

Actually, we do not even at this late day, know for a certainty just what electricity is,

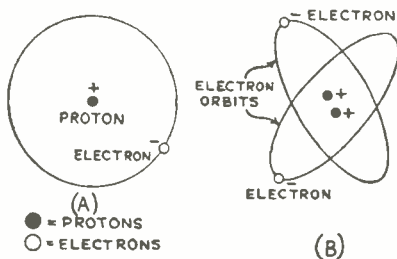


Figure 1: The graphic structure of two simple elements, hydrogen (A) and helium (B), showing the orbits of electron rotation. The most complicated of the elements, uranium, has an atomic structure which includes 92 electrons each rotating in its own orbit around a nucleus consisting of an equivalent number of protons.

nor do we even know precisely how electricity "flows" through a conductor. A theory has been evolved, however, which is generally accepted because it fits in so well with generally observed facts, although not proven to the extent that it can be termed a "law" of science. This is known as the "electron theory" and it is one that dovetails much that was formerly mysterious not only in electricity but in chemistry and physics as well.

All matter, whether gaseous, liquid or solid, is made up of one or more of the 92 fundamental chemical "elements"—basic substances of the universe that cannot be broken down into anything else by chemical means. Ninety-two elements have thus far been isolated, from hydrogen (the lightest and most abundant) to uranium (the heaviest and one of the rarest). An atom is the smallest particle of a given element that still retains the characteristics of that element. If disintegrated or altered in structure, as by cyclotron bombardment, it becomes a particle of a different element or isotope. It is interesting to note that the outside diameter of an atom is only about 1/100,000,000 of a centimeter—much too small to be seen, even with the most powerful microscope. Even the new electron microscope will not reveal anything smaller than 1/1,000,000 centi-

meter. Literally millions of atoms would fit comfortably on a pin point.

In the electron theory, each atom is recognized as a miniature solar system in itself. Its "sun" consists of a nucleus composed of protons (and sometimes neutrons) around which planetary electrons spin in planetary orbits as illustrated in fig. 1. The energy that holds the nucleus together is what science seeks to extract by atom-smashing. An atom, therefore, small as it is, is mostly empty space, its confines being marked by the orbits in which the electrons most remote from the nucleus are moving.

The difference between atoms of the different elements lies in the number of protons and neutrons composing the nucleus, and the number of electrons revolving around it. Thus a hydrogen atom, the simplest of all, has a single proton as a nucleus and a single electron rotating around it. Helium, with a nucleus of two protons and two electrons rotating around it is another simple atomic structure. Atoms of other elements may have more complicated nuclei consisting not only of protons but also neutrons, and up to 92 electrons spinning around these cores.

A PROTON is one particle of the matter-energy that constitutes an atom's nucleus. It carries a "positive" electrical charge.

A NEUTRON is another particle of matter-energy that may comprise part of an atom's nucleus. It carries no electrical charge, hence the name neutron.

AN ELECTRON is a particle of matter-energy that is 1/1,800th the weight of a proton and carries a negative charge. It rotates in a planetary orbit around an atom's nucleus, held in attraction by the opposite (positive) charge of the protons in the nucleus. In a given normal atom the number of electrons is always equal to the number of protons, with the result that the total negative charges of the electrons balance the positive charges of the protons. It is possible to remove or add one or more electrons to an atom without changing its elementary characteristics. If, however, an electron and proton were both removed from an atom, that atom would no longer retain the characteristics of the element. Thus if a proton and an electron were removed from an atom of helium, that atom would become an atom of hydrogen.

When two or more elements are combined to form a compound, the individual atoms remain unchanged but group themselves into molecules. The MOLECULE is the smallest particle of any given chemical combination of atoms, which evidences all the characteristics of the compound as a whole. Thus a molecule of water (H_2O) would be found to include two hydrogen atoms and one atom of oxygen. If these were separated each would be found to retain its separate identity as hydrogen or oxygen, yet the molecule as a

whole is definitely water. Linkage between atoms in a molecule is established by their electrons.

The applications of these theories to chemistry are obvious but thus far the explanation seemingly has little to do with electricity. Yet, because protons and electrons represent electrical charges, and because it is the electrical attraction that binds the component parts of the atom together, it becomes apparent that all matter is basically electrical in nature. Now let us see where all this applies to our study of electricity and radio.

It was stated that the proton is a positively charged particle of matter-energy that constitutes all, or part, of an atom's nucleus. Since the nucleus is composed of protons (and sometimes neutrons also) it is always electrically positive. This being the case, this nucleus exerts an attraction for the negatively charged planetary electrons spinning in orbits around it and thus the original structure of any stable atom is inclined to remain unchanged. However, in the atoms

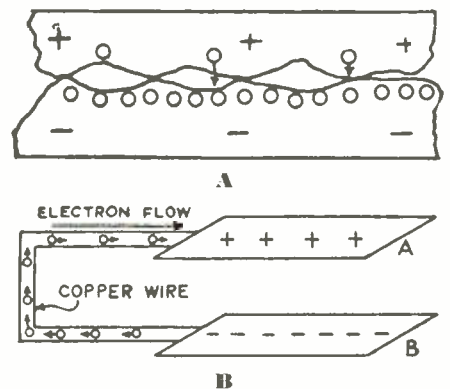
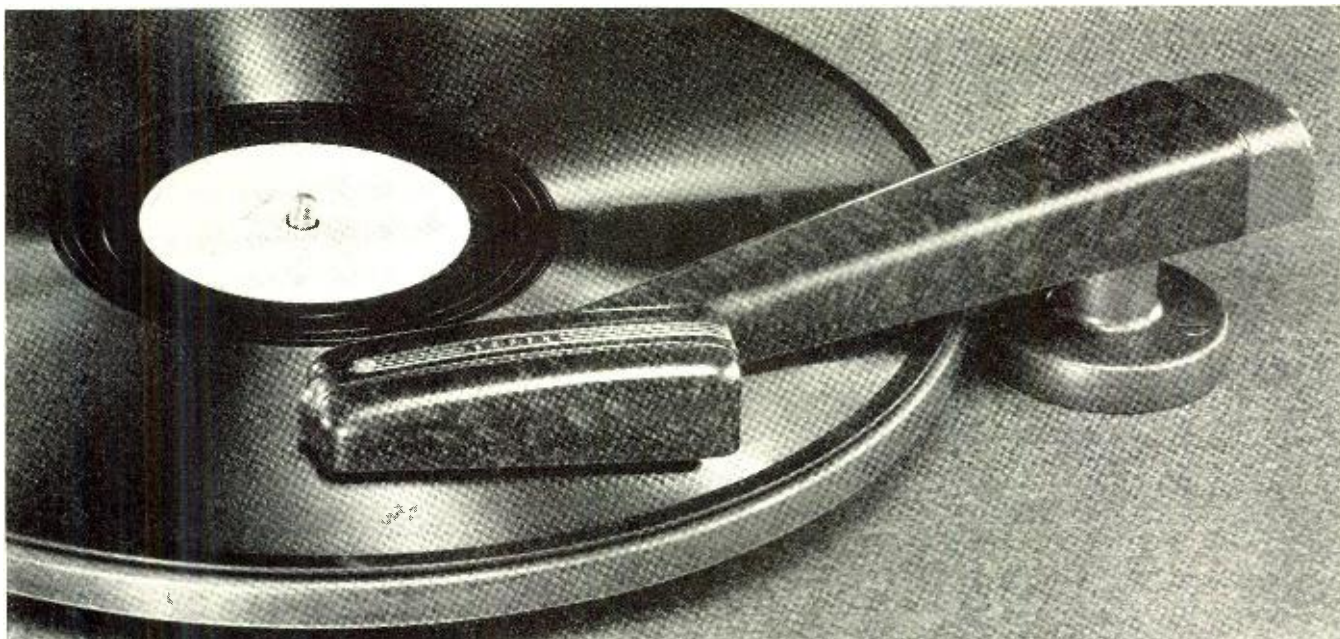


Figure 2: In some substances, such as glass, some of the electrons are less tightly bound to their nuclei than in others. If we rub glass with silk (a substance in which the electrons are tightly bonded) the simple act of rubbing will be sufficient to dislodge some of the electrons from their atoms in the glass and these freed electrons will transfer to the silk. This upsets the normal electrical balance of both substances. The glass becomes positive, the silk negative, as shown at (A). Because of the attraction of unlike charges the two will tend to cling together. That this tendency is due to electrical phenomena can be demonstrated by quickly separating them, then connecting them together by means of a copper wire. Immediately there will be a measurable flow of electrons (current) through this wire, as shown at (B), due to the rush of excess electrons to re-establish the original balance. When this flow ceases it will be found that there is no longer this tendency for the two materials to cling together.

of some elements, the attraction of the nucleus for some of its outer electrons is relatively small, with the result that one or more electrons in the outer shell of the atomic formation may break away or may be attracted away from its nucleus by a stronger external positive force (see Fig. 2). In that event the electrical balance of the atom is upset. Having lost part of its negative charge its overall characteristic becomes positive and it will therefore tend to attract other electrons to it from other atoms to make up the deficiency. Thus there may be a certain amount of normal electron interchange between adjacent atoms. This does not mean that the fundamental character of the atom is changed, because, as explained above, an atom of one element cannot change its chemical identity and become another element unless the number of protons in its nucleus is also altered.

If this interchange of electrons can be accomplished in such manner that the "free" electrons (those that have broken away from their atoms) tend to move in unison (within a copper wire, for instance), we have a flow of electric current. This is actually accomplished when we connect a battery (or some

(Continued on page 50)



Most all modern phonos are designed to take full advantage of the results offered by the "off-set" head.

Part 5

MANY theories have been advanced regarding the effects of "tracking error" with the result that the reader is often confused when attempting to understand the fundamental rules that govern the final results. In this installment of our present series on "Theory and Practice of Disc Recording," we shall attempt to refrain as much as possible from using technical terms that might add to the confusion, but rather to analyze the situation in as non-technical terms as will serve to cover the subject thoroughly.

So-called "straight-arm" phono pickups were used up until a few years ago, and little thought was given to the effects of proper "tracking" and "groove-skating." The distortion meant but little as few instruments were capable of attaining so-called

Theory and Practice of DISC RECORDING

by **OLIVER READ**
Managing Editor

A non-technical discussion of the effects of groove tracking with various phono pickups.

where the needle will be seated correctly within the groove. At all other positions of the arm travel the needle will either be forced to the right or to the left of that position. In other words—the pickup element will not be at right angles to the direction of travel.

The error becomes greater as the two extremes are reached by the needle as the angles become greater with a resulting increase in distortion and record wear. At all positions except that at which the needle appears at *right angles to the groove* there will be a tendency for the needle to "ride-up" on the walls of the groove. This becomes rather serious as the outside or inside grooves are reached as the action becomes more violent.

This "groove-skating" results in improper tracking and it is then impossible for the needle to reproduce properly as a great part of the applied pressure is from the sides or "walls" of the groove which tend to *steer* the needle. There is only one pivot point. Obviously then, the only remedy to offset the tendency of the needle to

ride the walls of the grooves is to change the straight arm design to one which will *offset* the angle enough

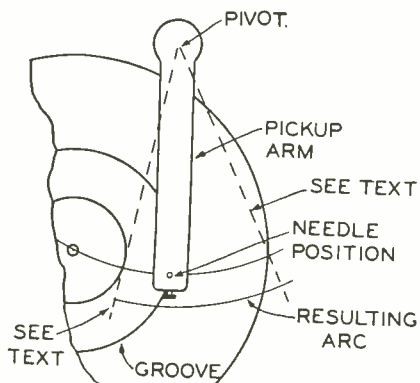


FIG. 1

high-fidelity. Fig. 1 illustrates this type of pickup assembly. The needle swings in an arc as indicated.

There is only one point on the record, that near the center of swing,

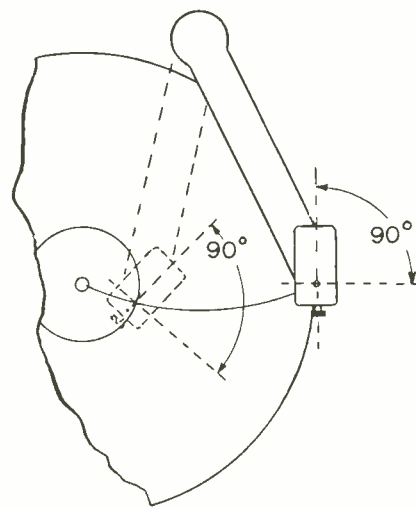


Fig. 2

to arrive at a better *average* position
(Continued on page 60)

LETTERS

IT has been most gratifying to read the many congratulatory letters that have been received as a result of our special January Defense Issue of RADIO NEWS. These messages substantiated our belief that there was a definite demand for first-hand information on radio activities in our military and civilian defense picture. The following excerpts are taken from some of the letters we have received:

"The Special National Defense Issue of RADIO NEWS . . . contains several articles of special interest to us here and I am glad you have been able to have them prepared by the officers actually in charge of the activities discussed."

PARKER HITT
Colonel, Signal Corps
Signal Officer

Headquarters Fifth Corps Area, Office of the Signal Officer, Fort Hayes, Columbus, Ohio

"This certainly looks like a bang-up job, and I am sure that it will be well received by your readers."

JOHN P. ALLEN
RCA Manufacturing Co., Inc.
Camden, New Jersey

"It is the finest piece of work of its kind that I have ever seen and I think you can well be assured that the tremendous amount of work involved in its preparation was very much worthwhile."

A. GHIRARDI
Radio & Technical Publ. Co.
45 Astor Place
New York City

"The entire issue is composed of timely and extremely interesting articles, and I was happy to note that the National Youth Administration was given space with other national organizations utilizing radio."

"This particular issue will be very useful as reference material on the radio activities of the various government agencies . . . etc."

ROBERT R. BURTON, Chief
Radio Projects Section

Federal Security Agency, National Youth Administration, 2145 C Street NW., Washington, D. C.

"I very much appreciate your sending me this publication as a matter of information because I am naturally interested in anything of the kind that pertains to National Defense. I have enjoyed very much looking through the publication."

E. R. STETTINIUS, JR.
Administrator
Office of Lend-Lease
Administration
Five-Fifteen 22d Street NW.
Washington, D. C.

"The communications facilities of the Army under modern methods of warfare—for which the Signal Corps is held responsible—have assumed a most commanding place, and your publication is to be congratulated for the comprehensive coverage of this highly technical and involved subject."

DAWSON OLMSTEAD
Major General
Chief Signal Officer
of the Army

Office of the Chief Signal Officer, War Department, Washington, D. C.

"Your Special National Defense issue of RADIO NEWS is a very interesting and exceedingly timely piece of work. You could not have had a more authoritative group of contributors."

E. H. RIETZKE, President
Capitol Radio Engineering Inst.
3224 Sixteenth Street NW.
Washington, D. C.

"The National Defense Issue of RADIO NEWS is a very fine compliment to the radio applications which become more and more necessary for every individual type of communication needed in modern warfare."

"I am keeping the copy on my desk for future reference."

E. G. SHALKHAUSER, President
Radio Manufacturing
Engineers, Inc.
Peoria, Ill.

Our sincere thanks are extended to all who have taken the time to give us their reactions.—Ed.

QRD? de GY



by JERRY COLBY

OUR Seattle reporter signed off with "hoping to see you some of these days if I'm lucky and get back OK." "HC" Craig, CRM USN, who for the past few months put a "tin can" in commission in a Seattle shipyard, can always be found where the going is the roughest and the opposition the toughest. The San Pedro local of the ACA never was able to put HC into the groove. So Brother Craig ups and lends his services to the ROU with which he saw eye to eye. We know that he and his kind will protect any area in which their ships happen to be. Good luck, OM, we're rooting for you to "come back OK."

OUR midwest sleuth hound, however, is still on the job what with children, a bald pate, etc. and etc. Yes, CB Bolvin is expecting to take care of WPDO, Akron, Ohio, Police radiosta. He blows in with the news that Pan-Am is still hiring ops down Miamiway. Sez he, "Whilst vacationing stopped in at WBSP, Beckley, WVA, and got a look at their new RCA job and very fancy, too. This is one of about six new highway patrol stations being constructed hereabouts. Incidentally, "Hy" Willoughby is being paged. On the return trip came thru Washn. D. C., and spent an evening chatting with Hal Dinger of the Naval Research Labs who sez they are in need of men. They can use men with all grades of qualifications with corresponding grades of pay. Hal also passed along the info that Newton Snyder, formerly with Goodyear Airship and more recently of Uncle Sam's Army, is once more in the Commersh opp biz as a result of marriage, over-age, etc. and is now with American Airlines. Paul Nurches who has been at the Goodyear Akron Base moves to the Miami Base next week for the winter . . . lucky guy. One bit of sad news: W. Renner, long time op for the Ohio State Highway Patrol at Massillon, WPHC died about three weeks ago from the

effects of a brain tumor. 73-30."

NOW that we are at war with the turbulent, terrible trio, we wish to bring to the attention of the powers that be the following "beef" registered by one radiop . . . quote . . . With conflicting regulations on the increase, it is becoming increasingly difficult for a conscientious law-abiding radiop to keep within the bounds of the law and still adhere to some of these newly enacted decrees. Most perplexing of all is the habit some ship masters have in advising their radiomen to "keep off the air unless absolutely necessary." Consequently, the bewildered op finds himself in a quandary as to what is and what is not "necessary." Many of us who abhor halfway measures feel that we should receive definite orders, either to perform our duties without such molesting hindrances or to inaugurate complete "radio silence."

For some time now his Majesty's Jamaican customs have been sealing our radio shackles upon entering Kingston harbor. Latest pronunciamientos hailing from Colombia and Guatemala have ordered us to refrain from xmitting whilst within the boundaries of their territorial waters. Radio activity around Belize has long been taboo. The Canal Zone authorities also have us properly hog-tied with local regulations. Here are a couple examples of how some of these decrees conflict with existing radio laws. Regulations laid down by the FCC require us to run a test on emergency shipboard equipment prior to departure from all ports and to make a red inklog entry of the results; the Panama Canal Zone, the Crown Colony of Jamaica and our neighboring republics of Colombia and Guatemala forbid such radiation.

Both FCC and the Cairo International Radio-communication regs also instruct us to promptly notify "QTP-QTO" to a coastal station upon entering or departing from all ports. But, even this order must be foregone if we are to abide by local ones. In addition, there are other confidential cautions we have quietly been instructed to observe. Some do so, many do not. In other words, we simply can't win. By abiding with the laws of one particular administration we are forcibly violating those of another. So the bewildered marine radiop can scarcely be held responsible for his involuntary violation of some particular reg when they are forever contradictory . . . unquote . . . To which we add that the FCC will iron out this matter to the satisfaction of many radiops as soon as the shock of the fast moving events of the past few weeks wears off.

Another thought for the FCC is the reports from many radiops that while their vessels are in a danger zone, and, in most cases, thousands of miles before they enter the danger zone, they have received orders from the Master not to use the transmitter: yet nothing is said about the receiver, the auto-alarm, or broadcast receivers aboard.

(Continued on page 49)



"Happy Boithday dear Admiral,
Happy Boithday to yaouu!"

AS this country's foreign relations become increasingly acute, so the role of a major radio network in National Defense grows in importance. For besides radio's other advantages, there is the immense value of instant communication from Government to the people and also the opportunity to help in maintaining public morale.

Among the effective ways in which radio has rallied to the Nation's need are the following:

Broadcasting news gathered by correspondents stationed in pivotal centres throughout the world.

Disseminating information culled by listening post experts from the stream of talk—in approximately a dozen languages—from foreign radio studios.

Presenting new types of documentary broadcasts.

Broadcasting activities and descriptions of U. S. military maneuvers.

Sending programs over the air to Latin America and also presenting within this country radio entertainment from republics south of the U. S. border, with the idea of making for an even better understanding between all nations of the Western Hemisphere.

Broadcasting programs of Air Raid Precaution drills and instructions to the public.

Making announcements regarding the Government's needs in National Defense.

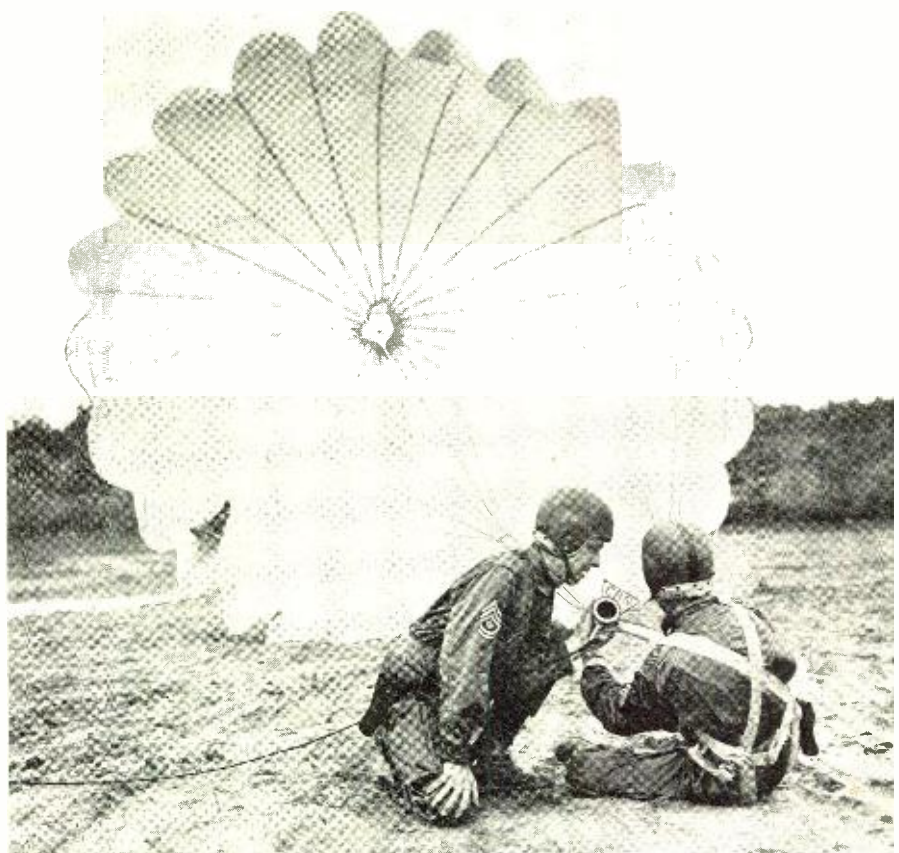
Short-waving news in eight languages to Europe—from CBS's station WCBX, in Brentwood, Long Island. This is done in fifteen minute periods from 7 o'clock in the morning to 5 o'clock in the evening, EST.

Accelerating interest in the sale of Defense Bonds and Stamps.

Broadcasting activities of interest and progress made in airplane, tank and other plants, also accounts of work done in shipbuilding yards.

Presenting programs concerned with various phases of relief for foreign

(Continued on page 58)



Parachutist of the 501st Infantry being interviewed by CBS announcer Daly.

CBS Radio Nets

by DOUGLAS COULTER

The Broadcasters have organized their radio networks to meet any emergency at any time.

Charging Infantry is described by a CBS announcer.

Broadcasting direct from a B-18 bomber of the 3rd Task Force.



DEFENSE and the AMATEUR

by F. WILLIAM STEWART

The time has arrived when Amateur Radio is being called upon to provide emergency communication service for the entire country—not for a few hours or days—but for the duration. Operators and equipment are prepared.



Control station of the Fairfield, Conn., Emergency Radio Corps network.

Equipment is tested thoroughly at regular intervals. Note J antenna.



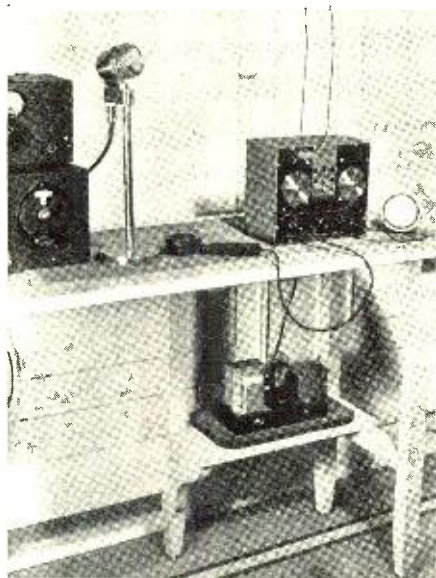
WHEN our country declared war on December 8th, that declaration ushered in the biggest job that has ever faced amateur radio! We have all had a lot of fun out of ham radio during past years, and the ham has established an enviable reputation for the assistance he has rendered during innumerable emergencies that have arisen in the past—incidents ranging from the saving of the life of an individual in an isolated Alaskan shack, to supplying means of communication for whole communities cut off from the rest of the world by floods, storms or other catastrophes. But now the time has arrived when ham radio is being called upon to provide an emergency communications service for the whole country—not for a few hours or days, but “for the duration.”

Already an appreciable part of the ham personnel of the country is serving in the armed services—having jumped into the breach when trained operators and technicians were badly needed. This puts an extra burden on those who still remain in civilian life, but it likewise provides them an opportunity for an invaluable service—an opportunity which handdom is losing no time in grasping.

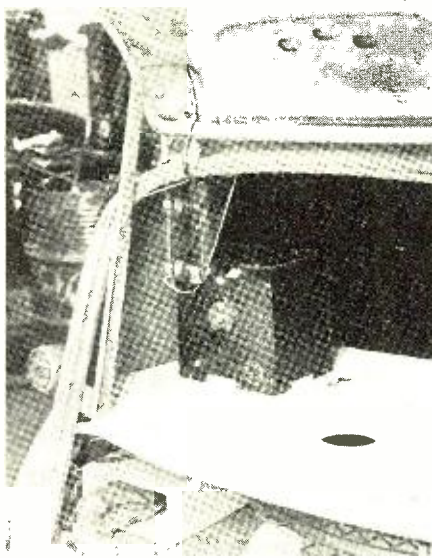
For many months preparations have been quietly going on among local and regional ham organizations from coast to coast. When war was declared there were many local communities which found themselves possessors of trained emergency communications nets; local Defense Councils, worried with a million details of organization and equipment, had the problem of emergency communications lifted bodily from their shoulders. Literally millions of dollars' worth of emergency communications equipment, complete with the capable operator-owners, was voluntarily placed at the disposal of the civilian defense authorities.

In some instances these local amateur organizations were prepared for types of communications service which do not find practical application at a moment when major attention is being focused on local defense preparations. The government itself is working out plans for taking advantage of every type of service made available to it by amateurs, but in the meantime has given the signal to go ahead full speed on all communications activities pertaining to local defense.

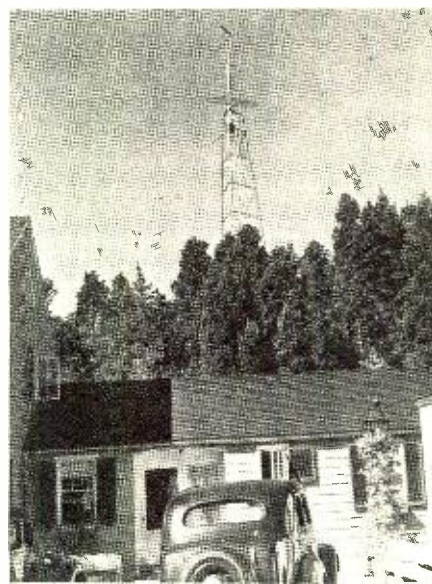
The value which authorities in Washington attach to this service is perhaps best indicated by the fact that within 72 hours after war was declared the FCC, despite the multitudinous other pressing duties imposed by the emergency, started issuing extensions of station and operating li-



Commercial 2½ meter transmitter-receiver packs a husky wallop.



Revamped RADIO NEWS "Tiny-Tot" on 2½ meter band is ideal for mobile.



The antenna tower at the net control station. Feeders are over 200' long.

censes of hams who were already organized and affiliated with their local Defense Councils. It is known that within three days after hams were ruled off the air a group of close to 40 amateurs of Westchester County, N. Y., was duly authorized to resume operations immediately for defense purposes. A day later another group in the town of Fairfield, Conn., received similar authorization. At this writing, less than three weeks after "Pearl Harbor," there are thousands of amateurs who possess proper credentials to enable them to go on the air under orders from their local defense chairmen.

Thousands of others are hurriedly organizing themselves, or where previously organized for inter-state or other long-range network operations, are reorganizing for local, ultra-high frequency service. Such organization cannot be accomplished in a day. Many have equipment to purchase or build, others have to gain more complete knowledge of the ultra highs, or of organization details. The next few weeks and months will be very active.

For the time being this new department, "Defense and the Ham," will dedicate itself primarily to this branch of emergency service, its purpose being to present information on both organization and technical matters to the end that dissemination of information gleaned from the experience of now active nets and their members will be helpful not alone to those which have yet to be organized, but also to other existing groups which will profit by the interchange of ideas through a medium such as that offered by this department.

Organizations and their individual members everywhere are invited to submit information (and photos if possible) on their activities; on points of technical interest concerning equipment, antennas, mobile installations, emergency power supplies, etc.; and

any other sort of dope that may be considered helpful to others. In addition, the writer of this department, in the role of "roving reporter" will endeavor to glean information here and there, through his own defense activities and contacts, passing along such of it as seems warranted.

Emergency Radio Corps Fairfield, Connecticut

A DESCRIPTION of an emergency net organized early in 1941 in the Town of Fairfield will be of general and specific interest, particularly to groups in towns where the number of hams is limited, thus imposing an obstacle which requires unusually careful thought to organization and planning if it is to be overcome.

Perhaps Fairfield faced an unusual number of problems, but not so many that ham spirit, plus the close cooperation of the chairman of the local Defense Council could not overcome.

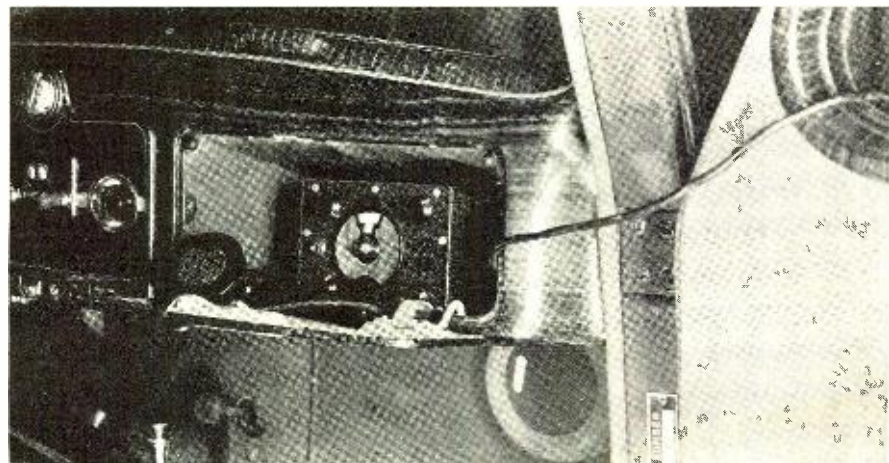
Organized in the early months of 1941, this group consisted of all the Fairfield amateurs—some ten in number. By the time the early planning

had been completed the number had been reduced to seven by enlistment in the army and navy. At best this latter number is small to provide emergency u.h.f. coverage of an area of something like 50 square miles of hilly, wooded country. So far as practice drills were concerned there was the additional drawback that practically all of the net members were engaged in essential defense industries and working 7 days each week. Some were on day shifts, others on night duty, with the result that it was indeed a rare occasion when all could be assembled at one time.

A distinct advantage existed, however, in the fact that the organizer of the group was thoroughly familiar with 2½-meter conditions throughout the entire area of the town. Moreover his own home station location was up in the hills and centrally located, making it a highly desirable position for the fixed control station. These factors eliminated a good deal of experimental operating surveying which would otherwise have been

(Continued on page 53)

Revamped "Tiny-Tot" receiver mounted in one of the emergency net cars.

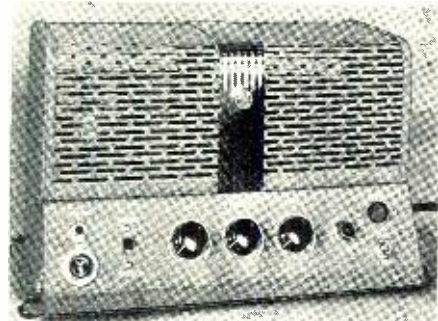


WHAT'S NEW IN RADIO

New 15-Watt Amplifier Added to RCA Sound Line

A newly developed 15-watt amplifier which achieves an increase in operating efficiency when compared with an earlier model it replaces, has been announced by George Ewald, Manager of the Commercial Sound Division of the *RCA Manufacturing Company*.

While rated at 15 watts, the new unit is capable of 21 watts of output as a maximum. At its rated output, distortion is less than



3½%. Provision is made for microphone and phonograph inputs, the former at 560,000 ohms, and latter at 500,000 ohms. A terminal board is provided for making output connections. Separate volume controls are supplied for the microphone and phonograph inputs. A continuously variable tone control and voice-music switch are also incorporated in this amplifier.

Gain of 125 db is provided for the microphone input, 85 db for phonograph. Frequency response is from 30 to 10,000 cycles. Dual control intro-tube mixing is another feature of the new unit. The fuse is easily accessible. A microphone plug is furnished with the unit.

Nothing has been sacrificed to appearance in the amplifier, which is designated as Model MI-J2222. It is housed in an attractively styled cabinet of modern lines, painted a neutral grey. Its dimensions are 14½" long, 8¾" deep, and 8½" high.

Allied 16 Tube 3 Band FM-AM Phono-Radio Combination

A new contribution to the field of custom-style high-fidelity receivers are the *Knight "Kensington"* and *Rokeby* 16-tube 3-band FM-AM Radio models with Automatic Phonograph. The "Rokeby" style console is illustrated.

Both the "Kensington" and "Rokeby" are housed in massive lifetime consoles of authentic period design—the product of skillful hand craftsmanship. No nails or blocks are used. Assembly is by means of tenons, dowels, cross-grained tongues, and perfectly fitted joints. Selected one-inch woods insure finest acoustical results.

The *Knight "16"* incorporates two separate chassis. The Hi-Fidelity tuners provide Frequency Modulation reception from 40 to 50 mc.—covers standard broadcast band from 540 to 1650 kc.—receives short-wave broadcast from 4.8 to 17 mc. and the 60-meter S.A. band. The tube lineup is: 6SG7 as r.f., 6AB7 as FM Mod.; 6SA7 as Broadcast SW Mod.; 6J5 as Osc.; 2—6SG7 as IF's; 2—6SJ7 as Limiters; 6H6 as Discriminator; 6SR7 as 2nd Det. and 1st Audio; 6SQ7 as 2nd Audio; 6SR7 as Inverter;

6U5 as Electric Tuning Eye. Outstanding features include RF on all bands, AVC, Dual Tone Control, special 12" FM Dynamic Speaker, etc.

The specially designed Hi-Fidelity ampli-



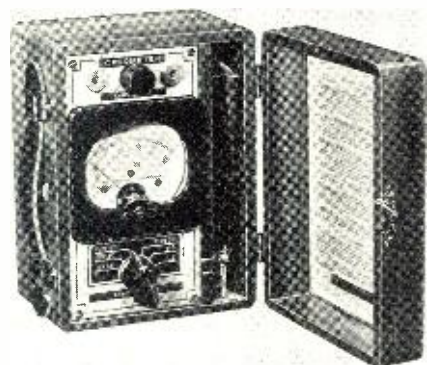
fiers are built on separate chassis and have a frequency response of 30 to 10,000 CPS. Output is powerful 10 full watts, undistorted. The following tubes are employed: 2—6K6GT as push-pull output; 5Z3 as Rectifier.

The *Deluxe Garrard RC-30* record mixers are mounted in a panelled drawer that slides easily forward on roller bearings—plays eight 10" or 12" records. Has a featherweight crystal pickup of one ounce and lifetime needle which assures longer life and eliminates needle changing. Generous record album space is provided behind hinged lower left-hand panels. Cabinet size: 40" wide, 38" high, 18" deep. For 105-125 volts, 60 cycles a.c.

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

Tester for Coin-Operated Devices

Especially designed for testing and servicing coin-operated amusement devices such as pin-ball games, reproducers of recorded music, commercial voice recorders, etc., is



the new Model 415 test instrument just introduced by *Radio City Products Co., Inc.*, 88 Park Place, New York City.

Only 6 inches long, 3 inches wide and 2¾ inches high, it requires little space in the service kit, yet is capable of the full variety of measurements involved in servicing this type of equipment. Its small weight, only 24 ounces, is another important feature which contributes to its convenience.

The 415 measures a.c. and d.c. voltages with ranges so allocated as to provide accurate measurement of a variety of voltages including line, lamps, batteries, transformer secondaries, etc. It tests continuity and measures resistance of relays, contacts, coils, resistors, chokes and transformers; tests conditions of condensers and other sources of leakage, shorts and open circuits. Also included are jacks to permit tests by means of headphones.

There are two types, shop and portable. The only difference is that the portable model is made somewhat larger by its huskier case and hinged cover with handle. Both instruments are supplied with permanently attached leads terminating in test prods. An Alligator clip is also included.

New Vibration Resistant Relay

A compactly constructed unit is the new Series 165 Vibration Resistant Relay by *Guardian Electric*, specifically designed for applications having a serious vibration problem such as aircraft, generators, etc.

The Series 165, 24 volt d.c. Relay (also available for a.c. in the Series 160), is exceptionally resistant to vibration, achieved largely by careful counterbalancing of the armature assembly and due in no small degree to the compact design of contact assemblies and its generally sturdy and scientifically balanced construction.

The manufacturer states that tests conducted by the laboratory of one of the leading U. S. airlines substantiated earlier findings that the Series 165 Relay, with two normally open contacts, would withstand a vibration test of 16.2 times gravity without making contact when the coil was de-energized, or breaking contact with the coil energized. The company claims that 16.2 (G's) is not the maximum vibration resistance of the relay, representing the maximum obtainable on the testing machine.

Further vibration life tests by another user on one of the original production models, since improved, required 230 hours of continuous vibration at 100 cycles per second, with the Series 165 relay tested in two positions 90° apart, before it became inoperable. These relays are said to be entirely insulated from ground with insulation withstanding a minimum of 1500 volts. The field piece and armature are of annealed magnetic iron. Tinned phosphor bronze blades carry heavy fine silver points. All contacts are connected to tinned solder lugs.

Armored Power Rheostat

To withstand exceptionally hard usage, particularly where the unit is exposed, an armored type power rheostat is now made by *Clarostat Mfg. Co., Inc.*, 285-7 N. 6th St., Brooklyn, N. Y. In fact, many such rheostats have already been made for and are now standard equipment in certain types of fighting aircraft, usually in the capacity of instrument-panel-lighting dimmers.

The usual *Clarostat* 25-watt power rheostat is mounted in a perforated metal housing. (Continued on page 59)

Home Made Parts for Radio Construction
(Continued from page 23)

of plywood are warp-resistant, take a handsome finish, and will in every respect fill the panel bill in the absence of steel, aluminum, and masonite. In spite of the pre-emergency popularity of iron and steel foundation units, many amateurs have employed wood-start.

The commonly encountered wooden racks are simply carbon copies of the standard steel relay racks. They are constructed of the hardest wood the builder can obtain, and are painted to suit the fancy of the owner. The popular radio handbooks all carry working drawings in which the detailed dimensions of standard racks are given for the benefit of private builders working in wood or metal. Several journals have likewise published these specifications from time to time, and repetition here does not seem warranted.

Knobs and Dials

Wood may also be employed in the manufacture at home of knobs for dials and of pointer-indicators. However, a good-appearing product requires a degree of woodworking skill, to say nothing of special tools.

If the experimenter has the requisite tools, any style of bakelite or composition knob on the market may be copied in wood. The wood used should be very hard, since the set-screw hole must be threaded and these threads must resist a number of removals and reinsertions of the screw during the useful life of the knob. The knobs may be finished in any color the builder desires, however we feel that a word of caution is in order regarding the use of black paints. Most blacks contain graphite or some other form of carbon, which makes for a high-resistance (rather than insulated) surface. When upon grasping a tuning knob, the operator connects himself to circuit through an effective

high resistance; he is apt to find body capacity aplenty; or if the circuit is one of high voltage, he is apt to find that the knobs "bite."

Figure 4 shows some of the popular patterns that might be used for hardwood knobs. A, B, and C are readily cut and finished with common tools, and D may be cut from round hardwood stock of appropriate diameter. But E and F are designs that will require a lathe for best fabrication.

White cardboard dial plates, carefully marked off and numbered in black India ink and protected by transparent celluloid discs, may be cemented directly to the wooden knobs. Or, if a more durable, warp-proof assembly is desired, the dial disc base may be cut from tin or other sheet metal.

Next month's story will tell how to build resistors, volume controls, and meters and will discuss substitute busbar for receiver construction. —30—



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Spot Radio News

IN DEFENSE AND INDUSTRY



FOR MANUFACTURERS • SERVICEMEN • DEALERS • ENGINEERS • AMATEURS

Special to Radio News

by Alfred Toombs—RN Wash. Corres.

Washington.—The Signal Corps of the Army is getting the benefit of the advice of an outstanding group of experts from the field of radio and other communications industries. These experts are members of the recently appointed Civilian Technical Advisory Board, named by Major General Dawson Olmstead, the Chief Signal Officer. The Board's task is to help the Materiel, Operations and the Coordination and Equipment branches of the Signal Corps.

The membership of this board, including some Reserve Officers now on active duty, is as follows:

Dr. Frank B. Jewett, Chairman of the Board, Bell Laboratories, Inc., and President of the National Academy of Sciences; Dr. W. R. G. Baker, Vice President of the General Electric Co., who is an expert in all fields of radio and an authority on television; Dr. William P. Hilliard, Vice President in charge of Sales and Engineering of the Bendix Radio Corporation, who is an engineer who has been closely associated with the development of aviation radio; Walter Evans, manager of the Radio Division of the Westinghouse Co., an engineer who has given much time to developing radio equipment for the Government;

J. B. Coleman, Chief Engineer, Special Apparatus Engineering Division, RCA, who has vast knowledge of the design of direction finding, television, facsimile and other types of equipment; Dr. L. M. Hull, President of the Aircraft Radio Corporation and former head of their frequency laboratories, who is a pioneer in the research and development of aviation radio equipment in connection with military and commercial airways;

Brig. Gen. William I. Westervelt, retired officer and former official of the Sears Roebuck Co., who is serving on the Supply Priorities and Allocations Board; L. C. F. Horle, manager of the Materiel Bureau of the Radio Manufacturers Association;

Col. E. H. Armstrong, inventor of the Superheterodyne receiving system and of Frequency Modulation; Col. David Sarnoff, President of the Radio Corporation of America; Col. C. O. Bickelhaupt, assistant vice president of the American Telephone and Telegraph Co.; Lt. Col. Leon E. Rudd, superintendent of Western Union; Lt. Col. F. W. Wozencraft, R.C.A. Communications, Inc.; Lt. Col. William Carter Henry, President of the Northern Ohio Telephone Co.; Lt. Col. Edwin L. White, Engineer with the F.C.C.; Lt. Col. E. R. Shute, Vice President of Western Union; Lt. Col. Darryl F. Zanuck, movie producer; Major Clinton B. Allsop, Vice President of Postal Telegraph, and Major David W. Magowan, of the Western Newspaper Union.

The current appropriation available to the Signal Officer for purchase of communications equipment totals one and a quarter billion dollars. In addition, the House in the Third Supplemental National Defense Appropriation Bill, which came before Congress for consideration early this month (January), gave the Signal Corps \$239,074,852.

Most of this money will be used for equipping eight new Aircraft Warning regiments and nine Aircraft Warning battalions. The Aircraft Warning branch of the service, it is now contemplated, will be expanded to include about 17,000 officers and men. The \$239,074,852 supplemental appropriation will cover expenditures which were not contemplated when the original Signals Corps budget was drawn up last year. Some of the supplemental funds will be used to purchase additional radio equipment for tanks, airplanes and anti-tank forces.

Maj. Gen. Olmstead said that he expected to allot this money within a short time and to have it all spent by July 1, when the new fiscal year begins. He said that he was confident that the American communications manufacturing industry could handle the load of defense work.

Other recent appropriations for purchase of radio equipment include \$17,600,000 for Signal Corps purchases for Lend-Lease equipment and a part of \$120,000,000 appropriated for new Navy equipment. The Navy's Bureau of Ships

LAST
MINUTE



There is persistent talk in Washington of big changes to come in the radio manufacturing industry. Speculation chiefly centers around integration of all plants for defense and civilian manufacturing. Within the year, we are informed reliably, all radio manufacturers in the country will in effect be operating as one large manufacturer. By June, 1942, experts estimate half of the radio manufacturing will be defense radio. In order to spread the work out and keep all the factories going, plans have been projected to form one board to oversee production throughout the industry, assigning contracts and sub-contracts and allocating the needed materials.

At the same time, it is likely that the industry will settle upon two or three standard radio models for civilian use. These models will be turned out in one factory, with all manufacturers sharing the expenses and profits. There will be just enough of these radios to meet the country's minimum needs.

At the same time, the industry will continue to produce all the replacement parts needed to keep the country's radios going.

has asked that it be given \$1,275,000 for radio shore stations and another \$75,000 has been set aside to purchase radio transmitters and receivers for "fleet training equipment."

Washington.—Commander Jennings B. Dow, U.S.N., has moved in to take charge of the Radio and Sound Branch of the Bureau of Ships in the Navy Department. Commander Dow now has charge of a bureau which has approximately \$160,000,000 worth of radio contracts distributed among 29 major contractors and a number of sub-contractors. This Bureau has 28 officers on duty, in addition to 72 professional civilian employees, and because of the increased demand for radio equipment for the Fleet, Aircraft and Marine Corps, the bureau will soon expand into a force of more than 230 officers and civilians.

Commander Dow is well known in the radio industry and is the inventor of the Dow circuit. His principal assistants are Commander S. F. Patten, in charge of communications materiel, and Commander A. M. Granum, in charge of special radio equipment.

Washington.—Among the new comers to Navy duty in Washington is Lieut. Commander William G. H. Finch, who has resigned from the Presidency of the Finch Telecommunications Laboratories. He is serving under Commander Dow in the Radio and Sound branch. Lieut. Commander Finch came on active duty despite the fact that his company has been working on large, important orders of a highly secret nature for the armed forces. Because of this, he could have been exempted from service, but instead put his company in the hands of his top executives and went on active duty. He has been active in the Naval Reserve, serving since 1929 as executive officer of the Naval Communications Reserve for the Third Naval District.

He has had considerable sea duty, serving as Communications officer on the U. S. S. Wheeling as well as on other warships. In 1932, he was assigned to special duty on the destroyer Reuben James—which was sunk off Iceland in November by a German submarine. A

former FCC engineer, Lieut. Commander Finch has more than 100 inventions to his credit. Among the most important of these are the automatic highspeed radio printing system, radio relay and recorder and high fidelity broadcast facsimile transmission system, both black and white and in natural colors. He established the first radiotypewriter press circuit between New York and Chicago in 1932 and the first international radiotypewriter circuit linking New York and Havana in 1933. He has attended many important national and international radio conferences.

Joliet, Ill.—Trainloads of TNT, artillery shells, aircraft bombs and assorted explosives are now moving through the immense switchyards of the Elwood Ordnance Plant, Joliet, Ill., without the use of signal blocks or lights. It's all being done by radio.

The War Department announced that FM equipment, made by the General Railway Signal Corp., according to specifications furnished by the plant's communications department, had been installed. The trains which run over the 80 miles of railroad track in the plant will be controlled by a dispatcher from a central station and engineers will operate according to orders received from this station.

Washington.—The Defense Communications Board has imposed the most stringent regulations against allowing aliens to visit centers of communication systems or plants manufacturing defense radio equipment. Broadcasting stations, of course, have always been the first goal of fifth columnists. At the same time, Congress has empowered the Navy to remove from merchant vessels any operators whose loyalty to our Government is suspected.

Custom officials, going aboard a Spanish vessel as it was leaving New York recently, found enough equipment to build 50 radio transmitting stations. Observers suspect this material may have been bound ultimately for South America, where numerous fascist secret radios are known to be operating.

Washington.—The OPM has at last gotten around to including the Defense Communications Board in its consideration of priorities and other necessities of the communication industry. It has been announced that the OPM and DCB have formed a liaison to coordinate plans for handling material needs for the communications industry.

The DCB is composed of experts on and spokesmen for all branches of the communications industry. These spokesmen are intimately acquainted with the part various radio organizations are playing in defense and with the needs of those organizations for materials. Therefore, the DCB is assuming the responsibility of advising the OPM and SPAAB on policies affecting the industry. The new arrangement will bring the DCB into close contact with the Priorities Committee of the Army-Navy Munitions Board, also.

FCC Field Inspectors

Washington.—The Federal Communications Commission announces that at the request of the Army, it has assigned field inspectors to perform liaison duties between the Interceptor Command and the commercial radio stations in each area where radio silence may be required. When the inspector directs a station to maintain radio silence, it should be understood that the order originated with the Interceptor Command of the Army

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Explain fully about your course in the subject marked X:

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**LAST
MINUTE**

Flashes

The proposed radio production "limitation" order will be the first affecting the radio industry during the present emergency. The 75 percent production rate covering January, February and March 1942, on the basis of 675,000 sets monthly, is only 10 percent less than the production requests presented by the RMA Priorities committee.

The OPM order proposes that it should not restrict supplies of tubes and component parts for sets in the hands of the public. Manufacturers would have the option of building either small or large receivers within their 75 percent quarterly quota. Continued industry production in January, until the special nickel allocation in prospect becomes available, is regarded as assured, as tube and set manufacturers advised OPM that they have sufficient inventories on hand.

Officials announced that it was the OPM policy to maintain the industry during the interim period, until the large military radio contracts are available, and also provide for adequate maintenance repair parts for sets now in the hands of the public.

and carries with it the authority of the Federal Communications Commission.

Radio stations will be advised as promptly as possible when radio silence is no longer required so that they may resume normal operations. In this connection, plans are being made to effect a more rapid system of communication between the Commission's inspectors and the radio stations which may be required to go off the air.

DCB to Appoint 3 Engineers

Washington.—Coordinated plans for handling materials needs for the communications industry in war time have been worked out by the Defense Communications Board in cooperation with the Office of Production Management.

In brief, here is how it is proposed to handle expeditiously the priorities problems of the radio and wire services under the present emergency:

The Defense Communications Board assumes the responsibility of acting as adviser to the Office of Production Management in all such matters. The former, on which all branches of electrical communications are represented in an advisory capacity, will undertake to formulate a program covering the over-all requirements of the industry for a particular period. Further, it will recommend to the OPM or the Supply Priorities and Allocations Board, as the case may be, policies covering communications problems, make recommendations as to orders which should be promulgated in this connection, and recommend basic rules for the guidance of the various branches of OPM which process applications.

The Communications Branch of the Division of Civilian Supply is to be assigned office space in close proximity to the Engineering Department of the Federal Communications Commission. The Chief of this Communications Branch will be assisted by three officers appointed by the DCB to serve on a full-time basis. These liaison officers will be loaned for this purpose by the FCC or other agencies represented on the DCB.

FCC to Appoint Radio Monitoring Officers

Washington.—Within the past year there has been considerable expansion of the radio monitoring activities of the Federal Communications Commission. Even further expansion is anticipated in connection with national defense. To secure qualified people to do this work, the U. S. Civil Commission has just announced an examination under the title "Radio Monitoring Officer." The positions pay \$2,600 and \$3,200 a year.

Radio monitoring officers are assigned to monitoring and direction-finding stations of the FCC where they stand watches at any time of the day or night, including Sundays and holidays. They provide surveillance of all communication channels by listening to and recording transmissions. Copying radio-telegraphic transmissions is also a part of the work. Monitoring officers investigate complaints alleging subversive uses of radio and secure evidence leading to the prosecution of operators of unlicensed stations. They are required to travel a great deal and to drive direction-finder cars.

No written test will be given for these positions. To qualify for the full-grade position (\$3,200 a year), applicants must have at least 2 years of responsible supervisory experience in installation, testing, inspection, laboratory development, or responsible maintenance of commercial

or Government radio transmitters. In addition, they must have either similar experience, not necessarily supervisory, or have completed appropriate college or technical study. Applicants for the assistant grade (\$2,600 a year), may qualify on appropriate study or experience such as that of studio engineer supervising high-fidelity recording of aural programs and their reproduction. For some positions, applicants must also meet certain license and code receiving and transmitting requirements.

Applications may be filed with the U. S. Civil Service Commission, Washington, D. C., until June 30, 1942. However, interested persons are urged to secure a copy of the announcement and application forms at once from the Commission's representative at any first- or second-class post office or from the Commission's central office in Washington, D. C.

Priorities Information

Washington.—Appointment of the OPM Radio Defense Industry Advisory Committee, of 29 members, was announced recently. The committee was named upon the recommendation of Mr. Jesse L. Maury of the OPM Division of Civilian Supply, who is the government presiding officer or chairman of the Industry Committee.

Appointment of the OPM Radio Committee followed the industry conference in Washington on October 30, when 58 nominations were made for the committee membership of 29. This includes 9 members chosen from set manufacturers, 4 each from the tube and transmitting apparatus manufacturers, 9 representing parts and accessory manufacturers and 3 representing miscellaneous and special equipment. The size, geographical location, and other factors of various companies were considered; and the appointment of the committee was approved by the OPM Legal Department and also by Attorney General Biddle.

No announcement was made by OPM regarding future meetings or organization of the Industry Committee, but Mr. Maury, the government presiding officer, has plans for formation of several subcommittees, or panels, including panels on allocations, conservation and simplification, receivers, tubes, parts, etc.

Members on the Committee are:

- Benjamin Abrams, Emerson Radio & Phonograph Corp., 111 Eighth Avenue, New York, N. Y.
- W. R. G. Baker, General Electric Co., 1285 Boston Ave., Bridgeport, Conn.
- M. T. Balcom, Hygrade Sylvania Corporation, Emporium, Pennsylvania.
- W. J. Barkley, Collins Radio Company, 11 W. 42nd St., New York, N. Y.
- A. Bloom, General Instrument Corp., 829 Newark Ave., Elizabeth, N. J.
- H. C. Bonfig, RCA Manufacturing Company, 201 N. Front St., Camden, N. J.
- Roy Burlaw, Ken-Rad Tube & Lamp Corp., Owensboro, Kentucky.
- H. W. Clough, Belden Manufacturing Co., 4647 W. Van Buren St., Chicago, Illinois.
- Allen DuMont, Allen B. DuMont Laboratories, Passaic, N. J.
- P. V. Galvin, Galvin Manufacturing Co., 4545 Augusta Blvd., Chicago, Ill.
- Larry Gubb, Philco Radio & Television Corp., Tioga and C Streets, Philadelphia, Pennsylvania.
- K. D. Hamilton, Isolantite, Inc., 343 Cortland St., Belleville, N. J.
- W. P. Hilliard, Bendix Radio Corp., 920 E. Fort Ave., Baltimore, Md.
- H. J. Hoffman, Westinghouse Electric Co., Bloomfield, New Jersey.

- J. J. Kahn, Standard Transformer Corp., 1500 N. Halsted St., Chicago, Ill.
- L. L. Kelsey, Stewart-Warner Corp., 1826 Diversey Pkwy., Chicago, Ill.
- R. H. Manson, Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y.
- Jack M. Marks, Fada Radio & Electric Co., Long Island City, New York.
- Victor Mucher, Clarostat Manufacturing Co., 285 N. 6th Street, Brooklyn, New York.
- L. F. Muter, The Muter Company, 1255 S. Michigan Ave., Chicago, Ill.
- Harold L. Olesen, Western Electrical Instrument Corp., Newark, N. J.
- W. F. Satterthwaite, General Dry Batteries, Inc., Cleveland, Ohio.
- Ernest Searing, International Resistance Co., 401 N. Broad Street, Philadelphia, Pennsylvania.
- S. N. Shure, Shure Brothers, 225 W. Huron St., Chicago, Illinois.
- Ray Sparrow, P. R. Mallory & Co., Indianapolis, Indiana.
- R. C. Sprague, Sprague Specialties Co., Beaver St., North Adams, Mass.
- Arthur E. Thiessen, General Radio Co., Cambridge, Mass.
- S. T. Thompson, Zenith Radio Corp., 6001 Dickens Ave., Chicago, Ill.
- A. S. Wells, Wells-Gardner Co., 2701 N. Kildare Ave., Chicago, Ill.

Radio Aluminum Allocations in OPM-RMA Industry Meetings on 1942 "Victory" Program Provision for Maintenance and Repair Parts

Washington.—The "Victory" program for military radio production and also civilian production in 1942 were considered at meetings in Washington this week of the OPM Industry Advisory Committee and RMA. Announcement was made of special radio allocations of aluminum for January, February and March 1942, continuing similar aluminum allocations begun last July, following recent requests of the RMA Priorities Committee headed by Chairman Fred D. Williams. Nickel for permanent magnet speakers was allocated during the previous week, and further allocations of copper and plastics for radio during the first 1942 quarter are promised next week. The special allocations are based on the OPM policy to maintain the radio industry facilities and skilled personnel pending receipt of large defense radio contracts scheduled in March or April.

Industry leaders gathered at Washington last Tuesday for the meeting of the OPM Radio Industry Committee. Jesse L. Maury, government presiding officer, was in charge of the all-day session on December 16, and afterward there were meetings of the RMA Executive Committee with President Paul V. Galvin presiding; the RMA Priorities Committee, and also informal conferences of receiving set and parts subcommittees of the OPM industry organization. The set and parts conferences were conducted by Mr. J. A. Cook, assistant to Mr. Maury, on December 18. An addition to the OPM Industry Committee is Mr. James P. Quam of Chicago, RMA Vice President, who was unanimously nominated. Complete organization of the subcommittees was not effected, but it was arranged to have the various set, tube and parts committeemen constitute, respectively, the subcommittees covering various branches and problems.

The industry military and civilian programs were considered at a meeting of



Radio...all out for Victory

Research and invention have placed radio in the first line of battle

COMMUNICATION—rapid communication—is a vital necessity, on land, at sea and in the air. RCA research and engineering developments in both radio and electronics are strengthening—and will further fortify—the bulwarks of our communications system. At Princeton, New Jersey, the new RCA Laboratories—the foremost center of radio research in the world—are under construction.

★ ★ ★

International circuits, operating on short and long waves, have made the United States the communication center of the world. Today, R.C.A. Communications, Inc., conducts direct radiotelegraph service with 49 countries.

★ ★ ★

Production of radio equipment is essential for news and timely information, for military and naval communications, for dissemination of news among foreign countries. The "arsenal of democracy" has a radio voice unsurpassed in range and efficiency. In the RCA Manufacturing Company's plants, workers have pledged themselves to "beat the promise," in production and delivery dates of radio equipment needed for war and civilian defense.

★ ★ ★

American life and property at sea are being safeguarded by ship-and-shore stations.

The Radiomarine Corporation of America has equipped more than 1500 American vessels with radio apparatus and is completely engaged in an all-out war effort.

★ ★ ★

Radio broadcasting is keeping the American people informed accurately and up-to-the-minute. It is a life-line of communication reaching 55,000,000 radio sets in homes and automobiles. It stands as the very symbol of democracy and is one of the essential freedoms for which America fights. The National Broadcasting Company—a service of RCA—and its associated stations, are fully organized for the coordination of wartime broadcasting.

★ ★ ★

New radio operators and technicians must be trained for wartime posts. RCA Institutes, the pioneer radio school of its kind in the United States, has more than 1,200 students enrolled and studying in its New York and Chicago classrooms.

★ ★ ★

When war came and America took its place on the widespread fighting front, radio was At the Ready . . . with radio men and radio facilities prepared to answer the call to duty "in the most tremendous undertaking of our national history."

David Sarnoff

PRESIDENT



Radio Corporation of America

RADIO CITY, NEW YORK

The Services of RCA: RCA Manufacturing Co., Inc. • RCA Laboratories • R.C.A. Communications, Inc. National Broadcasting Company, Inc. • Radiomarine Corporation of America • RCA Institutes, Inc.

the RMA Board of Directors at the Stevens Hotel in Chicago on December 4, prior to the Washington industry meetings. Two members of the Washington OPM staff, Messrs. W. H. Maxwell and M. E. Whitney, were sent out to Chicago for preliminary and informal conferences.

Decisions regarding the 1942 civilian radio program, simplification, continuance of present models, and other major policies were deferred at the Washington conferences this week. In prospect is a general OPM limitation order, similar to those curtailing production of automobiles, refrigerators, etc., but for the 1942 first quarter the special allocations of aluminum, copper, etc. will be made available for new set production and also for maintenance parts.

After long months of inaction, the OPM provided for a supply of materials for maintenance and repair parts in the hands of the public, through a new "Production Requirements Plan," effective in the first quarter of 1942. This permits manufacturers to apply for materials and special ratings for maintenance parts and their sale, subject to the OPM restrictions, to jobbers, dealers and service men. The volume of such manufacture and sales will be determined later by OPM.

In the RMA Priorities Committee requests for special allocations of aluminum, copper, nickel and plastics, applications were made on a tentative production basis of 750,000 sets each month during January, February and March. The OPM aluminum authorizations for the first 1942 quarter were reduced below this basis but general opinion is that, considering existing aluminum inventories, the special allocation will permit substantial maintenance of production in the industry during the next three months and pending formulation by OPM of the additional 1942 civilian radio program.

Efforts to secure preferential rating for police radio for municipal, state and other authorities is being made by RMA with the assistance of Chairman Fly of the FCC. City officials have reported difficulties in securing essential police radio apparatus in connection with the Civilian Defense work, where its need is obvious. Chairman Fly has assured RMA of his wholehearted assistance in securing OPM action.

National Defense Has Priority in FCC Activities

Washington.—The Federal Communications Commission is giving priority to the many communications problems which arise from the Nation's defense effort, according to an abbreviated annual report by the Commission. This 66-page summary of Commission activities under the emergency also takes cognizance of the new horizons opened in the broadcast and other radio fields, as well as developments in the wire services. The report is extended from the close of the fiscal year to include important happenings within recent months.

Some of the report's highlights may be briefed as follows:

NATIONAL DEFENSE.—Typical of the Commission's augmented activities are development of new facilities and services necessary to defense; expediting wireline extensions and new radio links; providing additional frequencies for military purposes; improving the service of short-wave stations beamed on foreign countries, and, at the same time, forestalling

possible misuse of existing facilities by more effective ether policing, banning amateur communication for the duration of the war, and checking the citizenship of more than 150,000 radio operators and communications employees. All such defense work is in close cooperation with other Federal agencies, as well as with the industries and operators concerned. During the year two particular defense units were established:

National Defense Operations Section—which has established nearly 100 monitoring stations at strategic points throughout the United States and its possessions to detect any operation in violation of laws, treaties or regulations. Every state has at least one such station. Each station utilizes highly specialized fixed and mobile equipment. The National Defense Operations Section acts in conjunction with other intelligence and investigative agencies of the Federal Government, as well as with State and municipal law-enforcement bodies. During the year it handled several thousand cases of suspected radio violations. Several hundred illegal transmitters were closed down, the licenses of four stations were revoked, and licenses of some 40 operators were suspended.

Foreign Broadcast Monitoring Service—which is recording, translating, analyzing and reporting on from 600,000 to 900,000 words transmitted daily by foreign broadcast stations. Speeches, news, and entertainment are carefully watched for intelligence and trends, which are reported immediately to Government officials responsible for counterpropaganda or other action. Four "listening posts" are attuned to foreign broadcasts. They are so located that each can best hear transmissions from a particular region of the world. These stations have quick communication with a central Washington office by means of radio, telephone, teletype, and telefax. Here pertinent confidential information is prepared in the form of spot bulletins, daily reports with over-all content and analysis, weekly summaries of propaganda methods on the long-range basis, and special reports and analyses.

DEFENSE COMMUNICATIONS BOARD.—Created by Executive order on September 24, 1940, the Defense Communications Board has coordinated plans for defense use of wire and radio communications. It has no operating, procurement or censorship functions, and reports to the President through the Office for Emergency Management. Headed by the Chairman of the Federal Communications Commission, the board comprises representatives of various Government branches particularly interested in communications under war conditions. The board has no paid personnel but functions with the aid of a coordinating committee and a law committee staffed from the agencies represented. The board is advised by committees representative of labor and industry, as well as committees which speak for the various industries and other groups concerned. These committees have formulated plans to meet any foreseeable contingency in maintaining service and providing supplemental or alternate facilities. In particular, plans have been drafted for regional telephone networks, with a super linking of the country's broadcast stations. The broadcasters, in turn, are prepared to prevent their stations from being used as beacons for enemy aircraft. Alternate routes for international communications have been worked out, and special study made of repair work under war

conditions. Attention has also been given to expansion of police and fire communications, and to priority for defense communications. A special committee is studying material and equipment requirements for both wire and radio services, while another liaison committee cooperates with the Office of Civilian Defense.

BROADCAST.—Significant was the opening of two new fields of broadcast—frequency modulation and television—both on a commercial basis.

Frequency Modulation (FM).—On November 1 there were 67 such FM authorizations and 43 applications pending, with an estimated 120,000 FM receivers in public use and new sets being produced at the rate of 1,200 a day. Applications for FM stations in New York City far exceeded available frequencies there.

Television.—Given the "go" signal on July 1, eight television stations had received commercial authorizations within four months, and a score of experimental television stations had signified their intention of going commercial as soon as possible.

Standard Broadcast.—On November 1 there were 915 standard broadcast stations in operation or under construction, and the number of standard receivers in use was placed at more than 50,000,000. The North American Regional Broadcasting Agreement, which went into effect March 29, has served to improve radio reception throughout North America by eliminating or minimizing the mutual interference problems of Canada, Cuba, the Dominican Republic, Haiti, Mexico, and the United States. On October 11 the Commission extended the normal license period of standard broadcast stations from one to two years. On May 2, 1941, the Commission issued its report and regulations with respect to chain broadcasting, supplementing the same on October 11. On November 12 the Commission, under stipulations with NBC and CBS, postponed these regulations pending court decision on ensuing litigation. Increasing applications by newspapers to operate FM stations prompted the Commission, on March 20, to order inquiry to determine what policy or rules, if any, should be promulgated in this connection, and also with respect to future acquisition of standard broadcast stations. On October 6 the Commission heard oral argument on a proposed ban on the operation of more than one standard broadcast station in any service area by a single interest or group of interests.

RADIO OPERATORS.—Commercial radio operator licenses are now held by some 89,000 individuals. There are also about 60,000 amateur licensees which is several times the number for all other countries combined. On December 7, the day that Japan declared war on the United States, the Commission ordered a shutdown of all amateur communication in this country, its territories and possessions, except special authorization for defense purposes.

West Hartford, Conn.—Hundreds of amateur radio stations are being returned to the air by the Defense Communications Board to furnish communications vital to the national defense, according to officials of the American Radio Relay League, national amateur organization.

All auxiliary and emergency communications services deemed necessary for OCD and defense uses will be in operation in a short time, it was stated.

Examples of the networks being authorized or planned include the civilian defense net of Westchester County, New York; the amateur communications sec-

tion of the Florida State Defense Council; a communications chain of the state guard organization of California, sponsored by Governor Olson; and Connecticut's comprehensive state police network.

While normal amateur activities have been suspended due to the war, amateurs capable of performing necessary defense functions are being given special DCB authorization upon application by federal, state and municipal officials. Where emergency networks of amateurs are already organized, activation of all stations in the net results from request and certification by the appropriate official. At the plea of local and state officials, other systems which will require the services of additional thousands of licensed amateurs are now being organized.

Radio Engineers Study War Requirements

New York, N. Y.—The technical sessions of the Winter Convention of the Institute of Radio Engineers, held on January 12, 13 and 14 at the Commodore Hotel in New York City, were highlighted by four addresses of major importance bearing on radio's expanding role in the prosecution of the war.

At the opening session on Monday morning, January 12, Dr. F. B. Jewett, Chairman of the Board of Bell Telephone Laboratories, Vice-President of the American Telephone and Telegraph Company, and now at the head of the communication division of the National Defense Research Committee, spoke on: "The Mobilization of Science, with Special Reference to Communication." Facing in combat the German genius for organizing technical forces, the United States is systematically drawing on superior scientific and engineering resources in the Country's commercial laboratories and universities. How the talent engaged in radio and the other electronic and communication industries is being focused on the problems of war was the topic of Dr. Jewett's significant address.

Lieutenant Colonel Rex V. D. Corput, Jr., Director of the U. S. Signal Corps Laboratories at Fort Monmouth, N. J., outlined the functions of his organization at the Wednesday afternoon session. Recent publicity has been given to the development, at those laboratories, of two-way, push-button controlled, ultra-high-frequency radio telephone apparatus for intercommunication among squadrons of tanks in action. Since such developments constitute radio's front-line attack on the problems of adapting modern devices to requirements of the Army in action, Colonel Corput's address was most timely.

The principal speaker at the banquet, Tuesday evening, was Mr. Don Francisco, Director of Communications on the staff of Mr. Nelson A. Rockefeller, Co-ordinator of Inter-American Affairs. Mr. Francisco is an ace advertising executive, former President of Lord and Thomas, who recently made a whirlwind tour of Latin America to find out—to quote Time—"Why the United States usually puts its wrong foot forward." Not only does he control the battery of United States short-wave radio broadcasting stations serving Central and South America and the West Indies, but he also superintends the production of American motion pictures sent to South American countries. In Mr. Francisco we secured at once a forceful speaker and a man who brought the Institute a message the importance of which transcends the usual boundaries of engineering thought.

RMA Convention and Radio Parts Show June 9-12, Chicago

Chicago.—The eighteenth annual RMA Convention has been scheduled at the Stevens Hotel in Chicago, June 9 and 10, 1942, in conjunction with the annual National Radio Parts Show, which is now scheduled for three days—June 10, 11 and 12. The tentative program, with joint sponsorship of the Parts Trade Show by RMA and the Sales Managers Clubs, was arranged by the RMA Board of Directors at its Chicago meeting on December 4. The parts show is planned subject to future conditions, and both reservations will be received soon from prospective exhibitors.

Helping Hands

Chicago.—At a meeting of Local 1220 of the Associated Broadcast Technicians' Union in Chicago on December 12, definite action was taken to offer aid to the armed forces of the country and to the Civilian Defense commission in the Chicago area.

A resolution was adopted, and later delivered to Mayor Edward J. Kelly, offering the individual and collective support of the members in Civilian Defense. At a conference between Mayor Kelly and Charles Warriner, president of the union, the Mayor expressed his appreciation of the action taken by the group of nearly 200 highly skilled radio technicians.

NEW UTAH AC FIELD EXCITED SPEAKERS

SUBSTITUTE FOR PERMANENT MAGNET SPEAKER NOW AVAILABLE

● A serious problem for the radio and sound equipment industry has again been solved by Utah engineering. Several months ago critical shortages occurred in the raw materials needed for the fabrication of permanent magnet speakers. The condition made it necessary to develop a line of speakers to replace those in which materials vital to national defense were used.

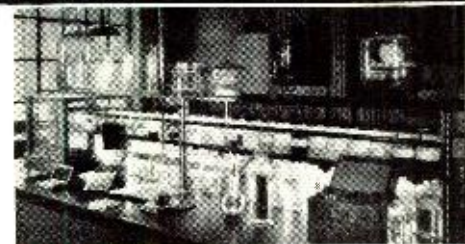
Utah solved the problem! A complete line of AC Field Excited Speakers is now available—humless in operation and equivalent in performance to the famous Utah Permo-Dynamic line. A speaker has been designed for every public address and sound requirement. They require only the addition of the AC Field Supply shown at right to substitute for any Permo-Dynamic application. The new Utah speakers have standard Utah weather-resistant construction.

If Your Jobber Can't Supply You Write Us Direct



USE STANDARD UTAH OUTPUT TRANSFORMERS

Utah Transformers assure reliability and satisfactory performance under all operating conditions. They avoid failure due to



In the laboratories of the Utah Radio Products Company, engineers are constantly engaged in new developments and in intensive research—working day and night to meet the demands of the National Defense Program and its necessary restrictions of some materials. All the experience, knowledge and skill of the Utah production staff are required to comply with the ever-increasing demand for Utah Speakers, Transformers, Vibrators, and Utah-Carter Parts.

NEW UTAH AC FIELD EXCITATION SUPPLY PROVIDES HUMLESS OPERATION

This AC Field Supply is properly designed for humless operation of any of the speakers listed below. At 117 volts, 60 cycle input, the maximum output is 12 watts at 105 mills. The supply may be mounted directly in the speaker baffle. A separate supply should be used for each speaker. The price does not include rectifier tube, but includes ballast and plug. No cord is furnished. 1-50 Y6 GT rectifier tube is required. New Utah AC Field Excitation Supply, U.S.A. list price \$4.75. Special Bracket P-9030 for Mounting Field Supply on 12" Speaker, U.S.A. list price 25c.



NEW UTAH AC FIELD EXCITED SPEAKERS						
STOCK NO.	CONE DIAM.	VC IMP.	VC DIAM.	NORMAL WATT.	PEAK WATT.	U.S.A. LIST PRICE
8AC30	8"	6-8 Ohm	1 1/4"	12	18	\$9.50
10AC12	10"	6-8 Ohm	1"	9	14	6.60
12AC12	12"	6-8 Ohm	1"	10	15	7.75
12AC20	12"	6-8 Ohm	1"	13	20	10.00
12AC40	12"	6-8 Ohm	1 1/4"	16	24	12.50
12AC75	12"	6-8 Ohm	1 1/2"	21	32	19.25

moisture because of the complete impregnation of interlayer insulating paper by Utah's vacuum pressure methods.

Be sure to insist on Utah products. Look for the Utah trademark. Utah Radio Products Company, #24 Orleans Street, Chicago, Illinois. Canadian Office: 560 King Street, W., Toronto. In Argentina: UCOA Radio Products Company, SRL Buenos Aires. Cable Address: Utaradio, Chicago.



S P E A K E R S
VIBRATORS • TRANSFORMERS • UTAH-CARTER PARTS

Future Everyday Electronics

Chicago.—Mass military training in radio, electronics, and high frequency may have more effect in the Post-War era than we can imagine today, according to A. D. Davis, president of Allied Radio Corp., Chicago.

"A good share of the radio development work in the early twenties was done by men who received their radio experience during the World War," declared Mr. Davis. "The tremendous amount of radio training being given young men today should have similar results."

Approximately 1,000,000 men between the ages of 20 and 30 will have received specialized communications training and experience in the various services.

"Out of this group there will be so many inventive minds working," said Mr. Davis, "that we will probably have far more extensive application of radio and electronics through our everyday life than we can now imagine."

Defense vs. Offense

Chicago.—It is common knowledge that under no circumstances or conditions involving both *Defense* and *Offense* that when the position is changed from movements of Defense to movements of Offense, the tempo, speed and results must increase in order to gain the offensive objectives desired. This is exactly what is happening and must happen in industry today for a *final and complete victory* states Mr. C. P. Cushway, vice pres. The Rauland Corporation.

The business of The Rauland Corporation, like most other businesses in the U. S., was established for normal peacetime pursuits. The regular channels of operating and merchandising as well as the building up of cooperative distributing outlets, was the prime and original objective. Contrary to some opinions and beliefs, very little, if any of this effort, has been or will be wasted under the War-time needs of our country.

Thus it can be readily seen that there is no legitimate reason for a distributor to feel that he is outside of the war time activities or that his business will necessarily be severely injured by it. It is only required that he look in slightly different fields for this business. Furthermore, the approach and development of sales are of an entirely different complexion. It calls for more direct contact and a searching of Governmental records and reports so that the distributor will know everything that he needs to know about the past, present and future war time plans in his territory. He should be the first to know, outside of the Governmental Department itself, when a new powder plant, army barracks, training camp or any other Governmental war development is to take place within his field of operations.

RCA Places 120 Sound Systems in One Month

Camden, N. J.—Industrial plants, schools, churches, outdoor festivals, and a number of similar locations were equipped with RCA sound amplification and distribution systems during a recent 30-day period when 120 such installations were completed, according to George Ewald, Manager of the Commercial Sound Division of the RCA manufacturing Company. The total represents a record-breaking accomplishment, topping a total of 93 sound installations recorded the preceding month.

Sylvania Steward Mort Weed Retires to His Native Home

New York.—Mort Weed, genial host of the Sylvania Club, Emporium, Penna., who for the past 12 years has entertained prominent radio industry personalities



and is well known to hundreds of jobbers, dealers and servicemen, has retired from his stewardship to take up private life in his native town of Penfield, Clearfield County, Pennsylvania, 35 miles southwest of Emporium.

All who have stayed at the Sylvania Club during Mort's administration will remember his pipe, his white shirt, his poker, and above all, corn fritters, one half dozen vegetable varieties per meal and delicious pies.

Dr. Baker Honored by Radio Industry Engineers

Rochester, N. Y.—Dr. W. R. G. Baker, Vice President of the General Electric Company and Director of the Engineering Department of the Radio Manufacturers Association, receives a gold es-cutcheon plaque for his successful work



as Chairman of the National Television System Committee.

Presenting the award, right, is L. C. F. Horle, Consulting Engineer, toastmaster at the Annual Dinner of the Radio Engineers Fall Meeting held in Rochester, New York, recently. Standing by, left, is Virgil M. Graham, Chairman of the Rochester Fall Meeting Committee, Director of Radio Tube Application Engineering Department, Hygrade Sylvania Corporation, Emporium, Pennsylvania. The Fall Meeting Committee members were the donors of the insignia.

Outlook for 1942

N. Y. C.—The General Electric Company in 1942 will apply itself wholeheartedly to the task of multiplying and speeding up its already substantial production for all the armed services.

What Hams Can Do

SOME months ago, we told you in our "Washington Communication" that while the declaration of war would see an end to frivolous ham activities that this time the amateurs would not be completely banned from the air. This, it was explained, would be true because the Government would use so many amateurs in war work on the home front. Events are bearing out this prediction.

Every effort is being made by the War Department, the Navy, the Office of Civilian Defense and other government agencies to bring the talented hams into the war effort. The first FCC order banning the hams from the air threw all operators into the dumps. But the Defense Communications Board soon announced that permits to operate would be restored to amateurs participating in Civilian Defense.

The Office of Civilian Defense expects to use *hundreds* of amateurs. A booklet, describing the work that amateur operators can do, has been prepared for distribution to all state offices of the O.C.D. When a ham can show that he is participating in this work, his license will be restored, for limited operation, by the FCC.

All hams have been asking "What Can I Do?" Washington has many tasks for hams. Chief among these are tasks in the military forces. Both the Army and Navy need all unmarried, able bodied operators of military age.

The Army suggests that amateurs of military age who want to enlist report to the nearest recruiting station or to the Signal Officer of their Corps Area. It is suggested that you bring your amateur license with you when you enlist.

Men who are not of military age, who are married or have slight physical defects which keep them out of the Army can serve with the armed forces anyway—as civilians. The Army is trying to get as many civilians as possible to take over communications jobs in Army radio stations at Corps Areas and other Headquarters. By using civilians, the Army can release the enlisted personnel now performing these tasks for more active duty. Those who wish to volunteer for these jobs as civilian operators with the Army should write to the Corps Area Signal Officer in their area or apply in person. You can find out what Corps Area you are in and where the headquarters are located by making inquiry at a recruiting office or other Army establishment in your vicinity.

The Navy is seeking to enlist 5,000 radiomen by next October 1 and expects to have 1,000 new men in service by the early part of February. Men enlisting in the Navy will be given ratings as Radiomen Second Class and have opportunity for advancement to the rank of Chief Radioman. The class in which to enlist is the V-6 Class of the U. S. Naval Reserve. Applicants must be high school graduates and either hold or have held an amateur Class A or B license. In the absence of the latter qualification, the applicant must have had experience in radio repair or service work or had experience in connection with high frequency design, transmission or reception. The Navy is particularly anxious to get men who are engaged in radio service or repair work.

Those interested in continuing their radio activities as members of Civilian Defense units should get in touch with CD authorities in their own town or state.

There's plenty for everyone to do.

Aviation Radio
(Continued from page 25)

the market within the last few years but still we see better ones coming off assembly lines. Some mechanisms are equipped with extra large knobs which may be manipulated with a gloved hand, while others are equipped with button attachments which tune the receiver by touch.

The button tuning mechanism will usually be found on sets that are designed for use in Arctic regions where no provisions have been made for heating the plane. The mechanism is quite similar to that found on our modern home sets, but sturdier. The electric motor used to spin the main tuning gang is a variable speed quick acting motor, and it's design required much time and labor because of its size and weight.

Most tuning apparatus coupled to the receiver through a flexible cable comparable to that found in auto radio installations must have a minimum of backlash. This is especially true when the set must tune to the ultra highs.

Tuning and trimming condensers when subject to changes in capacitance due to expansion and contraction due to temperature usually throw the set out of tune resulting in poor reception. When Invar was developed and used for the construction of tuning condensers, our engineers employing their "Yankee ingenuity" again licked another perplexing problem.

Frequency stability is of paramount importance in the modern-day aircraft radio receiver; without it, inconsistent communication is the inevitable result.

-30-
(To be continued)

Servicemen's Experiences
(Continued from page 16)

"Road show—broke up in Arkansas," Smythe said.

"Well, that's the way it goes," Al said, philosophically, "but all of us get a run of tough luck once in a while. Did you read in the paper about the players in Honky Snack, Pennsylvania, last week, who received such a cold reception they threw tomatoes at the audience?"

Smythe chuckled. "I never thought I'd enjoy being a 'straight man' to a radio mechanic!" he remarked.

"Up until now," Al said, glancing at me, "you've never met the right mechanics!" He walked toward the door, pulling me with him. "Leave 'em laughing!" he said, and waved goodbye.

"Just a minute, there," Smythe said, "how much do I owe you?"

"Don't worry about it," Al replied, and I looked at him in amazement. "When you get fixed with your next

assignment, send a fiver down to the shop. Meanwhile—enjoy the music!" He closed the door, and shoved me ahead of him down the hall. Boy, I was so mad I could have—

"Wait!" shouted Smythe, bursting from his room. Al paused on the top step, and Smythe put two dollar bills into his hand. Then he took off his wrist-watch, and offered it to Al. "Security," he said, kind of embarrassed, "for the other three."

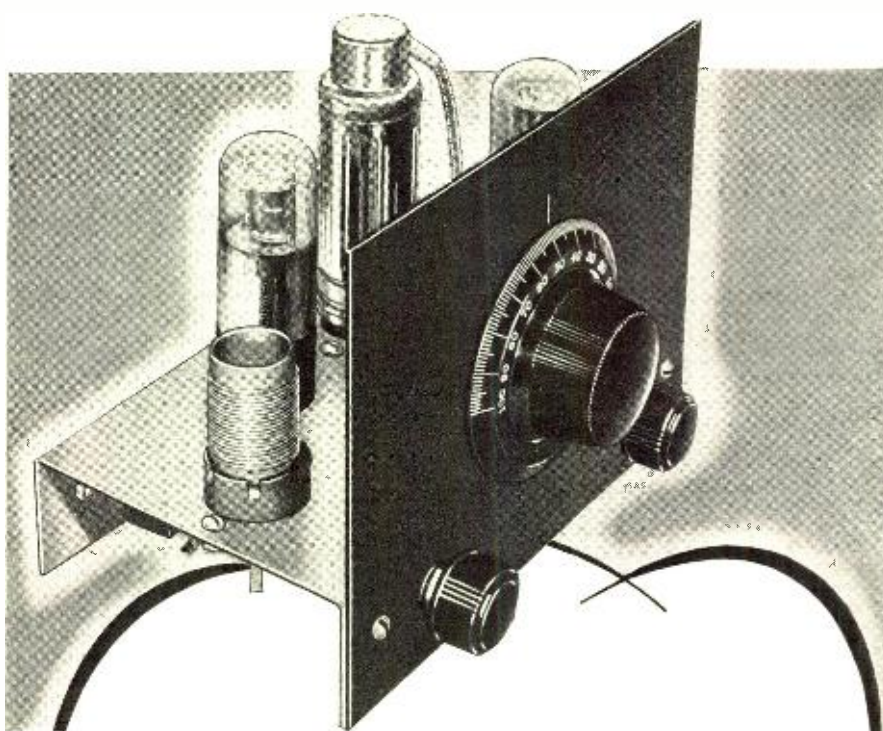
But Al waved the watch away.

I cut loose on him as soon as we stepped into the truck.

"Of all the damned foolishness!" I yelled. "No signed receipt, no profit, no—"

Al patted my knee. "No customer, regardless of what he tells you, ever wants a makeshift repair. He wants the best one in the world—the only kind we have to offer. If we'd have carried out your patch-work job, we'd have lost prestige and good will. This way, while it's true we've used up some spare time at no immediate profit, we have done a customer a favor he'll never forget. And remember that he's got some spare time of his own to fill in—I'll bet he sends more than one customer our way before he gets his next job. Don't worry too much about that three-dollar balance!"

-30-



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Radio Servicemen Help Win the War

(Continued from page 17)

(See "Uncle Sam Needs Civilian Radio Men" in the February 1941 issue of RADIO NEWS.) The F.B.I. needs certain types of trained radio men, as I brought out in "F.B.I. Radio Traps Spy-Ring"—December 1941 issue of this magazine.

Again I urge you to re-read past articles by many writers regarding the privileges of serving our country in any one of a number of ways. Without throwing any bouquets, these articles were written with the definite conviction that not only could they be interesting current reading, but that they would prove a source of information to which any radio man could turn for official qualifications.

It is to the high credit of the Editors of RADIO NEWS that they were farsighted enough to see the long-range value of such information in the event of war.

Within the past eighteen months the Editors of RADIO NEWS have published a number of articles which deal with fundamental qualifications for government positions in military and civilian branches, as well as articles pertaining to radio servicing under National Defense conditions, etc. *Unofficially*, I'd suggest that qualifications for government positions in both the military and the civilian branches may be eased somewhat, if—in the opinion of the government — it is to the country's best interests.

Back again to the radio service man who does his part by continuing his radio service business. Please re-read my suggestions in the September 1940 issue of RADIO NEWS regarding the keeping of your eyes and ears open for possible enemy activities — *and your mouth shut!* Remember? I said in part:

"Is it not quite understandable that inasmuch as we are a part of the great American *communications* industry that, as a vital part of our national life, spies and saboteurs will no doubt aim some of their activities communication-ward. Does it not seem reasonable that we, as practicing radio servicemen who have entrance to all types of homes and businesses, could act as "listening-posts" against such anti-American activities?"

"Let those of you who think that the writer is calling 'Wolf' look back over the results of the present world war. Nations died with hardly a struggle because they were so attacked from within that resistance became rout and democracy became but a death rattle.

"Liberty is kept only at the price of eternal vigilance! And, liberty, as we know it, is more precious than life itself!"

Those were strong words for eighteen months ago. The idea seemed just a little on the silly side then—except

to those of us who remembered Hitler's boast that *America will be an inside job!* So—I say again, keep your eyes and ears open for any enemy activity in your neighborhood. Keep your mouth shut. Don't start a one-man war. Turn over your information to the nearest FBI headquarters, or address your letter to "FEDERAL BUREAU OF INVESTIGATION, WASHINGTON, D.C."

There are other matters and ways in which radio service men can help in these times. For instance, there is much-needed war legislation pertaining to radio broadcasting which can be fostered by radio service men's organizations in conjunction with radio manufacturers and others in the radio industry.

An anti-static law has been needed for years — and, with the coming of war, it becomes even more important. I have reference to legislation aimed at curbing man-made radio interference from electromedical apparatus, motors, signs, electrical appliances, etc. The FCC should be given broad regulatory authority (similar to the Post Office authorities in Great Britain, or government agencies in other countries) to compel owners of sources of man-made interference to muzzle them, and to compel manufacturers of such interference-creating devices to include adequate filtering in their original design.

Remember that whole sections of our country have already had radio-broadcasting "blackouts," and for short periods citizens in these sections have had to rely upon distant radio stations for their radio news and other programs. Sources of man-made interference in these locations impair such distant reception, may imperil lives, *and should no longer be tolerated.*

Until such national legislation is enacted, here is an important local field for radio service men to tackle. Fight man-made interference with noise-reduction aerials, line filters, and filters at the source of the interference. Fight man-made interference by requesting (though the local radio service men's organization) *local* legislation *with teeth* in it against such interference.

A typical ordinance, as enacted by the city of Alhambra, California, is included at this point as a suggestion. It reads as follows:

"ORDINANCE NO. 1511

AN ORDINANCE OF THE COMMISSION OF THE CITY OF ALHAMBRA REGULATING THE USE OF DEVICES, APPLIANCES, EQUIPMENT, OR APPARATUS WHICH INTERFERES WITH RADIO BROADCASTING RECEPTION, AND PROVIDING PENALTIES FOR VIOLATION THEREOF.

The Commission of the City of Alhambra do ordain as follows:

Section 1. It shall be unlawful for

any person, firm or corporation to operate in the City of Alhambra any device, appliance, equipment or apparatus generating or causing high frequency oscillations or radiations which interfere with radio broadcast receiving apparatus or wireless receiving apparatus, except that a person duly licensed to practice medicine, osteopathy, chiropractic, or dentistry by the State of California, in the course of practice of his profession, may operate or cause to be operated under his direct supervision any machine necessary to give treatment, provided, however, that all reasonable methods of preventing interference with radio broadcasting receiving apparatus or wireless receiving apparatus has been applied.

Section 2. It is expressly understood and provided, however, that this ordinance shall not apply to radio stations, either broadcast, commercial or amateur licensed by the Federal government, or which are engaged in interstate communications, nor to public utilities under the supervision of the State Railroad Commission.

Section 3. That the enforcement of this ordinance be placed in the hands of the department of Electrical Inspector, City of Alhambra, California, which is given power to deputize one or more persons without pay to assist in the duties herein set forth.

Section 4. When an inspection and test shall have been made by the Electrical Inspector and it is found that any device coming within the terms of this ordinance is being operated in violation of this ordinance, the owner or the operator of such device shall, within forty-eight (48) hours after notice has been served, either entirely discontinue the use, or repair the same, or attach silencing device thereto, so that it complies with the provisions of this ordinance. Such owner or person in possession or operator shall be deemed to be operating such device in violation of the provisions of this ordinance, and such persons shall be subject to the penalties hereinafter provided for such violation.

Section 5. Any person violating any of the provisions of this ordinance shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine of not more than \$500.000 or by imprisonment in the City Jail for a period of not more than six (6) months, or by both such fine and imprisonment.

Section 6. The City Clerk shall certify to the adoption of this ordinance and cause the same to be published once in the Alhambra Post-Advocate."

It has been already suggested that one radio frequency channel—preferably in the broadcast band—be set aside as a national air-raid warning frequency (similar to the 600-meter SOS channel). All radios when not tuned to their normal local radio programs could then be left on and tuned to the air-radio emergency channel. Whether the raid is made during the

day or night, every radio set owner could then be assured that he would get instant notification through his radio receiver located in his home (possibly right in his bedroom).

If such a plan is put into force, it would make the radio service man an even more important cog in national defense because it would then be of supreme importance that every receiver be capable of receiving such warnings. It would also be important that the hum level and tube noise be reduced to such an extent that they would not become objectionable even with the radio volume control turned well up.

There is one other subject which I wish to comment upon this month. It can not be emphasized too much. *Do not be a spreader of rumors.* Our enemies thrive on such rumors, as flies thrive on filth. As a radio service man, your customers believe that you listen almost continuously to the war news. Thus, they will be asking you, "What's the latest news on the radio?"

Please, for your country's sake, be very careful how you relay such news. In the first place, don't "color" it. If the news release announces the sinking of, let us say, two enemy destroyers, don't tell your customer it was three or four destroyers, or that the ships were cruisers or battleships. If the news is bad, don't make it sound more grim by announcing it in a hollow voice and with a downcast manner. State it clearly, correctly and with some cheerful follow-up statement. War news is always a mixture of good and bad. If you must be the carrier of bad news, try to obtain some piece of good news which you can give as an antidote to reassure your customer.

Also, I would caution you to be *very* sure of your news source. Not the station or the newscaster, but the *original* source of the news should be known. By it, you can pretty well judge its authenticity.

Army and Navy official communications can be considered as absolutely true.

If a responsible government official *by name* is quoted as the news source, and he is an authority on the subject of the quotation, the news release may be considered as true unless he is quoted on a matter of opinion, when the matter then becomes but one man's opinion—although that man be an expert.

Examples

The *Secretary of War* is quoted with reference to the *Army*. He is an authority and the subject has to do with his work so it may be taken as true.

Senator Whoosis of the *Rivers and Harbors Senate Committee* is quoted with reference to the *Army*. Senator Whoosis may be an authority on rivers and harbors, but any news from him regarding the *Army* must be taken as one man's opinion, maybe correct, maybe incorrect.

When the source is credited to "a

responsible government source," "a high-ranking Army officer," "an authority on foreign affairs," etc., etc., do as our President suggested, discount the news *heavily*.

When the news source is given as the British government, or a high-ranking British officer or official *by name*, you have every reason to believe that the news is correct. News from sources in the smaller countries which are our Allies can for the most part be accepted as true. News from Russia is scarce at best. Until Stalin allows U.S. military observers in the Russian front lines, the authenticity of Russian news can only be judged over a long period.

When the news source is given as

Japan, Germany, Italy, or any of the Axis-dominated countries, it should be heavily discounted or discarded completely. Always remember that our enemies tell us *only what they want us to believe*. They will even go so far as to admit temporary reverses so that when the true news of their successes is given, it will be psychologically even more crushing. *This is a war of words as much as of bullets!*

So—when you tell your customers the latest radio news, be very careful to state the *original* source. Don't relay news credited to enemy sources. By doing so, you play into their hands.

In conclusion, may I echo the requests of government officials for *patience* among us all. Before we chafe

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under this or that war regulation, or before we become arm-chair strategists over night, let us remember that we cannot win this war in a week or a month. We are up against tough opponents—desperate opponents—opponents who are ready to stake their all in one supreme effort to wipe liberty, as we know it, from the face of the earth.

But on the other hand, we are the most powerful nation in the world. We have as our Allies the next most powerful nation—Great Britain—and her Commonwealth of Nations, as well as a host of smaller countries. We have *right* on our side, and when that right is backed up by our armed might, together with our national will, *we can not lose!*

Finally, we not only have God on our side, *we are on God's side!* With His unflinching help, we march forward to certain and complete Victory!

—30—

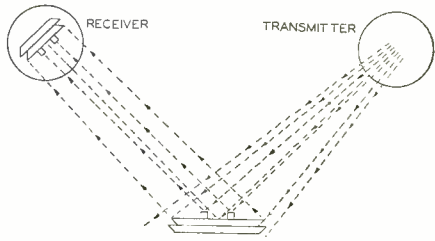
Detecting Aircraft at Night

(Continued from page 7)

made entirely by the infra red rays and not by visible light.

The essential part of the apparatus as already explained, consists of a television transmitter and a television receiver coupled together. The television transmitter operates only by the invisible infra red rays, so that objects invisible to the eye become visible on the screen of the television receiver.

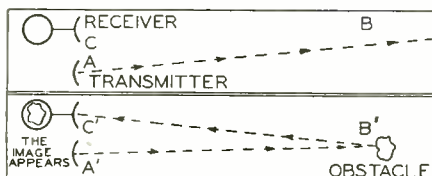
Mathematically speaking, infra red rays have sixteen times the fog penetrating power of the ordinary rays of the spectrum, and their value for discovering the approach of hostile aircraft under cover of darkness or fog is obviously inestimable. The longer the wave of light, the greater is its penetrative power. For this reason the light at the blue end of the spectrum which contains the shortest rays can penetrate fog to a much less degree than the red rays. This fact explains how it is that the sun seen through a fog is red, for the fog ab-



sorbs all the rays except the red ones. It is for a similar reason that, when the sun sets, it turns red, for the dust and fog in the atmosphere have filtered out all the rays but the long red ones. The infra red rays are far longer than the red rays, and therefore possess an enormously greater fog penetrating power.

It will be interesting to learn that this instrument was used, not exactly in *Baird's* manner, but in a similar

style, in peace times on ships. When the wireless equipment of the new *S.S. Normandie* was first described, mention was made at the time of a special, secret device which had been installed, and which enabled the vessel to discover the presence of an obstacle in its path, such as an iceberg or an-



other vessel which, by reason of fog or other obstructions to vision, might otherwise not be detected. We are able to give an account of this "feeler" equipment which makes use of the properties of micro-waves in a novel manner, and is known as the "obstacle detector."

The device is dependent upon the property possessed by micro-waves that they are reflected from a solid object. The exact nature of the object does not matter. If, then, a micro-wave transmitter sends out a beam which strikes an obstacle, reflection of the beam takes place, so that it can be picked up by a receiver which may be located comparatively near the transmitter, provided that precautions have been taken to prevent any direct reception of the transmitter at the receiver. If there is no obstacle in the path of the transmitted beam no reception is obtained at the receiver, and it is only when some obstacle is encountered that the reflected energy is picked up at the receiver.

Method of Estimating Distance

Another important point to be considered is how it is possible to locate the obstacle and estimate its distance from a ship. A wavelength of the order of 16 centimetres is used, giving the advantage that it is possible to concentrate a very sharp beam of only a few degrees with small-sized reflectors. This makes it possible to tell the direction of the obstacle to within a very few degrees. The distance of the obstacle from the transmitter and receiver can be calculated by treating the line between the transmitter and receiver as a base and rotating the reflector at the receiver through a few degrees until maximum signals are obtained. Then, knowing the angle of the reflectors both of the transmitter and receiver to the base line, lines drawn through the angles will intersect at a point corresponding to the distance of the obstacle from the ship.

In some of the first tests carried out, the transmitter and receiver were placed on the side of a ship about eight metres above the level of the sea, the distance between the transmitter and receiver being six metres. After this, the receiver was placed as far as was conveniently possible from the transmitter in order to have as

long a base line as possible and to assist in preventing direct pick-up by the receiver. The receiver incorporates a similar valve to that of the transmitter, but in this case operating as a detector. The receiving antenna is placed as before, within the glass container of the valve, and the whole included in a similar parabolic reflector to that used in the case of the transmitter.

When a beam is reflected by an obstacle and reaches the receiver, the current detected is carried to an amplifier, and is received on ear-phones, or on a visual indicator. As soon as signals are detected, the reflectors, which are normally revolving automatically through about forty degrees, are stopped and precisely directed for maximum received signals. It is then possible to make all the necessary calculations for obtaining bearings of the obstacle.

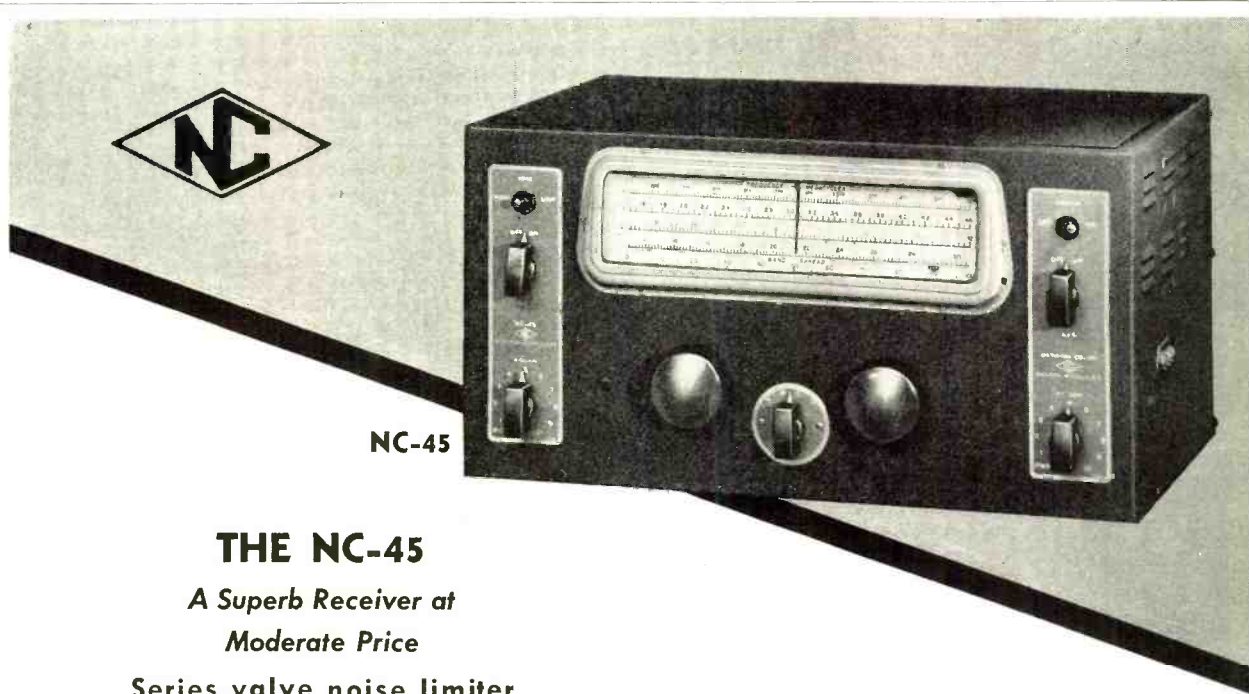
The significance of this apparatus can now be readily appreciated. Mounted on the bridge of a steamer, a mariner is enabled to detect an approaching ship or the harbor lights of a port, although the fog renders them invisible to the naked eye. However, it must be borne in mind that the perfection of this invention was not achieved immediately. Its development covered a period of more than a decade, during which time painstaking efforts were put forth to produce the perfected apparatus.

This is the history of the "Noctovisor" and obstacle detector which is the new weapon of England's war machine.

It is now possible to install along England's coast this apparatus or even to equip airplanes with Noctovision. In

darkness or fog a fighting plane so equipped would have an enemy plane, not so equipped, at its mercy. It would direct its invisible rays on an enemy machine floundering in the dark quite unaware that it was under observation and harried by a foe which it could not see approaching in the darkness.

In a similar manner, a naval battle between a fleet equipped with Noctovision searchlights and one relying on ordinary means of observation would in the dark be a one-sided affair. In the majority of cases it is likely that the sweep of an infra red beam all difficulties of fog, poor visibility, and



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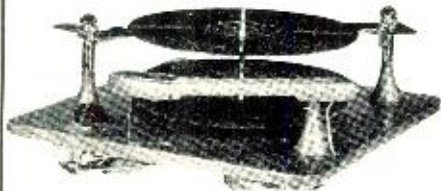
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—30—

Book Review (Continued from page 20)

"RADIO SERVICING COURSE BOOK," 5th Edition, published by *Supreme Publications*, 328 So. Jefferson St., Chicago, Ill. Price, \$2.50. A comprehensive presentation of various problems and solutions found in radio servicing. Many subjects are covered and each is analyzed in concrete fashion so that the reader may get the greatest benefit from each. Learn new speed-tricks of radio fault finding, case histories of common troubles, servicing short-cuts, extra profit ideas. Many large lessons on the use of regular test equipment, explanation of signal tracing, television to the minute, recording dope. Reprinted in 1941 with information on signal tracing, television, visual alignment, P.A., photo-cells, etc. All about AVC, how to use an oscilloscope, what is feedback, resonance action, and every other fact you must know to be more expert in your work.

"AMATEUR RADIO"—A Beginners Guide, published by *Thordarson Elect. Mfg. Co.*, Chicago. 156 pages. Price 75c, net. Written especially for the amateur radio beginner, this guide-book contains all the information necessary to become a full-fledged amateur and includes plans, photos, diagrams, etc., for the actual construction of a complete rig to go on the air.

The reader is first introduced to amateur radio. Fundamental theory is then presented, and actual construction is begun on the first necessary piece of apparatus, the code oscillator. This leads to and includes the building of a receiver, crystal oscillator transmitter, two-stage transmitter and other amateur equipment. The book is clearly written and the reader without any previous radio experience should have no difficulty in passing his examination and building his own equipment.

This is an excellent reference book for both the beginner and experienced operator, for it contains information on the various parts and purposes of amateur equipment, symbols, list of Q signals, helpful hints, etc. Advanced amateurs will welcome the book for its wealth of information on amateur radio theory. *Thordarson Electric Mfg. Co.*, 500 W. Huron Street, Chicago, Illinois.

"A MANUAL OF THE SLIDE RULE," by J. E. Thompson, B.S. in E.E., A.M., dept. of Mathematics, Pratt Institute, Brooklyn, N. Y., 220 pages, price \$1.75. Published by *D. Van Nostrand Company, Inc.*, 250 Fourth Ave., New York City. Accounts of the slide rule are usually confined to encyclopedia articles, supplementary chapters of books on other subjects, and manufacturers' booklets of directions for its use. The first two are usually sketchy and incomplete and intended for general information rather than for specific instruction. The manufacturers' booklets are well suited to their purpose, which

is to give explicit directions for the mechanical operation of some one form of the rule and examples illustrating its use in particular calculations, but are not intended as general books on the slide rule.

The present manual is intended to supply in a uniform presentation an account of the history, principles and practical uses of the slide rule. Among its specific aims are: to show the unity of the principle of operation of all slide rules, to explain this principle in a manner which shall be easily understood, to give in clear and simple language explicit and inclusive instructions for the use of all the standard forms, and to supply a fairly complete account of the history of the slide rule and a description of the more usual of the special forms of the rule.

A valuable aid to any student of Mathematics and radio.

"THE RADIO AMATEUR'S HANDBOOK," published by *The American Radio League*, West Hartford, Conn.

Although designed primarily as a reference and constructional manual for use in amateur stations, the "Handbook" already has gained world-wide fame as an outstanding authority on short-wave radio. Previous editions have been used as texts in schools and colleges everywhere in the English-speaking world—and in South America, as well, through the authorized Spanish translation.

Perhaps the principal reason for the usefulness of the "Handbook" as a text is the practical manner in which it is prepared. The fundamentals of the science are presented lucidly, cogently and compactly, with everything that is useful but no surplus academic material not needed for the job at hand.

Another reason is the reputation for authoritative reliability the volume has achieved through its total of nineteen editions and thirty-four printings in fifteen years. The "Handbook" is as much at home in engineering libraries and the radio rooms of the Navy's battleships or the tents of the Signal Corps as it is the amateur's shack, and is a recognized authority on the art.

Still another reason for its popularity is the value it represents. Not only is the "Handbook" the most widely-read technical volume on radio—three-quarters of a million copies have been printed—but it is also probably the biggest book of its kind ever published for a dollar, containing enough material in its 552 pages to fill six ordinary two-dollar books. This value is made possible by the format used and the fact that it is published by the non-profit national organization of the hams.

The "Handbook's" present role as a defense tool constitutes a new addition to its notable record of accomplishment. Coupled with unprecedented amateur demand—advance orders for the new edition were 60% above the previous year—the 1942 edition promises to be even more widely-distributed and productive than its illustrious predecessors.

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Practical Radio Course

(Continued from page 28)

other source of electromotive force) to the two ends of an electrical conductor. The positive terminal of the battery sets up a strong attraction for the negatively charged electrons. Thus one or more electrons break away from the atoms located near the positive electrode of the battery.

These atoms then become electrically unbalanced (positive) and attract electrons from other atoms further down the line. At the same time the negative electrode of the battery tends to repel electrons from nearby atoms, forcing them toward the positive end of the circuit. Thus a continuous movement or "drift" of electrons is maintained around through every part of the continuous electrical circuit so long as the battery is connected to the circuit.

It is difficult to find an analogy to accurately illustrate this action. The conventional comparison with water flowing in a tube is not exact because that suggests movement of the entire contents of the tube whereas in a solid electrical conductor actually not any mass of material for the conductor (in other words, the nuclei of the atoms) moves. Only some of the electrons (which are simply minute electrical charges) move along through the conductor.

If we consider a large pipe bent into the form of a circle and filled with rocks, each of which is covered with barnacles, and the space between the rocks filled with water, we have perhaps a closer analogy. In this case the rocks correspond to the stationary nuclei of the atoms, the barnacles to the associated electrons. If we break this pipe and insert a pump (corresponding to the battery or other source of electromotive force) in this break the water will be drawn from one end of the tube and forced into the other by the action of the pump. Its flow will correspond to the attraction by the positive terminal of the battery and repulsion by the negative terminal.

The movement of the water will dislodge some barnacles which are loosely attached to the rocks. These barnacles, looking for a new foothold will strike other rocks and in so doing will dislodge other barnacles, some of them gaining footholds in spots thus vacated. Even though no one barnacle is carried continuously around the complete course of the tube, there will nevertheless be some always in motion and the overall result will be a constant flow or "drift" of barnacles throughout the complete conducting path offered by the tube. Immediately the pump is turned off each barnacle will again associate itself with some rock and movement will cease except for small, normal, local movements of the barnacles.

In this analogy we assume some spaces between rocks and this is done advisedly. According to the atomic theory of matter many things which we normally think of as dense and solid are in reality far, far from it. It is the belief that if we had microscopes powerful enough to enable us to see the actual structure of a copper wire, for instance, or even the hardest steel, we would find it to be exceedingly porous in structure.

The amount of attraction which the nucleus of an atom exerts on the individual electrons associated with it varies according to a definite plan embraced by the electron theory. In effect, the electrons spin in "Shell-like" orbital paths concentrically disposed around the nucleus (Fig. 1). There may be up to seven of these concentric orbits in the make-up of the more complicated atoms, such as those of the elements thorium, radium and uranium. We need not go into a detailed discussion of how the electrons are disposed among these orbital shells beyond saying that

if an atom has more than 2 electrons the surplus up to 8 will rotate in a second orbital shell outside the first, if there are more than 10 a third orbital shell will accommodate the surplus up to an additional 18, etc. If any shell is unfilled with its normal complement of electrons, the electrons in that shell are less tightly attracted to the nucleus. Moreover, the attraction for electrons in outer shells will be less than for those in the inner shells.

It is important to visualize this structure clearly because it helps one to understand

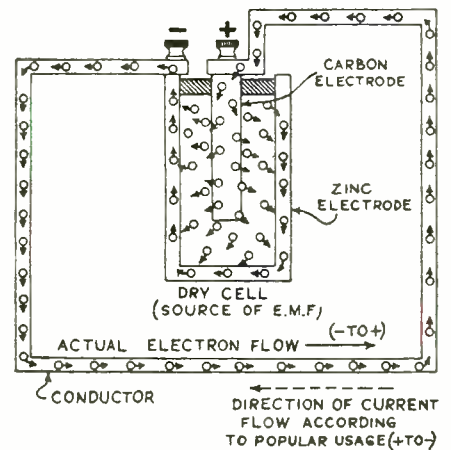


Figure 3: The actual direction of electron flow as contrasted with the commonly assumed direction of current flow. According to the electron theory this latter assumption is incorrect. However, it has become so firmly established in popular understanding that the misconception is allowed to continue. The student should clearly understand the important distinction, as pointed out in this article.

why in an element or compound in which all electrons are strongly attracted to their nuclei it is difficult to establish electrical current flow. The reason is that there will be few "free" electrons. Such a compound will therefore be a poor electrical conductor. On the other hand, where there are electrons in the atomic structure which are less closely bound to the nucleus, by virtue of their occupancy of an unfilled shell, that material will be a better electrical conductor. If the material is one in which the atoms include numerous electrons (and therefore several shells) and also has insufficient electrons to fill its outer shell, these "orphan" electrons will be liberated more freely and the resulting electrical conductance of that material will be still better.

Because the precise atomic structure of every known element has been accurately diagrammed and tabulated it is apparent that the electron theory is extremely helpful to the scientist and engineer. It enables him to predict many of the electrical, chemical and physical characteristics of compounds made up of two or more elements, without the necessity for "cut and try" tests. He may plan to combine two elements, perhaps obtaining a compound totally different from either of the elements, yet will be able to determine many of the characteristics of this compound before he even attempts to make it. Thus much experimentation is avoided and new developments are speeded up.

He may even plan to transmute the atoms of one element into those of another element—for example lithium atoms into helium atoms—simply by rearranging their constituent particles of matter-energy by some external means such as bombardment with the nuclei of lighter atoms by means of a Cyclotron or other suitable device. In this conversion, for example, a small amount of the weight vanishes (passes from the matter state into energy), with a discharge

of 17,000,000 electron volts. This atomic energy would be very useful if it could be extracted and harnessed to do useful work.

Such possibilities are mentioned to indicate the vast scope and importance of this electron theory. The radio student can scarcely hope to acquire a complete understanding of all its ramifications but *he should at least understand the fundamentals* as set forth in the present articles. With such a foundation he will be better equipped to understand electrical and radio principles to be discussed in future articles of this series.

An important and fundamental supposition of the electron theory is that electrons are nothing but negative electrical charges, or, in other words *they are electricity*. When they flow or "drift" through a wire or other electrical conductor they constitute what we have accustomed ourselves to calling a flow of electrical energy, or current—that is, such a flow of electrons causes around the conductor all of various effects which we have learned to associate with the flow of an electric current—magnetism, heating, chemical, etc. The electrons do not, it is true, create this current of themselves. It is necessary for us to provide some external influence in order to initiate and maintain the flow or "drift" of electrons. This is done, for instance, when we connect a battery to the two ends of a copper wire.

The fact that the positive terminal of the battery attracts electrons and the negative terminal repels them, inaugurates a condition of electrical pressure which causes the electrons to drift, or flow around through the entire electrical circuit under its influence. The greater this "electrical pressure" the more electrons will be torn away from their atomic nuclei and thus the amount of electric current flowing in the wire depends on the amount of pressure. This electrical pressure we know under several

names such as "electromotive force," or "voltage," etc.

It is the ordinary conception that the current flow in a wire thus connected to a battery, is from the "positive" terminal of the battery, through the wire and back to the "negative" terminal of the battery. On the other hand, it has just been explained that the electrons actually flow in just the opposite direction. Why this discrepancy?

For a complete and detailed answer we would have to trace the history of man's study and developing knowledge of electricity. It is only in relatively recent years that the electron theory was formulated and brought a true understanding of the subject. Earlier, electricity itself was a mystery, although its uses and applications were becoming widely known. In these earlier days it was recognized that there were opposite poles, or opposite influences evidenced within an electrical circuit. These were logically enough, called "positive" and "negative," but the error (in the light of our more modern understanding) was made in arbitrarily assuming that the current flow was from the "positive" terminal of the battery or other source of voltage, through the circuit and back to the "negative" battery terminal. Nevertheless, a system of terminology was established on this basis and, while it is not in agreement with modern electrical theory, it is for practical reasons still continued in use among electricians and many other workers outside of the electronic field.

To avoid confusion it has become common practice among engineers and others to follow the old, conventional standards when speaking of the direction of flow electric current, but to specifically state "electron flow" when referring to the actual direction of movement of the electrons. These distinctions are made clear in Fig. 3. This is

the practice that will be followed in the future articles of this series and the student is urged to think in these same distinguishing terms.

Thus, in considering the *vacuum tube*, it is generally stated that the plate current flows from the positive "B" voltage source, to the tube plate, across the intervening space inside the tube to the cathode, then back to the negative side of the supply source. We will find, however, that the actual electron flow within the tube is from the cathode to the plate and the internal operation of the vacuum tube can never be fully understood until one has full comprehension of this important factor.

With the foregoing basic discussion of modern electrical theory out of the way, we can proceed directly to more specific consideration of electrical circuits. In a way it is unfortunate that it has been necessary to start this instruction course with a discussion of one of the most complex phases of the entire study of radio or electricity. However, once the student grasps the fundamentals of the electron theory, and visualizes what takes place during the flow of an electric current, his path of learning will be made much easier. If this theory is not fully comprehended at this time it is not a cause for worry or discouragement. Its practical applications will become apparent as we delve more deeply into the later subjects. For that reason the student is urged to keep this first article handy for future reference. Reviewing it from time to time as the study progresses will help to clear up points which may not be entirely clear at this first reading.

(To be continued.—Ed.)

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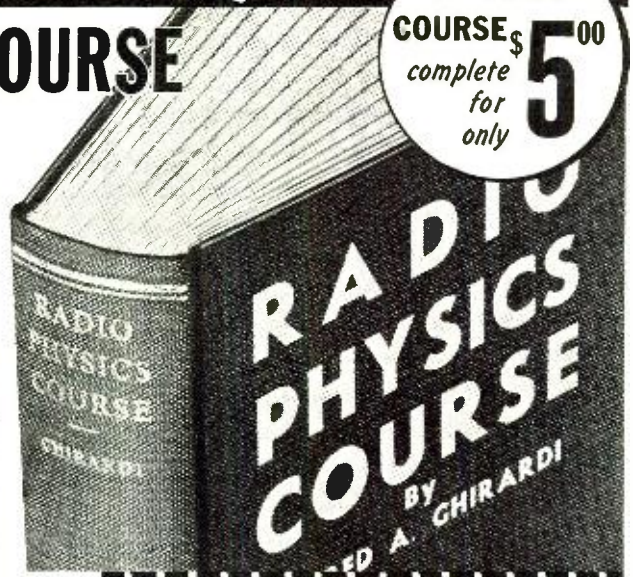
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For the Record

(Continued from page 4)

open for any information that will aid you in doing a better job. This then, is YOUR RESPONSIBILITY.

We, as publishers, have OUR RESPONSIBILITY too. Everyone is familiar with the phrase "a well-informed public is vital to defense." This applies to all forms of news matter, communications by radio and telephone, telegraph, etc. The Government has placed a rigid censorship on certain classifications of information in order to prevent this information from getting into the hands of our enemies.

The "handwriting has been on the wall" for many months. The editors of RADIO NEWS have featured many articles that have shown *how, when* and *why* a change in radio technique was necessary to meet the modern demands of servicing and communications. As far back as September, 1940, we have stressed the need for thousands of radio operators and technicians to train for National Defense. We have included information of what was happening in Washington. Our feature writers have presented first-hand information on many vital radio subjects such as the "Radio-Locator," without revealing technical secrets. So urgent became the need for educating the reader on radio activities in our Armed Forces that we presented the special National Defense Issue last month. In fact—the issue was ready for press at the very moment the Japs were bombing Pearl Harbor.

That brings us to the subject at hand: what is OUR RESPONSIBILITY in rendering the greatest possible service? The answer is obvious. First—we shall continue to present those articles which will be of greatest help to our readers so that they will be better equipped to understand the latest trends in radio. Second—we have engaged writers that are capable of analyzing every situation and who have the background needed to keep the reader informed of every important development. Third—we realize the urgent need for an up-to-date course in radio instruction and present the first of a series of twelve exclusive lessons, written by Alfred A. Ghirardi, who is a leading writer on radio instruction.

We have added to our roster Mr. F. William Stewart, one of radio's old-timers and a contributor to RADIO NEWS from way back. Mr. Stewart will specialize in matters pertaining to Amateur Radio in Defense. His first article appears in this issue.

Lewis Winner, one of the best-informed writers on Market Research, will present first-hand information on Priorities and Substitutions in the radio industry.

John Rider, known to all radiomen, gives authoritative views on the part Servicemen can and *will* play in the

future. Don't miss his column "AS I SEE IT," in this issue.

Sam Milborune, well known for outstanding feature articles, will continue to give his valuable aid to the serviceman by writing on subjects that will be of greatest value in helping the serviceman to increase his revenue and to prepare for the opportunities that lie ahead.

Al Toombs, special Washington correspondent, who has written "Washington Communication," will be of valuable assistance to the manufacturer, jobber, and dealer. This information will be included in our new section "Spot Radio News in Defense and Industry." The new section makes its first appearance this month.

Rufus Turner, brilliant radio engineer, and an exclusive contributor to RADIO NEWS, will write on equipment for the Serviceman, Amateur, Experimenter, and the Beginner. His timely series of articles on "Home-made Parts" should be read by every radioman.

With such an impressive list of writers, RADIO NEWS will offer its contribution to the Industry and to hastening the day when "ALL OUT FOR VICTORY" will be realized. We pledge ourselves to the job at hand, and are confident that we will continue to be of service to our readers and will aid them in understanding the urgent need for keeping informed on all important radio matters.

This then, is OUR RESPONSIBILITY.

* * *

A Forecast

THERE is every reason to believe that after this war is over that there will be a radical change in the Radio Industry. We do not mean that there will be a let-down. On the contrary—new sets will be sold in huge quantities and these will bring new income to the serviceman and set dealer. We cannot help but feel that here will be a golden opportunity to change the present status of the serviceman's income. The Industry has gone through many hectic years and there has been much cut-throating.

The Serviceman has fallen into a rut by offering 50c service charges as a minimum. It is hard to change all this in normal times but now, and in the future, things will not be normal. Pay envelopes have increased in radio factories. Why shouldn't they increase for the shop owner and serviceman? No reason at all! We predict that the midget sets will become less popular in the future. This will give some excuse for increasing charges to those who dislike the idea of raising the ante. We don't recommend using that example but would rather see the serviceman raise his standard to the point where he could demand a fair price based strictly on merit alone.

TELEVISION is, once again, put on the shelf as far as the public is concerned. Priorities, etc., have taken

away the essential materials needed for construction of receivers. Development work will, no doubt, proceed and after the shooting is over we predict that Television will, at last, come in for its share of popularity.

THE outlook for the radioman appears very bright. Those who study and follow new developments will be the ones that will come out on top, and will get the after-war jobs which will be available. 73, O.R.

Defense and the Amateur

(Continued from page 33)

necessary, and gave a clue, too, to the logical operating set-up.

His equipment includes a highly sensitive FM receiver, ideally suited to the reception of 2½-meter modulated oscillators, and capable of hearing signals from even low-power transceivers operating at the town's extremities. Seventy-five watts input to an HK-54 doubling to 2½, combined with a tower which boosted the "Q" 84 feet above ground, resulted in a signal which could be heard by these same transceivers anywhere within the town limits.

The plan adopted utilized this equipment as a control station through which all emergency communication would be handled. As a precautionary measure a gas-driven generator was installed so that even should the power lines fail the station would still be able to operate normally. With this set-up, plus a small amount of testing with a battery operated transceiver, it was definitely demonstrated that the field equipment need consist of nothing more than such transceivers.

The matter of field equipment, simplified though it was by this plan, introduced another problem. Not one of the members of the net was equipped for 2½-meter operation. All were willing to so equip themselves, in fact some had already started construction work. But it's a difficult matter to sandwich ham construction into a 7-day work week, plus overtime. Here the town fathers made their contribution, to expedite matters, by appropriating money to purchase the necessary number of commercially-built transceiver units. The net was thus enabled to immediately initiate weekly test drills and these were carried on throughout the summer and fall. The wisdom of handling all traffic through the control station was soon demonstrated. Were it not for this, much more powerful field equipment would have been needed. Even then, with the relatively unfavorable antennas involved in portable operation, direct communication between field units would have been difficult if not impossible in some localities.

This will be appreciated when it is explained that the main business center is located practically at sea level while the greater part of the town's



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area, including outlying fire stations and other important factors, lies in the valleys separated from the business center by a series of hills. The entire town area is heavily wooded, even the business center being noted for its magnificent trees. Many of the important strategic points, even those separated from one another by only a mile or so, are thus effectively isolated so far as both line-o'-sight and 2 1/2-meter paths are concerned.

With the network operating through its control station, intermediate relays were made unnecessary and thus the limited man-power could be used most effectively. Each field unit could be spotted at a strategic point to provide direct contact between these individual points and the control station. Field units at police, fire and defense headquarters take care of these three nerve centers, leaving three for assignment as occasion requires—at the scene of a disaster, first-aid headquarters, outlying fire stations, etc. In an actual mock disaster, staged during the summer, this small net proved itself capable of handling all communications.

On this occasion it was assumed that all normal services had been interrupted, including telephones, signal systems, power lines, etc. The radio net not only brought police, fire, Red Cross and defense services to the spot in record time, but likewise emergency crews from the telephone and power companies, water department, etc.

When war was declared this had become a smooth running unit, thanks to its regular weekly drills and field tests. Prompt steps were taken by the Defense Council chairman to obtain extensions of the licenses of the radio net members, with the result that within 5 days after amateurs were ruled off the air, this group was again ready for service, duly authorized by the FCC to continue its defense operations.

The planning of the Fairfield net extends not only to the type and operation of equipment, but maintenance as well. Thus at frequent intervals, all field units are brought to the control station for a periodic check-up. Formerly this extended only to a check-up of batteries and general inspection. Now that a state of war exists and emergencies are more imminent, this check-up is more thoroughgoing and includes actual operating tests and measurements to forestall any possibility of trouble developing insofar as it is humanly possible to do so.

Another important factor which has received serious attention from the start is the matter of antennae. The first step was to experiment with different forms of antennae mounted directly on the transceiver units. It was found that a "J" antenna provided much more dependable and satisfactory service than did the original single telescoping rod. The "J" units now used consist of one short and one long telescoping elements, the former serv-

ing as one side of the matching section, the latter as the other half of the matching section and as radiator. With the *Abbott* DK-3 transceivers (the type used by this group) the bottom of the matching section mounts directly on the antenna stand-off terminals on the front of the case.

With this "J" arrangement a more potent signal is put out, partly because a better match seems possible, and partly because the actual radiator is brought further above ground, the transceiver case and the body of the operator by the interposition of the matching section. All of these are factors which can and do appreciably affect the signal when operating at these frequencies and with such low power. In these units the oscillator input drawn from the 135-volt, self-contained battery, is only about 1.5 watt.

To further increase efficiency, permanent antennas have been installed on the roofs of headquarters and other buildings where units are most likely to be required to operate during emergencies. Permanently installed feeders are brought down to the point where the unit is to be operated and it is only a moment's work to connect them in place of the portable "J's." This not only insures a stronger signal reaching the control station, but should that station be put out of commission it would be possible for at least some of the field units to maintain direct communication among themselves. Thus the important agencies of defense would be tied together by this modified net.

Most of the net members have cars and the field units can therefore be rushed quickly to their assigned places when needed, or can be moved from one point to another as the need arises. Because intermediate relay stations are not required no serious thought has been given to the use of permanently mounted car antennas. Most operation is from buildings housing the various defense agencies such as police, fire, medical, etc., rather than from cars.

Even where these buildings do not have permanent antennas as mentioned above, it is usually possible to carry the transceiver and its attached antenna to an upper floor and thus gain greater elevation and higher efficiency than would be possible from a car. When it is necessary to operate out in the open it is a simple matter to place the whole rig on the car roof or other position which will provide greater clear elevation for its antenna than would be provided by any practical antenna system mounted directly to the car.

If there is any weakness in the Fairfield set-up it lies in the lack of a secondary control station to serve as a substitute for the master station in case of necessity. This need would have been supplied by some of the higher power portable rigs that some of the boys have under construction but coincident with the more urgent

need for such equipment attending actual participation in the war, came the imperative demand for more and more defense production. As a result the boys now have even less time than before for ham construction activity.

This equipment, an *Abbott TR-4*, employs 20 watts into an *HY-75*, modulated by a *6L6G* which is driven by a *7F7* microphone amplifier. In the receive position an *HY-615* serves as the super-regenerative detector with the *7F7* and *6L6G* functioning as the audio system to drive the built-in speaker. It utilizes an external plug-in power supply which may be either one of the a.c. type or a car battery and vibrator combination. Thus this rig is suited for either fixed or mobile service. In fixed service a storage battery and vibrator pack provides a simple emergency power source should the power lines fail. Its compact size (9" x 8" x 5") make it readily adaptable to car mounting and a number of design features make it of special interest for emergency service, not the least of which are the improved efficiency made possible by separate oscillators for receive and transmit, antenna coupling adjustable from the front panel, jacks for metering the modulator and oscillator circuits, etc. *An excellent mobile rig of similar design was completely described in November 1941 RADIO NEWS.—Ed.*

In the meantime an important step being taken by the Fairfield group is the addition of a simple plug arrangement in the present transceivers, to permit the use of external, heavy-duty batteries during tests and drills, thus reserving the internal batteries fresh for actual emergency service. These external batteries are being inclosed in battery cases for added convenience. Such a case might prove too cumbersome for use in actual emergency operations, but not so in drills.

This, therefore, is the story of one civilian defense communications set-up. This is not presented as the ideal set-up for every town, but some of the details as worked out by this group will undoubtedly prove suggestive to hams and defense authorities in many other towns, villages and cities.

Insuring Effectiveness of Emergency Nets

EXPERIENCE in net organization and operation has disclosed some precautionary measures that are of the utmost importance, yet are likely to be overlooked.

Many operators make periodic checks of their radio equipment but overlook the fact that they themselves, and their cars, are as important to the functioning of the emergency communications net as is their equipment. This is not to suggest that each one rush immediately to a doctor for a physical checkup (although this might not be a bad idea, just as a general principle) but it does suggest that one should provide for his physical comfort, and to insure proper car oper-

ation at all times and in any weather.

When an alarm does come it may remain in effect for many hours. If one happens to be assigned to duty atop a cold, windswept hill he will appreciate the advantages of warm clothes, a thermos bottle of hot coffee, perhaps a supply of chocolate to sustain the inner man, and so on. One may feel that in the case of an air alarm there will be no time for considerations of personal comfort. But of what use is a man with teeth chattering, fingers numbed, and perhaps putting himself in the way of a cold which will make him inactive for days or weeks?

The smart arrangement is to have the proper clothing and accessories set aside where they will be instantly available either at home, in the car trunk, or wherever best suits the requirements of each individual. If at home the *XYL* can prepare coffee and fill the thermos bottle while the *OM* climbs into his warm clothes; if away from home maybe the thermos bottle from the trunk can be filled at a beanery while enroute. We wouldn't go on record as recommending it, but a bottle of something stronger than either tea or coffee has been known to offer definite advantages at such times—but don't go in for it unless you are the type that "can take it or leave it alone."

As to the car, the safest plan is to keep it well gassed at all times, tires in good condition and properly inflated, battery checked frequently, and so on. If a mobile rig depends on the car battery for power this requires extra precautions. It may even be worth while to provide a spare battery in the trunk, with a charger to plug into the house lines overnight now and then. If this battery is used to operate the rig it will help to avoid excessive drain on the car battery—perhaps allowing the latter to be used to operate the heater during a long cold vigil. Lacking such an extra battery, the source of supply can be assured by leaving the car engine running—providing there is plenty of gas in the tank.

If there are mechanical troubles, such as occasional difficulties in starting, for instance, better have the trouble attended to rather than take a chance on failure at an important time. Windshield wipers should be in good condition. An alarm might be accompanied by a black-out. In stormy weather under these conditions every possible aid to vision will be necessary.

In taking the various precautionary and preparedness measures suggested, it is well to bear in mind that most communication nets are insufficiently manned and equipped to afford relief operators. When one goes on duty it will in all probability be for the duration of the alarm. No one expects an alarm to last for hours on end—but then no one expected the attack on Pearl Harbor. When prepared for the worst, anything less is that much easier. So, be prepared!

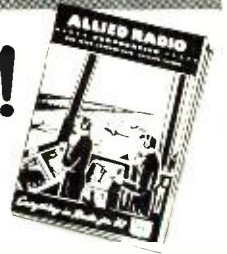
A suggestion to both operators and net directors concerning batteries is

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very much in order. The battery stocks of radio dealers are growing depleted and replacements are scarce. It's a good stunt to lay in a reserve stock if emergency equipment depends on dry batteries. Certain types of batteries are completely off the market. If rigs employ these types, suitable substitutes should be found at once. It is most inadvisable to wait until B batteries drop to 30 or 35 volts per 45-volt block before seeking replacements. Recently we had to wait more than 30 days for delivery of standard B blocks. Had the emergency rig been dependent on this order it would have been out of commission for something like three weeks before the shipment arrived. This is another argument for the external battery box idea being employed by the Fairfield net.

One last point, in closing this initial installment of this department. Don't advertise the fact that you are a member of an emergency net, or that your license has been extended. The government does not disclose the locations of its anti-aircraft guns and other defenses, and has mighty good reasons for its reticence. We hesitate to be accused of being a calamity howler, but none of us knows what information is being obtained and tabulated by subversive elements. Many hams probably feel that their individual efforts are too minor to be of interest or use to such elements and this is likely so. The fact remains, however, that every communication net operator is a cog in the defense wheel. It is even conceivable that putting even one such cog out of the running might seriously handicap the whole local defense function of the community in time of need. Visionary? Perhaps. But it's better to be safe than sorry and anything can happen in war.

-30-

HAMS: Blanks are now available at your nearest Western Union office for registering your emergency equipment with the ARRL. Even if you have previously registered, changing conditions make it imperative that you do so again. Get those blanks today and mail them to the ARRL. Ed.

Aircraft Radio Labs.

(Continued from page 9)

and new types of aircraft accessories and miscellaneous equipment such as oxygen masks, helmets, etc.

The development program of the Laboratory in broad terms is divided into research projects and development projects. An example of a research project is that covering the elimination of precipitation static, while a development project might, for example, involve the development of a pilot operated, multi-channel command radio set with definite limitations as to size, space, weight, power drain, and frequency coverage, but involving no fundamentally new basic

radio principles that have been used.

The radio industry is well aware of the basic policy laid down by the Chief Signal Officer that wherever possible the facilities of commercial development laboratories shall be used to the fullest in carrying out the development program of the Laboratory.

As a result, the major portion of the development funds allotted to the Laboratory are expended on contracts with commercial radio manufacturing companies and laboratories based on specifications drawn up by the Aircraft Radio Laboratory engineering personnel. The fundamental reason for this policy was to reduce to a minimum the amount of engineering necessary to pass from the development model stage to quantity production. In these times of "all out" production no one laboratory could possibly cover the maze-like network of radio facilities so necessary to the Air Force in modern military operations. Even if the concentration of complete development facilities for the entire program in one laboratory were economically feasible, there would still be the problem of providing sufficient highly specialized engineers. Therefore, it is not only desirable but absolutely necessary that the facilities of commercial radio concerns, large and small, be utilized to the utmost.

In addition to its responsibility for the development of aircraft radio equipment, the Aircraft Radio Laboratory is responsible for the final inspection of the finished equipment as it comes off the production line of the radio manufacturer in quantity. At the present time when single types of aircraft radio sets are being manufactured literally by the tens of thousands, this inspection service requires the employment and training of hundreds of inspectors and their administration and supervision in factories from coast to coast.

The close cooperation which is maintained between the development engineers at the Laboratory and the field inspection forces has resulted in a quality of product which has the complete confidence of the users—the Army Air Forces.

Research and development, in its broadest sense the sole mission of the Laboratory, is divided into two sections; that dealing with problems of air navigation, and that dealing with communications problems. Although important in themselves, the other units of the Laboratory, which include administration, contracting and supply, shop and installation, are subsidiary to these two.

So we find the Signal Corps Laboratory at Wright Field is an all out effort to supply, and if possible anticipate, the needs of the Air Corps insofar as radio equipment is concerned, doing original research with its own able staff when necessary, and coordinating and encouraging the efforts of private industry wherever possible.

-30-

**Build This
Low-Cost Receiver**
(Continued from page 27)

coil winding is reversed, wound in opposite direction from detector coil or an open (broken) wire. A poorly soldered joint might have the same effect.

Reception of stations but lack of volume all along the line: A battery reversed, inductance, improper C biasing, try phones or speaker for shorted windings, try other values of grid leaks on detector grid lead, test tubes.

Another hint where one is doubtful regarding r.f. action and where it appears there might be a little more volume desired on stations received: with all tubes in and, preferably a distant station in operation, remove the antenna wire from antenna post. Place this wire temporarily on the grid cap of the radio-frequency tube and note if the signal strength builds up. If it does the antenna winding is surely in a reverse position.

ERRATUM

The cover photo on the December, 1941, issue of RADIO NEWS should have been credited to the General Electric Company.

Our apologies to Mr. L. S. Fetcher whose name, by error, was given as L. S. Fletcher on page 74, January, 1942, issue of RADIO NEWS.—Editor.

COIL DATA

ANTENNA

Coil No. 1—700 to 1850 KC
Grid-L₂—70 turns No. 24 enameled
ANT-L₁—20 turns No. 24 enameled

DETECTOR

Coil No. 1—700 to 1850 KC
L₁—70 turns No. 24 enameled
L₂—20 turns No. 24 enameled, spaced $\frac{1}{8}$ "
L₃—20 turns No. 24 enameled, spaced $\frac{1}{8}$ "

ANTENNA

Coil No. 2—1.65 to 4.5 MC
L₂—35 turns No. 24 E, equally spaced over $1\frac{3}{4}$ " of the form
L₁—18 turns No. 24 E, tight wound $\frac{1}{4}$ " below L₂

DETECTOR

Coil No. 2—1.65 to 4.5 MC
L₁—35 turns No. 24 E, spaced over $1\frac{3}{4}$ "
L₂—14 turns No. 24 E, tight wound $\frac{1}{8}$ " below L₁
L₃—14 turns No. 24 E, tight wound $\frac{1}{8}$ " above L₁

ANTENNA

Coil No. 3—3 to 7.3 MC
L₂—19 turns No. 24, spaced over $1\frac{3}{4}$ "
L₁—12 turns No. 24 E, close wound $\frac{1}{16}$ " below L₂

DETECTOR

Coil No. 3—3 to 7.3 MC
L₁—19 turns No. 24, spaced over $1\frac{3}{4}$ "
L₂—14 turns No. 24 E, $\frac{1}{8}$ " below L₁
L₃—15 turns No. 24, close wound $\frac{1}{8}$ " above L₁

ANTENNA

Coil No. 4—6 to 12 MC
L₂—10 turns No. 18 E, spaced over $1\frac{1}{8}$ "
L₁—8 turns No. 28, close wound $\frac{1}{16}$ " below L₂

DETECTOR

Coil No. 4—6 to 12 MC
L₁—10 turns No. 18, spaced over $1\frac{1}{8}$ "
L₂—10 turns No. 24 close wound $5/32$ " below L₁
L₃—12 turns No. 24, close wound $3/32$ " above L₁

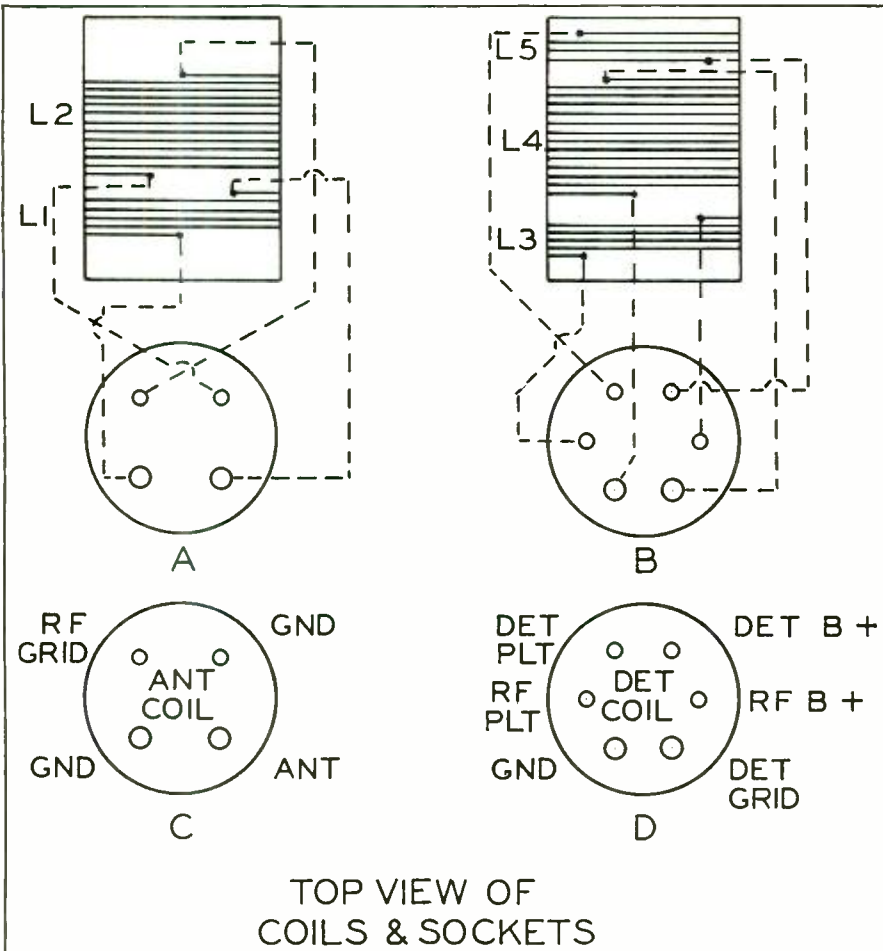
ANTENNA

Coil No. 5—11.5 to 22MC
L₂—7 turns, wire described in text, spaced over 1"
L₁—7 turns No. 24, close wound, $1/32$ " below L₂

DETECTOR

Coil No. 5—11.5 to 22MC
L₁—7 turns, wire described in text, spaced over 1"
L₂—7 turns No. 28 E, close wound, spaced $1/32$ "
L₃—12 turns No. 28 E, close wound, spaced $\frac{1}{8}$ " above L₁

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Dept. C, 38 West Biddle St., Baltimore, Md.

CBS (Continued from page 31)

lands.

Since President Roosevelt declared a state of National Emergency, National Defense has speeded up. For its part, the *Columbia Broadcasting System* has donated, and will continue to donate, time, facilities and talent to the Nation's present need.

Columbia continues to cover fully the news of defense in its regularly scheduled broadcasts, to devote period after period each week to enlightened talks on all phases of defense, to pick up from all parts of the world news-worthy special defense events and to provide for all significant defense announcements in the public interest.

The basic CBS policy was extended to include the preparation and presentation of programs in the interest of National Defense, and, last July, the following statement was issued:

"The purpose of *Columbia's* over all defense schedule are the support and encouragement of the laws enacted by Congress, the free and balanced discussion of issues not resolved into law and edict, and the honest and factual presentation of news of defense privileged to the citizen of one of the few great nations where free radio can still exist."

Army maneuvers in Louisiana, and the more recent operations in North Carolina, have been described over the network by CBS narrators and military experts.

Hundreds of announcements have been broadcast calling attention to the Government's needs in National Defense—enlistment requirements, technicians wanted, drives for special materials, conservation, and other communications the Government desired to make to radio listeners.

So far as South America is concerned, affiliation has been established by CBS with radio stations in every one of the twenty countries south of the United States border. Actually, the total of affiliates at the present writing is 74. *Columbia's* engineers estimate that the "Cadena de la Americas" will be in full swing early next year. It was hoped that this network would be placed in operation two or three months earlier, but exigencies arising from National Defense demands within the United States caused unavoidable delay in the delivery of equipment essential for the two new 50,000-watt transmitters which are to beam the broadcasts southward.

But this delay has not interrupted the service to Latin America, for *Columbia* has pursued vigorously a program of expansion of its organization that has accomplished definite results, going far toward the realization of aiding to improve further the relations between the peoples of the United States and those of the Latin American countries.

CBS has established a special Latin American news room, which draws on

the facilities of the *Associated Press*, *United Press* and the *International News Service*, as well as on CBS's own short-wave listening station.

Pending the completion of the 50,000-watt transmitters for WCBX and WCRC, *Columbia* is utilizing several of the new directional antennas of advanced design. This necessitated moving station WCBX 96 miles—from its former site in Wayne, N. J., to the scene of the new transmitters in Brentwood, Long Island. Improved reception through greater signal intensity now in Latin America is attributable to this change.

Another function of CBS is the broadcasting of Red Cross programs, also those for USO, the British American Ambulance Corps, British War Relief, United China Relief, Russian War Relief, Bundles for Britain, etc.

Aside from the news that is broadcast over here at regular intervals on the schedule, CBS has special news periods for the sending of news in eight different languages to Europe. This is done in 15 minute periods, from 7 a. m., to 5 p. m. EST, weekdays. The languages are: German, Swedish, Polish, French, Italian, Dutch, Serbo-Croatian and English. The only change in the program on Saturdays and Sundays, is that the French periods are omitted.

Five engineers take turns on duty at the Listening Post, at Roosevelt, Long Island, which works usually on a twenty-hour basis. When an emergency arises it is kept going 24 hrs.

The station's short-wave receivers were replaced recently with the most advanced powerful models. A new antenna has also been set up and it is aimed particularly at reception from Saigon, Indo-China; Delhi, India; Chungking and Vladivostok.

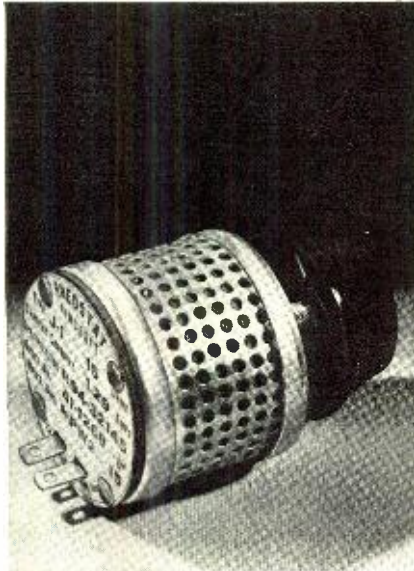
The listening staff of foreign news reporters understands approximately a dozen languages. Their main task is to winnow out of the 100,000 words piped in every day the significant news and revelatory propaganda trends. It may be remembered that *The New York Times* and many other newspapers throughout the United States gave CBS credit for the translated text of the Goebbels reading of Hitler's proclamation and Ribbentrop's memorandum when the German armies marched into Russia.

Some of the foreign radio studios employ introductory signals to their broadcasts. For instance, London invariably opens with the booming of Big Ben. Germany identifies itself with two chords of a folk song. Italy prefers the chirping of birds, and the Vichy-controlled Algiers station attracts attention by the whir of a spinning wheel.

Listening post editors and reporters endeavor to determine what the Governments of certain nations want outsiders to believe. Having fathomed the ideas back of the talks, the CBS experts have a good clue regarding the line of a news break.

What's New in Radio?
(Continued from page 34)

ing. Flat lug terminals are brought out at the rear of the casing. The front face has an ear or locking pin, which engages in a hole or indentation in the panel or mounting surface, preventing the turning of the entire unit when the knob is turned. The $\frac{3}{8}$ "



bushing and nut provide the one-hole mounting.

This power rheostat employs a unique insulated metal core to support the winding which is imbedded in a special inorganic cement. Maximum heat dissipation is obtained even when a portion of the winding is cut in. Even at one-third total resistance, the unit dissipates a full 25 watts. Units are available in standard resistance values of 1 to 5000 ohms, and other values on special order.

New Precision 832-A Tester

This 31 range, compact, a.c.-d.c. multi-range tester is an ideal precision instrument, built to withstand abuse and rough handling in services to which compact instruments are routinely applied, as in radio service, amateur radio, trouble-shooting, etc.

Though small in size, $7 \times 4\frac{1}{2} \times 3$ ", the Series 832-A incorporates ranges to 1200 volts d.c., 2400 a.c., 5 megohms, 600 milliamperes and 62 db. The 3" square bakelite cased, 800 microampere meter features a scale plate design that has been carried through in Black, Red and White with large sized numerals, for maximum visibility. 2% d.c. and 3% a.c. accuracy. Wire-wound shunts and matched metallized multipliers of 1% accuracy.

Manufactured by Precision Apparatus Company, 647 Kent Avenue, Brooklyn, New York.

Latest Katolight Power Plants

Newly designed Kato light Plants are now available in the $7\frac{1}{2}$ and 10 kw. sizes at 1200 or 1800 r.p.m. and in 15 kw. sizes at 1800 r.p.m. Where quietness of operation and continuous service is desired, the 1200 r.p.m. models are the ones to select.

These models are available two ways either self-excited or with separate exciter attached. The self-excited type can be made self-cranking by connecting to 18 or 24 volts of battery. 25 amps. d.c. at about 24 volts is available for battery charging. 40-ft. or

500-ft. Remote Control may be added at any time when plant has self-excited type generator.

More prompt shipment can usually be made on separate exciter type. Separate exciter generator is mounted on outer end of alternator and bell. Exciter armature is carried on tapered shaft extension of main generator shaft. Easily accessible d.c. brushes, both frame and armature easily removed. Exciter volts 50 d.c. If remote control operation is desired, this must be specified when ordering plant with this type of generator which necessitates addition of automotive type starter.

Alternator has oversize a.c. brushes, extra large collector rings, all easily accessible for inspection and adjustment. Enclosure cover easily removed for inspection. Filtered for radio operation. Voltage regulation ap-

proximately 8%. Motor starting capacity is very high. Alternator is conservatively rated, will carry 50% overload intermittently, with constant speed, inherent regulation about 4%. Rooney design, large volume of air forced through entire generator. Field poles are laminated, riveted and securely bolted to frame with capscrews. Generous copper in field coils which is so necessary to give good voltage regulation and stability for starting a.c. motors. Designed for ease of maintenance.

-30-

Follow the New
Radio Trend!
Read RADIO NEWS!

**THE STRANGE CASE OF
SERVICEMAN WALDO MUDD**

Dear Miss Barefacts:

I know that your column is entitled "Advice to the Loveless" and I am not loveless. As a matter of fact, I have more love than I know what to do with. That's why I am writing to you.

You see, Miss Barefacts, I am a radio service man. I make good money and I'm very happy. I mean I was happy until I met Arabella Blotts. She is one of my customers. In fact, she is my very best customer. That's the trouble.

Arabella has a very nice apartment with about eight radios in it. The first time she called me, I went over and fixed two of the radios in about half an hour. Then Arabella asked me to sit down and have a drink with her.

The correspondence course I took in radio servicing didn't say anything about what to do in a case like this. Besides, I don't drink anything but ginger ale. However, Arabella insisted, so I asked for ginger ale. It was very funny tasting ginger ale and I even felt funny after I drank it.

Then Arabella sat down beside me. She is a very big girl. Also, she is very determined. Every time I moved away from her, she shoved over closer to me. Finally, I was at the end of the davenport and couldn't move any farther. Also, I was at the end of my wits.

When I got back to my shop, I remembered she hadn't paid me for fixing the radio. Also, I was dizzy and didn't feel like working any more that day.

The next day, Arabella called and said both of the radios I had fixed were broken again and would I please come right over. Well, there wasn't anything to do but go over and fix them. So I did.



Then the same thing happened again, the very next day.

However, Miss Barefacts, I will not bore you by telling you any more of this sort of thing. Suffice to say, it was six months ago that Arabella first called me. Since then, she has called me almost every day. I have fixed all of her radios at least a half dozen times each and she still hasn't paid me for a single job. What's more, I am afraid to send her a bill. Arabella is funny that way. She might get mad and not call me any more. After all, she

is the best customer I have.
What shall I do?

Very truly yours,
WALDO MUDD,
Radio Service Man.

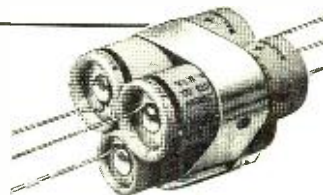
★ ★ ★

Dear Mr. Mudd:

Don't worry. Your problem should be an easy one to solve. My first suggestion is that you marry Arabella Blotts. Evidently that would please her. Then you can repair her radios in your spare time and spend the rest of your time at work for which you will be paid. My second suggestion is that, in the future, you use Sprague Condensators and Koolohm Resistors for every replacement. Once you install them you can forget them—and so can your customer. Then, the next time you meet a girl like Arabella, she will have to be more original in finding an excuse to invite you back again.

Sincerely yours,
GERTRUDE BAREFACTS,
Editor, "Advice to the Loveless Column."

• ATOMS are made in five different types, thus making them practically universal for any replacement job whether it calls for a single-section or multi-capacity unit, lug mounting, or a condenser with separate positive and negative leads.



Make up hard-to-get replacements by strapping individual Atoms together with ST Mounting Straps—supplied free! You'll find the combined Atoms actually smaller, often cheaper, and fully as reliable. You save time—money—space.

SPRAGUE PRODUCTS CO.
North Adams, Mass.

GOOD CONDENSERS—EXPERTLY ENGINEERED—COMPETENTLY PRODUCED

Theory and Practice of Disc Recording, Part 5

(Continued from page 29)

that will enable the needle to approach a closer correct angle to the groove.

Fig. 2 illustrates one of these so-called "offset heads." This does not correct the situation but merely helps to attain a *better average* angle. A further improvement is had when the point of needle contact is swung through a lower arc—one farther from the normal hub-line, or center hole of the record. This is shown in Fig. 3.

The new arc now is from A to O and the needle travels approximately $\frac{3}{8}$ " below the arc shown in Figs. 1 and 2. Three possible positions for the needle are illustrated—one at the outside groove, another at point D, and the other at the inside groove of the

record. Note that we approach a right angle to the groove as the arm travels throughout the record and a better average is maintained due to the offset position of the head.

We mentioned "record wear" in an earlier chapter. If a needle, especially a sharp one, is allowed to ride up on the sides or walls of the groove there can only result a continuous wear on the record material at the point of needle contact. Sound modulations are cut into the sides of *each* groove, not at only one side. Naturally then we must take the required steps to make certain that the needle is allowed to engage *both* walls at the same time, or more accurately, to see that the needle is *seated properly*.

The effects of improper tracking became even more acute with the "transcription" and "home-recording"

distortion than with the commercial hard shellaced pressings.

Further improvement can be had in the playback setup by employing pickups of the "light-weight" class—those having a needle pressure of but an ounce or two. On the other hand—too little pressure is not recommended as this too can actually *increase* the wear to the groove walls. A pickup must have enough point pressure to permit the needle to seat in the bottom of the groove and to be able to guide the complete pickup arm across the record.

The use of sapphire playback needles, "styli," is recommended for all types of soft discs due to the ability of the stylus to maintain the correct shape for hundreds of playings. These are more expensive than other types, but the initial cost is offset by the savings had in records and in replacements of regular needles.

Next month we shall discuss other problems that should be analyzed by those who take their recording hobby or profession to-heart.

-30-

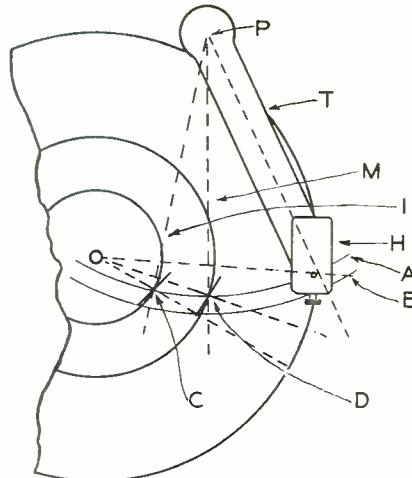


FIG. 3

blanks as the record material is considerably softer and the walls of the grooves more subject to mechanical

As I See It!

(Continued from page 15)

called for duty or who may have enlisted. There may even develop the condition of requisitioning of test equipment now in possession of men who at one time did radio service work and no longer do so because they have procured jobs in factories or with various armed force authorities as inspectors and the like. . . . In fact this may be carried to the point where test equipment in the hands of those men who have been experimenters or who did part time work will be called for and supplied to those who need it. . . .

Be that as it may, it seems to be the opinion of government authorities that whatever can be repaired *must be repaired* rather than replaced by something new. A somewhat serious situation exists among some of the nation's radio servicemen. They have in their possession test equipment which is not accompanied by schematic wiring diagrams and whatever other data may be necessary to enable most rapid repair in case the equipment develops a defect. . . . This should be remedied at the earliest possible moment. . . . Just how it will be done it is difficult for us to say because it lies in the hands of those who own the equipment as well as those who made the units. . . . In view of what may happen and the necessity for minimum curtailment of civilian radio repair facilities, is a patriotic duty for those manufacturers who released service test apparatus without schematic wiring diagrams to make them available to the owners of the units. It means a little work and some minor expense, but it

(Continued on page 64)

ARMY, NAVY OR COMMERCIAL RADIO COMMUNICATIONS
offer
INTERESTING CAREER!

Begin now to prepare yourself through Candler System Training for code proficiency and highest rating. Courses for beginners and advanced students and operators who need greater speed and accuracy. **CODE TRAINING** right in your own home, with immediate and surprising progress.

CANDLER'S NEW 1942 BOOK OF FACTS

Find out today how you can learn code easily with Candler System personal training, or become a highly proficient operator. Vast experience in training operators in Army, Navy, Commercial and Amateur Communications is back of the Candler System. You can get expert advice on improving your future. No obligation. Write today for **FREE** **BOOK OF FACTS** and personal advice.

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Communication established - but not without transformers - dependable transformers!

THORDARSON
Transformers
THORDARSON ELECTRIC MFG. CO., CHICAGO, ILL.
Transformer Specialists Since 1895

Defense Savings Pay-Roll Allotment Plan

Now company heads can help their country, their employees, and themselves

voluntary pay-roll allotment plan helps workers provide for the future helps build future buying power helps defend America today

This is no charity plea. It is a sound business proposition that vitally concerns the present and future welfare of your company, your employees, and yourself.

During the post-war period of readjustment, you may be faced with the unpleasant necessity of turning employees out into a confused and cheerless world. But you, as an employer, can do something *now* to help shape the destinies of your people. Scores of business heads have adopted the Voluntary Pay-roll Allotment Plan as a simple and easy way for every worker in the land to start a *systematic* and *continuous* Defense Bond savings program.

Many benefits . . . present and future. It is more than a sensible step toward reducing the ranks of the post-war needy. It will help spread financial participation in National Defense among all of America's wage earners.

The widespread use of this plan will materially retard inflation. It will "store" part of our pyramiding national income that would otherwise be spent as fast as it's earned, increasing the demand for our diminishing supply of consumer goods.

And don't overlook the immediate benefit . . . money for defense materials, quickly, continuously, *willingly*.

Let's do it the American way! America's talent for working out emergency problems, democratically, is being tested today. As always, we will work it out, without pressure or coercion . . . in that old American way; each businessman strengthening his *own* house; not waiting for his neighbor to do it. That custom has, throughout history, enabled America to get things done *of its own free will*.

In emergencies, America doesn't do things "hit-or-miss." We would get there *eventually* if we just left it to everybody's whim to buy Defense Bonds when they thought of it. But we're a nation of businessmen who understand that the way to get a thing done is to *systematize* the operation. That is why so many employers are getting back of this Voluntary Savings Plan.

Like most efficient systems, it is amazingly simple. All you have to do is offer your employees the convenience of having a fixed sum allotted, from each pay envelope, to the purchase of Defense Bonds. The employer holds these funds in a separate bank account, and delivers a Bond to the employee each time his allotments accumulate to a sufficient amount.

Each employee who chooses to start this savings plan decides for himself the denomination of the Bonds to be purchased and the amount to be allotted from his wages each pay day.

How big does a company have to be? From three employees on up. Size has nothing to do with it. It works equally well in stores, schools, publishing houses, factories, or banks. This whole idea of pay-roll allotment has been evolved by businessmen in cooperation with the Treasury Department. Each organization adopts its own simple, efficient application of the idea in accordance with the needs of its own set-up

No chore at all. The system is so simple that A. T. & T. uses exactly the same easy card system that is being used by hundreds of companies having fewer than 25 employees! It is simple enough to be handled by a check-mark on a card each pay day.

Plenty of help available. Although this is *your* plan when you put it into effect, the Treasury Department is ready and willing to give you all kinds of help. Local civilian committees in 48 States are set up to have experienced men work with you just as much as you want them to, and no more.

Truly, about all *you* have to do is to indicate your willingness to get your organization started. We will supply most of the necessary material, and no end of help.

The first step is to take a closer look. Sending in the coupon in no way obligates you to install the Plan. It will simply give you a chance to scrutinize the available material and see what other companies are already doing. It will bring you samples of literature explaining the benefits to employees and describing the various denominations of Defense Savings Bonds that can be purchased through the Plan.

Sending the coupon does nothing more than signify that you are anxious to do *something* to help keep your people off relief when defense production sloughs off; *something* to enable *all* wage earners to participate in financing Defense; *something* to provide tomorrow's buying power for your products; *something* to get money *right now* for guns and tanks and planes and ships.

France left it to "hit-or-miss" . . . and *missed*. *Now* is the time for *you* to act! Mail the coupon or write Treasury Department, Section A, 709 Twelfth St. NW., Washington, D. C.



FREE - NO OBLIGATION

Treasury Department, Section A,
709 Twelfth St. NW., Washington, D. C.

Please send me the free kit of material being used by companies that have installed the Voluntary Defense Savings Pay-Roll Allotment Plan.

Name _____

Position _____

Company _____

Address _____

A Letter from Gibraltar

Europa Lighthouse, Bungalows,
Gibraltar.
17-11-41.

Editor Radio News.

Dear Sir, It was with considerable interest that I read the article "Local Servicemen's Associations" by S. C. Milbourne in the October issue. I have worked for about fifteen years in the radio industry on this side of the "pond," both on actual manufacture test, development, and service and I consider the idea an excellent one—although conditions in the British Isles (before the War) were somewhat different to those which apparently exist in the U.S.A.

By what I can gather from various sources service work in the States is not particularly well paid—due partly no doubt to the fact that the initial purchase price of receivers (broadcast) has been brought down to a rock-bottom level.

In the British Isles seven or eight years ago there was a tendency for manufacturers to go "all-out cut throat" to produce receivers with a fair standard of performance as cheaply as possible—but this did not meet with much success for several reasons which are apparent, and so a lot of cheap jack manufacturers went to the "wall."

The bug-bear of all servicemen are the "midgets" which, on the whole, are very poor—they will get the stations (some of them, when new) but the quality of reproduction leaves very much to be desired—the majority badly over heat—due to insufficient space in which to radiate it—in consequence of which if the cabinet (?) is made of the usual plywood it tends to come apart. The speaker is too small to give anything like good reproduction and taken with the practically non-existent baffle is a poor show. Further the speech coil is very small and the gap very tight, indeed, which makes centering a watchmaker's job. Service on these receivers invariably takes far longer than on a big job and the customer as he only paid a very little for the receiver in the first place: just will not pay for the time spent on repairs.

In the business in which I spent many years of my life, it was the policy to do ones best to persuade a customer to leave these midgets severely alone as for an extra £2 to £3 they could procure a far better receiver giving better performance and far less trouble both to the purchaser and the serviceman, and also expect a far longer life from it.

I do not consider that this policy was wrong—we were in business and would supply a midget if the customer WOULD have one but we sold very few of them; which I am sure contributed to the good name our business earned for itself.

Unlike some service shops we always worked on the principle that the labourer was worthy of his hire and each repair job was charged for: parts used plus time plus % profit to the firm (except in a few cases on midgets where unfortunately we put up with a loss for the sake of our good will).

There is much I feel sure which could be done to improve conditions both in Gt. Britain and in the States, but I think it will be necessary for the retailers and manufacturers to have a better understanding. Some manufacturers, of course, will produce to a price always—but for the good of everyone it is far better for a manufacturer to produce a good receiver and then fix its price.

If once manufacturers could be persuaded to adopt this attitude I feel sure we should have gone a long way towards improving the radio industry all 'round. As then fair trading for everyone concerned becomes a possibility and would put the trade on a par with any other respectable business and give each individual his fair reward and make radio less of a "racket."

We all realize that development must and will go on, but at the present state of things midgets are not a forward move at all. When tubes are produced which do not radiate anywhere near as much heat: when the ideal good reproduction speaker 4" diameter which requires no baffle is produced—then the midget may come into its own.

A further point which manufacturers might adopt to good advantage is to attach a circuit diagram inside the cabinet—preferably on the cabinet back so that in the event of some of the unorthodox circuits which are occasionally encountered the serviceman does not have to rake through his files of service data and then find that he still has

no dope on that particular model. We have surely advanced beyond the stage when manufacturers still think their circuits are secret. This was the attitude adopted when the first commercial receivers were produced in this country—probably in the hope that if anything went wrong it would be returned to the factory with the consequent or should I say the inevitable large bill for repairs and freight charges.

Regarding the actual factory conditions which exist over here, and I believe also in the States. The majority have a peak production from August to Xmas., during which time they take on nearly double the staff—come Xmas. the 50% are sacked—having worked a lot of overtime (earning good money—but bad health) during this period.

The best firm I ever worked for altered this procedure nearly six years ago and started an even load policy and during the slack months built to store. This firm is the only one which ever did such a thing "this side" as far as I can find out—it was also a great success and I take my hat off to the firm of Murphy Radio for their long sightedness as—

1. It kept each worker employed all the year round.

2. The firm knew just how many skilled men they had available.

3. They were able to provide each worker with three weeks paid holiday per annum and to pay six weeks full pay to any who were unfortunate enough to go sick.

4. Overtime with all its detrimental effects on the workers became an almost unknown thing.

5. Each employee, providing he behaved himself, was almost sure to get a small raise each year.

All this contributed to make this firm one of the happiest which it has ever been my privilege to work for.

I regret that this typewriter has had its day, but it is the only one available at the moment so will just have to do. May I take this opportunity of wishing your magazine all the very best; it is greatly sought after over here.

I remain,

Yours sincerely,
R. C. CAVE.

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.

Hallcrafters Catalog for 1942

Amateur and commercial radio men, short-wave listeners and boat owners will find particular interest in the fresh-from-the-press 1942 catalog of Hallcrafters receiving, transmitting and radiophone equipment.

Included among the nine communications receivers described and illustrated are models in every price range to meet the varied requirements of amateur and commercial operations as well as those of the broadcast listener who desires effective, direct short-wave reception of foreign war news. Further, all but one model includes provision for operation from either batteries or a car battery and vibra-pack, in addition to its normal line operation. This independence of line power is particularly important in emergency communications facilities now being developed as a vital part of the civilian defense program.

Copies of the new catalog are avail-

able from radio dealers everywhere, or from the Hallcrafters Co., 2611 Indiana Ave., Chicago, Ill.

R.C.P. 1942 Test Instrument Catalog

The 1942 line of radio and electrical test instruments manufactured by Radio City Products Co., Inc., 88 Park Place, New York City, is presented in a 20-page, illustrated catalog just released. This new line includes more than 40 models of 22 basic test instruments and in this new Catalog No. 125 each of these models is illustrated and its specifications presented in concise, time-saving form.

Approximately half of the models are general-purpose electrical multi-testers, each providing a variety of measurement ranges equivalent to those of 12 to 35 individual meters. These models are available in various types from the tiny pocket size to larger bench and portable units. Other instruments listed include vacuum tube testers, radio circuit analyzers, a radio signal generator, an electronic multi-tester—with 26 vacuum-tube operated ranges for measuring a.c. and d.c. voltages to 6,000 volts, resistance to 1,000 megohms, capacitance to 1,000 mfd., etc.

Copies of the new catalog are now available from RCP distributors throughout the country, or from the manufacturer direct.

Precision Catalog

The Precision Tube Co. of 3824 Terrace Street, Philadelphia, Pa., have announced the issuance of a new catalog covering Precision Metal Shielded Wire by their new method of protecting insulated wires, enclosed in either seamless aluminum, copper or lead tubing—tinned or untinned. Copies are available direct from the manufacturer.

Donald Duck Takes Charge of New Sylvania Display

A new Sylvania Radio Tube display featuring Donald Duck and his little nephew is being released today to Sylvania jobbers for distribution to dealers and servicemen. It is made in two sizes, a large display 36 inches high for use in store windows located in good street traffic areas, and a miniature which is an exact duplicate reduced to 12 inches high for counters and small shop dealers with limited window space.

The art work was done by the Walt Disney studios and was reproduced by lithography in eight colors by the Einson-Freeman Company. Easels are affixed to support the display in a firm standing position.

Walsco Reference Chart

The Walter L. Schott Co. of 5266 West Pico Blvd., Los Angeles, Calif., has just issued a new "Walsco Unibelt Reference Chart," which is available to distributors, dealers and radio servicemen. Most popular sets using Dial

Belts are listed in this chart, which gives the required number Unibelt for every set and also specifies the length to which the belt should be cut in each particular case.

The chart shows that 98 out of 100 replacements can be made with 3 Unibelts.

Free copies are obtainable from *Walsco* distributors or by writing the manufacturers.

Two New Solar Catalogs

Just off the press are two catalogs issued by the *Solar Manufacturing Corporation*, Bayonne, N. J. These are now ready for distribution. The 12-F catalog describes and illustrates the famous Elim-O-Stat radio noise suppressors. Catalog 12, section G, illustrates and describes the Models CB, CE, CC analyzers, and the "Quick-Check" models QCA and QC. Another item of interest to servicemen is the *Solar* "Cap-Check," an a.c. capacitor checker and Emergency replacement. Finally: the full line of *Solar* optional Accessories are listed. Copies may be had from *Solar Manufacturing Corp.*, Bayonne, N. J.

Bell Sound-Equipment Catalog No. 36

This comprehensive catalog of all kinds of sound-systems and accessories is now available to radio servicemen, jobbers and dealers. It lists the complete line of *Bell Sound-Systems* ranging in power outputs from 6 to 100 watts. Other items described are: Intercommunicators, Loudspeakers, Microphones, Mobile systems, Pre-Amplifiers, Recording Equipment, School Systems, and Volume Expanders. Requests for a copy should be addressed to the *Bell Sound Systems, Inc.*, 1183 Essex Ave., Columbus, Ohio.

-30-

"Point of View"

Radio to Be Factor in Winning the War

Philadelphia.—The first duty and privilege of the radio industry in the coming year is to help the nation win the war. The miracle of radio, which received its first great impetus in the last war, promises to be one of the decisive factors in winning the one now in progress, says James T. Buckley, Philco Pres.

Upon the shoulders of the nation's radio engineers rests a heavy responsibility. Much of what is being done in the Philco Research Laboratories and by other companies must obviously be regarded as military secrets for some time to come. It is possible to point out, however, that a continuing project of great importance is the improvement of equipment to detect the approach of enemy planes. Other equipment, of equal if not greater importance, is in process of development or even in production.

Present indications are that the Government will call upon the industry to

begin the production of approximately \$1,000,000,000 worth of radio equipment for the armed services and home defense in the coming months. Some idea of the magnitude of this task may be gained from the fact that the normal, peacetime output of the industry is only about \$500,000,000.

Production of radios for civilian use must obviously take a secondary position until the war is over, but in view of the importance of radio to civilian defense and to maintain morale, it is hoped and believed that civilian production can be maintained on a reduced basis. Never before has it been so important to have a satisfactory, efficient radio in every American home and automobile.

Only through radio can the Government and the Civilian Defense authorities establish immediate contact with all the people. Air raid warnings can be given more quickly and efficiently by means of radio broadcasts than in any other way. Motorists whose cars are equipped with radio receivers can be given broadcast instructions to clear highways for troop movements, advised to avoid congested areas, and warned to shut off car lights when enemy planes are approaching.

From the longer point of view, the peacetime progress of the radio industry will undoubtedly be greatly stimulated by the enlarged activities of the present time. The research work now being carried on in the laboratories, particularly in the field of ultra-high frequencies or so-called "micro-waves," will result in great improvements in broadcast service and FM receivers, but particularly in the field of television, which awaits only the return of peace to become a very large industry.

All this, however, is in the future. The immediate task before the industry is to give all possible assistance in the struggle in which the country is now engaged. This the radio industry is eager and prepared to do.

This Will Help You Service Men

Newark, N. J.—Much has been written recently about the Radio Service Profession in general and in particular of the practices prevalent among some service men.

Regardless of whether or not the charges are legitimate, the public has had most of the weaknesses brought very forcibly to its attention.

In an effort to aid the service men to constructively counteract any ill effects, NATIONAL UNION has had a series of four cards prepared as follows:

1. A reprint of the Reader's Digest article.

The purpose of this card is to build up in the mind of the prospective customer the fact that the service man realizes some of the troubles obtaining in the industry and that knowing them strives to overcome these malpractices. It points out to the customer what could be done but leaves the customer with the idea that this shop is pledged to truth in Radio Service.

2. An individually embossed sign attesting to the fact that the shop was inspected by a NATIONAL UNION representative and found to contain all essential testing equipment.

3 & 4. Reserve the right to charge for testing all tubes where replacements for the defective items are not purchased and a nominal service charge for all inspecting of sets.

American Red Cross Donates Radio Equipment to Fort Dix

Camden, N. J.—The Fort Dix committee and the Southeastern Pennsylvania Chapter of the American Red Cross Camp and Hospital Service Council has purchased and donated 2 Radios and 1000 earphones as an entertainment service for the boys hospitalized in the camp's two hospitals.

Aware of the success of the individual entertainment experiment in major hospitals throughout the country, the American Red Cross committee put on a special drive to collect the funds. The purpose,



as explained by Chauncey Brown, American Red Cross Field Director at the camp, is to provide the hospitalized boys with when-you-want-it-music, sporting events, and other entertainment to take their minds off injuries and aid time-passage.

Installation was performed by the camp's electrical staff, under supervision of Raymond Rosen and Co., Philadelphia, from whom the equipment was obtained. One radio and 500 earphones are installed in each hospital, Tiltan General and Station. The installation required two month's work and more than 10 miles of wire.

The earphones, connected to the master radio set, enable the boys to hear programs at any time of the day and night. Each earphone picks up the same program. However, this system enables the patient to decide when and what he wants to hear and doesn't interfere with patients who shouldn't or don't want to hear. Choice of programs is mainly in the hands of the soldier assigned to radio control duty. He decides pretty much what the boys will hear during his shift, although public opinion is an important factor. Saturday is strictly football day.

Sale of FM Receivers in Chicago Continues at Rapid Pace

Chicago.—The sale of FM receivers in Chicago is continuing at a rapid rate, it has been announced by FM Broadcasters, Inc., a trade association interested in the advancement of frequency modulation broadcasting in the United States. According to the latest bulletin issued by the association, there are now about 19,000 FM sets in the Chicago area serviced by W59C, W-G-N's frequency modulated station. This represents a potential audience of approximately 75,000 FM listeners in the Chicagoland district.

FM Broadcasters, Inc. pointed out that the sale of 19,000 FM sets indicated the purchase of 5,000 sets in Chicago during the month of November.

-30-

As I See It!
(Continued from page 60)

should be done. . . . Publications who have in their possession schematic wiring diagrams and parts list of test equipment manufactured during the last five or six years, should publish such data.

There are many who wonder about the possible functions of radio servicemen in connection with various defense activities. Forgetting for the moment civilian radio as we understand it today, there remain a number of other possible forms of activity. Although we are not certain—for that matter no one is—about the manner in which war will be brought home to the people living within the boundaries of the United States, there is no doubt about the fact that preparations are being made against to say the least, attack from the air in the form of

bombings. . . . If this at the moment does not apply to the inland cities, it does apply to those along the coastline, and strangely enough, many of those cities are vital production centers and as such, centers of population. The radio servicemen in such communities cannot help but be of tremendous value as members of whatever communications corps may be set up for not only the proper maintenance of such apparatus, but perhaps even its operation. Today, the cities provide telephone communication between local police boxes and the various precincts. . . . There is no reason why each of these local police telephone boxes installations and locations cannot be arranged to be also a radio-communication unit to be used in case of emergency.

If the use of the recently announced "alert" receivers in connection with home units comes into general application, the radio repairmen may find his place in the making of regular weekly or semi-monthly checkups of the condition of such units. Since each home in a building would have such a unit, regular assignments of time could be made for these tests.

Radio repair shops located near industrial centers can be placed where various kinds of electronic equipment, not necessarily radio, but of such kind as come within the servicing capabilities of the shop, can be repaired. . . . We already have seen examples of this kind of work. . . . Some such is necessary in view of the fact that those shops which in the past acted as general service stations for different manufacturers of precision and semi-precision equipment, are hopelessly swamped with work. . . . We realize that the majority of radio service shops do not have precision standards, but in times like these, there are in use for different applications much apparatus which is not of precision character or at least a high precision is not required. . . . Whether they are few or many, it is still valuable to the nation to know that some additional servicing facilities exist.

Coordination of thought and man power is of greatest importance today. A shortage of man power exists in the radio repair shops of this nation. It might be well to give some thought to the possible segregation of operations within a radio service shop in such manner as to permit the use of inexperienced help or at least people who do not know enough about a radio receiver to complete a diagnosis properly, yet can be of use in the shop. What we have in mind specifically is that the work in a shop where more than one individual is employed, be divided between those who do the diagnosis and those who make the actual repair or replacement of a defective part which is identified in the diagnosis. Today in most shops, one man completes the whole job. . . . If the work is divided as outlined, it enables the use of people who are familiar with industrial processes, yet are not necessarily wholly qualified radio

repair men. . . . There are available today many young boys who have had some form of training in electrical matters, who would fit in ideally for such operations. . . . At least it is worth some consideration.

Inasmuch as diagnosis takes longer than the actual repair, that is, in most cases, one such boy could be of much aid, for it would release the services of the more competent individual for diagnosis only and more jobs could be completed in any one unit of time. Again we repeat that we realize the acute shortage of capable radio men and the burden this places upon those now in the shop. . . . Despite the extreme busy state which exists, this idea which we have advanced should not be cast out without some consideration. . . . This is particularly true in shops where several men are working now. . . . Since time is of the essence, it is possible that the reorganization of those men in the shop now, in accordance with such a distribution of effort may prove extremely worthwhile, this without hiring any additional people, but working with those now in the shop.

It is also of value to consider the routine of operations now in effect while a service job is being done. Routine in the past has been that which the individual operator preferred. Regardless of the type of equipment used in a repair shop, there must be, according to any form of rea-

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soning that is normal, some form of procedure which is the most methodical and at the same time effective. This is based upon the type of equipment available and it should be worked out. The time spent doing this is not excessive and is worthwhile in every respect. . . . If necessary the routine should be laid out by the man who is most proficient and should be followed by the rest. . . . In the long run the time spent arranging this will be more than made up in the time saved during service work. . . . If you'll try this, you will find that it is the truth and it applies to small as well as large plants. . . . Lest you develop the wrong impression, the system we are referring to is not book-keeping, but mechanical and manual as it applies to the diagnosis and repair. . . . So much for the subject of the present and the future in the radio shop. Let us now devote a few moments to what part the radioman can play in the armed forces.

In this respect we can speak only about this which has happened and not so much about that which will take place, for the future is in the lap of the gods. However, it is true that as a rule, happenings of the past have a way of repeating themselves.

Capable radio men who have had a desire to affiliate themselves with the armed forces are welcome for there is a dearth of radio repairmen. The experience which a commercial repairman has had for years in the field will stand him in good stead, for many receivers which are of commercial character are finding their way into service with the armed forces. True many of these communication units are special, but many are commercial, therefore familiar to the serviceman.

A need exists for instructors in various military teaching organizations and those radiomen who are well enough versed in theory to be able to teach elements of electricity, magnetism, and radio are needed. Whether or not their association with the military services will be as civilians or as enlisted men, if they make their contacts before the draft, depends upon conditions existing at the time the men communicate with the authorities. From what we hear, there are numerous civilian services which can be rendered and if you desire to communicate with the government and learn the correct details, write to *The Executive Officer, National Emergency List, U.S. Civil Service Commission, Washington, D.C.*, telling him that you would like to serve. They'll mail you a blank to fill out upon which you will tell them all of your qualifications.

Many radio servicemen have found employment as inspectors for various branches of the armed forces and are employed as civilians in the different manufacturing plants. As to such employment as a civilian, no one knows how long it will last, for there always exists the possibility that all such civilians will be inducted into the service, although they may continue doing

the same work as before.

Concerning the possible results of the contemplated expansion of personnel in our armed forces, there is no doubt that it will take more radio servicemen, thus aggravating the situation. As to which men will be called, that depends upon age and dependents and you know as much about that as we do. From all appearances those who have done work in the radio field are suitable for operations in the communication branches of the service, as for example the *Signal Corps*. However, if men feel that they are better qualified for other branches of the service, statement of that fact may lead to such classification upon entry into the armed forces.

Summarizing the entire subject of the radio repairman and for the moment forgetting about induction into military service, which is a condition embracing every person of suitable age and condition, *those who view the repairing industry with gloom are wrong. . . .* The industry has a job cut out for itself and as adverse as operating conditions may be, the fortunate fact remains, that there is a place for the industry, which is more than many men in other fields can say. . . . Radio repairing is a patriotic job as well as a means of earning a livelihood, and if some of the things we have outlined in this column come to pass, then the radio repairman will contribute even more to the safety and welfare of the people of this nation.

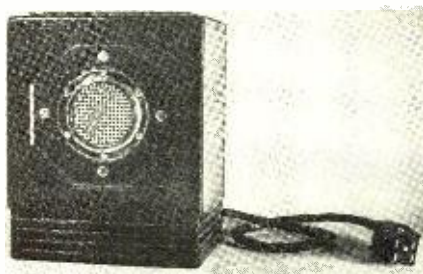
-30-

Flexible Amplifier

(Continued from page 14)

in the bottom of the case. Another piece of bakelite was placed over the bottom of the preamp to prevent the battery from scraping the small parts located below the chassis.

It may be desired to use a.c. on the



Pre-amplifier in case.

preamp and if so this can be done, but will increase the chance of hum pickup and lessen the portability somewhat. This amplifier herein described is used only two or three times a week and then for about a half hour each time so in this case the "A" battery will last a long time making the complication of an a.c. operated pre-amplifier unnecessary.

-30-

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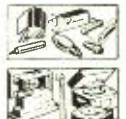
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Receiver Oscillation

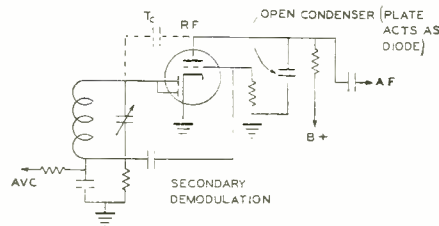
(Continued from page 10)

since the high grid impedance has made the grid-plate capacity more capable of causing trouble.

If two i.f. circuits have their grid returns connected to the same a.v.c. point, or an i.f. circuit and the mixer grid return are so connected, oscillation due to an open condenser may be due to the voltage drop across the impedance that does remain in the circuit.

The coupling, electro-static and magnetic, between the windings of the i.f. transformer, results in a voltage of i.f. frequency across R and L/C. This voltage is in series with the grid of the 1st tube and is amplified by it, and reamplified, until the input resistance is made so low that oscillation is the result.

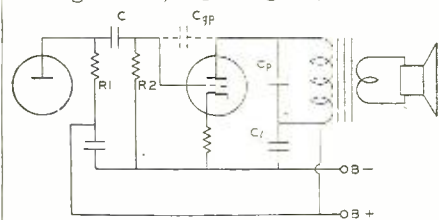
Another form of oscillation is that caused by an open condenser in the diode return circuit. The effect is like that in the case just cited, since the impedance is effectively in the grid circuit of the i.f. and plate i.f. reacts on grid i.f.; also second harmonic of the i.f. reacts on grid of mixer as well as the fundamental signal. Further, in tubes such as the 6SQ7 the triode plate may become a diode detector and the receiver audio section will amplify the rectified signal. The re-



sult will be distortion due to the phase difference of the two demodulations.

The commonest causes of instability in the audio section of a modern receiver are the open plate by-pass of the output tube, resulting in the plate load becoming too high and feedback occurring between plate and grid.

A typical circuit is shown in the following sketch, depicting a type of tube



such as the 25L6 or 43 or other similar, modern tube.

Oscillation in such a circuit is commonly caused by a high plate impedance represented by an open capacity Cf. This would result in coupling between the plate of the first tube and the plate of the output tube, allowing the first tube's varying plate current impulses to be put on the output tube's grid, the whole process being repetitive until oscillation sets in.

Where Cp is open, the high plate impedance of the transformer load on the output tube would be appreciable at high frequencies and cause oscillation due to the current surging between grid and plate of the output tube. A curious form of oscillation may also be caused by an open or partially open coupling capacity represented by Cg, which would reduce the effective grid-to-ground impedance of the output tube, by preventing the loading effect which would otherwise be introduced by a low value of R1. It is apparent that R1 is a shunt across R2, with Cg in series. If R1 is low, then the net impedance in the circuit will be correspondingly low, assuming the usual values used in common receiver practice.

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Weightless Power Supplies

(Continued from page 11)

the d.c. resistance of the choke which is necessary in most power packs. Large condensers and low-resistance chokes make for higher voltage and better regulation with any given load.

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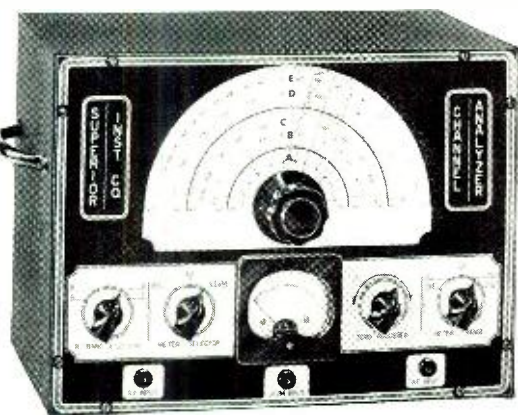


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- ★ Features an attractive etched aluminum panel.
- ★ Works on 90 to 125 volts 60 cycles A.C.
- Model 1240 comes complete with instructions and tabular data for every known type of receiving tube. Shipping weight 12 pounds. Size 6" x 7 1/2" x 10 3/4". **\$14.85**
- Our Net Price. **COMPLETE WITH PORTABLE COVER**



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, alone or with A.F. (any frequency) modulating R.F.
3. Latest design full-range attenuator used for controlling either the pure or modulated R.F.
4. Accuracy is within 1% on I.F. and broadcast bands; 2% on higher frequencies.
5. Giant dial etched directly on front panel, using a new mechanically perfected drive for perfect vernier control.
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**

SUPERIOR INSTRUMENTS CO. 227 Fulton St., Dept. RN2 New York, N. Y.

SRN-111-J61281-R-102
EDWARD MENNING
BOX 337
CATAWBA WISC

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AC



'YES, MRS. SMITH, I'LL MAKE IT SOUND LIKE NEW'
...the oscillator is off a few thousand beats a second'

**YOU CAN'T GET
'LIKE-NEW' RADIO RECEPTION
WITH OLD, WORN TUBES!**

Tubes are truly the 'heart of any radio. Countless cases of poor lack of volume, interference, popping, sputtering and similar troubles in old radios can be easily and economically be remedied simply by replacing worn tubes. That is why diligent radio repair men have habit checked or replaced every tube in every radio they repair. Meet an RCA tube. These replacement tubes, made in the same factory as the best-known name in radio, backed by leading designers and famous technicians—insure many recognizable signs of new tube performance.



It's another of those cases of normal wear of sensitive radio parts which, although not sufficient to cause the set to stop operating, may result in tuning difficulties, noise, poor volume, weak volume and other verification quality. Your radio service man can fix such troubles. Your radio service man can fix such things promptly—at a modest charge you will be well justified in paying.

For instance, the oscillator in an average radio fluctuates almost two million times a second—perhaps ten times that often if it operates on short wave bands. Should the oscillator even slightly out of adjustment, the result may be an uncertainty of several thousand oscillations a second—a small percentage error, to be sure, but still enough to cause the set to work far less efficiently than it should. Although conditions of this sort are beyond the comprehension of most radio owners, they are no mystery to the service man. He has both the knowledge and equipment to correct them accurately and well.

Such things clearly indicate the importance of a routine service check-up every year or 18 months—at a probable cost of no more than \$2.00. This means the correction of minor troubles resulting from long hours of daily use. Equally important, it indicates whether additional repairs are advisable to assure the kind of reception to which you are entitled and, perhaps, even to avoid more extensive work later on.

Always a good investment, always important, competent radio service is even more so today when home radios form a valuable link in defense—when the National Emergency message broadcast messages of vital importance, and when new radios, although finer, will be limited in number.

Call your service man today! Give your radio the attention that any such fine, well-made mechanism deserves!

RCA MANUFACTURING COMPANY, INC.
A SERVICE OF THE RADIO CORPORATION OF AMERICA
CAMDEN, N. J.
IN CANADA: RCA VICTOR COMPANY, LTD., MONTREAL



**Make your old Radio
LAST LONGER**

It doesn't happen that often, but it does happen. Just normal wear and tear on your tubes and other parts of the kind of which you are not likely to be aware, may be causing a pleasure. Depending upon how long you have had your radio, it may be important. It may mean trouble. It may mean that your radio repairs are not being made in time. It may mean that your radio is not working as well as it should. It may mean that your radio is not giving you the kind of reception to which you are entitled. It may mean that your radio is not giving you the kind of pleasure to which you are entitled.

Regardless of the make or model of your old radio, it is his job to help you get the most out of it—to make it operate satisfactorily over a long period of time. Call him today. Keep your radio working—and keep them working well!

RCA MANUFACTURING CO. Inc., Camden, N. J.
A Service of The Radio Corporation of America.
In Canada: RCA Victor Company, Limited, Montreal

Call your service man today! Give your radio the attention that any such fine, well-made mechanism deserves!



ABOUT RADIO SERVICE

It is the duty of the radio serviceman to make your old radio work as well as it should. It is his job to help you get the most out of it—to make it operate satisfactorily over a long period of time. Call him today. Keep your radio working—and keep them working well!

TESTING A RADIO SERVICEMAN

There are many ways to test a radio serviceman. One way is to ask him to test your radio. Another way is to ask him to test your radio. A third way is to ask him to test your radio.

RADIO TEST EQUIPMENT



EVERY NEWSSTAND IN YOUR TOWN is selling **Radio Service!**

...Here's the greatest national advertising support ever extended to Servicemen and Dealers
"Your Radio Serviceman *deserves* your patronage!"
That's the theme of the biggest national advertising campaign ever devoted to boosting the business of servicemen and radio service dealers... the greatest support ever offered you by *any* manufacturer!

In the December 27 issue of *Collier's*, RCA—for the *third* time in three months—takes a full page in

two colors to tell America about the vital work of the competent, honest radio repairman. These three ads are directed to the cream of America's radio-owning families... two million of them... the men and women upon whom *your* livelihood depends.

For RCA believes that the radio serviceman's work today is more important than ever before... that the serviceman himself has *earned* public confidence, and should *have* it!

WHERE ELSE CAN YOU OBTAIN THIS SUPPORT?



Tubes and Test Equipment

RCA Manufacturing Company, Inc., Camden, N. J. • A Service of the Radio Corporation of America
In Canada: RCA Victor Company, Ltd., Montreal