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GAIN: 84 decibels, maximum.

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POWER OUTPUT: Plus 8 decibels at 1.0% distortion.

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In reverence and memory of that greatest of all holidays, we take much pleasure in extending our sincere good wishes and hearty greetings to you and all of yours for the merriest Christmas you have ever known. And for good measure, we wish that each day of 1941 will bring to you new happiness and prosperity.

the hallicrafters inc.
JANUARY 1941

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"IT SEEMS TO US—"

THE I.A.R.U. SOCIETIES

We've just been checking up on the effect of the war on the member-societies of the International Amateur Radio Union around the world. As is to be expected, it has left a heavy impress on amateur affairs. But not too completely so, by any means: in a surprising number of countries the societies are carrying on in much the same old way.

There are in fact only half a dozen countries from which we have definite word of the cessation of all activity for "the duration": Czechoslovakia, Egypt, France, Lithuania, Poland and Switzerland. From some we've had no word at all since the initial impact of war: Finland, the Netherlands, Norway, Roumania and Sweden. Germany seems a special case: when its officers went to war they left a clerical staff who presumably have been carrying on routine affairs but we get no word from them, no answers to letters and I.A.R.U. calendars. The other seventy percent of the associations are continuing their activities, a goodly list which, in addition to A.R.R.L. and its Canadian section, includes the societies of Argentina, Australia, Belgium, Brazil, Burma, Colombia, Cuba, Denmark, Eire, Estonia, Great Britain, Hungary, Italy, Japan, Luxembourg, Manchoukuo, Mexico, Netherlands Indies, Newfoundland, New Zealand, Portugal, Spain, South Africa and Venezuela. In a dozen countries in this list and in another dozen Latin countries not represented in the Union, amateur transmitting continues unabated.

The remarkable thing is the extent to which nearly normal activities are being continued in those countries where the war has brought a halt to operating on the air. It is a fine and inspiring thing to see these societies carrying on despite the temporary loss of transmitting privileges. To the best of their means, varying of course with the circumstances, they are maintaining their old functions. Most of them continue the publication of their official magazines, even though in some cases they're a bit abbreviated. Despite depletions in their ranks and their finances through the absence from home of men in the services, skeleton staffs continue serving ardent memberships and looking after their interests, innumerable affiliated clubs and district groups continue their meetings, and the journals are filled with descriptions of receivers and receiving experiments and observations on reception, and with courses on theory and radio math—improving otherwise lost time. We should like particularly to make a bow to the Radio Society of Great Britain, which it seems to us is doing a superlative job under conditions which at best must be very difficult. To read their well-known T. & R. Bulletin one would scarcely think it came from a country at war were it not for the service notes and the unhappy list of Silent Keys.

To us, these things demonstrate anew the unconquerable spirit of the amateur in science, and it pleases us to think that that is particularly true of the radio amateur. He will find a way to carry on. He is nurtured on disappointment; he will discover another solution. He is determined to have his amateur radio, and to pursue it to the utmost that circumstances permit. He keeps his hand in, takes what he can get, plans for a better day. To us in America it is a splendid sight that so many of the amateur societies continue their functioning regardless of handicaps. We extend to them encouragement, congratulations, bravos. Their actions show, as nothing else could show, the affection we all feel for this our chosen art. They leave no room for doubt about our future. There will be a happier day; no war lasts forever. There will come a day of peace, and of the reopening of our international contacts, and of greater recognition of the value of the radio amateur. We all live for that day. Amateur radio in these countries will be better off then, and will get off faster to a new start, if its organization meanwhile has been maintained to every extent possible. To the officers and memberships of those amateur societies that still proudly hold the torch aloft, despite the din and clamor, all praise!

K. B. W.

January 1941
The "Variarm 150"

A Simple ECO Exciter and Its Power Supply

BY HENRY E. RICE, JR.,* W9YZH

In order that this discussion may best serve its intended purpose— that of demonstrating that stable note generation is actually a very simple matter— a review of the circuit design rules for self-controlled oscillators will be omitted. These well-known principles are all essentially simple in themselves, but their many ramifications would only tend to muddle an otherwise straightforward story. Let's grant that all of them have been considered carefully, each being given a relative value in the design of the working model with which we are concerned at the moment.

This device consists of a power supply in the form of a full-wave voltage-doubler circuit with a condenser-input filter, an electron-coupled oscillator impedance-capacity coupled to a beam power amplifier, and a parallel-resonant tuned circuit which is link-coupled to the plate tank of the amplifier stage. The r.f. power output of the amplifier is roughly 2 watts over a frequency range of plus or minus 75 kc. from the resonant frequency (plus or minus 150 kc. when used as a frequency doubler) and the power available from the output coupler is ample for driving any one of the tubes commonly used in the first stage of existing transmitters. The unit is specifically designed to excite the control grid of the crystal-controlled oscillator stage in any transmitter, when variable frequency control is desired, without the necessity for extensive changes in existing equipment. The comments below will serve to explain the reasons for each necessarily unusual detail.

Circuit Features

The absence of all transformers insures vibrationless operation without the necessity for resorting to a separate power supply unit.

The simplest possible system of voltage stabilization has been used to produce a good keyed note.¹ This idea is worthy of much wider use by amateurs than it seems to enjoy. It can be used to good advantage with nearly all tube combinations, and in any locality which has fair line volt-

A view into the top of the oscillator box, showing the arrangement of the frequency-determining tank circuit. C₁ and C₂ are mounted on the sides of the box. C₃ consists of two 200-µµfd. negative-coefficient units in parallel, supported between C₂ and the top of L₁.

The 6K7 oscillator tube is mounted directly to the box, projecting through a hole in the bottom slightly smaller than the bottom rim of the tube. It is clamped in place by spade lugs with the threaded end cut short and fitted into opposite slots in the tube base, the spade ends being bolted to the box. The tube socket is mounted to the main chassis with rubber grommets for insulating it from mechanical vibration. The chassis is 9½ by 5 by 1½ inches.

Age regulation this constant current arrangement should be the logical answer for oscillator plate voltage stabilization. It is certainly economical, and practically invaluable for use with a line-powered supply for a keyed oscillator which is, in turn, the most economical answer to the e.c.o. problem.

Almost perfectly regulated plate voltage must be used with all of the commonly known self-controlled oscillator circuits if chirpless keying is to be achieved. For one reason or another, all of the conventional methods of improving regulation at the source proved inapplicable in this instance.

The inherent voltage regulation of a supply of the type used in this experiment, although somewhat better than that of a half-wave voltage-doubler, is poor even when a fairly low-resistance bleeder is used. It so happens that amateurs are most familiar with variable frequency e.c. circuits at the present time, and that small tubes and low voltage are essentially easiest to handle. Thus, the only reasonable solution which presented itself was the scheme used in this unit, namely, the maintenance of a constant load. Assuming that all circuits are resonated, the value of the cathode resistor in the amplifier stage can be adjusted for a perfect balance of current flow to the two stages with or without excitation. In this case, we find that the 25L6GT draws 30 ma. plate current and 2 (plus or minus) ma. screen current with excitation when loaded by the output coupler. The plate and screen of the 6K7 total about 14 ma. The amplifier screen current remains very nearly constant at all times, although the screen voltage varies with keying. Thus, the 25L6GT must be biased only enough to reduce the idling plate current to 44 ma., and a constant load will be drawn from the power supply. In figures: 0 ma. plus 2 ma. plus 44 ma. (key up condition) equals 14 ma. plus 2 ma. plus 30 ma. No voltage divider or bleeder is necessary, and the fact that the amplifier following the self-controlled oscillator is not, in this instance, operated strictly in Class A is more than compensated for by the high order to voltage stabilization attained by the method described.

The by-pass condenser, C₁₈, between the voltage doubler plates is absolutely necessary for generation of a pure d.c. signal. It is in effect a substitute for the conventional by-pass across the a.c. line commonly found in line-powered receivers, but is definitely more effective when connected as shown, especially when the actual operating frequency is the fourth or higher harmonic of the fundamental control frequency (that which is determined by the constants of the 6K7 grid tank). At any rate, this one 0.002 condenser in-

The electron-coupled oscillator continues to be a popular piece of equipment with amateur designers. Here's one with some novel features, not the least of which is its intriguing appearance. And it works as well as it looks!
sures that the below-chassis parts can be rearranged within reasonable limits.

The value of the 25L6GT screen dropping resistor, $R_1$, may appear unreasonably high, in view of the general rule of high screen voltage for a beam power tube for optimum loading and power output, but it is actually correct. The reason why this is so lies in the fact that the power input is definitely limited by the supply capability. In other words, higher screen voltage tends to cause the amplifier to draw more plate current, as would be expected, but this in turn lowers the available voltage. With the cathode at ground potential, the static plate current of the stage will not exceed 75 ma. with the 50,000-ohm screen resistor specified, and thus the amplifier tube seems to be safely on the road to a long and carefree life.

The keying method is strictly conventional in its action. The apparent oddity of the system is another result of the oscillator tube mounting, and is actually a convenience in that additional lead wires can be dispensed with.

**Mechanical Layout**

For the information of those amateurs who have an eye for design of radio equipment — *i.e.*, design in the sense of pre-determination of the finished appearance — this unbalanced and strictly functional gadget developed because every other arrangement proved to be inconvenient to wire. The chassis layout indicated is not essential to the successful operation of the circuit by any means.

There are a number of reasons for the omission of a case for the entire assembly. In the first place, the use of a case immediately implies additional labor and added expense, and its use can in no way improve the performance of the equipment. Also, our rectifier and amplifier tubes seem to thrive on free air, the vernier arm enjoys its freedom, and the main tuning control can bounce around at will without being accused of passing transient shocks! All in all, the considerations of simplicity and economy have been the determining factors.

The rather odd method of mounting the oscillator tube has one distinct advantage in that this method of assembly produces a truly rigid grid circuit; *i.e.*, the grid end of the circuit wiring (the danger point of mechanical and frequency in-

---

**Fig. 1** — Circuit diagram of the control unit. Important: Ground symbols on this diagram indicate a common negative. Because of the rectifier circuit an actual ground cannot be used on the unit. If grounds indicated are made to the chassis, care must be taken to keep the chassis from touching any grounded objects. The usual a.c.-d.c. practice of keeping everything insulated at the point of contact will be eliminated. The dotted enclosure represents the box containing the oscillator section.

- $C_4$ = 5-µfd. (approx.) variable.  
- $C_5$ = 100-µfd. variable.  
- $C_6$ = 300-µfd. fixed (Centralab neg. coeff. type).  
- $C_7$, $C_8$, $C_9$ = 3-30-µfd. trimmer.  
- $C_{10}$ = 100-µfd. mica.  
- $C_{11}$ = 250-µfd. mica.  
- $C_{12}$, $C_{13}$, $C_{14}$, $C_{15}$ = 0.002-µfd. mica.  
- $C_{16}$, $C_{17}$ = 0.02-µfd. paper.  
- $C_{18}$, $C_{19}$ = 0.01-µfd. paper.  
- $C_{20}$ = 0.001-µfd. mica.

- $C_{18}$ = 0.002-µfd. mica.  
- $C_{19}$, $C_{20}$ = 8-µfd. electrolytic.  
- $C_{11}$, $C_{12}$ = 10-µfd. electrolytic.  
- $R_1$ = 0.15 megohm, ½ watt.  
- $R_2$ = 25,000 ohms, ½ watt.  
- $R_3$ = 500-ohm variable, wire-wound.  
- $R_4$ = 50 ohms, 10 watt.  
- $R_5$ = 165-ohm line cord.  
- $R_6$ = 0.25 megohm, ½ watt.  
- $R_7$ = 50,000 ohms, ½ watt.  
- $L_1$ = 20 turns No. 10, length 2", diameter 1¾", supported by slotted insulating strips. Tap for $C_2$ at 12th turn from the bottom; cathode tap 6th turn from bottom.

- $L_{15}$, $L_{16}$ = 3.5 Mc.: 43 turns No. 26 enam. close-wound, diam. 1½". Link 3 turns.  
- $L_{17}$ = 7 Mc.: 19 turns No. 22 enam. length ¾", diameter 1¼". Link one turn.  
- $L_{18}$ = 50-ohm midget filter choke, "30 henry."  
- $F$ = ½-amp. fuse.
Inside the plug-in tank. The coil socket is mounted upside down on small brackets cut from aluminum to fit. A miniature two-prong socket in the wall brings the link into the box. A five-prong plug is mounted in the bottom to fit the conventional five-prong socket used for crystal mounting.

stability) has less chance to bend, sag, vibrate, or otherwise move in relation to the shield, the shell of the tube, or anything else which is at ground potential. Also, this tube mounting simplifies the problem of wiring between the chassis and the oscillator grid circuit. It is interesting to note that a metal tube with control grid and cathode connections brought out at the top would be ideal for use in e.c. oscillators: in this case, no lead would have been used between chassis and shield box, and practically zero frequency shift would have resulted from pressure applied to the shield— but that is all by way of wishful thinking. For now, the old-style tubes with the grid at the top seem generally better suited to the layout of e.c. circuits than the newer single ended types.

The grid circuit shield for the oscillator is mounted on live rubber, and is essentially a three-point suspension. One of these supports is formed by a standard "non-microphonic" cushion mounting of the octal tube socket. The metal shell of the 6K7 is clamped tightly into a hole in the bottom of the shield.

Tuning and Stability

The tuning method seems to work out satisfactorily in that all one has to remember is to keep the vernier handle roughly opposite the front corner of the shield box at all times. The final calibration should be done with it in this position, and the two-plate variable condenser which it controls must be turned so that the plates will be half-way open. Then, after the main dial is turned to the desired frequency setting, the final close adjustment can be made with the long arm. It seems to be possible to work the bands a bit faster by this method, and the band edges should be no more of a hazard than with the more commonly used mechanical bandspread. In this particular application, where the coil is never changed in the frequency control circuit, the number of kilocycles covered by the vernier doubles each time the operating frequency is doubled. It will be immediately evident that the use of the vernier makes it practical to spread

(Continued on page 74)
A top view of the W9ZGD transmitter shows how small a complete transmitter can be made when using one of the combination beam-power and half-wave rectifier tubes. The outboard condenser is the antenna coupling condenser.

**Pocket-Sized Complete Transmitters**

**Transformerless Operation With the 117L7GT**

The recent introduction of tubes containing a beam-power amplifier and a half-wave rectifier in the same envelope offers a number of possibilities for low-power transmitter construction. The design is further simplified by the fact that the heaters of these tubes work directly from 115 volts, thus eliminating the usual heater dropping resistor. Other similar types of tubes use heaters requiring 70 volts (or 35 volts, in some cases), and these can be used with the heaters in series without any dropping resistors.

Here are two transmitters, using the 117L7GT in slightly different circuits, that show how simple the whole thing can be.

**A Pocketful of Watts**

**By Keith Hayes,** W9ZGD

Several tubes have been introduced recently which are admirably suited for use in ultra-compact transmitters. The most likely of these are the 117L7GT, the 117M7GT and the 70L7GT, since each has a half-wave rectifier and a beam-power tetrode in one small envelope.

The photographs show two views of a small transmitter using a single 117L7GT to combine the rectifier and r.f. functions in the same envelope. The circuit, shown in Fig. 1, shows the rig to be a tetrode crystal oscillator with capacity coupling to the antenna and negative-lead keying. The rectifier is a half-wave affair, but 16 µfd. of filter does a good enough job of filtering to make the signal T9.

The gear is all mounted on a small chassis made of strips of Masonite fastened together by small screws. The under side of the "pocketful of watts" shows that not much room was left after the parts were put in place. Note the tank coil that projects out at the rear of the chassis.

*Fig. 1—Wiring diagram of the W9ZGD transmitter.*

- \( C_1 \) — 100-µfd. midget variable (Meissner 21-517)7.
- \( C_2 \) — 100-µfd. midget variable (Hammarlund MC-100).
- \( C_3 \) — 0.01-µfd. 600-volt paper.
- \( C_4 \) — 1 µfd. 150-volt electrolytic.
- \( R_1 \) — 20,000 ohms, ½-watt.
- \( L_1 \) — 3.5 MΩ; 50 turns No. 24 d.c.c. closewound on \( \frac{3}{8} \)-inch diameter, 7 MΩ; 23 turns No. 24 d.c.c. spaced to occupy 1-inch winding length on \( \frac{3}{8} \)-inch diameter form.
If high-powered operation has begun to pall and you're looking for some new fun, or if you're simply interested in gadgety little transmitters, you can get plenty of ideas from the two simple transmitters described here. The fact that they use no transformers and are just about the ultimate in simplicity doesn't seem to prevent their giving an excellent account of themselves on the air.

The transmitter is tuned as is any crystal oscillator of this type, and the antenna coupling is varied by adjusting the condenser C2. Listen to a harmonic on the receiver while tuning, and you will notice a roughness to the note when the oscillator is tuned "on the nose". Tuning slightly to the low-capacity side of resonance will clear it up completely. Don't fail to check this adjustment with a receiver or monitor. The cathode current should run around 35 or 40 ma. when the oscillator is properly loaded.

Although 4 or 5 watts doesn't sound like much input, it is surprising what one of these little transmitters will do, particularly to one who has never tried anything like it before. Possibly, according to tradition, I should list the stations worked but, since the antenna, receiver and operating ability affect the statistics as much as the transmitter power, I'll just mention the fact that 5 watts give a signal about one "S" point lower than 20 watts and 2 "S" points lower than 80 watts. And, anyway, it's more fun to fish with bareless hooks!

A "Pee-Wee" Transmitter

BY R. T. LAWRENCE,** W8LCO

This is the old story told once again. I had been rebuilding the big rig and, getting tired of being off the air, I threw together a little rig to play with. Result: there hasn't been much work done on the big rig!

The power input is just 3 watts. The entire array of tubes is just one 117L7GT. As can be seen from the circuit in Fig. 2, the transmitter uses a switched antenna network that allows work on the 80-, 40- and 20-meter bands with no more fussing than changing the crystal and retuning the output circuit. The network permits matching to almost any piece of wire used as an antenna.

A slightly larger coil would also allow 160-meter operation. Cathode keying is used, and the output of the half-wave rectifier is adequately filtered through the use of two condensers and a choke in the filter.

The photographs show how the transmitter is housed in a 3- by 4- by 5-inch metal box. The tube socket and crystal socket mount on the top of the box (one of the 3- by 5-inch sides). The two tuning condensers, the on-off switch and a 60-ma. pilot lamp used for a plate current indicator mount on the front panel, and the band switch is supported on the rear panel. The filter choke mounts on one side, and the tapped inductance is fastened to the other side. A feed-through bushing at the top, between the tube and crystal sockets, serves as an antenna terminal, and the key plugs in to a jack on the side.

With the antenna used at W8LCO, an 80-meter crystal works best with the coil switch set to put 50 turns in the circuit, and a 40-meter crystal seems to work best with 30 turns in the circuit. However, other settings may work best for other antenna systems, and it is well to try various settings until the one is found which allows good loading of the oscillator and a minimum of chirp during keying.

Tuning is very simple. When the tube is not oscillating the indicator bulb lights up to almost full brilliancy. The output condenser, the one next to the antenna, is placed at maximum capacity. The input condenser, the one next to the plate,
Fig. 2—Circuit of the W8LCO pre-vec transmitter.

- **C1** = 100-µfd. midget variable (Hammarlund SM-100).
- **C2** = 140-µfd. midget variable (Hammarlund SM-140).
- **C3, C4** = 0.001-µfd. midget mica.
- **C5, C6** = 16-µfd. 150-volt electrolytic.
- **R1** = 50,000 ohms 1/2-watt.
- **RFC** = 2.5-mh. r.f. choke.
- **L1** = 90 turns No. 22 enam. cold-wound on 1-inch diameter form. Tapped at 50, 30, 20, and 10 turns from shorted end.

is tuned to resonance as indicated by the indicator light going out. The output condenser is then tuned until the antenna takes the desired load. It will be necessary to adjust the input condenser to resonance as these adjustments are made. Further information as to the operation of this type of network may be found in the 1941 Radio Amateur’s Handbook, pages 336 and 337.

Operation with a low-powered rig like this holds a lot of thrills. The main point to remember is that QRP requires “riding the skip”; that is, working stations at the distance that is optimum at any particular time. Using a 66-foot end-fed wire for the antenna, I have managed to run up a score of 29 states on 40 and 80 meters in slightly over a month’s operation. Working in the Sweepstakes Contest, where no one will deny the competition is tough most of the time, 41 stations were worked in 17 sections. Prior to the SS Contest, the best DX was Colorado, but a 7-Mc. contact during the Contest with W6IDZ broke that record and handed me a thrill that it will take a long time to forget. No doubt “charity begins in contests,” and the average signal report of S6 may be only an indication of good humor and tolerance on the part of the stations worked, but the contacts are there in the log and that’s what really counts.

Editor’s Note.—Transmitters working into a single wire, such as the two units just described, find their ground connection back through the power supply and the power line. More often than not this is not the best ground path for the transmitter, and the performance can be improved by running a short direct ground to the transmitter. This ground lead could be connected to the transmitter through a mica condenser, but this would not comply with the A.R.R.L. Safety Code, which requires that a d.c. ground be maintained. If, however, the transmitter is grounded directly without regard for the polarity of the 115-volt a.c. source, there is a possibility that the line will be shorted. This can be checked by plugging in the transmitter and grounding the transmitter through a small 115-volt lamp. If the lamp lights, the line plug should be reversed. If the lamp doesn’t light, the direct ground connection can be made without danger of blowing a fuse. In some d.c. lines, the positive side may be grounded and, in this case, it will not be possible to run a direct ground lead because the line would be shorted. However, an r.f. ground can be made through a mica condenser (0.001 µfd. or so), and special care should be exercised to avoid contact with the d.c. leads of the transmitter.

If only a.c. operation is contemplated, the single-prong plug idea suggested by W8CMP (QST, November, 1940, page 48) is well worth considering.

**Strays**

A red-hot piece of resistance wire, heated by a source of a few volts, will cut through “Quartz Q” sheets and do a better job than a hacksaw.

—W8AZV.
The A.R.R.L. code-proficiency tests have stimulated a tremendous interest in building up speed in code reception. It is natural that one would wish his transmitting speed to keep pace with his ability to copy, but not until he has made the attempt does he often discover that increasing speed in transmission is more difficult than in reception. Whereas reception at increasing speeds is largely a matter of brain development through constant practice, transmission includes also the development of accurate control over muscles, which in their normal functions do not require precise control, and the development of an accurate sense of timing. The latter is probably the most difficult, yet most important.

There are a few operators who seem to have the uncanny ability to do a good job merely by a well-developed sense of touch, but most of us require some sort of monitoring system by which we may have a check on what's going on if we are to turn out stuff which we can reasonably expect others to copy with accuracy.

A monitoring system can be extremely simple. It does not necessarily require direct monitoring of the transmitted signal, although direct monitoring does permit a simultaneous check on both keying and the signal characteristics.

*Asst. Technical Editor, QST.
Comparison of Systems

Each one of these monitoring methods has its advantages and disadvantages and these must be considered before the best one for any given set of requirements may be chosen. Neither the i.f. oscillator of Fig. 2 nor the signal monitor of Fig. 3 is likely to be entirely satisfactory for break-in operation unless special precautions are taken to prevent blocking of the i.f. amplifier by the transmitter signal. A low-power transmitter may not cause trouble except when the receiver is tuned near to the transmitter frequency, but, in a series of tests which were conducted, a medium-power transmitter with a decent antenna for the receiver would knock the i.f. practically dead so that no satisfactory monitoring signal could be heard with the receiver tuned to any part of the band. If either system is to be used with break-in, a relay short-circuiting the input of the receiver when the key is closed should cure most of this trouble. If break-in operation is not required, a switch in the receiver should be provided which cuts off the "B" supply of the r.f. stages, leaving the i.f. and audio circuits in operation.

The chief advantage of the i.f. oscillator of Fig. 2 is that it is possible to obtain a monitoring signal of more pleasing quality than that of the simple audio oscillator. It is also possible to obtain a wider range of audio frequencies, the range actually being unlimited. Since the signal is at the i.f., the monitoring signal does not change with tuning of the receiver. Once set, the adjustment is good for all bands.

The advantage of the signal monitor of Fig. 3 is, of course, its ability to check the quality of the output signal as well as the keying. Another advantage is that no keying connections are required. Operators who change transmitter frequency often will find that its greatest disadvantage is that it is necessary to retune the moni-

**Fig. 1** — Circuit of the audio-oscillator monitor.
- $C_1$ — 40 µfd., 450-volt electrolytic (Mallory FPS146).
- $C_2$ — 0.002 µfd., mica.
- $C_3$, $C_4$ — 0.1 µfd., paper.
- $R_1$ — 50,000 ohms, 1-watt.
- $R_2$ — 5,000 ohms, 1-watt.
- $R_3$ — 0.5 meg., variable.
- $T_1$ — Interstage audio transformer, ratio 1 to 3 (Thor-darson T13A34).

**Fig. 2** — Circuit of the i.f. oscillator monitor.
- $C_1$ — 8 µfd., 450-volt electrolytic (Mallory CS-133).
- $C_2$ — 0.01 µfd., paper.
- $C_3$ — 50 µfd., mica.
- $C_4$ — 25 µfd., midget variable (Hammarlund SM25).
- $C_5$ — 0.01 µfd., paper.
- $R_1$ — 50,000 ohms, 1-watt.
- $R_2$, $R_3$ — 0.1 meg., 1-watt.
- $R_4$ — 50,000 ohms, 1-watt.
- BFO — Beat-oscillator unit (Sickles 465 kc., permeability-tuned, No. 6577).
tor each time a change in transmitter frequency is made. Once set for any particular transmitter frequency, however, the monitoring signal will be unchanged, regardless of tuning of the receiver.

The Audio Oscillator

The audio oscillator is perhaps the most foolproof. It is simple and has the advantage that it is free from the effects of blocking r.f. stages. While its tone is not as pure as that of the i.f. oscillator, many will prefer it to the "pure-c.w." type of signal for monitoring keying.

Either audio or i.f. oscillators may be assembled and wired in a few hours' time. A standard steel case, 4" by 4" by 2", is used as a chassis for each. Both top and bottom plates of the case are removable so that most of the assembly and wiring may be done before the unit is placed in the case.

A type 117L7GT is used as the oscillator tube. This is a combined half-wave rectifier and beam-type tetrode with a 115-volt heater, requiring no filament transformer. In the audio oscillator, a cheap interstage audio transformer is used to couple the grid and plate circuits to provide feedback. This particular transformer works with the terminals connected as marked. Other types may require reversal of connections to one winding to correct the polarity. The frequency of oscillation does not depend so much upon the inductances of the transformer windings as upon the RC combination in the grid circuit, although a different transformer may require different values of grid-leak resistance and grid-condenser capacity to produce the most desirable audio range. Filtering of the 60-cycle supply is provided by the 40-µfd. electrolytic condenser, C1. Audio output is taken from across the 5000-ohm resistor R2. The output frequency may be varied over a considerable range with the variable resistor, R3. Further variation may be obtained by altering the value of C5.

Placement of parts is not critical. The 40-µfd. condenser is mounted by drilling a hole about ¾ inch in diameter and bending the mounting tabs outward. Pin jacks are provided at the rear for output and key connections and a grounding terminal is provided for the chassis. One precaution is necessary in connecting the unit to the 115-volt line. The side of the line which is grounded to the chassis should be the grounded side of the line, otherwise, it will be possible to receive a shock between the chassis and ground, or if the chassis is grounded, reversal will cause a short-circuit of the line. This possibility may be avoided by permanently grounding the chassis to a water-pipe or other ground and using but a single wire to the power plug. Thus, if the plug is inserted the wrong way, there is no danger of injury or damage.

The audio oscillator is coupled through a capacity, C4, to the high-potential side of the phones, while the chassis of the oscillator is connected to the chassis of the receiver. The high-potential side of the phones may be determined readily after the oscillator is in operation, since little or no signal from the oscillator will be heard if connection is made to the low-potential side. Should

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**Fig. 3** — Circuit diagram of the signal monitor.

- C1 = 50 µfd., mica.
- C2 = 100 µfd., mica.
- C8 = 0.01 µfd., paper.
- C4 = 75 µfd., variable (Hammarlund HFA75A.)
- C5 = 250 µfd., variable (National STP250).
- C6 = 0.01 µfd., paper.
- C7 = 25-100-µfd. mica trimmer (Meissner 22-7002).
- C9 = 250 µfd., mica.
- R1 = 0.01 meg., ½-watt.
- R2 = 20,000 ohms, ½-watt.
- R3 = 10,000 ohms, 10-watt with slider.
- RFC = 2.5-mh. r.f. choke.
- L = 19 turns No. 22, 1-in. diam., 1½-in. long, tapped at 7th turn from ground end.

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Interior of the signal monitor. Cs is to the left and C4 at right center. The i.f. trimmer condenser is soldered across the r.f. choke at the right. The oscillator coil plugs into the inverted socket in the center.

(Continued on page 80)
**WHAT THE LEAGUE IS DOING**

**SERVICE RECORDS WANTED**

Are you in the draft? A volunteer, or a reservist on active duty? Are you participating in national defense radio work in any way?

If so, then we want the dope on it. The League desires to compile statistics on the contributions made by radio amateurs to the present national effort. It goes without saying that such data will be of great interest in the continuing representation of the interests of amateurs. It is, therefore, requested that all amateurs serving in radio work with the military forces of the United States be kind enough to register that fact by means of a postcard to A.R.R.L. at West Hartford. Please give the following information:

1. Are you a Selective Service conscript, a volunteer, or a reservist on active duty?
2. For how long a term are you serving?
3. Is your service in the Army, Navy or the Marine Corps?
4. To what outfit or organization are you assigned?
5. Location: where is your organization stationed?
6. What rank or rating do you hold?
7. What is your present radio duty assignment?
8. Were you previously a member of N.C.R. or A.A.R.S.?
9. Give your name and your home call.

These data are particularly desired from draftees but should not be filed at headquarters until they have passed through reception centers and have been definitely allocated to radio work.

We know that hams are making a splendid showing in the preparedness program, and we want as complete a record of this service as it is possible to get. Make it your responsibility not only to supply this information with regard to yourself, but also to call this request to the attention of other amateurs whom you know to be in service.

**WASHINGTON NOTES**

The licensing log-jam at F.C.C. now seems to be thoroughly unsnarled, as a result of the actions proposed by A.R.R.L. and adopted by the Commission. As reported last month:

- Expiring licenses are automatically extended, provided applications for renewal and proof of citizenship are filed.
- The permitted period of "portable" operation while awaiting modification of license for change of address is extended from two months to four months.

Long before the end of these extended periods, F.C.C. can get out definitive new licenses to all concerned. In the meantime, no amateur will be kept off the air because of licensing tie-ups; and, of equal importance, applicants for new licenses are now receiving satisfactory attention and this work is practically up to date.

We repeat that F.C.C. has promised a waiver of the proof-of-use on behalf of men in the military services, before the time that such cases begin to occur.

Before long there should be some interesting announcements on steps being taken by F.C.C. and the industry to eliminate interference from diathermy apparatus. An informal engineering conference is being held in Washington as we write, with Jim Lamb in attendance in our interests.

Most important development of the month has been the progress in the organization of the Defense Communications Board. Itself consisting of the ranking radio men of F.C.C., Army, Navy, State Department and Coast Guard, the board will do business chiefly through a coordinating committee comprised of government radio experts, working in liaison with committees on law, labor and industry advisory matters. Under this coordinating committee are eleven "industry" committees, representing groups such as amateurs, aviation, broadcasting, cables, etc., whose duties will be to recommend plans for the most effective use and control of their facilities in time of military emergency. At the time of writing, appointments to these committees have not been made, but it is expected that A.R.R.L. will participate in the amateur committee in representation of our interests.

**CODE PROFICIENCY STATISTICS**

Have you been wondering how the gang stacks up who have qualified for the A.R.R.L. code proficiency certificates? Here they are:

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<th>Speed (w.p.m.)</th>
<th>Percent</th>
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</tr>
<tr>
<td>100.00</td>
<td>100.00%</td>
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</table>

Thus 90% of our entrants have done 20 w.p.m. or better, while 71.5% have copied 25 or more.

Improvements are noted with each proficiency run and many "stickers" are being issued. We find that 25.4% of the fellows have increased
their speed by at least 5 words a minute since the test began and that 6.3% of them are up 10 words a minute or more.

**FINANCIAL STATEMENT**

The League lost about $6000 from normal operations in the third quarter of last year, before taking into account disbursements against Board appropriations. This is about normal for that season of the year which is dull from the business standpoint. By order of the Board, the operating statement appears hereunder for your information:

**STATEMENT OF REVENUE AND EXPENSES, EXCLUSIVE OF EXPENDITURES CHARGED TO APPROPRIATIONS, FOR THE THREE MONTHS ENDED SEPTEMBER 30, 1940**

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**STATEMENT OF REVENUE AND EXPENSES, EXCLUSIVE OF EXPENDITURES CHARGED TO APPROPRIATIONS, FOR THE THREE MONTHS ENDED SEPTEMBER 30, 1940**

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<tr>
<td><strong>Less:</strong> decrease in reserve for news­­ dealer returns of QST</td>
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<td><strong>Net Revenues</strong></td>
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<td><strong>Net Loss before Expenditures against appropriations</strong></td>
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**RADIO IN THE DRAFT ARMY**

Naturally every amateur who is drafted will want to be in radio work. The military authorities, for their part, want to utilize the specialist qualifications that amateurs possess. So we repeat our suggestion to all conscripted amateurs: Take your license with you when you report to your reception center and plug hard for a radio assignment. If you really want radio work, you won't know a thing about any other craft or vocation.

If you get a radio assignment it does not necessarily mean you will go to the Signal Corps, unless you happen to be a member of A.A.R.S. All the arms and services that use radio personnel will receive them from the draft, including such branches as the Air Corps, the tanks, and, of course, the infantry itself. You may be assigned to any one of these.

In the case of A.A.R.S. members, however, the Army has made arrangements whereby any member who is inducted will be assigned to radio work in Signal Corps organizations. Orders to that effect were issued to Corps Area commanders on October 28th and will guide the reception centers. We quote the following from the order:

It is desired that all Selective Service men inducted into the service whose civilian occupation has been in the Engineering or Naval Departments of the American Telephone and Telegraph Company, the Associated Bell Companies, the Independent Telephone Companies, Western Union, or Postal Telegraph Company, and all members of the Army-Amateur Radio System be assigned to Signal Corps organizations.

In the event that the total number of Selective Service trainees falling within the occupations named above, received in any one corps area, be in excess of the needs of Signal Corps Units in that corps area, the War Department will direct the transfer of the excess to Signal Corps Units of other corps areas.

**ELECTION NOTICE**

To all members of the Northwestern Division:

You are hereby advised that no candidate for Northwestern Division alternate director has been nominated under the call published August 1, 1940. By-Law 21 provides that if no eligible nominee be named, the procedure of soliciting and nominating is to be repeated. Pursuant to that by-law you are again solicited to name a member of the Northwestern Division as a candidate for alternate director. See the original solicitation published at page 22 of September QST and page 30 of October QST, which remains in full effect except as to dates mentioned therein: Nominating petitions must now be filed at the headquarters office of the League in West Hartford, Conn., by noon E.S.T. of the 20th day of January, 1941. Voting will take place between February 1 and March 20, 1941, on ballots to be mailed from the headquarters office the first week of February. The new alternate will take office as quickly as

(Continued on page 70)
Here are a few design considerations that may help you in getting the best frequency response out of any simple audio amplifier.

The designer of an audio-frequency amplifier approaches his problem with three requisites in mind — sufficient gain, minimum wave distortion, and correct frequency response.

Getting sufficient gain is probably the least of his worries, although when he has his gain he may find plenty of "hogs." Generally, it is a simple matter to estimate the number of stages required.

Minimizing wave distortion is not quite so simple. The usual procedure here is to follow the tube manufacturer's recommendations as to electrode voltages, load resistances, and signal levels. The signal level is usually so low compared to the electrode voltage, however, that the plate load may vary widely without introducing distortion in voltage amplifiers. Even-harmonic distortion may be eliminated by using balanced (push-pull) stages.

Push-pull circuits offer so many advantages that it often pays to use all push-pull stages in an amplifier. A comparison of typical circuits A and B in Fig. 1 will show that the push-pull stage does not require twice the number of parts required by a single-ended stage. A further saving in push-pull may be made in power-supply filter and in decoupling circuits, since push-pull stages are less sensitive to disturbances in plate supply voltage than are single-ended stages. Also, the coupling transformer in the plate circuit of a balanced push-pull stage does not suffer from d.c. saturation. This permits the use of a smaller transformer, with consequent increased high-frequency response, or greater low-frequency efficiency with a given transformer.

The benefits of all-push-pull operation can be enjoyed with single-ended input by using a single-ended input tube with its output in push-pull with a phase-inversion tube (Fig. 2). The ratio of resistance $R_1 + R_2$ to resistance $R_3$ equals the actual amplification factor of the inversion tube. This ratio should be adjusted to produce equal excitation to the power tubes, or until no signal voltage appears across the cathode bias resistor, $R_{ex}$, of the balanced Class-A stage.

In any resistance-capacity coupled amplifier there is a plate load resistance, a coupling condenser, and a grid leak. The correct value of load resistance is taken from a tube data chart. The coupling condenser allows the a.c. to pass but blocks the plate voltage of the driving tube from the grid. The grid leak feeds the grid bias, since it is connected to a source of potential negative with respect to the cathode and no current is allowed to be drawn through it, and it also acts as part of the plate load. An increase either in the capacity of the condenser or the resistance of the leak will extend the response range of the stage in the low-frequency region. An $RC$ product of 0.01, where $R$ is the grid leak resistance in megohms, and $C$ is the coupling condenser capacity in $\mu$fd., will give a substantially flat response curve down to 30 cycles. Such a product could be obtained, for example, with a 0.01-$\mu$fd. condenser and a...
A coupling circuit for preventing cathode degeneration. The products $R_1C_1$ and $R_2C_2$ should be 0.01 or more, where values of resistance are in megohms and values of capacity in µfd.

1-megohm leak, or with a 0.002-µfd. condenser and a 5-megohm leak. The author prefers the latter combination because mica condensers are superior to paper condensers as to low leakage, long life, and resistance to damage by heating; and 0.01-µfd. micas are a little hard on the pocketbook. Another reason for using a high-resistance leak is that bass response can be attenuated simply by switching in a lower-resistance leak, say 1 megohm, without fear of too low a grid leak resistance affecting the loading of the driving stage.

Frequencies above 5000 cycles are not so easily controlled on CA. However, the input impedance of conventional tubes is in the megohms over the whole audio range, so it should be possible to build a satisfactory wide-band amplifier without inverse feedback or other compensation. Stray, uncontrolled feedback is our worst enemy, but a logical layout of parts with short leads and with the power and low-level stages well separated should minimize valleys and peaks in the response curve below 5000 cycles. One other thing to remember when considering the high frequencies is that electrolytic condensers are not very efficient at 5 kc., and should be shunted by small paper condensers. The zero-audio-potential elements of tubes used in single-ended circuits must be by-passed to "ground." Perhaps the most common destroyer of both low- and high-frequency response is the cathode by-pass condenser. For good response down to 30 cycles, this should be at least 5 µfd. for by-passing 2000 or 3000 ohms and at least 25 µfd. for by-passing 400 ohms or so.

The coupling condenser and grid resistor are effectively in series across the load resistance. The coupling coefficient equals the signal voltage developed across the grid resistor divided by the signal voltage across the resistor and condenser in series, or

$$K = \frac{R}{\sqrt{R^2 + X^2}}$$

(assuming $Z = X$). By manipulation and substitution of $\frac{1}{2\pi f C}$ for $X$, we obtain the useful form

$$R/C = \frac{K}{2\pi \sqrt{1 + K^2}}$$

Probably the easiest way to handle it is to assume a minimum satisfactory value for $K$. Choosing 0.9 for this value and substituting,

$$R/C = 0.326$$

or, for 33 cycles, $RC = 0.01$.


Analysis will show that the degeneration caused by a cathode resistance common to grid and plate returns is

$$= \frac{\text{gain}}{\mu} \left( \frac{R_{\text{load}}}{R_{\text{bias}}} + \mu \right)$$

where $\mu$ is the actual amplification factor. It will be found that $\frac{R_{\text{load}}}{R_{\text{bias}}}$ will nearly equal $\mu$, and thus that the gain of a Class-A amplifier which obtains all of its bias from an unby-passed cathode resistor will be approximately half that of a perfectly by-passed stage. This degeneration does not alter the signal wave-form; and it is perfectly practical to design an amplifier without cathode by-pass condensers if the lower gain can be tolerated. Otherwise the cathode by-pass impedance must be a small fraction of the cathode resistor value over the entire desired frequency range if a flat frequency-response curve is to be obtained.

The author knows hams who never use "tone controls" because they want true, unimpaired frequency response. Nevertheless, it is an advantage to be able to eliminate the high frequencies or the low frequencies for more efficient and understandable modulation. A bass attenuator has already been mentioned, and

(Continued on page 28)

Fig. 5 — The theoretical frequency response of the tone control of Fig. 4 for various settings of the tone control. The solid line (normal response) corresponds to a midway setting of $R_4$. 

January 1941
An Amateur Application of the Wien Bridge

A. F. Oscillator for General Ham Use

BY R. WADE CAYWOOD,* WIKRD

The Wien bridge is quite an old timer in the communication game, but it has remained in the laboratory until recently. During the last year, however, there have been several commercial applications, although the "Hetrofil" is so far the only amateur device using the principle.

The fundamental circuit, shown in Fig. 1, is quite simple, and with some modifications can be applied to such uses as heterodyne reduction, oscillator frequency selection, sound analyzing, frequency measurement, capacity measurement, and condenser power-factor measurement. Our present concern is with its application in simple audio oscillator circuits, of the type suitable for speech amplifier testing and similar uses about the ham shack. Without going into the operation of the bridge, already covered in Dr. Woodward's article, we may say that it is a selective network with a sharp selectivity characteristic, Fig. 2 being typical.

In many applications of the bridge circuit it is necessary to use a transformer or a Wagner ground to get balance to ground. The circuit in Fig. 3, the equivalent parallel-T network, has a common ground connection for input and output, and is therefore frequently more convenient to use. The bridge shown in Fig. 1 can be tuned by varying the two resistors $R_a$ and $R_4$ simultaneously, or by varying $C_1$ and $C_2$ simultaneously. The equivalent parallel-T network can be tuned with three ganged resistors, $R_5$, $R_6$, and $R_7$, or three ganged condensers, $C_3$, $C_4$, and $C_5$. If, in the circuit of Fig. 1, $R_1 = 2R_2$, $C_1 = C_2$, and the ganged resistors $R_5$ and $R_4$ have the same value, the simple equation defining the frequency of the null point is:

$$f = \frac{1}{2\pi R_a C_1}$$

In the parallel-T network of Fig. 3, if $C_3 = C_4 = \frac{1}{2}C_5$ and $R_5 = R_6 = 2R_7$, the equation is:

$$f = \frac{1}{2\pi R_5 C_3}$$

Audio oscillators using the Wien bridge or its equivalent parallel-T network as a selective feedback network have recently been introduced commercially. Essentially such an oscillator is an amplifier with both positive and negative feedback. The positive feedback occurs at all frequencies while the degenerative feedback just cancels the positive feedback at all frequencies except the frequency for which the network is tuned. By varying this null point, the frequency of oscillation is varied. An audio oscillator using the Wien bridge or its equivalent-T for the degenerative feedback has many advantages over the conventional heterodyne and LC audio oscillators. The heterodyne oscillator is a complicated affair with many tubes and circuits; while the LC oscillator requires an iron-core coil.

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A simple oscillator circuit having many uses about the ham shack. Continuously variable over the audio range, and generates a signal with good waveform.

Fig. 4—Simple bridge audio oscillator circuits. A — using the parallel-T network; B — using the bridge.

C1, C2 — 0.15 µfd.
C3, C4 — 0.15 µfd.
C5 — 0.1 µfd. or larger.
R1 — 4000 ohms.
R2 — 2000 ohms.
R3, R4 — 10,000-ohm potentiometers.
R5, R6 — 10,000 ohms.
R7 — 5000 ohms.
R8 — 500 ohms.
R9 — 5000-ohm variable.
R10 — 0.25 megohm.
R11 — 0.5-megohm potentiometer.
T1 — 3:1 audio transformer.
T2 — 500-2000-ohm transformer.

The above listed values are merely examples. Any resistors and condensers that satisfy the equations may be used.

and large condensers to tune to audio frequencies, with the result that the frequency is usually varied in steps rather than continuously. The Wien bridge oscillator can be made quite simply, requiring only one tube, and can be tuned continuously by resistances; in addition, it gives practically harmonic-free output because of the sharp characteristic curve of the degenerative network.

Fig. 4-A is a simplified oscillator of this type, using the parallel-T network. The Wien bridge and a transformer are used as the selective network in the oscillator shown in Fig. 4-B. A Hetrofil can be used as the bridge in the latter circuit. In both circuits the positive feed-back is obtained through the 1:3 transformer, T1, with the low-impedance side in the grid circuit. The amount of regeneration is controlled by the cathode resistor, R9. A by-pass condenser across R9 is apt to cause the oscillator to produce all sorts of gurgling sounds, and therefore should not be used. The oscillator can be tuned by either of the methods previously described. If the feed-back is too great a resistor, R8, of the order of 500 ohms, will have to be put in series with the grid lead.

The circuit of Fig. 4-A has the advantage of requiring only one cheap transformer, but has the disadvantage that a three-gang resistor that stays ganged is needed. Condenser tuning might be used instead, or a number of feed-back circuits could be switched in or out for different fixed frequencies. The circuit of Fig. 4-B has the advantage of being easily tuned by a two-gang resistor, but has the disadvantage of requiring two transformers.

It would be possible to obtain the 180-degree phase shift necessary for degeneration by using a voltage from the plate circuit of the second section of a double-triode tube. This would make possible the elimination of a transformer, thereby cutting cost and reducing size. However, in this connection it must be pointed out that the two feed-back voltages applied to the grid must be exactly 180 degrees out of phase. This condition is hard to fulfill when more than one tube is used.

In Fig. 4-A, the resistance of the potentiometer across the output should be high so that the degenerative voltage is unaffected. The resistors in the degenerative network should be fairly high in value so that a substantial degenerative voltage can be developed at low current.

The cathode-resistor control should be advanced only far enough to set up reliable oscillation. The plate-supply voltage can be varied from about 150 volts to about 450 volts without causing a noticeable shift in oscillator frequency.

At medium and low output, the harmonic distortion is so small as to be negligible. However, at high output a small second harmonic is discernible. The output volume is too great for comfort when using a headset, but if greater volume is needed for loud-speaker operation it would be advisable to add an amplifier rather than to try to get more output directly from the oscillator. This will keep the harmonic content to a minimum.
Marathon certificate winners for each A.R.R.L. Section for the year 1940 will be announced shortly... with the Medallion awards to the leading operators for the records made for each of three uhf band groups, 56-60 Mc., 112-116 Mc., and above 224 Mc. Suggestions for a new A.R.R.L. Marathon received from a number of sources have been incorporated in plans for a brand new opportunity for the coming year.

(1) In 1941 the high monthly scorer will receive certificate recognition for the leading results reported covering performance between each 16th of one month and the 15th of the following month inclusive. (2) Special certificates will go to Marathon Leaders for each A.R.R.L. Section for the whole period Jan. 16 to Dec. 15, 1941, inclusive. (3) Solid-bronze medallion awards will be engraved with the calls of winners for each of four uhf band groups for the whole 1941 period (56-60 Mc., 112-116 Mc., 224-230 Mc., 400-and-above Mc.). Reproductions of the medallion and certificate awards, each to be approved by an award committee consisting of the Contributing Editor, U.H.F., QST's Technical Editor, and the A.R.R.L. Communications Manager, appear herewith.

Rules

1. The Contest is open to all U. S. licensed radio amateurs, and will take into account operating and experimental work reported at monthly intervals during the contest period Jan. 16 to Dec. 15, 1941, inclusive.

2. Contact Points. Contacts may be scored for each completed QSO sufficiently good to permit exchange of intelligence with a station! One contact only, per band, per year, per different station, counts in the claims. Points claimed depend on distances measured by a great circle line between stations as follows:

- Under 25 miles: 1 point
- 25 to 75 miles: 2 points
- 75 to 250 miles: 5 points
- 250 to 500 miles: 25 points
- 500 to 1500 miles: 100 points
- Over 1500 miles: 500 points

3. Multipliers.

- 56-60-Mc. contacts: 1
- 112-116-Mc. contacts: 2
- 224-230-Mc. contacts: 10
- Above 400-Mc. contacts: 25

The frequency band of one's transmitter shall determine contact multipliers allowed (1, 2, 10 or 25) and permits cross-band work to count.

4. Frequency Modulation Multiplier. For all points made in which the transmitter of the claimant is adjusted for and uses controlled FM, the points may be figured as in Rules 2 and 3 for various frequency bands, and then a multiplier of two in addition to any other factors may be applied. The use of FM at stations contacted does not
affect your own score. Claims for a given station in a given band may include either an FM or AM credit, but not both.

5. Special Credit for Regular Activity. A maximum of 3 points per day, one for each contact with a different station, may be claimed by each contestant, the total number of points per month on this basis not to exceed 50. For this factor, the same stations may be worked on different days toward this regular activity credit. It is necessary that all three contacts for a particular day be made with transmitter on one particular u.h.f. band. All QSO's must be shown in logs kept available for call (in proof of the points, if requested by award committee). This monthly credit not to exceed 50 points is added after the score has been determined under Rules 2, 3 and 4.

6. Substitution of Portable or Portable-Mobile Credits. Instead of a credit for work with a fixed or permanent amateur station, a credit for communication with that same call identity operating portable or portable-mobile, may be substituted in a given band, if the distance and the resulting credit is greater. All locations of temporary stations of portable or portable-mobile character must be accurately and correctly defined to permit a valid claim. A call signal is regarded as indicating a single station identity, whether operated in fixed or portable or mobile status. Points claimed must, therefore, be only those attained by an individual amateur operator, operating equipment under his own call, and whether one or both stations go portable, there is only one acceptable claim per band for those stations, that of the best DX.

A portable or portable-mobile equipment may be used by the competitor himself, and when duly controlled and operated by this operator, points attained by contact with stations not included in claims resulting from the operation from the fixed or permanently located station, may be granted. In other words, but one contact between any two station identities may count for credit in a particular band, that claim for the best distance between two given stations taking precedence.

7. Reporting. Monthly claims must be made in the form of a "stations worked" list, showing distances and points for each QSO and giving claimed total of all credits for a given reporting month (16th to 15th inclusive).

Reports must be sent at once after each reporting month for claims to be allowed. i.e., reports for a particular month must bear a postmark not later than the 22nd of that month.

The special mimeographed report forms (or facsimile thereof) available from the Contributing Editor, U.H.F., should be used in making monthly report.

8. Proof of contact in writing from any stations contacted may be required as prerequisite to credit whenever thought necessary by the award committees. E.C.C. logs may be submitted as necessary to straighten out points in doubt.

9. An extra credit, in no case to exceed 10%, may be granted participants for submitted articles in the u.h.f. field. Intelligent observation of unusual conditions, "photos, etc., such to count for marathon awards only if these items are summarized and brought to the attention of the Committee toward the end of the 1941 Marathon. No claims will be considered if received after December 31, 1941.

Operating utilization of the u.h.f. bands and experimental progress making contacts possible on the higher frequency of these bands will prove important and necessary to come out a winner. The Marathon should clearly indicate the U.H.F. leader for the year for each territorial Section.

In computing scores, claims will be allowed for each different station worked but once on a particular u.h.f. band (of the four named in Rule 3) for the entire year. The monthly additions to your credits based on this standing to be considered at the year-end toward the 1941 U.H.F. ACHIEVEMENT Certificates for Section leaders — and toward the four medalllion awards! All points claimed must be those obtained by one individual amateur operator himself, operating equipment only under his own call and control. A call signal indicates a single station identity for all purposes whether combined with the portable indicator or not. The Award Committee may declare "no award" if fewer than three entries turn up in any classification or may declare "duplicate awards" if circumstances warrant. A.R.R.L. staff members may participate but are ineligible for awards. It is not required that an amateur be a League member to take part fully. All licensed U. S. hams are invited to report their worked lists and point claims for each reporting month, starting in mid-February for the period Jan. 16th-Feb. 16th inclusive. Mail reports to A.R.R.L. Communications Department, West Hartford, Conn.
A.V.C. for C.W. Reception

Automatic Control of Code Signal Levels

BY EDWARD H. WEBER,* W2GRD

A common fault of the ordinary superheterodyne receiver using a "c.w. oscillator" is the inability to use automatic volume control when the c.w. oscillator is turned on without greatly reducing receiver sensitivity. This is due to the fact that the c.w. oscillator loads up the a.v.c. rectifier which, in turn, imposes proportionate negative bias on the grids of the preceding amplifier tubes. Since the output of the c.w. oscillator is usually much greater than the output level of the i.f. amplifier, there is a very great reduction in receiver sensitivity. For this reason, receivers are equipped with switches to disable the a.v.c. when the c.w. oscillator is operating. Receiver gain then is controlled manually by an "r.f. gain" dial.

In more elaborate receivers of a few years ago, a separate i.f. amplifier and rectifier was used for a.v.c. alone. One such receiver is described in the Handbook of 1936. One purpose of this design was isolation of the c.w. oscillator from the a.v.c.

Whether in reception of phone or c.w. signals, automatic gain control is desirable for three reasons: (1) to prevent overloading of i.f amplifiers, (2) reduction of level variations due to fading, and (3) limiting output to a desirable level. In present-day receivers these features are not attainable automatically for c.w. reception.

A simple modification of the second detector-a.v.c. circuit has been designed by the writer which permits a.v.c. action both for phone and c.w. reception without the fault previously mentioned. Because of its simplicity, modification of most modern receivers is practical at little or no expense.

The Circuit

The fundamental principal involved in the new circuit is illustrated by Fig. 1, where the second detector is represented by the parallel impedance $Z_1$; $Z_2$ is a balancing impedance equal to $Z_1$ at the intermediate frequency; $R$ and $R'$ are equal resistances representing the two halves of a center-tapped i.f. output transformer secondary. The arrangement is seen to be equivalent to a Wien bridge which is in balance at the intermediate frequency, which is also the frequency of the c.w. oscillator. Since the second detector is one arm of the bridge, it receives the output both of the i.f. amplifier and the c.w. oscillator. Any audible difference in frequency between these two sources will, consequently, be found in the output of the second detector — the familiar heterodyne. The a.v.c. rectifier, however, is bridged across opposite corners of the balanced bridge. For this reason, it receives only the output of the i.f. amplifier, and is unaffected by the c.w. oscillator.

The practical circuit is shown in Fig. 2. Here, $V_1$ and $V_2$ are second detector and a.v.c. rectifier, respectively, and may be contained in a single envelope, as in a 6H6. $R_1$ and $R_2$ are the second detector load resistors. $R_2$ and $C_2$ form an r.f.

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filter circuit to isolate the c.w. oscillator from the audio output and C3 and R3 together comprise the balancing impedance Z2 of Fig. 1. R4 and C4 make up the filter and time circuit for the automatic volume control, while R5 is the a.v.c. rectifier load resistor, C1 and C2 are r.f. coupling d.c. blocking condensers, and C5 is an a.f. coupling, d.c. blocking condenser. The c.w. oscillator is merely represented as a block, since it may be of any conventional design. The potentiometer P will be explained later. The values shown are representative only, and may be chosen in accordance with requirements.

The essential condition for balance is that Z1 of Fig. 1 must equal Z2 at the intermediate frequency. Z1 is represented as shown, since the input impedance of the second detector is composed of the inter-electrode capacity of the diode, shunted by its input resistance to the carrier. The input resistance of a diode, when the load resistance is high, is nearly equal to one-half the total load resistance, or, \((500,000 + 100,000)/2\) for the values assumed in this case. The plate-cathode capacity of the No. 1 section of a 6H6 is 3 µfd. Since Z2 is composed of C3 and R3, these values may be determined by the expression

\[
R_3 - jX\alpha = \frac{rX}{r - jX}
\]

where \(r\) is the input resistance of the second detector, and \(X\) is the reactance of the plate-cathode capacitance at the intermediate frequency. For the values assumed, and an intermediate frequency of 456 kc., the values of \(R_3\) and \(C_3\) are 38,600 ohms and 3.5 µfd., respectively.

Other requirements are that the c.w. oscillator and its wiring be well shielded to prevent any stray coupling into the receiver circuit at any point other than as indicated in the diagrams; and that the secondary winding of the i.f. output transformer be balanced, both in inductance values and in capacities to ground, on each side of the center-tap. This latter is more readily assured if an air-core transformer is used, with primary and secondary windings well separated.

Now that a.v.c. action is obtained on c.w. reception, there is the annoyance of rapid changes in receiver sensitivity as the incoming carrier is keyed, resulting in a thump. One way to reduce this effect is to use a large time constant in the a.v.c. circuit. A better method, however, is to augment the a.v.c. with manual r.f. gain control, adjusting the latter until the change in gain due to a.v.c. action is slight. However, for receivers using full a.v.c., the sensitivity must be greatly reduced to accomplish this. Where delayed a.v.c. is used, the optimum adjustment of the r.f. gain control is obtained when the peak value of the signal applied to the a.v.c. rectifier is equal to the d.a.v.c. bias voltage. This gives smooth reception of c.w. signals, but limits the output level of the i.f. amplifier to the fixed value of the d.a.v.c. bias voltage, and makes delayed a.v.c. a requirement for smooth c.w. reception.

A very much better method of controlling receiver sensitivity is to increase the d.a.v.c. bias voltage as sensitivity is reduced. By so doing, there is no sacrifice of receiver sensitivity, output level, or the desirable features of a.v.c. action. The slight modification necessary to accomplish this is shown in Fig. 3, and is applicable to any diode-type a.v.c. system. Values, including that of potentiometer \(P\), may be chosen at will in accordance with good practice. The potentiometer uses or replaces the r.f. gain control on the receiver. It will be seen that this potentiometer accomplishes the dual functions of supplying variable negative bias to the amplifier grid returns, and biasing the a.v.c. rectifier by the same amount. Thus, the total bias delivered to the amplifier grids is the sum of that obtained from the potentiometer, and the voltage delivered by the a.v.c. rectifier. Up to the point on the potentiometer where rectification ceases in the a.v.c. rectifier, due to the bias from \(P\) being equal to the peak r.f. voltage, the total bias delivered to the amplifier grid returns is uniform, and is the same as would be obtained from the a.v.c. rectifier if unbiased. Consequently, the gain of the receiver remains the same up to that point, but reduces beyond that point. However, as that position on \(P\) is approached, the variation in receiver sensitivity, as the carrier is keyed, becomes less, and remains perfectly constant at the point where rectification just ceases, the ideal condition.

In most receivers the manual r.f. gain control consists of a potentiometer, or its equivalent.
in the cathodes of the r.f. and i.f. tubes, to vary the potential of the cathodes above ground. In such cases, the only modification necessary to obtain the same result is to return the cathode of the a.v.c. rectifier to this potentiometer instead of to ground. The resultant combined circuit is shown in Fig. 4.

Here are combined the advantages of manual and automatic volume control, for c.w. reception. There is also a decided improvement in the reception of non-continuous carrier radiophone, such as is encountered when voice-operated relays, or push-to-talk switches, are used on transmitters in certain types of commercial services. In such cases, the advantage lies in the fact that by adjusting the manual r.f. gain control near the optimum setting as previously explained, overall receiver sensitivity is restricted when the carrier is off, thereby limiting the noise level during carrier-off periods.

By combining the two modifications, either as shown in Fig. 2 or in Fig. 4, nothing is sacrificed in the receiver, and much is gained at little or no expense.

**Results**

For the original trial, these modifications were made in an RCA ACR-155 receiver, which is "made to order" for the arrangement of Fig. 2. The ACR-155 uses a 6H6 second detector-a.v.c. tube, the c.w. oscillator is thoroughly shielded and isolated, and the manual r.f. gain control is arranged to provide variable negative bias for the grids of the r.f. and i.f. tubes. Complete changeover was accomplished in three hours, and the only expense involved was replacement of the i.f. output transformer with one having a center-tapped secondary. The 100,000-ohm r.f. gain control was retained for P, but a 10,000-ohm unit would work as well. Incidentally, values of the balancing impedance $Z_2$ components were found to be non-critical, full satisfaction having been attained using an available 35,000-ohm resistor for $R_3$, and a $5-30 \mu F$ trimmer condenser at minimum setting for $C_3$.

Operation of the receiver for c.w. can be handled in the same manner as for 'phone reception. With the r.f. gain control at maximum receiver sensitivity, and the c.w. oscillator on, it is a pleasure to tune across the c.w. bands and hear the weakest signals, with the assurance that the speaker won't jump out on the floor when strong signals are encountered, since the a.v.c. is always in use. When a particular signal is selected, the r.f. gain control may then be adjusted for smooth operation if necessary, and the a.v.c. will still take care of increases in signal strength due to unsteady transmission, or sudden blasts from strong interfering signals. When an interfering signal is considerably stronger than the desired signal, it will take control of the a.v.c. and cause variations in the strength of the desired signal as the interfering signal is keyed. This is remedied by adjusting the r.f. gain control until the interfering signal no longer operates the a.v.c. The desired signal then no longer controls the a.v.c., and is weakened accordingly, just as when full manual r.f. gain control is employed as in present receivers.

There is an advantage in tuning 'phone stations, particularly on the ten-meter band where tuning may be critical, since the c.w. oscillator may be turned on to zero-beat a signal without reducing volume, and without causing frequency shift if stability of the converter tube is affected by changes in grid bias, since the c.w. oscillator has no effect on grid bias through the a.v.c. channel. This system may also facilitate break-in operation, since the a.v.c. will prevent overloading the receiver when the transmitter is operating at or near the receiving frequency.

All in all, the improvements attained by these changes are well worth the little effort and expense involved, for, after all, if a.v.c. is desirable for 'phone reception, why not equally so for c.w. reception? Furthermore, operation is simplified by the elimination of one more control, the a.v.c. switch, from the front of the receiver panel.

**Some Notes on Fidelity**

(Continued from page 21)

Treble frequencies can be attenuated by a small condenser shunting the load resistance or the grid resistor. For example, a 250-$\mu F$ condenser shunting a 0.25-megohm load will begin its attenuation at about 2000 cycles. Fig. 4 shows a circuit in which a single control attenuates either bass or treble, depending upon the setting, and the curve in Fig. 5 shows the range of control using this system.
**Fifth U.H.F. Contest Successful**

**BY JAMES R. BUCKLER, JR.* W9NFL**

With many established routes of past relays working in fine style, the September Contest Relay saw many new stations taking part and a further extension of the trend to higher frequencies. The absence of DX-skip communication made the work of carefully planned routes stand out as being the most reliable and effective means of handling messages over distances on the u.h.f. bands. Reports indicate that 112 Mc. was used to a greater extent than ever before; many participants used this band exclusively.

Outstanding was the score of W2DKJ/2, taking top place with 858 points and a total of 50 contacts. Arthur Lynch used both 56 and 112 Mc., exclusively - this time making the work of carefully planned routes to set this new high for U.H.F. Contest scoring. Runner-up W1AUN/1 piled up a score of 476 points with 65 contacts from Mt. Wachusett. Third place we find taken, once again, by a station using 112 Mc. exclusively - this time making the work of carefully planned routes to set this new high for U.H.F. Contest scoring. Arthur Lynch used 112 Mc. exclusively - this time making the work of carefully planned routes to set this new high for U.H.F. Contest scoring. Runner-up W1AUN/1 piled up a score of 476 points with 65 contacts from Mt. Wachusett. Third place we find taken, once again, by a station using 112 Mc. exclusively - this time making the work of carefully planned routes to set this new high for U.H.F. Contest scoring. Arthur Lynch used 112 Mc. exclusively - this time making the work of carefully planned routes to set this new high for U.H.F. Contest scoring. Runner-up W1AUN/1 piled up a score of 476 points with 65 contacts from Mt. Wachusett. Third place we find taken, once again, by a station using 112 Mc. exclusively - this time making the work of carefully planned routes to set this new high for U.H.F. Contest scoring. Arthur Lynch used 112 Mc. exclusively - this time making the work of carefully planned routes to set this new high for U.H.F. Contest scoring. Runner-up W1AUN/1 piled up a score of 476 points with 65 contacts from Mt. Wachusett. Third place we find taken, once again, by a station using 112 Mc. exclusively - this time making the work of carefully planned routes to set this new high for U.H.F. Contest scoring. Arthur Lynch used 112 Mc. exclusively - this time making the work of carefully planned routes to set this new high for U.H.F. Contest scoring. Runner-up W1AUN/1 piled up a score of 476 points with 65 contacts from Mt. Wachusett.

W1HDQ, making use of both 56 and 112 Mc., came through with 348 points and 33 contacts for the highest score yet attained by a fixed station. Of the many routes along the East Coast, W1HDQ-W2ILK/2-W3HOH-W3ABS-W3BZJ route and the circuit of W2DKJ/2-W1MRF-W1IJ-W1HDQ were among the foremost. These channels handled a number of third party messages in addition to test messages.

The East Coast-Illinois route was clicking very well, indeed, with the line-up of W3BZJ-W3HWN-W8EUO/8-W8CIR-W8QUO/8-W8QDU-W8MDA-W8CVQ-W9VHG. Variations and extensions of the route took messages from New England to Chicago and to other points along the route in both directions. Too much credit cannot be given those covering long distances, shows that relays are rapidly developing into a practical and efficient system. The routes listed below each carried a message to its destination. Asterisks mark those routes by which a reply was returned to the originating station. In some cases the return route may have differed slightly.

**SCORES, FIFTH U.H.F. CONTEST AND RELAY**

(Figures represent score and number of different stations worked. Letters indicate band or bands used. A for 56, B for 112 Mc.)

<table>
<thead>
<tr>
<th>Call</th>
<th>Score</th>
<th>Band</th>
<th>Call</th>
<th>Score</th>
<th>Band</th>
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<td>W2DKJ/2</td>
<td>858-50-AB</td>
<td>A</td>
<td>W1HDQ</td>
<td>58-25-A</td>
<td>A</td>
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<tr>
<td>W1AUN/1</td>
<td>476-65-AB</td>
<td>A</td>
<td>W1BDS/1</td>
<td>392-46-B</td>
<td>A</td>
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<tr>
<td>W1HDQ</td>
<td>348-33-AB</td>
<td>A</td>
<td>W1MU</td>
<td>46-16-B</td>
<td>A</td>
</tr>
<tr>
<td>W8BZJ/8</td>
<td>392-8-A</td>
<td>A</td>
<td>W1LNS</td>
<td>14-14-A</td>
<td>A</td>
</tr>
<tr>
<td>W8QUO/8</td>
<td>241-15-A</td>
<td>A</td>
<td>W8MDA</td>
<td>43-5-AB</td>
<td>A</td>
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<tr>
<td>3BZJ</td>
<td>222-28-A</td>
<td>A</td>
<td>W1LPF</td>
<td>32-21-A</td>
<td>A</td>
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<td>W8HO</td>
<td>172-22-A</td>
<td>A</td>
<td>W1KSB</td>
<td>40-12-B</td>
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<tr>
<td>W2WM/W</td>
<td>159-27-B</td>
<td>A</td>
<td>W1LEA</td>
<td>39-22-A</td>
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<td>A</td>
<td>W8VHG</td>
<td>38-4-A</td>
<td>A</td>
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<td>W1KSB</td>
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<td>W9ARN</td>
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<td>A</td>
<td>W1MRQ/1</td>
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<tr>
<td>W2DIZA</td>
<td>117-39-B</td>
<td>A</td>
<td>W3BFH</td>
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<tr>
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<td>W2MOP</td>
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<td>W1MF/K</td>
<td>224-A</td>
<td>B</td>
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<td>105-11-A</td>
<td>A</td>
<td>W8BFW</td>
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<td>103-50-AB</td>
<td>B</td>
<td>W1CEA</td>
<td>20-A</td>
<td>B</td>
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<td>W1IUI/1</td>
<td>109-24-A</td>
<td>B</td>
<td>W3BRZ</td>
<td>16-5-A</td>
<td>B</td>
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<td>W2CZU</td>
<td>94-19-A</td>
<td>B</td>
<td>W2DS</td>
<td>15-A</td>
<td>B</td>
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<td>91-35-B</td>
<td>A</td>
<td>W1IP</td>
<td>14-5-B</td>
<td>A</td>
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<td>71-28-B</td>
<td>B</td>
<td>W1MNC</td>
<td>10-3-B</td>
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<td>69-10-A</td>
<td>B</td>
<td>W2HZP</td>
<td>6-A</td>
<td>B</td>
</tr>
</tbody>
</table>

*Communications Department.*

(Continued on page 70)
Why Not Parallel Feed?

A Comparison with Series Feed in Transmitter Circuits

BY T. M. FERRILL, JR.,* WILJI

Without risk of serious contradiction, the author considers the points of highest importance in transmitters of any power class to be efficiency, cost, compactness, and dependability. If a good design, based on the first three of these considerations, is properly constructed with quality parts, dependability will result.

Economy, efficiency, and compactness depend a great deal on the circuits used. A quick glance at the photograph will give a clear comparison between two push-pull amplifiers of the same power and efficiency, but with marked contrast in compactness and cost. The same tubes are used, operated at the same plate voltage, excitation, and grid bias, with the same L/C ratios, and on the same frequency.

The important difference between the two circuits lies in the use of parallel feed in the plate and grid circuits of the compact amplifier. The other unit, operated at equal efficiency and equal power, but using a base twice as large to hold the bigger parts, uses conventional series-feed in plate and grid circuits.

One important feature in transmitter design is the degree to which the operator is protected from death-dealing shock. The two r.f. amplifier designs shown contrast strongly in this respect — the parallel-feed system is far safer. Even without the economic reasons, increased safety alone should stand as a sufficient reason for choice of parallel feed. Strangely enough, an amateur who would not tolerate the risk of bare 110-volt a.c. wiring in his home too often will scarcely give a thought to exposed 2000-volt transmitter circuits almost asking to be touched!

With several advantages of the parallel-feed r.f. amplifier pointed out, let's go a bit further into detail on how much is to be gained by use of parallel feed, and why these benefits result. To begin with, this is an old-timer among transmitter circuits — as old as Hartley oscillators. Although parallel-fed circuits were very popular many years ago, they are seldom found in modern medium- and high-power amateur transmitters.

parallel-fed high-power circuits at 14 and 28 Mc.

About the only strain to which chokes are subject in the series-fed circuits is the heating effect of the d.c. plate current. The chokes are usually rated only in terms of d.c. current-carrying capacity, d.c. resistance, and inductance measured at low frequencies. Connecting a conventional r.f. choke across a high-power transmitter tank invariably results in marked inefficiency at the high-frequency amateur bands — and the choke usually burns up in a hurry!

With series feed, the r.f. voltage across the choke is a very small fraction of the r.f. tank voltage, but with parallel feed half or all of the tank voltage, depending on the circuit, is across the choke. Unless the choke has very high impedance at 28 and 14 Mc., as well as the three lower-frequency bands, the r.f. amplifier efficiency will be low and the choke will be short-lived.

If the amplifier is used only on the lower frequencies, ordinary pie-wound chokes may be used successfully and the advantages of parallel-fed circuits may readily be obtained. Similarly, solenoid-type chokes may be wound for transmitters working on one, or perhaps two, bands at the high-frequency end of the ordinary communications spectrum, the proper number of turns and type of winding being determined experimentally. However, if the same transmitter is to be used on all five bands the construction of a choke which will provide high impedance and efficient operation over such a wide frequency range is a prime necessity. Consideration of this problem led to the development of a choke of the type shown in the photograph. With fewer turns of smaller wire single-layer wound on a special form, this choke has low d.c. resistance and can stand the full r.f. voltage across a high-power tank circuit without overheating or sparking. The design is the result of a considerable amount of experimental work, in the course of which it was found that, although the construction is simple enough, the performance depends critically upon the number of turns per section and the dielectric constant of the form on which it is wound. Even the wire size must be held to a closer tolerance than is ordinarily the case with common gauge numbers, and substitution of other materials for the ceramic form probably will necessitate some revisions in the coil sections. For the benefit of those who might want to "roll their own", the data on the original wooden-form choke from which the final model was developed are given in Fig. 3.

There is more difference between the circuits of these two amplifiers than just insertion of new r.f. chokes. The series-fed circuit of Fig. 1 has been in very common use during several years past. In it, no attempt has been made to minimize voltage across tuning or neutralizing condenser sections, and no thought is given to precautions for the operator's safety. Three measures can be taken to remove the (Continued on page 78)

At the right, a conventional r.f. amplifier with series-fed plate and grid circuits. Note the large tank and neutralizing condensers required; these are not only expensive and inconvenient, but the capacity ranges obtainable are limited and the large size makes them poorly adapted to high-frequency circuits.

The same supply and modulating voltages may be used in the parallel-fed amplifier at the left, in spite of the small plate spacings of the variable condensers. Greater compactness (with a base half as large), lower cost, better circuit arrangement, and more operating safety are features of this parallel-fed amplifier.

January 1941 31
These predictions are for maximum and minimum useful distance ranges in the five amateur frequency bands regularly useful for long-distance sky-wave transmission during January, February, and March 1941. For a discussion of sky-wave transmission see Letter Circular 614 of the National Bureau of Standards, "The ionosphere and radio transmission"; it was published in part in QST, page 32 of March, 1940. The use of the charts in the present article was explained in the article in the September, 1940, issue, page 26, entitled "Predictions of useful distances for amateur communication."

Propagation conditions during January and February 1941 are shown in the graphs below. The charts are organized by frequency band and show the useful distances for each band. The local time at the place of reflection is also indicated. The 56-Mc. band will be useful only for local transmission (optical and quasi-optical paths).
February will be of the winter type, similar to those during November and December. The daytime skip distances will be short and the static and absorption small, so that conditions will be favorable for daytime long-distance transmission. The night skip distances will be greater than during the summer and in general conditions will be poor at night on the 14- and 28-Mc. bands. Daytime transmission at 28 Mc. will be still be good over long distances.

In March the static and absorption will increase somewhat and the daytime skip distances will start to increase for the approaching summer. Ionosphere storms may also be more likely to cause periods of poor transmission. It should be kept in mind that the graphs represent average conditions for undisturbed days. There will be some day-to-day variations about the average, and on days of ionosphere storms variations may at times be extreme.

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**BOOK REVIEW**


With amateur radio completely closed down, with many amateurs themselves actively engaged in a military service, yet the first edition of the R.S.G.B.'s Amateur Radio Handbook during the past year sold out 3000 copies of a second printing fatefully received from the printer the week following the outbreak of hostilities last September.

In the face of such an amazing demonstration both of the amateur's loyalty and of the genuine merit of the publication, the Society felt itself justified in bringing out a thoroughly-revised second edition. Like the earlier edition, this one will be found not only in ham shacks throughout the Commonwealth, but "in barrack rooms, dug-outs, ship's wireless cabins, research laboratories and workshops." It is accepted as an authoritative instruction manual by many branches of H.M. forces.

The revision enhances the utility of the book as a text somewhat, but in no wise does it destroy the ham spirit or convey any purpose other than that of catering to transmitting radio amateurs. Two entirely new and very useful chapters have been included — one on Workshop Practice which every American amateur could read with profit, and one on Crystal Band-Pass Filters.

With the previous edition, the emphasis is on theory and fundamentals, rather than practical constructional information. It is therefore an ideal source of technical instruction and training.

The R.S.G.B., the fifteen collaborators and contributors, and in particular Jack Claricroft, G6CL, the editor, are most heartily to be congratulated on an excellent job done under trying circumstances. The Editor's Foreword concludes: "The Spirit of Amateur Radio shall never fail." They have done their part to make this statement a true one. — C. B. D.

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**Strays**

We often see hams climbing over roofs and up poles to make changes in the antenna system, fumbling around trying to get their pliers out of their back pocket. As a rule, the pliers work their way down into the bottom of the pocket where it's difficult to get them out. This trouble can be avoided by just hanging them over the edge — one handle in the pocket and the other handle outside. You might think they would fall out, but my experience has proved otherwise. Any electrician or telephone man uses this trick when he doesn't have a belt. — *WSOKP*.

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**BOUND VOLUME XXIV OF QST**

We have a limited number of Bound Volume XXIV of QST. This volume is made up in two sections, each containing six issues of 1940 QST. Handsomely bound and gold imprinted the complete volume is priced at $7.50, postpaid.
Fourth Annual A.R.R.L. Member Party

Saturday—Sunday, January 18th—19th—Certificate Awards—Get In On Membership Fun—Call "ARRL de . . . ", Start a QSO List—Use 'Phone or Telegraph or Both, Any Bands—Try Your Luck; See What You Can Do; Report

Our don't ask anybody to shift from c.w. to 'phone, from 'phone to c.w., or from one band to another. Work any or all ways you like best. Try new sides to amateur radio if you wish. Just take part and send in the list of calls of members you worked, with the exchanged information (name of Section 1 and the date their membership expires, month and year) with your claimed score. Just for information tell what frequency bands you worked.

Log forms (not necessary) will be sent free on request to Hq., or rule your own, just three columns listing calls, Section, 2 dates. In radiotelephone contacts the Section, membership month and year will be named. No special order is required. It's a "one operator" activity, or separate scores for each operator may be sent in.

Radiotelegraph members will abbreviate Section names and use four numerals to show membership dates. "Conn 0343" will mean "Connecticut Section, my membership good through March 1943" for example. Information to be exchanged in every case comes right off your own League membership certificate or pocket card.

League Members only are eligible. It is a family party for members. To get contacts send "ARRL de . . . " Chat with as many other A.R.R.L. members (anywhere) as possible. The leading member in each Section will receive a Certificate Award. Advance entry is not necessary. Scores can be all by one mode, or part telephone and part voice — and any combination of frequencies you like. When completing contacts, be sure to add to fraternalism by giving your personal "sine" (c.w.) 2 or nickname ('phone) before your identifying final transmission of your call signal, at the conclusion of QSO's.

One new factor this year: A fixed credit of 50 points may be added to one's score, before multiplier, depending on (1) submitting evidence such as the date of having received a League W1AW Code Proficiency Award, responsive to the A.R.R.L. Member QSO Party Advance Announcement appearing in December QST or previous W1AW code-qualifying runs, or (2) submitting with the report or list on this activity, copy made during this Member Activity, at any one of the speeds, on the W1AW run starting at 10:30 P.M. EST, Sunday, January 19th. (Send your copy, however it looks to you.)

Starting Time: Saturday, January 18th, 3 P.M. PST; 4 P.M. MST; 5 P.M. CST; 6 P.M. EST or the equivalent time at any point.

Ending Time: Monday, January 20th, 12:01 A.M. PST; 1:01 A.M. MST; 2:01 A.M. CST; 3:01 A.M. EST or equivalent.

Operate any 20 hours of the 33-hour party. "Time out" is permitted for copying W1AW. State contest hours you did not operate if your score is over 10,000.

Scoring: 1 point for each complete set of information sent; 1 point for each set of data received and logged. No member can be worked to get more than one complete exchange for 2 points. Add 50 points if you include Code Proficiency Evidence, as explained. The sum of all points will be multiplied by the number of different Sections 3 in which at least one member has been worked and exchange effected. A convenient way to keep record of new and different Sections as you work them is to circle and number the name of the Section the first time it is written in your list . . . or mark the list in the front of QST, also.

1 See complete list of A.R.R.L. field organization Sections, in the front of this issue of QST.

Easy to take part. Enjoyable! SWAP name of Section and month—and-year of A.R.R.L. membership expiration; 50 Points (new) for Code Proficiency Evidence. Get In It! Send worked list to A.R.R.L.
The WAS (worked all states) possibilities are unlimited. Fun and new member-contacts are assured. See how many members you can work on these dates. If you work anyone not a member, ask him "Why not?" After all, that fellow also has a stake in our frequency assignments, and continued operating privileges, and the proper support of the only organization giving insurance or assurance through its program of both representation and activities, and he owes it to himself to become a Member. This activity is one of the big annual events. Don't miss it.

—F. E. H.

THE feature article of the January, 1916, issue was "The Oscillating Audion," by Tuska, the editor. Describing the Ultradion circuit in connection with a long-wave loose coupler having a secondary 10 inches in diameter and wound with 1100 turns of No. 28 wire, it reported the almost unbelievable feat of hearing Honolulu and German stations on an antenna only 50 feet high and 200 feet long. "It is beyond the scope of QST to go into the theory of this wonderful piece of radio apparatus. . . . In order that the reader may understand the operation, it is well to say that the audion is used simultaneously as a receiver and generator of undamped waves. The incoming oscillations are received at a definite frequency and are superimposed on a slightly higher or lower frequency of the audion oscillations. For example, the incoming wave has a frequency 100,000 per second and at the same time the audion is generating waves at the rate of 101,000 per second; the result of two series of oscillations is a musical note of 1000 vibrations per second. This is known as a 'beat' effect. . . . It is difficult to give precise directions for operating the oscillating valve but the majority of amateurs will have no trouble with it. In five or ten minutes they will stumble on the proper combination and get far better results than the writer could suggest. Important: If the audion is operating properly, a sharp click can be heard in the telephones when the point marked X in the diagram (the grid) is touched."

The Correspondence Department, Ham-ads and "Amateur Radio Stations" appeared in QST this month for the first time, the latter including a description of the station of Ross Gunn in Oberlin, Ohio. Dr. Gunn is now a physicist at Naval Research. The first story appeared by The Old Man, on rotten testing between A.R.R.L. and 200 feet long. "It is beyond the scope of QST to go into the theory of this wonderful piece of radio apparatus. . . . In order that the reader may understand the operation, it is well to say that the audion is used simultaneously as a receiver and generator of undamped waves. The incoming oscillations are received at a definite frequency and are superimposed on a slightly higher or lower frequency of the audion oscillations. For example, the incoming wave has a frequency 100,000 per second and at the same time the audion is generating waves at the rate of 101,000 per second; the result of two series of oscillations is a musical note of 1000 vibrations per second. This is known as a 'beat' effect. . . . It is difficult to give precise directions for operating the oscillating valve but the majority of amateurs will have no trouble with it. In five or ten minutes they will stumble on the proper combination and get far better results than the writer could suggest. Important: If the audion is operating properly, a sharp click can be heard in the telephones when the point marked X in the diagram (the grid) is touched."

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In the editorials, a Volunteer Radio Corps is projected as a practical way of offering amateur services to the government if the trouble in Europe becomes acute enough to involve the United States. The editor also complains of "new wireless associations while you wait," saying that it seems to be the fashion to announce a new one every few days and calling attention to the fact that A.R.R.L. is not organized for private profit "but entirely for our mutual assistance in telegraphing to each other."

Bunnell and Mesco are the leading advertisers but the best-looking piece of gear is the handsome Navy-type loose-coupler offered by J. F. Arnold: "Will tune up to 3500 meters on a fair-sized antenna." F. B. Chambers & Co. also feature their loose coupler, having a double-slide primary. Brandes' "Superior" headphones are offered as "the great favorite with both professionals and amateurs." The Institute of Radio Engineers advertises their Proceedings as of interest and value to amateurs. The League itself offers for sale its "List of Stations Book," being a complete list of the relay stations of A.R.R.L. "Shows what relay stations are within your range; gives name of owner, complete address, call letters, sending power, kind of gap used, number of words can receive per minute, listening hours, what license is held, telephone connection or not. . . . Indispensable to every amateur whether in Relay League or not."

**WWV Schedules**

The standard frequency station WWV of the National Bureau of Standards was destroyed by fire on November 6th. A temporary transmitter has been established in another building and is carrying on a reduced service which will be in effect for the several months required for establishing a new permanent station.

In the interim, a 1-kilowatt transmitter (the old transmitter was 20 kw.) is broadcasting continuously from 10 A.M. to midnight, E.S.T., every day except Sunday. Transmissions are continuous-wave only, with telegraphic announcements of the call letters WWV every 20 minutes. The accuracy is the same as before, better than one part in ten million.

Until the new permanent station is complete, the 10- and 20-Mc. transmissions will be discontinued as will also the standard second pulses, the 440-cycle musical pitch standard, and the 1000-cycle standard frequency.

**Strays**

W8RME has N. Y. car license plate 73-88. W2IQQ drew FB-88-S.
ON THE ULTRA HIGHS

Conducted by E. P. Tilton, W1HDQ

It is said that there is something of the Crusader in every man of us. Nearly every amateur worthy of the name is a salesman for his hobby, but nowhere else in the whole amateur picture is the booster instinct so pronounced as among the die-hards who work on Five the year around. The true 56-Mc. enthusiast spends the better part of his time selling his band to the devotees of the lower frequencies, in contacts over the air, at hamfests, radio clubs, and even by mail.

When Five opens up for skip DX and word spreads around that another DX season is getting underway, there is little need for crusading. In nearly every part of the country, operators scramble for their u.h.f. gear and take a crack at some of the elusive DX thrills. But during the late fall and winter months, those of us who regard the Ultra-Highs as something more than a three-months DX spree are often hard put to it to find enough activity to keep interest alive.

The going started off in a particularly rocky fashion this fall, with counter-attractions on every hand. Ten crossed us up. Just when it was scheduled to be passing out for a few years, the 28-Mc. band has turned up with some of the best days (and plenty of them, too) in several seasons. In late October and into November the political campaign held the attention of many during the hours ordinarily spent on Five. Operating range on Five shrank, as it always does with the passing of summer and early fall inversions. All in all, the regular occupants of Five found little to get enthused over as they went into November.

Particularly lacking in consistent nightly activity was the area within a 50-mile radius of New York City. Once the scene of almost unbelievable turmoil in early days on Five, the Greater New York area was too often a complete blank as far as 56-Mc. signals were concerned. This aroused the crusader instinct in several of the gang of W2 and W3. We have been unable to get anyone to claim responsibility for the movement, but we have heard that during early November just about everyone who was known to have operated 56-Mc. gear within the past two years received a card asking him to join in a series of Tuesday-night Roundups, beginning on November 12th. Everyone who was contacted on Five was told of the plan and asked to be on deck. No special program was arranged, no “net” operation planned; everyone was just invited to fire up the old rig and get acquainted again. The result? Well, the Tuesday Nites have had two sessions of it as this is being written, and we find 34 calls listed in the reports sent in by several of the gang. They are listed below:

<table>
<thead>
<tr>
<th>Callsign</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>W2ACR</td>
<td>Millburn, N. J.</td>
</tr>
<tr>
<td>W2AMJ</td>
<td>Bergenfield</td>
</tr>
<tr>
<td>W2AQG</td>
<td>Bronx</td>
</tr>
<tr>
<td>W2AWO</td>
<td>Corona, N. Y.</td>
</tr>
<tr>
<td>W2BGX</td>
<td>Flushing</td>
</tr>
<tr>
<td>W2BW</td>
<td>New York City</td>
</tr>
<tr>
<td>W2CLA</td>
<td>Garden City</td>
</tr>
<tr>
<td>W2CVF</td>
<td>Ridgefield Park, N. J.</td>
</tr>
<tr>
<td>W2DAJ</td>
<td>Jamaica</td>
</tr>
<tr>
<td>W2DJO</td>
<td>Brooklyn</td>
</tr>
<tr>
<td>W2FHJ</td>
<td>Bronx (YL)</td>
</tr>
<tr>
<td>W2FQ</td>
<td>South River, N. J.</td>
</tr>
<tr>
<td>W2FY</td>
<td>Elmhurst, N. Y.</td>
</tr>
<tr>
<td>W2GHV</td>
<td>Dumont, N. J.</td>
</tr>
<tr>
<td>W2GUC</td>
<td>Summit, N. J.</td>
</tr>
<tr>
<td>W2HLK</td>
<td>Island</td>
</tr>
<tr>
<td>W2MO</td>
<td>Summit, N. J.</td>
</tr>
<tr>
<td>W2NFT</td>
<td>Elmhurst, N. Y.</td>
</tr>
<tr>
<td>W2QZ</td>
<td>Bronx</td>
</tr>
<tr>
<td>W2RM</td>
<td>South Branch, N. J.</td>
</tr>
<tr>
<td>W2SS</td>
<td>New York City</td>
</tr>
<tr>
<td>W3AXU</td>
<td>Trenton</td>
</tr>
<tr>
<td>W3AXC/3</td>
<td>So. Boundbrook, N. J.</td>
</tr>
<tr>
<td>W3BA</td>
<td>Millburn, N. J.</td>
</tr>
<tr>
<td>W3BC</td>
<td>Ridgefield, N. J.</td>
</tr>
<tr>
<td>W3CC</td>
<td>New York City</td>
</tr>
<tr>
<td>W3NE</td>
<td>New York City</td>
</tr>
<tr>
<td>W3NFT</td>
<td>Elmhurst, N. Y.</td>
</tr>
<tr>
<td>W3OI</td>
<td>Island</td>
</tr>
</tbody>
</table>

It will be noted that these calls represent all stages of amateur radio, from the 10-watt mobile W2HLK to the 700-watt W2MO. There are several real old-timers represented, some of those two-letter boys having up to thirty years of hammering to their credit; and there is also the newcomer, W2NFT. Everyone agrees that he hasn’t enjoyed himself so much in many a day. No DX there — but no QRM, either — and a swell chance to get reacquainted with the rest of the gang in your own neighborhood. If your call is not on the above list, why not put the rig on Five next Tuesday and join the “Tuesday-Nites”? Nice work, fellows — keep it up!

A somewhat similar lack of regular activity was confronting those of Five in the Boston area. Like New York, this territory was once literally crammed with 56-Mc. enthusiasts, but recent times have seen a considerable drop-off in daily activity, though not to the extent noted in the New York area. Deciding to see what could be done by concentrating on one particular night, the boys picked Thursday. Each Thursday at 9 P.M., W1DHQ, Lynnfield, Mass., calls the gang together. November 7th saw less than ten stations active. The following week 23 stations responded, with this number or better each week since. A snappy round-table follows the first call, following which the gang breaks up for general QSO’s. No official name has as yet been approved but the suggestion of W1JTBA, “persistent Five-Meter Cusses” is finding favor! They include the following W1s:

<table>
<thead>
<tr>
<th>Callsign</th>
<th>Name</th>
<th>City, State</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOZ</td>
<td>Melrose, Mass.</td>
<td>58,500</td>
</tr>
<tr>
<td>BJB</td>
<td>Brookline, Mass.</td>
<td>58,120</td>
</tr>
<tr>
<td>COX</td>
<td>Lowell, Mass.</td>
<td>56,100</td>
</tr>
<tr>
<td>DA</td>
<td>Lynnfield, Mass.</td>
<td>56,966</td>
</tr>
<tr>
<td>DJ</td>
<td>Winthrop, Mass.</td>
<td>58,060</td>
</tr>
<tr>
<td>DID</td>
<td>Andover, Mass.</td>
<td>58,916</td>
</tr>
</tbody>
</table>
DXK Clinton, Mass....................... 56,220
EHT Stonestown, Mass.................. 56,500
EKT Wakefield, Mass................... 56,200
GAQ Boylston, Mass.................... 56,400
HUV Winchester, Mass.................. 56,200
IIQ Arlington, Mass................... 56,200
IUI Kingston, N. H........................ 57,500
JDV Nashua, N. H........................ 56,632
JLX North Easton, Mass................. 58,776
JTB Wayland, Mass....................... 57,380
LPF Lowell, Mass......................... 57,724
LTJ Dunstable, Mass..................... 56,632
LSN Exeter, N. H........................ 56,816
MDN Amesbury, Mass..................... 57,966
MJ Wakefield, Mass....................... 57,384

This list was taken from a report of the second week’s activity. Many more calls have been added recently. If you are located within 50 miles of Boston, you are cordially invited to join these Thursday-night sessions. The boys are particularly desirous of hearing from some of the gang south of Boston.

The month of November provided little in the way of operating thrills. There were a few scattered reports of sporadic-E skip. W5VV, back on the job at Austin, Texas, reports the band open on November 8th; contact being made with W6OVK, Tucson, Ariz., at 9:42 P.M. C.S.T. Harmonics from Ten were heard by W6OVK and W6QLZ on November 18th, but no contacts were made. W2AMJ was reported heard by W9NFM on November 21st. Short skip of summer-time proportions was noted on ten on several other occasions, but lack of activity on Five in the right places very likely was responsible for the scarcity of 56-Mc. reports. One we missed in October is reported by W8RUE, Pittsburgh, Pa., who heard W9WTL on October 21st.

The first session of the “Tuesday-Niters” was marked by the first pronounced aurora refraction of the season, but the boys were so busy working each other locally that they paid little attention to the DX. The familiar broadness of signal and fuzzy quality of speech on all but purely local signals were first noticed by several W1’s shortly after 7 P.M. Only a few of the gang recognized the symptoms of aurora and went to c.w. Despite all that has been said and written about this type of refraction, not more than half a dozen of the fifty or more stations active in the area affected realized what was up. Most of them continued to attempt to get through on voice or tone modula-

**U.H.F. DX RECORDS**

**Two-Way Work**

56 Mc.: W1EYM — W6DNS, July 22, 1938, 2500 miles.

118 Mc.: W6BGI/6 — W6KIN/6, July 4, 1940, 255 miles.

224 Mc.: W6GIOJ/6 — W6LEN/6, August 18, 1940 — 135 miles.

400 Mc.: W6GIOJ/6 — W6MYJ, September 23, 1940 — 11 miles.

“When good fellows get together.” George Sperry, W9CBJ (left), and Ed Grabill, W9ZHB, at the “Hamfesters” Picnic last August. Note tags, “I’m on Five Meters.”

**HERE AND THERE:**

The Boston-Washington relay circuit mentioned last month is gradually taking shape. Each Friday night, messages for W1DEI/3 are started from Natick, Mass., by Mel’s brother, W1QB. A reliable net has been lined up as far as Wilmington, Del., but from here on the going has been not too successful, to date. More stations between Wilmington and Washington are needed before the net can be considered reliable. Mel reports things rather quiet around Washington, with W3AWM and W3IHW most active. W3CIC is on occasionally. What has become of W3DBC, the Washington rock-crusher, and that old standby, W3RL? W3EIS tells us that he is moving to a new home in Arlington.
and Western Pennsylvania to hop over into Pittsburgh. All right when conditions are good, but not the sort of thing for should certainly help matters. John is listening especially serious damage in the loss of all antennas at W8QDU, De- Philadelphia is now definitely assured, but from Eastm·n W8OKC, Shamokin: and W8RUE, Pittsburgh. '!'hat still troit. Fred is now off the Ultra-Highs entirely until some­ New England.

received from W3BRZ, Lanoaster, Pa.: W8FDA, Pottsville; include the eight half-waves in phase at WlHDQ and more too much for several antenna •tructures. Known casualties November brought high winds and ice storms which were

concerned in Pennsylvania and New York are gradually

established, following which Clyde scampered up and down that ham population is large. States can be broken down by the right technique. schedule. Clambering down in haste, contact was estab­ are not normally many signals heard at Pottsville. W8RUE, Pittsburgh, has been hearing W8GU, Erie, Pa., and, W8GBK, Sherman, N. Y., frequently on their 10 p.m. schedule, so it would appear that if we can get contacts through to Pittsburgh, Ted and W8CIR should be able to get traffic through to Detroit without too much difficulty. W8OKC, Shamokin. Pa., writes that he works W8FDA nightly on 10-45. Bill has worked W6OVK at chanleisure, and W8RUE in the past, but he has not heard anything of him for some time. He reports W8PIK and W8SBM of Williamsport as likely net prospects. W8QCM, Osceola Mills, who has been on the receiving end of W8FDA signals, via W8MO, has promised to get on Five if he can hear someone to work first. Unfortunately, someone has to start things off. Development of activity on Five in a new area invariably involves plenty of calling and listening — the Crusader angle, again.

in the spring, and will resume activity on Five as soon as settled. Landlord trouble has been holding Don back recently. There appears to be a good chance of extending the Atlantic Seaboard Five-Meter Net to Portland, Maine. W1MEF writes that he is listening and transmitting on Five at regular intervals, but is getting nowhere yet. A new converter and beam antenna are under construction which should certainly help matters. John is listening especially for some sign of those Thursday-night sessions in Eastern New England.

November brought high winds and lee storms which were too much for several antenna structures. Known casualties include the eight half-waves in phase at WIHDQ and more serious damage in the loss of all antennas at WSQDU, De-troit. Fred is now off the Ultra-Highs entirely until some­thing can be erected to replace thatcons. and extended double sepp, for 56 and 112 Mc., respectively. Stations in Pennsylvania and New York are gradually being lined up for a permanent relay chain between the east coast and the middle west. Service from New Hampshire to Philadelphia is now definitely assured, but from Eastern Pennsylvania across to the Great Lakes area the route is less definite. Assurances of cooperation have been re­ceived from W2RZ, Lancaster, Pa.; W8QDV, Potville; W8OKC, Shamokin; and W8RUE, Pittsburgh. That still leaves us with plenty of mountainous country in Central and Western Pennsylvania to hop over into Pittsburgh. All right when conditions are good, but not the sort of thing for a reliable relay circuit. Rumors of increasing interest in Cen­tral New York may yet provide the solution. Will interested parties kindly get in touch with the writer in order that test schedules may be arranged? In the meantime, effort is being made to get everyone who has gear for Five to put it to work on Friday nights. Just turning the converter to the 60-Mc. range is not enough. Fire up the receiving gear, preferably on o.w., at frequent intervals. We feel certain that surprising things will happen if we can get everyone, the country over, to make “Five-Meters on Friday Night” a national slogan.

W8FDA. Pottsville, Pa., heard his first five-meter DX during the aurora refraction of November 12th. Using a straight regenerative detector, Stan logged the o.w. signs of WILL, WIHDQ, WIXL, WIXHF, W2BFF, and W8CIR. There were also many unreadable ’phone carriers on the band. These were DX of the aurora variety, as there are not normally many signals heard at Pottsville. W8RUE, Pittsburgh, has been hearing W8GU, Erie, Pa., and, W8GBK, Sherman, N. Y., frequently on their 10 p.m. schedule, so it would appear that if we can get contacts through to Pittsburgh, Ted and W8CIR should be able to get traffic through to Detroit without too much difficulty. W8OKC, Shamokin. Pa., writes that he works W8FDA nightly on 10-45. Bill has worked W6OVK at chanleisure, and W8RUE in the past, but he has not heard anything of him for some time. He reports W8PIK and W8SBM of Williamsport as likely net prospects. W8QCM, Osceola Mills, who has been on the receiving end of W8FDA signals, via W8MO, has promised to get on Five if he can hear someone to work first. Unfortunately, someone has to start things off. Development of activity on Five in a new area invariably involves plenty of calling and listening — the Crusader angle, again.

There has been plenty of throwing out of chest in Phoenix and Tucson these days. W8QZL and W6OVK, after over a year of persistent effort, have finally made the grade on Five. Though the distance is just over 100 miles, the country in between is a solid mass of mountains. It is safe to say that if these two fellows can work on Five (and they both run under 200 watts), they can get 100-mile path in these United States can be broken down by the right technique. In their case horizontal antennas did the trick, contact being made when W6OVK put up a 3-element (radiator and two directors) array. The boys are working on a daily schedule, now, and we hope that much interesting information will be forthcoming as they observe the changing conditions over this 100-mile mountainous path.

We won’t vouch for the authenticity of it, but a little bird told us that Clyde had his receiver up in a tree, making tests on his beam when he first heard his Budding. W8FDA on Five and his name is Mike, or some­thing to that effect, be sure to let us know if you get on that schedule. Clambering down in haste, contact was estab­lished, following which Clyde scampered up and down that tall cottonwood with the agility of a squirrel in order to keep things going each way!

112 MC.: "Hartford-Boston Link Established on 2½ Meters." This is not recent hot news, but the title of an article appearing in QST for March, 1936! How far have we gone since then, in nearly six years? Hartford to Boston is still considered as a rare feat on 2½, though greater distances are being covered over other paths. We have vastly greater activity in urban areas, but the coverage generally is not materially greater than when work was first started on frequencies higher than 60 Mc. years ago.

Perhaps this is as it should be, for 2½ has largely replaced Five as the ideal band for the beginner. Like Five in former days, 112 Mc. now also offers the old-timer in the game, long since tired of DX thrill, a chance to get back to the essentials of the game; essentially long buried in a maze of technical complications and manufactured gear on the lower frequencies. It is this combination of traits, together with the opportunity for friendly local chats, which has played such an important part in the development of the 112 Mc. band in Eastern New England, New York, Philadelphia, Chicago, Los Angeles, and many other areas where ham population is large. (Continued on page 48)
Minnesota Hams Whip History-Making Snows

BY GEORGE K. PRITCHARD*

M\onda\y morning, November 10, 1940, was a perfect day for duck-hunting in the Upper Mississippi Valley, in that region where the great river trails to its end and Lake Superior points down to Duluth.

The air was cool, and rain drizzled down from a slate-colored sky. Scores of hunters slogged through the bottoms of the Mississippi or crouched behind thickets waiting for the southbound ducks.

About noon, the rain changed to sleet, the sleet to snow. Ominous gusts of wind swept down from the North. The mercury began to drop, sharply. Suddenly the Northwest realized that it was in the grip of the worst November storm in its history and that hundreds of persons were literally fighting for their lives.

By nightfall the snow had blocked country highways; by morning, telephone and telegraph lines were down, railroads blocked, death toll mounting. (Before it ended, the storm would take 159 lives.)

Then, as always, amateur operators stepped into the breach. Fred Herman of Minneapolis, W9BPK, received an urgent call from the dispatcher of the Minneapolis and St. Louis Railroad. A passenger train was stalled in mountainous drifts and bitter cold outside Wallace, S. D. Could he contact the conductor? Herman could, and did. At his orders the engine was drained, the crew got its instructions to stand by for orders, passengers were conducted to shelter.

More telephone calls came in. Wives wanted to locate husbands, worried parents sought to find their children, gone on an Armistice Day holiday.

A. E. Swanberg of St. Paul, W9BHY, the Red Cross emergency co-ordinator for Minnesota, began to direct the work of all operators, most of them trapped in their homes by blocked streets and working alone.

The word came in — Willmar, Minn., is without telephone or telegraph communication. So is Watertown, S. D. So is Albert Lea, Minn. Can you get through?

The operators could and did. Twin City com-

(Continued on page 88)

Texas Ice Storm Isolates Amarillo

The newsboys of Amarillo still had the European war on their minds, even though there was bigger news right at home. "Amarillo taken!" they yelled, according to the Associated Press. "Amarillo taken by the enemy — nature," they shouted.

"Panhandle frozen like Finland, Texas flooded but refuses to surrender . . . read all about it!" they croaked.

The residents of storm bound Amarillo did not need to read, the last week of November, to know that power and communications lines had snapped beneath a 3- to 5-inch coating of ice, isolating the city.

Those elsewhere who read of Amarillo's plight did so because amateur radio was on the job.

Dr. William B. Thomas, Jr., W5ECL, and James B. Redfearn, W5AVM, stayed on the air constantly from W5ECL, powering the station from a storage-battery source and operating by light from a neighbor's gasoline lantern. A lengthy eyewitness account by Dr. Thomas was released through United Press.

Pryer C. Smith, W5CYX, who is on the staff of the Amarillo News-Globe, received AP dispatches from W5DAM at Dallas for his paper, as well as transmitting Amarillo news to the AP. Reports that fires, started by broken power lines, were burning in several parts of Amarillo were denied by W5CYX, preventing the spreading of rumors.

W5ECL reported that Ted Smith, W5CCJ, also worked night and day with storage-battery power, helping to clear the hundreds of messages pouring into Amarillo.

From Harold Brown, W5IBC, of Slaton, comes this report of a useful bit of work:

"We are located about one hundred and twenty-five miles southeast of Amarillo. . . . Slaton is a division point on the Santa Fe Railroad, and Amarillo is the next division point going North. All train orders concerning schedules, times, etc., originate at these two points, and of course they depend on the telephone line to dispatch their messages. Sometime last Sunday the telephone line went down and left one or two trains running blind between Happy and Amarillo, a distance of some thirty-five miles. One of the local dispatchers (a b.c.l.) went over to the shack of W5INM, who was operating on 100 'phone and asked him to try to get a message

(Continued on page 90)
SIMPLE 28-MC. VERTICAL ANTENNA

Fig. 1 shows a simple vertical antenna which Dr. M. C. Hecht, W9IJX, and several of the boys in the Chicago area have found to be particularly effective for 28-Mc. work. The half-wave antenna is made up from a 10-foot section of thin-wall copper tubing plus a 7-foot "buggy-whip" b.c. antenna. The top end of the lower section is fitted with a bushing to fit the lower end of the top section and the two sections are soldered together so that the total length is 16½ feet.

The base of the antenna is fastened to the top of a simple 37-foot mast with heavy stand-off insulators so that the bottom of the antenna is a full wavelength above ground. The mast is braced against the side of the house. Immediately below the base of the antenna a waterproof box is attached to the mast. This contains the antenna tank circuit which is connected to the base of the antenna through a feed-through insulator. The coil and condenser are the same size as the corresponding units in the final-amplifier tank circuit. The center of the tank coil is connected directly by a wire one wavelength long to a pipe driven 10 feet into the ground.

This wire should be run in the same vertical plane as the antenna. Grounding helps to balance the transmission line and also serves to give protection against lightning.

The shaft of the antenna tank condenser is fitted with a pulley which is driven from the operating position by a long line of 25-pound-test linen weatherproof fish line. A couple turns of line are taken around the pulley to prevent slipping. The line is guided by screw eyes at appropriate points. With the tuned tank, the antenna is equally effective over the entire band.

The antenna is coupled to the final tank circuit by means of a low-impedance link line. It is as effective in reception as in transmission.

Fig. 1 — Simple vertical 28-Mc. antenna used effectively by W9IJX.

Fig. 2 — Keying circuit used by WSFXO to eliminate clicks. L1 may be almost any coil resonating in the circuit at a frequency lower than that of the crystal. R1 and R2 are the usual grid leak and screen-dropping resistors respectively, 50,000 and 20,000 ohms for a 2A5.

Any inductance which, with the stray capacitances connected across it, will tune the cathode circuit to a frequency lower than that of the crystal should prevent oscillation. I use an r.f. coil taken from an old b.c. receiver. The chief disadvantage of the circuit is that the key leads form part of the r.f. return circuit, although it works successfully with keying leads up to at least 6 feet long.

One nice thing about the circuit is that there is no d.c. across the key, so that you can put your fingers across the key without getting hurt. It is a simple job to change over any standard cathode-keying system merely by substituting the coil for the usual by-pass condenser. While I have not tried the circuit with the 6L6, it should work equally well with a coil of appropriate size. However, plate voltage should be limited so that the rated dissipation of the tube is not exceeded when the circuit is not oscillating. — Lucius Smith, WSFXO.

This circuit is quite similar to the one in which a cathode resistance is used instead of the inductance. The resistance method has the ad-
vantage that the key leads may be by-passed, but it is not always possible to find a value of resistance which will stop oscillation and yet not cause considerable difference in plate current when the key is open. — Ed.

AN EASY WAY TO RAISE A MAST

Since assistance in mast raising is often lacking, others might like to know how a 60-foot pole was raised at W6QXK by one person unassisted. The general method, discovered by accident, is so simple that it has probably been used in many instances, but perhaps some may not have thought of it.

It was discovered when an attempt was being made to raise a 37-foot pole by sliding it up a 10-foot stepladder, top first, so that the pole would be in such a position that it could be pulled upright with a guy. The center of gravity had already passed the top of the ladder, creating the problem of keeping the base down while continuing to slide the pole over the top of the ladder without too much friction. The eventual result of this was that the pole got away and the bottom shot up as the pole pivoted on the top of the ladder. When the pole finally hit the ground, the top was on the ground and the bottom was sticking up in the air. The halyard had tangled around the bottom of the pole and the end was hanging down far enough to be reached. By merely pulling the base down with this rope, the pole was pivoted into the desired position using the ladder as a fulcrum, making it an easy matter to pull the pole erect with a guy. This pole was made of "two-by-three's" and, though it creaked some and bent considerably, it did not break from its own weight.

This job was so easy that it was thought that, with a fulcrum twice as high, a pole twice as tall could be raised in the same manner. Of course the strain on the mast at the fulcrum would be much greater for a taller pole. In order to see if a 60-foot pole made of the same material could be raised without breaking, the strain was calculated using the density of wood as 40 pounds per cubic foot (actually about 35, but it is best to have lots of safety). This strain for the 40-foot length, which would project beyond the 20-foot fulcrum, making it an easy matter to pull the pole erect with a guy. This pole was made of "two-by-three's" and, though it creaked some and bent considerably, it did not break from its own weight.

After painting the pole and bracing the joints with bands of No. 12 galvanized wire, the guy wires were put on. Three guy posts were used, each with three wires. One set of wires was 25 feet from the ground, the next 40 feet, and the top set was fastened at the end of the pole. The guy wires were No. 12 galvanized wire, broken every 12 feet with insulators. The guy posts were each 30 feet from the base of the pole. The length of the wires was calculated fairly closely so that there would not be too much slack while the pole was being raised. The fulcrum was a 20-foot "four-by-five." The top of this fulcrum was fitted with an arrangement something like that shown at (4) Fig. 3-A. In this particular case, a double roller-skate wheel with a guide made of "one-by-two-s" was nailed to the top of the fulcrum, to allow the pole to slide as easily as possible. To prevent the pole from sliding too far when being raised, a chock was nailed to the pole at the desired pivot point, 21 feet from the base (see (3) Fig. 3). The fulcrum was raised 6 feet from the pole at the desired pivot point. The result showed that some sort of bracing was necessary. Since there were many odd pieces of lumber available, it was decided that the pole should be made strong enough around the point of support so that it would not break of its own weight. This was accomplished by adding lengths of "two-by-three" and "two-by-two" as bracing until the pole was strong enough. The strength was tested with each additional bracing by hanging the pole on a short stepladder at the desired point of support. To be strong enough to support its own weight the pole had to have the thickness of three sticks around the point of support and two sticks halfway up and one stick at the top.

Now came the biggest problem of all — that of how to get the base of the pole onto the top of the fulcrum. The pole was quite heavy and, in spite of the thickness around the fulcrum, quite limber. Another factor was that the pole was very apt to break near the top, where there was only a single "two-by-three," if it were supported only at its two ends. These problems were solved by erecting another 20-foot "four-by-five," about 12 feet from the fulcrum in line with the fulcrum, peg
and guy post. This "crane" had a pulley arrangement with the pole as shown at (1), Fig. 3 A. To raise the pole to the fulcrum, it was hoisted slowly by the pulley arrangement. As it was being raised, the top end was braced with a 4-foot stepladder which was constantly moved back to keep the pole fairly straight. When the end was brought near the top of the fulcrum, it was guided with a 20-foot piece of "two-by-two."

After the end was securely on top, the pole was pushed from the far end until the hoisting pulley on the pole was even with the fulcrum. The hoisting rope was pulled through the pulley with the aid of a long stick. When this operation was completed, the pole was pushed the rest of the way until the chock hit the skate wheel. The lifting crane was now taken out of the way, and two sets of guy wires were tied off. Then the base of the pole was straightened a bit, the base was moved over to the peg by merely lifting and pushing. The only equipment needed to raise poles up to about 40 feet by this scheme is a 10-foot stepladder. — Bill Snyder, W6QXK.

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E.C.O. COUPLING CIRCUIT

I have found the circuit shown in Fig. 4 very efficient for coupling an e.c.o. to a former crystal oscillator. Coupling the e.c.o. to the rig is somewhat of a problem when the transmitter is located at some distance away. Ordinary link coupling, while efficient, requires the use of an additional tuned circuit at the transmitter. This circuit eliminates this tuned circuit, and provides good coupling efficiency. Since the control grid of the crystal oscillator is grounded, there is no danger of oscillation when the 6L6 is operated as a straight amplifier. — John Clemens, W9ERN.

(Continued on page 88)

On the Ultra Highs

(Continued from page 33)

From W8AVE comes word of a gathering of u.h.f. enthusiasts to be held in the Sherman Hotel, Chicago, on the evening of January 8th. Primary purpose of the meeting will be the encouragement of activity on 112 Mc. Main event of the evening will be a talk by Bill Conklin, W6BNX. There will be demonstrations of equipment and discussions of u.h.f. problems. The meeting, open to all, will be sponsored by a group of operators who are active in u.h.f. work.

We have some additional data on the contact between W1MON and W2LAU mentioned in last month's column. From W2LAU, we learn that W2MPQ and W2ZP, both of Irvington, N. J. (5 miles east of W2LAU), heard W1MON during the record-breaking contact. W2MPQ reports that W1MON reached S8–9 peaks at Irvington, but that the signal had "a very fuzzy quality," indicating the possibility of aurora refraction in this 200-mile work. As aurora conditions will certainly be in evidence frequently during the next few months, everyone who is active on 2½ is asked to be on the lookout for unusual signals of any sort. If you hear anything out of the ordinary on 2½, note the conditions carefully and send your observations to your conductor as promptly as possible. We should learn much on 2½ in 1941.

224 MC.

From W8IPU, Lakewood, Ohio, comes word of two-way work over a 15-mile path with W8UES at Lorain. Both stations are using Kraus "Square Corner" reflectors. The transmitter at W8UES is a pair of FK-24's in a push-pull oscillator, while W8IPU is running crystal controlled 24's as push-pull triplers, the rig starting out with a 4.7-Mc. crystal. The receiver is a National 1-10. W8UES uses a single 955. Signals are strong at both ends, and more consistent than those obtained on 28 Mc., with similar power. These fellows are situated on the curving coast of Lake Erie, and than those obtained on 28 Mc. with similar power. These fellows are situated on the curving coast of Lake Erie, and appear to have a fine chance for some long-haul work with WSUGU and others, or even up to Buffalo for a new record.

W2HWH, Jackson Heights, L. L., who puts a fine signal up to W1HDQ on 2¼ on occasion, says he has two rigs ready to go to work on 224 Mc.

As you read this, another year will just about be over. 1941, with another edition of the U.H.F. Marathon, will be just around the corner. Complete rules for the 1941 Marathon appear in this issue. There are a number of changes to increase interest and permit more prompt reporting in QST. Your monthly reporting will be made easier through the use of the standard reporting form which is available to any amateur without cost. Keep one of these sheets tucked in the regular log-book and, whenever a new contact is made, enter it on the report form at the same time it is entered in the station log. At the end of the monthly period just slip it into an envelope and mail it to Headquarters.

As we come to the close of our first full year of editing "On The Ultra Highs," may we take this opportunity to thank all those whose letters, reports, and helpful suggestions have made this department a success. A happy holiday season to you, and success on the Ultra-Highs in 1941 to all!
CORRESPONDENCE FROM MEMBERS

The Publishers of QST assume no responsibility for statements made herein by correspondents.

ARMY TRAINING SCHOOL  Fort Monroe, Va.

Editor, QST:

There has been much written about the time when amateur radio is to aid the Army. The Army is already aiding amateurs by sending them to school.

Any ham who wants to get in this "get-paid-as-you-learn" school merely has to enlist in the Coast Artillery Corps and come to the Coast Artillery School at Fort Monroe, Virginia. When you enlist, be sure you are enlisting in the Coast Artillery Corps and don't accept a substitute.

After you enlist, there is a short period in which you are taught the basic principles of soldiering. As soon as you arrive at your outfit, see the Battery Commander and tell him that you wish to attend the Coast Artillery School. You will be given a fairly easy examination and then sent to the school.

Here you will do nothing but go to school — from 8 A.M. to 4 P.M., with an hour out for lunch. There is a study period from 8 P.M. to 10 P.M. The Radio Course was originally a ten-months' course, but has been condensed into a three-months' course. After covering elementary basic principles, study is given to such topics as: Design of Audio Amplifiers, High Frequency Amplifiers, Detection-Receiving Systems, Rectifiers and Power Apparatus, Oscillators, Transmitters, Antennas and Transmission, and Ultra High Frequencies. There is also an interesting subject, Servicing and Instruments, in which is covered the use and operation of practically all instruments used by radio men. Special attention is given to the use and operation of the oscillograph. There is a well-equipped laboratory in which you can see the theory at work.

The course is divided into two sections. One section has no code at all; the other section puts in about three hours at code practice each day. Receiving practice is given by means of recorded signals, graded to suit beginners and experts. Time is also given to the delicate art of "bug-slap-ping."

Upon graduation the students are promoted to Staff Sergeant (Radio) as needed, which means an increase in pay. In these unfortunate days, after experiencing the longest enforced period "off the air" that I can remember, I am particularly glad to note that the hams have something to do. This training is being given to us in the Coast Artillery Corps and don't accept a substitute.

The letter from W9JGZ in September QST strikes home with me, and I wish to affirm Mr. Kingery's statements.

For you fellows who live in metropolitan districts, just make note of the frequencies of your popular local b.c. stations, then add 460 kc. to each and tune in each resulting frequency.

In every case you will find the wierdest, wickedest mess of cat calls one could imagine. Yours truly resided in Fall River, Mass., for several years. The local station operated on 1420 kc., the resultant being 1910 kc. (variation being due to misalignment or odd i.f. frequencies)

Many carriers were noted, some being S8 to 9, which, as you low-powered 160 boys will check, is tough on the f.s.s.-powered (or emergency) stations.

Just keep in mind that the h.f. oscillator in these cheap a.c.-d.c. and even in some straight a.c. superhet operates the i.f. detector frequency + the i.f., and in 9 of 10 cases the coil is unshielded and there is no r.f. stage to isolate the mixer from the antenna. 

Just try to tell the b.o.c. listener his set offends and see where you get.

Let's all push together for elimination of all this unnecessary QRM! ...

— S. H. Beveridge, W1MG

B.C.L. QRM

Middle Road, North Haven, Me.

Editor, QST:

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— S. H. Beveridge, W1MG

HAMS IN SERVICE

Chelsea Naval Hospital, Chelsea, Mass.

Editor, QST:

After reading your "It Seems To Us" editorial in November QST, I thought I would attempt to congratulate you on such a fine bit of reading.

You are absolutely right about the preference for hams in this draft business, at least in Uncle Sam's Navy. Here is an example of what the instructors in Submarine Sound Operators School think of the hams:

Upon entering the S.S.O. school, the students were given an application blank to fill out. Out of a starting class of 31 men, three of us were recommended for the Submarine Sound Material (Servicemen) grade even before we completed the operators' class, which lasted two weeks. Now, if that statement doesn't prove that the hams have something "on the ball," I'll pull the switch.

If some of the fellows think that there are no chances for advancement for the hams going into service under the (Continued on page 78)

January 1941

43
New Year's Resolutions. We could write a page on this subject, but we know you couldn't keep so many resolutions. We couldn’t ourselves. So let's boil it down to this: We're going to try to use the great privilege of Amateur Radio Communication in 1941 in such a way that we train ourselves to be more useful operators to Uncle Sam (and to ourselves). Suppose we ask ourselves a personal question: "If I was the only radio amateur would my use justify the license? Would the service that I give others, would the training that I give myself by use of my station authorization, be adequate to prove my case of 'public interest, convenience and necessity' under which F.C.C. grants me a station license authorization?"

The American Radio Relay League has represented the amateur in the government councils for many years, has sent witnesses to testify at public hearings and has proved the case of "public interest" for the fraternity. It must be remembered, however, that the case for the group, after all rests on the collective performance of the individual amateurs.

Are you supporting the one institution that is the sole institution to represent you? Are you up and doing things in the framework of that organization, the A.R.R.L.? Are you registered in the Emergency Corps? Do you belong to the A.A.R.S. or N.C.R., or participate in A.R.R.L. Net or private scheduled operations that are in the public interest, or give self-training? Have you your Code Award Certificate? Do you in other special ways advance yourself and the public interest? Only if you can truthfully say "yes" to some of these things can you be sure you belong to the number helping to preserve our amateur radio and keep it alive in the face of adversity within the vision of our founders by each amateur being able to justify his grant of authority by his actions.

Let us resolve to dedicate at least part of our operating time to constructive (as opposed to careless and purely selfish) activity; let us add our weight to the positive side of the record and not be found dragging our feet!

Amateurs Invited to Work WAR. On December 3rd WAR (4025 kc.) established communication with W1AW, exchanging formal messages signalizing the beginning of a program making possible informal contacts between the official station of the War Department and radio amateurs. A.R.R.L. President George W. Bailey took the key of W1AW, sending a personal response to the message to the League on behalf of all amateurs. The message from the Chief Signal Officer was as follows:

This message initiates the exchange of contacts between War Department Net Control Station WAR and amateur stations as represented by W1AW, the A.R.R.L. Headquarters station. It is my sincere hope that these contacts will help to foster closer relations between the Signal Corps and the Radio Amateur for mutual benefit. Very 73 to all.

MAUBORNE, Chief Signal Officer.

WAR’s schedules for contact with amateurs are Tuesdays, Wednesdays, Thursdays and Fridays. 4025 kc. is used for 80-meter band contact, 7 to 8 p.m. EST. 13,320 kc. will be tried for 14-Mc. band amateurs, 10 to 11 p.m. EST. Distinctive acknowledgment cards will be sent to all amateur stations contacted. The call CQ ZCOS, followed by a band designation, will indicate when WAR is ready for amateur calls. Traffic will not be handled except requests for A.A.R.S. Information or application blanks to be routed via Corp Area offices, since it is hoped to work as many amateurs as possible.

NAA-Amateur Schedule Extended. The frequency-day schedule for work with radio amateurs from NAA has been extended "as is," so the contacts taking place may continue until further notice. On the most recent night of operating we observed that the bands were hot with amateurs calling NAA and WAR! The battle is on to see who in one's community can first win a real QSL from one of Uncle Sam's key stations. We have the one from NAA—and now to follow the new information and get the word for a prominent place in our collection. See the tabulation giving both NAA and WAR schedules in this issue. Give them a buzz on their next schedule.

Coming Activities. See full details of the big January activity, the A.R.R.L. Member Party elsewhere in this issue. In February comes another popular operating activity, the 1.75-Mc. W.A.S. Party is scheduled.

Jan. 18th-19th, 4th Annual A.R.R.L. Member QSO Party
Feb. 15th-16th, 1.75-Mc. W.A.S. Party.
Feb. 21st, W1AW Code Proficiency Qualifying Run.

Fifty points fixed credit will be granted those taking part in the February W.A.S. doings (as in the Member Party) for holding an A.R.R.L. Code Proficiency Certificate, or submitting "copy" on either the January or February qualifying runs, with special mention of the desired
January 1941

State on copy if you are working for a first certificate or for endorsement. Underline the full minute of perfect copy that you believe qualifies you at any speed. Attach a statement that you copied by ear, without aid (except typewriter or pencil which please mention). Mail your original copy, for best chance of qualifying. We want to give every U.S.A. licensee a certificate. Got yours? If not, there's no time to start like now.

Habit in Operating. Advancing our Code Proficiency from any present level to a higher speed is a matter of training of our responses. The ability to coordinate, the essential ability, depends on habit, which in turn is largely a matter of practice. The ability to cultivate good operating habits determines the speed with which we can improve our sending or receiving ability. Every amateur should make a habit of taking a little time out each day to examine his operating. We must rationally direct our conscious impulses so they all aid the formation of good operating habits and so they handicap and slow down the development of bad operating habits. Skill and efficiency in code knowledge are the constant goals of the real amateur. Habit is a good slave but a bad master. We must not let improper mannerisms that we have to unlearn enter our operating!

The ability to handle procedure and message forms depends on having a fine Code Proficiency, maintained and extended unconsciously through customary habitual practice. While the subconscious responses speed up from day to day, making us better amateurs, with increased Code Proficiency, our conscious mind should explore the field that is new to some of us, that of procedure as required for speed and accuracy in recorded work.

As soon as we can do 15 w.p.m., we can profitably look at our procedure introspectively, and start forming efficient procedure habits, which are essential to the reliable operator. Habit will also assist us here. Getting the right start means a great deal. The sloppy operator who cannot be depended on is often the fellow who never took the time to keep his log properly, to put the

TOR (time of receipt) and date on his message, with the call of the station sending the message and his initial or personal "sine." The careful operator is one who checks his word count on all traffic before receipting, and who takes pride in things like the ability to copy "ten to a line" and use the efficient form and procedure for any occasion.

Copying behind. Several inquiries have been received from amateurs who want to know the "secret of copying behind." There is no secret about this, no mystery at all. Regular practice has enabled you to speed up from the point where letters are recognized to the point where you can copy down entire word groups. It is a habit born of fear that one is going to miss something that makes one copy character by character as information comes in. We have seen operators who had the even worse habit of guessing ahead and copying ahead. A reasonable practice period every day or two, listening to good copy, sending to emulate the style about 30% of the practice time, but not practising to the point of extreme fatigue will enable you to gain speed, and simultaneously gain confidence, so that you can copy behind.

Copying behind requires nothing but practice to give you the extra confidence in your ability to make it possible for you to carry a few letters and words in your head before you put them down. Try copying behind, when your speed permits even consistent reception, free of nervousness. It will shortly come to you as a good habit; continue to cultivate this habit of copying behind to a reasonable degree. An unusual word, some figure groups, or an unexpected bit of interference may throw you off at first. But your inherent ability will rise to the top with practice. Your subconscious mind will retain the image impressed from your ears if you will stop worrying about the thought that you may not be able to do it. To practice copying behind force yourself to stay two or three words behind, in spite of your inclination to overtake the transmitting station operator. Make a full and complete copy. Have no compunctions about dropping a word or two if you fail to get them. Don't let such a break stop you. Keep going; keep a few words behind; have some ability at "copying behind.

Copy a little faster than you are capable of taking, for a short time each day. Send a little faster than you normally send comfortably for a little while each day — but with ability to listen to your sending and special attention to insure perfection in spacing in characters and between words — which is the secret of good sending. Make habit your slave. Make Code Proficiency Your Aim.

— F. E. H.
The Most Interesting Band

BY JOHN T. FRYE, W9EGV*

Ten years ago, I put out my first feeble chirp from a single '2A on the eighty-meter band. Since that time I have operated on every band to and including the five-meters, but my first love is still the best. Eighty meters is the "home" to which I always return after a foray into the other frequencies.

Dependability is one of the virtues of this band. I know that I can raise a station on this "old reliable" any hour out of the twenty-four. Having spent five years in the A.A.R.S., with nightly schedules six nights out of the week, nine months out of the year, I know whereof I speak when I say that for day-in and day-out consistency, eighty is without a peer.

Being one of the lean-purse hams, I am also charmed by the fact that a fellow does not have to have a kilowatt in order to make his voice heard on my favorite band. Right now I am running twenty watts into a single 807, but I work in the A.A.R.S. Net during a crowded traffic hour, experiencing little or no difficulty. Just the other evening I had a forty-five-minute chat with W3CXL, and he did not ask for a special effort. Forty-six of the forty-eight states have been worked with the twenty watts without any special effort being made to do so.

Still another feature is that eighty combines the local rag-chew possibilities of one-sixty with the DX potentialities of the higher frequencies. I have often had schedules with a neighboring town and with a station a thousand miles away on the same night.

In short, I like eighty meters because it is dependable; it enables the low-powered station to work out; it permits both local and DX contacts; it is occupied by the best operators in our ranks, the traffic men; it is far enough away from the broadcast band to minimize BCL trouble; and it is one of the most economical bands in terms of equipment needed to place a transmitter in operation.

BRIEFS

W3BWT recently came across his first Official Relay Station Certificate issued in March, 1923. He has been an active O.R.S. continuously since—a record of which anyone might well be proud!

Flo K. Hart, W9CHB lives on Woman Lake Road in Pine River, Minn.

* 1810 Spear Street, Logansport, Ind.

ARTICLE CONTEST

The article by John T. Frye, W9EGV, wins the C.D. article contest prize this month. We invite entries for this monthly contest. Regarding subject matter, we ask you to tell about what activity you find most interesting in amateur radio. Here you will find an almost limitless variety of subjects. Perhaps you would like to write on working for code proficiency, Emergency Corps planning, traffic work, working in Section Nets, the Phone and Telegraph operating procedures, holding a League appointment, working on radio club committees, organizing or running a radio club, the most interesting band or type of ham activity, or some other subject near to your heart.

Each month we will print the most interesting and valuable article received. Please mark your contribution "for the C.D. contest." Prize winners may select a bound Handbook, QST Binder and League Emblem, six logs, eight pads radiogram blanks, DX Map and three pads, or any other combination of A.R.R.L. supplies of equivalent value. Try your luck!

Ensign E. L. Battey, U.S.N.R.

The call of National Defense was quickly answered by Assistant Communications Manager Battey of A.R.R.L. Headquarters. "Ev" immediately volunteered for a tour of active duty when he learned that N.C.R. officers were needed to conduct the Naval Reserve Radio School at Noroton, Conn. He is presently hard at work helping to turn out a goodly share of the many radio operators that will be needed under the nation's expanded naval program. We're proud to say that from among us the country has obtained as capable and experienced a man as Ensign Battey. We salute you, Ensign!

Radio Amateurs Help in Gale

On November 11th a terrific gale swept over the country, hitting Michigan in general, doing the most damage in the northern part of the state. Western Union facilities were crippled north of Bay City.

At 10:30 A.M. on November 12th, W8DPE established contact with WSLA of Frankenfield, Mich., who reported all lines down. W8DPE immediately took messages from WSLA to be transmitted to the Western Union here.

At approximately 10:30 A.M., WSNQI of Grand Rapids, Mich., came on the air. He was asked to contact the local Western Union office and to arrange to handle Frankenfield traffic through WSLA. This setup was established immediately, and WSNQI stayed on the air until 11:15 A.M. of November 13th, with the exception of a few hours' sleep during the time when no traffic was available. WSLA comments: Mr. Edwards, WSNQI, very highly for his very efficient work and also his reliability, WSLA is operator for the Ann Arbor Railroad, both for the radio station and the railroad system. Other stations who should also be commended for their work and willingness to cooperate are WSSQ of Traverse City, WSSQ of Owosso, who handled two of the most important messages, and WSSAY of Muskegon, who aided very materially in establishing emergency setups for "standbys." Others were W8NYR and W9UCD, and later, members of the QMN Net who reported in as soon as they returned home from their work.

A very important lesson was learned during the time when the only communication was radio. Each station should have an alternate, so when he is away to work his alternate would be available in the day time if possible.

Meet the S.C.M.'s

Edward Baunach, S.C.M., N.Y.C.-L.I., received his present call in 1920, and has managed to keep some sort of transmitter on the air ever since. He has been O.R.S. continuously since 1928 and is also O.P.S., O.B.S., and R.M. Active in the N.C.R., he hasn't missed a drill schedule in six years. A 6L6 e.c.o.-6L6 amp. with battery and generator supply is the emergency transmitter. Regular transmitting equipment consists of a Collins 45A and an e.c.o. rig ending up in PP-810's. The receiver is an HRO. W2AZV operates on 7 Mc., and with both 'phone and c.w. on the 1.75 and 3.5 hands. The most used frequency is 3710 kc. S.C.M. Baunach received a Public Service Certificate for his work in the 1938 Long Island hurricane. He's a member of the Radio Club of America and the I.R.E. His other hobby is amateur photography and, to keep in trim, he turns to swimming and handball. He's employed by the News Syndicate Co. as a photographer.

W7GNJ

Carl Austin of the Oregon Section is another S.C.M. whose experience in amateur radio dates back a good many years. He received his first ticket in 1922 and was active with the call 7ADD. 1.75- and 3.9-Mc. 'phone are the bands on which he spends most of his time these days. The rig in use is a 1.75- to 28-Mc. handswitching affair with PP-T55's final and a job with 204A's that works down to 14 Mc. A 12-watt self-powered 'phone-c.w. transmitter is on hand for emergency use. Receivers are an HQ120 and a Super Sky Buddy. W7GNJ is O.P.S., O.B.S., O.O., participates in many contests, and was the winner for Oregon in the 'phone section of the 1938 Sweepstakes. S.C.M. Austin is active in the Oregon Amateur Radio Association as one of its Directors at large.

Brass Pounders' League

(October 16th-November 15th)

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These stations "make" the B.P.L. with total of 590 or over. One hundred deliveries + Ex. Del. Credits also rate B.P.L. standing. The following one-operator stations make the B.P.L. on deliveries. Deliveries count.

W2AV, 284 W5GFT, 190 W3DRD, 129
W6LUJ, 251 W9TVY, 186 W9KEL, 128
W5CRK, 235 W3XLJ, 179 W9QG, 127
W1MEC, 223 W5CBE/S, 169 W3FDR, 122
W3HRS, 220 W7APS, 152 W8FCG, 112
W7GVL, 211 W7ZLR, 154 W4APS, 139
W6RQP, 204 W8J1W, 152 W3KE, 118
W8KWA, 198 W2CGG, 136 W9TKG, 114

A.A.R.S.

MORE-THAN-ONE-OPERATOR STATIONS

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<td>225 170 2841 73 3469</td>
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A total of 590 or more deliveries + Ex. D. C. will put you in line for a place in the B.P.L.

1 September—October.
2 August—September.
3 July—August.

BRIEFS

Correction: In December QST the call of Colorado S.C.M. Drummeller was in error given as W9EFC. Our mistake. It should have read W9EHC.

Back in the spark days one of the stations that made a lot of racket up and down the Pacific Coast on 200 and 375 meters was 7ZJ, which was operated by three brothers — Royal, Harold, and Bill Mumford. About the time c.w. came into general use the station was dismantled as each went to college, married, etc. At the present time the Mumford brothers are scattered around the country. They're on the air again using 7044 and 7046 kc. and have been holding successful schedules nearly every week-end, so if you hear W7AXZ, W2DIH and W6FAR rag-chewing far into the night, it is just a three-way family reunion going on.

January 1941
WHICH:

It would take a guy more skilled in legierdemain than we are to pull any plums out of the hat this month, but that isn’t going to prevent our telling all we know. Cheer, Jarvis now, using 7025 and 7175. JEG i•• on Sundays and sometimes Saturdays at 4 p.m. PST . . . . • . . You’ve been up - it won’t take long . . . . . W6PMB, working KF4JEG/KG6 (26,750 ‘phone), learned that K5BBM is on Jarvis now, using 7025 and 7175. JEG is on Sundays and sometimes Saturdays at 4 p.m. PST . . . . . You’ve been told before, but W6PMB reminds us that KF4JEG (14,360) should be QSL’d via his old QTH, W1KFV . . . . .

KSAP, ex-W4FJG, writes to say that K5BR, many of whose cards came to KSAP, was never located down there as far as he knows. Dave has been off a few months, but hopes to get back on in the near future . . . . . W6TGB sent us G2ZQ’s list of confirmations so, to keep the records KFGJEG/KGS told before, but W8TOB reminds us that K5AP, ex-W4FBD, writes to say that K5BR, many of whose cards came to KSAP, was never located down there as far as he knows. Dave has been off a few months, but hopes to get back on in the near future . . . . . W6TGB sent us G2ZQ’s list of confirmations so, to keep the records KFGJEG/KGS told before, but W8TOB reminds us that

WHEN:

KD4GYM is still active on 14,240 ‘phone and 14,200 e.w., and will be down there until the latter part of February . . . . . W6PMA reports the KA stations mostly off 7 Mc., but KENOT (7030), KEPIT (7010), KELKN (7080), KEFHD (7090), KEFAD (7105), KCAUSB (7045), W6WDN/K7 (7090), KBEHG (7090, 7100), KAX (7105) and K4FUV (7105) are all active. K5AX is a new one at Hobaton . . . . . More K5’s, reported by W6QKX, include KEFAZ (7170), KRE2J (7215), KC5AA (7150), K4ONZ (7120), K5AYD (7130), and KYGOM is on 14,355 . . . . . Since last month — we heard a couple of W6’s at 6 p.m. EST and got all heated up about the possibility of working 7 Mc. cross continent, with daylight all the way. Dunno if it has ever been done, but it’s certainly possible. Years ago, on the west coast, we heard a couple of W4’s at noon on 7 Mc. and almost burned up the pet 210 trying to raise them. It’s no fun, though, because the boys at the shack sure gave us funny looks for a couple of weeks afterwards . . . . . W6BAM was telling us during the DXCC Round Up that he had worked K6NZC on 28,100 e.w., and several other fellows have mentioned that the 10-meter e.w. activity is picking up. Weekends are the best times to go scouting, and you’d better get in your time this year because it is probably the last good season for some time.

HOW:

The notice last month that the DXCC listing is to be discontinued “for the duration” brought forth a few cries of anguish and despair from the poker men who play ‘em close, on the basis that they’d be holding out until they got one hundred, and now the door is closed. To take care of these fellows, cards will still be checked and certificates awarded to those who can hit one hundred or more with cards and other confirmations, sent in all at one time. Thus there is still plenty of incentive to score as many of the possible countries as possible, to get the award for the slack wall. But the burden of cards straggling in a few at a time will have been removed from the card-checking department. But we hate to think of the deluge when the listing is re-opened, in the very near future, we hope!

As far as lists of contacts go, the only ones we have here at HQ, aside from the DX Contest logs (which you can check on by looking in the story on that particular contest), are ones from VU2FA, PZ1AB, H1BCS, L1AN1, Y70XEN, FN1C, YAA, Y1BLK, Y3VCU, P26XX, Y3XX, VR6AY, OK2QY, KEBNJ (Jarvis), YL7TP, VP2NT, YU7BR, K4USA, K4UASB, K5USC, K6ERSA, K8GMV and KD4GYM.

Not all of these are complete, of course. Remember these are only used for checking fellows that can get into the 100 clubs if they are listed, so please don’t ask us for a QSL from these stations. QSL’s are still obtained by the usual methods: bribery, plaintive pleading, cajolery, fustian, or just downright luck. But please, Gretchen — no tricks!

The changes in the DXCC listing since last month are as follows:

W2GTZ ............. 149
W2QG ............. 148
W2BH ............. 126
W2BB ............. 144
W4CYU ............. 123
W1ADM ............. 132
W1AS ............. 120
W1BH ............. 119
W2PQP ............. 115
W1BCX ............. 112
W5LFE ............. 110
W8QQ ............. 109
W3T ............. 108
W4TZ ............. 102
W5LFE ............. 91

Since cards will now only be checked to bring applicants to a total of 100 or more, future listings here will show only those over 100. When the full listing is resumed the old procedure will be followed.

DXCC ROUND UP:

This Round Up, held over the last weekend in November, didn’t bring out quite as many fellows this time as last, although those who were in it seemed to be having a good time. It looks as though 14 Mc. folding up early had something to do with it, plus the fact that, while everyone seems to have listened on 40, very few put their transmitters up there. A rough check shows that about 35 of the gang were on during the weekend. That’s hardly enough to make the thing pay and, unless a lot of fellows request otherwise, we will have to let the Round Up go by the bored.
Merry Christmas
and
Happy New Year
from
National's Company
which includes

Samuel Samour . . . W1AMB  Jack Ivers . . . . . . W1HSV
Lester Harris . . . . W1AOP  Earle D. Benson . . . W1HXF
Thomas P. Leonard . . W1AUJ  Matthew Sokolowski . W1ISR
Rufus Turner . . . . W1AY  Joseph Homan . . . . W1IYA
Herman S. Bradley . W1BAQ  Sumner Herrick . . . . W1JDF
James A. Ciarlone . . W1BHW  Edmund Harrington . W1JEL
Dana Bacon . . . . W1BZR  Kenneth Nagle . . . W1JGD
Calvin F. Hadlock . . W1CTW  Delbert Hood . . . . W1LD
Seth Card . . . . . . W1DRO  Richard Ireland . . . W1LDT
Gene Simms . . . . W1DXD  Richard Gentry . . W1LEN
John F. Bartlett . . . W1EU  Walter McMillen . . . W1LIS
Donald E. Hinds . . W1FRZ  T. M. Ferrill, Jr. . . W1LJI
Robert Murray . . . W1FSN  F. A. Waden, Jr. . . W1LNV
Claude W. Darling, Jr. W1GDI  Edward Mallumian . W1LOE
Richard Minichiello . W1HBR  Walter Lannan . . . W1LOQ
Wallace Battison . . W1HE  R. Johnson . . . . W1LZG
Richard Chaloff . . . W1HME  Richard Heileman . W1MWT
Robert Moses . . . . W1HMH  William S. Doyle . . . W1TV
David Smith . . . . W1HOH  Arthur H. Lynch . . W2DKJ
Vicent Messina . . . W1HRW  Myrl B. Patterson . . W5CI
Herbert Becker . . . . W6QD

(Number eighty-three of a series)
Mallory X-64 is the symbol that designates the exclusively developed synthesized plastic dielectric which contributes so much to the amazing performance records established by Mallory Transmitting Capacitors. X-64 is a non-oxidizing, non-polar translucent resin of exceptional stability. Among its many special advantages are:

- Excellent for high temperature operation up to 200°F. (93°C). Power factor decreases with increasing temperature throughout normal operating temperature range. At high temperatures the power factor is below that of other types of dielectrics at normal temperatures.
- Capacitor may be mounted in any position without danger of leakage.
- Semi-solid Impregnant provides anchorage for capacitor components and helps resist effects of extreme vibration and physical shock.
- Average breakdown higher than usual for oils or waxes.
- Capacity change with temperature less than 12% from -80°F. to +200°F.
- Extremely high insulation resistance—long life—low leakage.
- High dielectric constant (K). Smaller size with main feature—repellent.
- Low vapor pressure.
- Maintenance quality.
- Non-inflammable.
- Anti-loose with main feature—repellent.

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**P. R. MALLORY & CO., Inc.**

**INDIANAPOLIS, INDIANA**

Cable Address—Pelmallo

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**October '40 O.R.S.-O.P.S. Parties**

The quarterly get-togethers in October were highlighted by numerous fine performances on the part of both the 'phone and c.w. gangs. W2DGM was the H of the O.R.S. show with a score second only to the record made by W8BES in the January 1940 party, Jerry took second honors with a total only slightly less than DGM's. Those days in the Eastern Pa. Section really have what it takes! Our "sleepless wonder," WTS, made a healthy third with quite a husky score, too. Competition in these parties is rapidly becoming stiff. Look at those figures! In the "big ten" there are seven scores over twenty million, and fifty-three over five million! W4DCQ, who manages to stay up near the top in the O.P.S. Parties, was top man for the second consecutive time in the 'phone doings with a showing that turned out to be a new high under the present scoring system. W8WMI, who might be placed in the "dark horse" category, "placed" with a handsome score. W2LXI, who is fast becoming a threat to the oldtimers, ran a very fine third.

January O.R.S. and O.P.S. quarterly activities are scheduled for the last week-end in January. The January bulletin will bring full details of a change in the plans that should make more QSO's than ever possible on January 18th and 19th. All League members who are interested in becoming top-notch operators and have a
HOW does it perform? How will it stand up? And, how soon will it be obsolete? These are all important questions in determining the actual value of any product. The "HQ-120-X" has established a record which answers all of these questions and assures the amateur of the finest dollar for dollar value. Many owners write that the "HQ" outperforms anything they have ever owned. Its ability to "stand up" is proved by the exceptionally few used "HQ" receivers on the market, despite the thousands which have been sold since the "HQ-120-X" was first introduced. As a matter of fact, we know of hams who bought other

makes last year in preference to the "HQ" but who, this year, traded them in on the "HQ-120-X" — no obsolescence in that!

So, if you intend buying a new receiver, by all means see and hear the "HQ-120-X." Its up to the minute performance and sound dollar value have been proved by thousands of users.

MAIL COUPON TODAY!

HAMMARLUND MFG. CO., INC. Q-1
424 W. 33 Street, New York City
Please send "HQ-120-X" booklet

Name ...........................................
Address ........................................
City ............................................ State .............
HIGHLY ACTIVE: Instantly snaps into oscillation. Accurately follows keying.

POWERFUL: Uniformly high power standardized in a loaded oscillator, measured with output.

ACCURATE AND STABLE: Frequency guaranteed .03% accurate. Drift less than 4 cycles/mc./°C.

DEPENDABLE: Thirty-one checks and inspections, including a final overload test, assure reliable operating characteristics.

OFFICIAL 'PHONE STATION SCORES (OCTOBER)

OFFICIAL RELAY STATION SCORES (OCTOBER)
THE high standards to which the "Super-Pro" is manufactured, assures the user of the best possible service over a long period of time. That is why "Super-Pro" receivers are used in practically every department of our national government, by a host of foreign governments, and by many important commercials and expeditions.

Early models of the "Super-Pro" have been in continuous service for nearly five years with remarkable satisfaction. As an example of its sound engineering, we find not a single record of band switch failure and that is an extremely important and much used part of any receiver. Slight changes and refinements have been made from time to time with a result that the "Super-Pro" is, and always has been, one of the finest pieces of communications equipment available. The many hours given to the inspection, testing, and adjustment of each "Super-Pro" by skilled craftsmen are not without results — the record speaks for itself.

SEND FOR BOOKLET

HAMMARLUND MFG. CO., INC.
424 W. 33 Street, New York City
Please send "Super-Pro" booklet

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

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

Export Address: 100 Varick Street, New York City  •  Cable ARLAB
High Sweepstakes Scores

Look from operators who took part in the 11th A.R.R.L. Sweepstakes are still pouring in at Hq., as we go to press. It appears that this SS will be a record breaker for number of participants. Entries from some 900 amateurs have been received at this writing, and we are listing the high claimed scores submitted. Further checking is necessary before we can give you any official results. A full accounting of the affair is scheduled to appear in the April issue of QST.

The highest score received is that from W2GSA, who worked 631 stations in 62 sections for 97,419 points. Although the information has not been verified, we hear via the grapevine that the all-time high of 101,500 points set last year by W2IOP has been topped by a good margin. However, we'll know more about that when all the reports are received. Thus far there is no indication that anyone worked all sections. W6PCE and W6ITY each worked 63 sections, Vermont being the one missed. W6ITH, who has led the 'phone gang in many previous Sweepstakes, also reports working 63 sections. He worked all states, which is no mean accomplishment! The missing section in his case was KA. The tabulation below shows scores, stations worked and sections worked.

<table>
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112 Mc. Hpt in Boston

A general picture of 2½-meter activity in the greater Boston area may be enlightening to the multitude of 2½-meter experimenters elsewhere in the nation! These results are deductions from a 2¾-meter station survey conducted by W1PI in November 1940. Information concerning 84 stations was obtained showing:

- Lowest power, 1 watt, used by W1LID
- Highest power, 150 watts, used by W1JDF
- Average power used, 28.5 watts
- Elevations — Highest, W1LY, 350 ft.
- Lowest, W1KIX, W1YCT, 20 ft.
- Average Elevation, 108.5 ft.

In all cases the stations reported their DX records in different directions from their location, exclusive of work portable and from hill tops. The best DX listed was a contact made by W1MON with W2LAU, Summit, N. J., a distance of approximately 200 miles.

A thirty-five per cent of the stations reporting had worked over 100 other 2½-meter amateur stations, W1QA of Randolph had worked most stations (885) in some four
Ben says ... "the performance of any transmitter is no better than the Class C amplifier... I was very careful in my choice of every unit that went into its construction... after considering them all, I chose Eimac 75T's and they have exceeded my expectations... I have loaded them from 150 watts to 1050 watts input and they have come through with flying colors."

At the present time Ben is running the pair of 75T's at 310 watts input. The results obtained with this class C amplifier speak well for the design and performance of the tubes. Right now Ben is converting other sections of his transmitter to Eimac Tubes. There's no stronger recommendation than that. A pair of 75T's going in as doublers.
— they put you on the air with plenty of pep and efficiency! They’re time-proved in thousands of amateur and industrial applications all over the world. Ask your Jobber for Ohmite Parts — you’ll insure peak performance for your rig!

**Dummy Antenna**
Used in checking R.F. power, impedance match, line losses, etc.; helps you tune up to peak efficiency.

**Brown Devil**
10 and 20 watt vitreous-enameled resistors for voltage dropping, bias units, bleeder, etc.

**Parasitic Suppressor**
Small, compact resistor and choke, prevents u.h.f. parasitic oscillation.

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**Get the New Ohmite Ohm’s Law Calculator—at Your Jobber**
Solves any Ohm’s Law problem with one setting of slide! Simple — handy, complete! Only 10¢ to cover handling cost. See your Jobber or send 10¢ in coin now.

**OHMITE MANUFACTURING CO.**
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**EUGENE, ORE. VOCATIONAL SCHOOL**

The Eugene Vocational School is offering training in several radio fields of interest to amateurs.

A course in radio operating designed to qualify trainees for the communication service of the Army and Navy is now in progress. Instruction is given in International Code, radio theory and in the servicing and maintenance of radio receivers and transmitters. Touch typing is given as a related subject.

Training will also include work in recording and in studio technique for those interested in those fields. Individuals may build radio equipment for their own use as a work project if they so desire.

Individuals holding amateur licenses may enter at any time; those with no radio experience may register only at certain specified times. Although no tuition is charged, there is a material fee of two dollars per month.

Roger Houglum, W7FHB is senior instructor.
Dual alignment of r-f circuits provides greater approach to constant sensitivity, higher image rejection throughout each range. H-f end of each coil aligned with Air-Dielectric Trimmer. L-f end inductance tuned.

Electrical bandspread at its best results from use of this special 3-gang, triple-section condenser connected in parallel with the 3-gang, double-section main-tuning condenser. Ceramic insulation used for dependability, strength.

A temperature-compensated trimmer condenser in the h-f oscillator circuit stabilizes frequency from effects of temperature changes. A voltage-regulator tube guards against frequency shifts caused by line voltage variations.

Selectivity is variable in six steps. Curves show degree of selectivity for each step. Note that step #6 has a bandwidth at "two times down" of less than 100 cycles.

AN RCA ENGINEERING ACHIEVEMENT

The few features shown above will give you some idea as to why the AR-77 is one of the finest, most sensitive and most stable receivers on the market today. Space here does not permit the inclusion of other outstanding features ranging all the way from more effective use of insulation to the manually-adjusted Noise Limiter. That is why we suggest that, before buying your new receiver, you see the AR-77, look it over from stem to stern and give its dials a whirl at your nearest RCA Amateur Equipment Distributor's store. You be the judge!

AR-77 Communication RECEIVER

Stay-put tuning; breakin operation; highest signal-to-noise ratio; uniform sensitivity; bandspread tuning for the amateur 10, 20, 40 and 80-meter bands; improved image rejection; negative feed back; antenna trimmer, etc.

Amateurs' Net Price, $139.50
MI-803 Table Speaker in matched cabinet, $8.00 extra
P.O. B. Factory

for Amateur Radio

RCA MANUFACTURING COMPANY, INC., Amateur Division, CAMDEN, N.J. • A Service of the Radio Corporation of America

In Canada: RCA VICTOR COMPANY LIMITED, MONTREAL

57
and Fred Riebe, W7HPS assistant instructor. Inquiries should be addressed to the Eugene Vocational School, Fourth and Madison Streets, Eugene, Oregon.

Thirty-Two Hams at N.C.R. School

How to Apply

“Eve” Battet, A.C.M., A.R.R.L., who is on active duty with the U.S.N.R. at the Naval Reserve Radio School at Noroton, Conn., sends us the following: The training schedule at the school is well under way. There are thirty-three amateurs among the officers and enlisted men. Lt. Comdr. H. F. Breckel, C-V(S), U.S.N.R., is the Communication Officer and is in charge of instruction. Lt. F. R. Tuthill, Lt. William F. Grogan (ex-W4QY and former Fla. S.C.M.), Lt. Perce B. Collison (W2XEB), Ensign D. C. S. Comstock (W1MY), Ensign Robert W. Perry (W8DZU) and Ensign E. L. Battet (W1UE) are instructors. C. E. Johnson, CRM, U.S.N., L. F. St. Amand, CRM, U.S.N.R., and F. B. Fucile (W8FZS), CRM, U.S.N.R., serve as assistant instructors. Among the students are the following amateurs: W1IOT, LBW, LDV, LJE, LQB, LRW, LZS, MQL, MTM; W2FQH, HYN, IMW, HPS, KYQ, KWO, LAW, MBB, MIF, MHB, IVF, KKN, NAI, IWM; W3EJ, HSY, ISO, GTB; W5ZHY. New classes are scheduled to begin March 1st. Anyone interested in signing up for the school should contact his local N.C.R. headquarters well in advance of this date, to ensure that all the necessary arrangements are made in time. For a list of Commandants from whom applications may be obtained, see page 39 in August 1940 QST. The Noroton School is the largest of its kind in the country. There are several others, and those signing up will undoubtedly be sent to the one nearest them.

CODE PRACTICE QRM

Collierville, Tenn.

Editor, QST:

Although I am not a licensed amateur, I expect to try for my ticket shortly. Your practice transmissions from WIAW sure have helped me to speed up my code. I listen to every one. At present I can copy 20 w.p.m., or a little better. The only complaint I have to make is that the transmissions don’t come often enough.

Also I hope you will make a plea in QST for other hams to avoid using the same frequency as WIAW during the practice transmissions. Sometimes it is barely possible to copy through the terrific QRM.

— Madison Wilson

SWEEPSTAKES

Editor, QST:

Again I come to you with a topic that is a sore spot in amateur communications... I refer to O.P.S. and S.S. parties and their objectionable interference with messages and communication. It always has been my understanding that the League was formed for development of orderly traffic-handling and communications. This useless QRMdefeats our very purpose, and the justification of the bands we occupy. You in your official capacity are entrusted in promoting these qualities; then why do you instigate these O.P.S. and S.S.
OUTSTANDING REASONS WHY

Taylor T-40 and TZ-40

Lead In Sales-Performance-Value

Safety Insulator protects against glass failure.

Safety Factor affords real protection against failure due to temporary overloads. T-40 and TZ-40 Safety Factor is 260 watts.

Processed Carbon Anode dissipates heat better and makes possible the high Safety Factor.

Complete Molybdenum Grid can stand heavy overloads—a costlier material but important to you in every day use.

Alsimag Base—one of the best insulating materials available.

Taylor T-40’s and TZ-40’s cost more to produce because better materials are used throughout. As a result, better performance, greater safety and longer life will be secured.

SOLD OVER 30,000
TAYLOR WONDER TUBES

T-40 and TZ-40 Characteristics

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<th>Filament Volts</th>
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<td>Safety Factor, Watts</td>
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"More Watts Per Dollar"

Merry Christmas and a
Happy New Year

FRANK HAJEK W9ECA
WARREN TAYLOR
JOSEPH HAJEK
REX L. MUNGER W9LIP
BILL BISHOP W9UI
CHARLES KIDNER

THEY TUBES, INC., 2341 WABANSIA AVE., CHICAGO, ILLINOIS
It is only fitting that at this season we give pause for a moment to contemplate the many Blessings which are ours and to rejoice with you that of all the places of the Earth, we are fortunate enough to live in a Land of Peace and Promise.

In looking ahead to the New Year, let us more firmly determine to solidify the Partnership ties which bind us together in the common cause to make that Peace secure and long lasting.

If, at times in the past year, you have had to endure delays and tardy delivery schedules, it was because a more pressing and more universal National Duty was ours to fulfill.

The entire Kenyon Organization from President to Watchman are as one man in support of the great cause which will make this Holiday Season more secure and to insure for you and for us — for all the future —

"Peace on Earth to Men of Good Will"

KENYON TRANSFORMER CO., INC.
840 BARRY STREET
NEW YORK, N. Y.

DECEMBER 25, 1940

U.S.S. Wyoming, Norfolk Navy Yard, Portsmouth, Va. Editor, QST:

It gave me just a touch of nostalgia to open the November issue of QST and find the announcement of the A.R.R.L.'s Eleventh Sweepstakes. I suddenly realized that I wouldn't be able to take part in the contest this year, and it hit me hard. . . .

Being a Radioman Third Class in the Naval Reserve, I am doing active duty now, whereas just about a year ago I was oiling up the old bug and getting ready to logon that first momentous "CQSS." I never realized, then, what those S.S. contests would contribute to my operating skill, but as I look back now I can see that they served as some of the finest training periods in my radio experience.

So, even though I won't be in the thick of the fray this year, I'll be sitting down here in the radio shack of the Wyoming listening to skilled operators in the making. They will be having fun, then, but no one knows how soon that fun will be converted into valuable experience so necessary to-day in our own national defense.

— Arthur Gralz, WBDK

BCL QRK

4317 Harrington Rd., Kensington, Baltimore, Md. Editor, QST:

Having worked as control operator for some time with one of the local broadcast stations, I've been impressed by the number of phone calls the broadcasters get relative to amateur interference. As some of these calls are transferred to the technical department in order that information may be given to the complainant, I've found that the person logically calls the station which is being interfered with for information as to how the interference can be eliminated, except when he knows the amateur personally.

The broadcaster has no other alternative than referring such complaints to the local F.C.C. office. However, if the local clubs or S.C.M.'s or any other responsible amateur agency could arrange with the local stations to gather these complaints and distribute them to the offending amateur, I'm sure that many citations by the R. I. would be stopped before complaints reached his office. Also, the broadcaster would probably be glad to have some way of handling the complaints.

Possibly arrangements could be worked out whereby the station could forward the information or it could be picked up periodically by some person connected with the amateur organization, who could distribute them as necessary.

— William Hess, WSPDJ
The complete transmitter is mounted in an attractive metal cabinet and the entire unit, including the chassis, is finished in smooth gray enamel.

Another new Thordarson designed and laboratory tested transmitter. Operates on either 115 volts AC or 6 volts DC, without change of parts or wiring for conversion from AC to DC — only the insertion of proper power plug is required. The transmitter may be used on all bands from 160 to 10 meters, and doubling may be accomplished in the crystal stage when using 160, 80, and 40 meter crystals. A built-in network provides matching to any type of antenna. A single meter is provided with switch which permits reading plate current in either the oscillator or final stage.
RADIO TRAINING

PORT ARTHUR COLLEGE—not privately owned, not operated for profit, a college built and endowed by the late capitalist-philanthropist, John W. Gates—offers the most thorough practical Radio training in America. P. A. C. owns Radio Station KPAC, which is equipped with the very latest type 1000-Watt high fidelity RCA transmitter, operating on 1220 kc. with directional antenna system. The college is authorized to teach RCA texts. Additional equipment consists of the latest type Marine and Airways Transmitter installation complete; SOS Automatic Alarm; Marine Direction Finder, two-way Television Transmitter and Receiver; Trans-radio Press Receiving Equipment; laboratory facilities where every phase of practical radio assembly technique is taught. Students assemble composite transmitters, audio amplifiers, RF amplifiers, etc. The Radio training covers thoroughly Airways, Press, Announcing, Teletype, Typewriting, Laboratory and practical experience at KPAC transmitter, control room and studios. Announcing is an optional part of this training; nevertheless a number of students annually make successful announcers.

Port Arthur College pioneered the teaching of radio with its first classes in 1909, and for thirty-one years has maintained an active Employment Bureau that is successful in placing graduates in airways, broadcast and marine radio industries.

If interested in details about the Radio Course, write for Bulletin R

PORT ARTHUR COLLEGE
Port Arthur (World-Known Port) Texas

CLEARANCE SALE!!

WELL KNOWN GROSS TRANSMITTERS

Completely Wired and Tested

95 WATTS C.W. .......... $ 64
95 WATTS PHONE & C.W. ... 110
150 WATTS PHONE & C.W... 200
250 WATTS PHONE & C.W... 295

Descriptive Bulletin on Request

GROSS RADIO, INC.
51 Vesey Street New York City

MINNESOTA HAMM HAMM WHIP STORMS

(Continued from page 39)

Commercial stations went on the air and told all listeners whom to call if they were attempting to locate relatives.

George H. King, W9OTE, Minneapolis, worked from morning to night on Tuesday. "The telephone rang continuously," he says. "My wife couldn't get away from it long enough to cook dinner."

Up in Kasson, Minn., Robert S. Erickson, W9QNH, was contacting missing hunters and relaying the messages. In Minneapolis, Forrest Nelson, W9NNO, and Arthur Anderson, W9ZMQ, never moved from their sets.

Trains stalled for 10 hours — for 15 hours — were located, and the operators stood by until the crews informed them "All's well."

Near Farmington, Minn., a C. M. St. P. & P. train steamed onto a siding, and the conductor informed passengers that trains ahead were blocking the main line. Passengers spent the night on the train, and when morning came they were still trapped. Dr. Ralph D. Casey, Chairman of the Department of Journalism at the University of Minnesota, had two urgent messages to get out, one to his family and one to faculty associates. But all telephone and telegraph lines were down. Finally, he located Ham Clay, Jr., publisher of the Dakota County Tribune, who took him immediately to Kenneth G. Springen, high-school instructor and amateur operator. In less than 10 minutes Springen had contacted a St. Paul operator and the messages were delivered.

Many persons from Watertown were stranded in Minneapolis. In that South Dakota city, however, Stanley L. Burghardt, W9BJV, was steadily on the job, and contacted dozens of persons.

Once, at the height of the storm, Burghardt's antenna collapsed, and he had to step out into an almost blinding gale to do a hurry-up job that held for the rest of the storm.

Fred Herman's antenna collapsed, too, and with only a pair of pliers he got it back in operation. Three times his power failed, but with the aid of his emergency plant he stayed in continuous operation.

Tom Davis, W9WVA, at Willmar, worked steadily from 10 A.M. to 5 P.M., as did Sherman Booen, W9RHT, at Albert Lea.

The operators virtually made the Minneapolis and St. Louis railroad their personal property "for the duration," and when they had finished, officials of the road could hardly find words to express their appreciation. The "thank you" calls from other railroads and persons aided were still coming in a week later.

It was grim work, but there was humor in it, too. Anderson recalls that one Minneapolis woman blandly demanded that he locate her husband "somewhere up in the North woods." He says she probably is still not convinced that this would have been a difficult assignment indeed.
NEW!
GL-866A/866
All the Wallop of an 866A
at the Price of an 866
Completely Interchangeable with Both Types...

Only $1.50

An amazing new tube and it's a bargain!

See or write your G-E dealer without delay.
General Electric, Schenectady, N. Y.

RATING
Fil. volts .................................. 2.5
Fil. Amp .................................. 5
Max. inverse peak plate volts .... 10,000
Average plate amp ....................... 0.25
Peak plate amp ........................... 1.0

BANDSWITCHING?
See "Magnetic Bandswitching" by Lew Bellem in QST for October, 1940. See your G-E dealer for those GL-807's and GL-814's.
NEW HEAVY DUTY RF ANTENNA RELAYS

Provide for switching antenna from transmitting to receiving.

FEATURE NEW MATERIALS

1. Lucite cross arm carries contact fingers.
2. Isol Randite block mounted on a Bakelite base support contact posts.
3. Contact fingers of stiff metal blades using coil springs to maintain contact pressure.
4. Contacts arranged for double pole, double throw, single break and rated at 25 amperes.

Write for Circular 507B

WARD LEONARD ELECTRIC COMPANY
41 South Street Mt. Vernon, N. Y.

Supplementing Mr. Pritchard's narrative account, additional reports on amateur work during the November storm emergency are here summarized.

From Sherman Booen, Albert Lea, W9IIRT:

"When all other means of communications fail, call on the ham radio operator! . . . About 6 p.m. most of the wire facilities of Albert Lea had been wiped out. The railroads were without orders, many people were stranded, and human suffering became acute. The 75-meter band became a beehive of activity. . . . W9BJV of Watertown was the first to take up the torch. I don't know how many hours Stan spent on the air, but it seemed he was on continually. . . . After sending a dozen personal messages Monday night, I went to bed, realizing that anything could happen. Tuesday morning at 10:30, the M. & St. L. depot at Albert Lea called. The dispatcher wanted permission from the chief at Minneapolis to start a snowplow north. . . . I went on the air. . . . W9BPK took the message and within 10 minutes the OK was given to Albert Lea to start the snowplow. At the same time all southbound traffic was ordered held at Montgomery. . . . About that time W9UOS, Fort Dodge, Iowa, reported that the local depot wished some information from Minneapolis. The message was relayed from W9UOS to W9RHT to W9BPK, then back via the same route. . . . A train was started from Fort Dodge, as a result of the contact. From then on until 10 p.m., the M. & St. L. sent 15 messages and answers. . . . Service to the railroads continued until wire service was restored. . . .

"The Interstate Power Co. wished to get a report from the head office. I took the message and relayed it through W9UOS to W9CQV at Cedar Rapids, Iowa, who telephoned it. . . . Hundreds of personal safety messages were handled. . . . A group of Hormel employees were marooned in Farmington. W9QMR relayed to W9OTE at Minneapolis, then to W9RHT at Albert Lea, then to Austin via the only telephone wire still up. That wire happened to be the KATE broadcast loop. . . . The worries of many people were dispelled by short wave radio. . . . Snow static was terrific, the 30,000-volt power line was chattering away R9, and the skip was long and uneven. Fading was very bad. . . . The Minneapolis and St. Paul gang figured
BUY ON EASY TERMS · MAIL ORDERS PROMPTLY FILLED · WRITE FOR FREE CATALOG

World Wide Service

Model
SX-28
for only
$15 95
down

Send for our New
and Bigger Catalog
with Exceptional Values

A complete stock of
other Hallicrafter Models
on hand for immediate
delivery. . . Write for
details. Liberal Trade
Allowance and Budget
Plan.

WORLD WIDE SERVICE

This title in three short words describes fully the performance
that we have been carrying on for the last seven years . . .
by command performance of thousands of satisfied Radio
Shack boosters reaching 'round the globe. This host of friends
through the years buys their needs from us, confident that we
will perform to their complete satisfaction. You too can
depend on us — we guarantee your satisfaction.

The RADIO SHACK
167 WASHINGTON ST., BOSTON, MASS., U.S.A.
it out so that someone was on all the time. All I had to do to get into the cities was to call for just a few minutes, and either Minneapolis or St. Paul would be standing by, ready to relay a message via the land line to its destination. . . .

W9HRT, incidentally, is chief announcer and program director of KATE, and when not on 75-meter 'phone during the emergency he was broadcasting personal messages on the b.c. band.

From Kenneth G. Springen, W9QMR:

"... At 5 p.m. the local AP correspondent called me and asked if I could get a message through to Minneapolis in case the storm continued. I informed him I could if the power was still available. About 8 o'clock the same evening he called me again, giving me an AP dispatch to handle as all land lines were out of commission. It was only then I realized that the services of my station might be needed badly. . . .

"Unable to raise any Twin City hams on 80, I contacted W9WCA, Douglas Lovelace, at Duluth, who finally raised W9BCT, Bert Coil, of St. Paul, and turned him over to me. We made a schedule for 7:15 a.m. the next day, little knowing the deluge of messages that was to come.

"Next morning things began to look serious. . . Here in Farmington over one hundred travellers were snowbound and innumerable others in farms along the highways. Messages pored into my house, and Mrs. Springen spent practically the entire day answering the telephone and writing messages for me to send to families of stranded travellers, besides numerous messages for the highway department, in routing snow removal equipment, the Jefferson Bus Company, and AP press dispatches.

"W9BCT . . . stayed on the job until his transmitter blew a by-pass condenser. He then got W9HCC at Wyzata for me by land line, and HCC took over until BCT got his transmitter back on the air. . . . The Minnesota Net, directed by W9BHY, did a grand job of relaying and delivering messages during the storm. . . ."

T. L. Graffunder, W9BMJ, of Marshall, Minn., is reported by WSCBI as working with 4 watts input and a wire thrown out the attic window. Despite weak signals and QRM, W8CBI, W2EC and W3ASW succeeded in getting W9BMJ hooked up with the Minnesota Net on 3795 kc.

Other stations who participated in the emergency work include: W9GEU, Rochester; W9HAS, Redwood Falls; W9HY, Winona; W9BQY and W9UYO, St. Paul; W9MYX, Sioux Falls, So. Dak.; and W9LKC, La Porte City, Iowa.

— C. B. D.
START 1941 with a Skylrider SX 28 by

hallicrafters

pay only $15.95 down and take all year to pay the balance

$12.68 per month for 12 months and it's Yours!


SX 28 complete, less speaker, cash price $159.50

CHOOSE ONE OF THESE FINE SPEAKERS

Regular PM 23 speaker in metal cabinet $12.00

Hallicrafters Jensen bass-reflex enclosure 30'' high, 16'' deep, 22½'' wide $29.50

Hallicrafters Jensen bass-reflex enclosure 23½'' high, 15'' deep, 17½'' wide $19.50

New Sky Champion S20R

$4.95 down $5.90 per month

EIGHT MONTHS TO PAY!

Sensitivity, selectivity, and all-around quality performance you'd expect only in a high priced receiver... yet Hallicrafters give it to you for only $49.50! Has all the essential controls for good amateur reception. Complete with tubes and speaker. Nothing else to buy. Cash price $49.50

FREE: . . . a book every Ham should have

BIG NEW CATALOG

Just out . . . with many more items than we've ever put between the covers of any catalog. Thousands of bargains, sets, parts, accessories, supplies, of best known makes. Hundreds of illustrations. This book belongs in every "ham' shack, ready for instant reference. Helps you plan your new rig, figure costs, learn sizes and specifications before you start construction. NEWARK'S most complete amateur radio catalog . . . 1941 issue . . . just out!

How to Order Your Hallicrafters Set

Pick out the receiver or transmitter you want, and write or print your order plainly. Include a transformer in the same order, if you want to. Write name and address plainly, enclose down payment and credit references. We ship immediately upon credit approval. You pay balance plus carrying charges in equal monthly payments of $5 or more. Any Hallicrafters receiver may be purchased this way if you order it from NEWARK!

FREE: . . . a book every Ham should have

BIG NEW CATALOG

Just out . . . with many more items than we've ever put between the covers of any catalog. Thousands of bargains, sets, parts, accessories, supplies, of best known makes. Hundreds of illustrations. This book belongs in every "ham' shack, ready for instant reference. Helps you plan your new rig, figure costs, learn sizes and specifications before you start construction. NEWARK'S most complete amateur radio catalog . . . 1941 issue . . . just out!

NEWARK Electric Company
323 W. MADISON ST. Dept. Q
CHICAGO, ILL.
EASTERN PENNSYLVANIA — SCM, Jerry Mathis, K3FX, is president of the chapter. 3BES and 3DGM ran a close race in the Pennsylvania Sweepstakes contest, besides making a forest in Harrisburg. AKB put in a little time in the SW and is in the Army. HFE is back on 112 MC again with frequency 17370 kc. The Eastern Penna. O.R.S. Net: 3HCT, 4CIDXC, 3BHE, and 3DRO, to town in the Sweepstakes. With the assistance of BR's Saturday and Sunday, at 11 P.M. and 10 P.M., on 7835 kc. Joy enjoyed the SS so much he wants 'em to bring on another campaign. O.P.S. Party. R.M. Night and Sweepstakes, besides making forrest in Harrisburg. AKB put in a little time in the SW and is in the Army. HFE is back on 112 MC again with frequency 17370 kc. The Eastern Penna. O.R.S. Net: 3HCT, 4CIDXC, 3BHE, and 3DRO, to town in the Sweepstakes. With the assistance of BR's Saturday and Sunday, at 11 P.M. and 10 P.M., on 7835 kc. Joy enjoyed the SS so much he wants 'em to bring on another campaign. O.P.S. Party. R.M. 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of AQ. Hope you all have a very prosperous and successful New Year, 73.

Traffic: W3ZBY 207 (WLMN 74) 1FT 136 CCC 80 ZI 82
373 35 DNU 50 BEI 30 HL 29 EW 21 QX 10 HTX 15
GVR 13 HZ 20 AQ I 14 GCX 12 ADE
10 ACC 6 AWS 5 CW 3.

WESTERN NEW YORK — SCM, Fred Chichester, WP8A — R.M.; HRJO, CSE, DSS, FCG, PCN, P.A.M. —
CGU, RVM, UNI, E.C.'s; FNT, GYW, DBH, SBB, SMH.
Thirteen amateurs attended the March 13 meeting of the
Annual Hamfest of the Finger Lakes Transmitting Society was
a big event in this Session. It was held at the Hotel Osborne in
Auburn, on Nov. 9th, with an attendance of about 185

Traffic: W5J8Q 272 QEC 43 DSB 111 FCQ 322 KRY 22
PCN 208 RKM 287 SBD 61 LW 322 THX 322 KYR 22
GVR 13 HZ 20 AQ I 14 GCX 12 ADE
10 ACC 6 AWS 5 CW 3.

western ham radio

Traffic: W5YHA 272 CSE 43 DSB 111 FCQ 322 KRY 22
PCN 208 RKM 287 SBD 61 LW 322 THX 322 KYR 22
GVR 13 HZ 20 AQ I 14 GCX 12 ADE
10 ACC 6 AWS 5 CW 3.

Western Pennsylvania — SCM, E. A. Krall, W3WPM. In charge of Emergency Communi-
W5AYY — Ass't S.C.M. in Charge of O.R.S., W3WA-
P.A.M., O.R.S., meet nightly at 8:30 P.M. to handle traffic.
BWP reports that UIQ is on assignment at Bloom-
field, N. S. 90TH is a fixed portable at Wilmington, OIL is
on duty at Newport, R. L., with the Naval Dental Corps,
and wants to hear from the gang. QRK sent in a nice report.
The 20 meter band is still pounding brass and the
new junior ops. TOJ worked hard in the S.S. NCJ sends in
a nice report and says that this winter promises to be a
busy traffic season. Both he and XYL hold 35 w.p.m. certificates.

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PCN 208 RKM 287 SBD 61 LW 322 THX 322 KYR 22
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western ham radio

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GVR 13 HZ 20 AQ I 14 GCX 12 ADE
10 ACC 6 AWS 5 CW 3.
MIDGET FREQUENCY METERS

Many amateurs and experimenters do not realize that one of the most useful "tools" of the commercial transmitter designer is a series of very small absorption type frequency meters. These handy instruments can be poked into small shield compartments, coil cans, corners of chassis, etc. to check harmonics; parasites; oscillator-doubler, etc.; tank tuning; and a host of other such applications. Quickly enables the design engineer to find out what is really "going on" in a circuit. Sold in sets of 4 in handy protective case or individually.

90605 Range 2.8 to 9.7 mc. $1.65
90606 Range 9.0 to 28 mc. 1.65
90607 Range 26 to 65 mc. 1.65
90608 Range 50 to 140 mc. 1.65
90600 Complete set of four, in case 6.50

What The League Is Doing
(Continued from page 19)

the result of the election can be determined after February 20, 1941, and will serve for the remainder of the 1941-42 term. The present alternate is W. N. Wintler, W7KL.

You are urged to take the initiative and file nominating petitions.

For the Board of Directors:

K. B. Warner,
Secretary

November 1, 1940

Fifth U.H.F. Contest Successful
(Continued from page 29)

Because of the lack of active u.h.f. stations in certain sections of the country and unfilled gaps between other active centers, some messages did not reach delivery points by the close of the contest. For the benefit of the fellows originating these messages we list below the points to which such messages were traced.

Starting Station To Starting Station To
W1AUN/1 . . . . W2ILK/2 W2LOS . . . . W1MRF
W1BSG/1 . . . . W1HDQ W2LXC . . . . W3GGR/3
W1CEA . . . . W1HDQ W2MES/2 . . . . W6VHG
W1CGY/1 . . . . W2ILK/2 W2MIV . . . . W2LAU
W1DLY/1 . . . . W3BZJ W2MLM/2 . . . . W1MRF
W1EHT . . . . W2BZJ W2MPS . . . . W2GPO
W1ERT . . . . W3HOF W2MUD . . . . W2LEX
W1HDQ . . . . W3IWA W2MWA . . . . W2LAU
W1HXQ . . . . W9VHG W2USA . . . . W1HDQ
W1J . . . . W3IWA W3ABC . . . . W5CIR
W1UTU/1 W3ABS W3BQW . . . . W1UTU/1
W1JDF . . . . W2CUZ W3FBN . . . . W1HDQ
W1JDY . . . . W9VHG W3GGR/3 . . . . W1HXP
W1KSB . . . . W2CUZ W3GKR . . . . W1HDQ
W1LEA . . . . W3GGR W3ZFR . . . . W3ABS
W1LMU . . . . W1HXP W3ZPF . . . . W3CGV
W1LWF . . . . W1JBE W3IWN . . . W9VEG
W1LSN . . . . W3GGR W3IDB . . . W1MRF
W1MDDN . . . W3BZJ W5CIR . . . W2GHI
W1MEP . . . . W9VHG W5CQW . . . W3ABS
W1MUB . . . . W2ILK/2 W5EEO/8 . . . W1HDQ
W1MWU . . . . W2ILK/2 W9MDA . . . W3ABS
W1SS . . . . W1HDQ W9EKC . . . W9VEG
W2BZB . . . . W2HFP/1 W5QDT . . . W2ABS
W2DAG . . . . W9VHG W5QDU/8 . . . W1MDN
W2DAZ . . . . W2GPO W5TCX/8 . . . W3HWN
W2FZA . . . . W2LAU W5ITU . . . W1MDN
W2JPT . . . . W2FZA W9GFA . . . W9HZB
W2LAU . . . . W1MRF W9VHG . . . W1HXP

Rubber feet on a bug, if clean, will not slip on glass. You can get a piece of plate glass for a table top cheaply by watching for broken store windows. — W4GMO.
Bass Reflex gives you better sound reproduction because it enables the loud speaker to function with full effectiveness, to perform even better than with an infinite baffle. This great development, originated by Jensen Engineers, is available in a complete line of acoustically-coordinated reproducers and cabinets for every application.

The arresting beauty of the new “CA” Reproducers qualifies them for the finest surroundings. Equivalent performance is provided in the practical, less expensive “MT” Reproducers. Economical “BR” enclosures accommodate your choice of speakers from 8 to 18 inch sizes. Write for complete information.
is very active. W1DHH is an ex A. D1ZT is on 1.7-Mc. phone. 'BAY is certainly busy man with all his schedules. LIP is coming along fine with his code speed. MNI has a new D104 crystal mixture on 1.75-Mc. phone. LWX has given up the 1.175-Mc. set to LTH, and 1.25 to TOSAH. CBP has taken unto himself a wife, and is living in Auburn. Hams in Lewiston and Auburn include 1 Moving Picture Op., 2 BC Ops., 1 Textile Service, 1 H.W.E. Operator, 1 Section Director, 6 U.B.R., 4 Shoe Workers, 1 Farmer, 1 R.R. Sig. Engineer and 1 H.R. Section Foreman. W1LK is a new NC-200. The P.A.W.A. had a swell Halloween Party, October 29th! It was sure a good job on 28-Mc. 'phone. KMM is active in Methuen, Mass., with WILKP, W1LKA, WIDEG and W1KKZ. Contacts with neighboring states is contemplated. T.BG. of bay Harbor are teaching several recruits to copy code. An orchestra was on hand, Fri., and that they work amateurs from 8 to 11 p.m. every amateur in Maine will get a certificate. I hope you all know that NAA is on 5865-kc. c.w., Mon., Tues., Wed. and Thurs. every one of you. who can sign up the largest number of new O.P.S. or O.R.S. in the next six months (Jan. 1st to June 30th), will get the usual test to pass the usual test is going to be held on July 16th, with all XYL's present. L.CQR of Feeding Hills, MA., is a busy man with all his schedules. W1GO.T is coming along fine with his code speed. MNI has a new Morse Code practice sheet. W1TB is a very active salesman. W1WZ is on 14-Mc. 'phone and working DX. W21YX has built a new fixed 28-Mc. beam which works fine. K4GIG visited K4Y and LFQ. W2HCV visited K4E, K4QG and K4F, They hold drills on Sunday mornings and Wednesday nights which tie in with the 1.75-Mc. A.R.R.L. Net, MGN is Alternating Net. We would like any other reports, traffic and otherwise from other A.R.R.L. nets or members. Milton hams had a test mobilization day on Nov. 12th, as a part of the town's Defense Committee.

Traffic: W1UMS 506 BDU 345 AKR 251 LWH 248 EBF 205 JCK 185 (WLG 33) 1X1 151 AAR KXU 89 FQW 77 AAI 39 HWE 29 LNN 23 KTH 14 GAG 12 S6 6 LZW 5 EYV 2 EMG 10 JYJ 8 MEU 83. 112, 123. A.R.R.L. Net: WA1AR 16 BU 15 BR 14 CT 13 RHR 12 IU 11 LIM 10 VR 9 (WLG 134) 8 IOR 135 (WLGJ 12) 7 MIF 4 MON 29 MGH 16 QD 51. (Sept.-Oct.: W1PEP 231 LWH 164 JYJ 138 MEU 81 EMG 140 LSA 36 LGH 20 WI 6 LBJ 3.)

W1GJ 81 HE 105 LKP 10 LHA 50 IRE 14 LML 157 IYK 17 LJP-MAP 2 CXY 19 BAY 89 Y4U 72 GTH 66 IYJ 46 LGH 86 FAP 135 GE 67 GHT 20 VGS 169 IJF 98 IST 34 KTO 177 KTN 74 LAF 36 LHA 55.

EASTERN MASSACHUSETTS — SCM. William J. Barrett, W1JAH — BIV leads us this month, the result of plenty of hours devoted to A.R.R.L. schedules. Nice going, Pres. 10IR says he would like a few traffic schedules. LJP turns in a nice score to wind up his first year as O.R.S. KZS joined the A.R.R.L. and is also fine for O.R.S. That's the spirit, Ernie. LUA is new S.N.C.4 for West. Mass. A.R.R.L. Division Director and Radio Aid for the First Corps Area. O.R.S. has a swell party. Those present were: 8NSO, AAR, BHL, EYR, KAL, LEM, LOS, MQF, MNI, MON, MQH and QD. They hold drills on Sunday mornings and Wednesday nights which tie in with the 1.75-Mc. A.R.R.L. Net, MGN is Alternating Net. We would like any other reports, traffic and otherwise from other A.R.R.L. nets or members. Milton hams had a test mobilization day on Nov. 12th, as a part of the town's Defense Committee.

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Traffic: W2KIN 236 JDP 102 GEY 116 MILO 90 GMM 77 BFT 58 RXJ 58 JKI 58 MMG 55 MOF/BFA 43 IP 30 HFO 5.

LONG ISLAND — SCM, Clayton C. Gordon, W1HRC — The N.A.A.R.O. has its application in for a station license and has applied for affiliation with A.A.R.L. KJKY has fully recovered and has resumed its operating schedule. Its new rig is a 600-watt o.e.o. and 800 with watts of 6000 on 30 Mc. Its new QTH is on 3.5, 7 and 14 Mc., with 90 watts. MRV received his 35 w. license and Certificate for 30 Mc. He has a 10-watt receiver with W4HBV. Saturday afternoon, at 4 P.M., on 7100 kc. DDJ has been having trouble trying to work a Collins Pi into EO1 cable. JP still leads the field in E1 Ultra-High Frequency activity. HJN has lots of 28-Mc. stuff is coming in on 28 250 kc.


VERMONT — SCM, Clifton G. Parker, W1KJG — GAN is busy building a new compact rack-and-panel transmitter for 8, 14- and 28-Mc. "phone to be installed in living quarters. KKY has joined the VT. National Guard as a radio operator. FSV is busy with S.R.A. duties. KOO has joined Hq. Co., 172nd Inf., VT. National Guard. CGY is busy with duties as rearman on N.A. project. MXY reports a new local operator at his home and all doing fine. MMU has invested in a new skycrwire and receiver. BZS has terminated his position at WCAX and goes to Portland, Maine, as operator at WGAN. Jim, GAB, has forgone "phone for "phone on 30 and M.I. is working on a new 2-Mc. antenna up. MJL is running 100 watts to an 812 on 3.5 and 7 Mc., has a new bug, and has joined the A.A.R.S. LWA is on 3.5, 7 and 14 Mc., with 90 watts. QR received his 35 w. license and Certificate for 30 Mc. He has a 10-watt receiver with W4HBV. Saturday afternoon, at 4 P.M., on 7100 kc. DDJ has been having trouble trying to work a Collins Pi into EO1 cable. JP still leads the field in E1 Ultra-High Frequency activity. HJN has lots of 28-Mc. stuff is coming in on 28 250 kc.


Hudson Division

EASTERN NEW YORK — SCM, Robert E. Haight, W2LU — MIY, E.N.Y. A.A.R.S., offers to handle monthly reports to the S.C.M. from O.P.S. E20 of Mt. Vernon, to conform to the spirit of the E20 reports. W2LU, the new E20S reporter for the E20S, reports the traffic to be. NIY has a new O.P.S. in E.N.Y. He comes to us from W.N.Y. Welcome, Andy. JRG is heard regularly on 7095 24 kc. SE participated in the E20S in using a new National 600-watt rig. LLU reports 654 QSO's total for this year, and remains the leader in the group. A.M., who has returned to the air after long absence, is heard on 9. Mc, 'phone. KKY has new skycrwire and continues to drop in on amateurs in his work about town. W2SMY 186 KBY 107 KJG 92 KJR 105 MJL 21 24 FSV 124 MJU 30.

Traffic: W2KIN 236 JDP 102 GEY 116 MILO 90 GMM 77 BFT 58 RXJ 58 JKI 58 MMG 55 MOF/BFA 43 IP 30 HFO 5.

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BE PREPARED

FOR THE

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COMMERCIAL FIELD

For over a quarter of a century the Candler System has trained men at home with their simple, practical system. You, too, can learn code the Candler way, easily and quickly. Let Candler give you that "Coordinative Knack" necessary to speed, skill and copying behind.

The Communications Reserve of the U. S. Navy is enlisting 5400 expert radio operators. You can qualify in half the usual time for your amateur or commercial license and a good rating by taking Candler Training NOW!

WRITE TODAY

For the New Book of Facts. It's FREE! It tells you how Candler trained world-famous speed champions. Get Candler's inside tips — drop a postcard now to

CANDLER SYSTEM CO.

DEPT. Q-1

ASHEVILLE, N. C., U. S. A.
Here's the Winning Combination—

Four X'tals and a Precision E-C-O!

The New Meissner SIGNAL SPOTTER

★ Four “Spot-Frequency” Crystals
★ Front Panel Crystal Switching
★ Pre-Tuned Tank Circuits
★ Provision for Crystal Oven and Thermostat Temperature Control

In response to unprecedented demand, we present a companion unit to the popular Meissner Signal Shifter—the Signal Spotter. Basically, the Signal Spotter is a crystal-controlled oscillator, operating from the voltage-regulated power supply of the Signal Shifter. Four crystals may be used and the desired “spot frequency” is instantly selected by a front panel control knob. A separate control on the Signal Shifter panel enables the operator to switch to either ECO or Crystal excitation. The four crystals can be placed on any one amateur band or may be divided over any two bands. Provision is made for installation of a Meissner Crystal Oven, designed to accurately control temperature of the crystals. Independent, pre-tuned tank circuits; designed for operation with any type amateur crystal.

SIGNAL SPOTTER, Complete with tubes and coils
No. 9-1044 Amateur Net . . . . . . $22.45

The Improved Meissner SIGNAL SHIFTER

★ Positive ECO Stability-Flexibility
★ Oscillator Keying for Break-In
★ Instant Switching from Crystal to ECO
★ Complete Voltage Regulation and Temperature Compensation

The popular Meissner Signal Shifter, universally used and accepted as the outstanding manufactured ECO design, now features oscillator keying for perfect “break-in” operation. The Signal Shifter is so well known that it is hardly necessary to repeat the story about its many points of merit. Positive PROOF of dependability, accuracy, stability and flexibility is clearly shown by the widespread acceptance of the precision-built Signal Shifter—throughout the amateur fraternity! The Signal Shifter—Signal Spotter Combination provides a COMPLETE SYSTEM for positive frequency control and selection; the Signal Shifter for full-band flexibility—the Signal Spotter for extreme band-edge operation, network frequencies, etc. This team deserves a place in every modern amateur station.

SIGNAL SHIFTER, Complete with tubes
No. 9-1028 Amateur Net . . . . . . $47.50

Write Today for Complete Amateur Catalog!

ADDRESS DEPT. Q-1


Meissner
MT. CARMEL
ILLINOIS

"PRECISION-BUILT PRODUCTS"
Double check all these new Hallicrafters Features in the 1941 SX-28: 15 tubes—6 bands—Frequency range 550 kc. to 43 mc.—Two stages preselection—Electrical bandspread on ALL BANDS including international short wave band—Calibrated bandspread inertia controlled—Beat frequency oscillator—AF gain—RF gain—Micrometer scale tuning inertia controlled—Crystal phasing—Send—receive switch—80, 40, 20, 10 meter amateur bands calibrated—Band pass audio filter—Push-pull high fidelity, audio output—Phone jack—Dimensions 20½" x 10" x 14¾". Model SX-28 with crystal and tubes. $159.50.

THE NEW 1941 SX-28

obtained with 40-meter crystal excitation, and the stage should operate satisfactorily either way.

Another example: how do we proceed in the case of a Tri-tet used as a doubler to 20 meters? Our grid bias is okay this time, but we will have to change to 40-meter coils for the 2S6GT and coupler. Also, it is good policy to short out the cathode coil, although this is not necessary in every case.

It is entirely practical to work 30-meter e.m., assuming reasonable care in neutralizing the entire transmitter; 3500 to 3650 kc. is all the coverage we have on that band. If the existing crystal stage has to be neutralized, the jumper in the output coupler plug can be utilized to make the connection at the grid of the tube. The neutralizing lead will be floating when the crystal is in use.

The general rule concerning the use of a frequency doubler (the output section of an e.c.o. or the stage which follows any self-controlled oscillator) as a guarantee against r.f. feedback is a very good rule to follow, but the method of shielding used in this particular instance seems to be effective enough to permit operation on the fundamental frequency.

We are now agreed that this has been a reasonably successful attempt to produce something in the way of a practical and really economical means of frequency change for use with normally crystal-controlled transmitters. Whatever degree of success may have attended this attempt has been due to a fortunate combination of ideas which have been developed by others. In order to effect this combination, one or two new structural tricks have been brought about, and these may in turn be applied to the problems of others, and so it goes. One idea can often make a complete piece of radio gear possible, and, because that is so, every amateur has a chance to contribute indirectly to the development of the highly specialized equipment required by the important communications services. True, they have their own great laboratories, but we have thousands of small ones in basements and kitchen corners.

I believe that those of us who never seem to get around to improving our operating proficiency by code practice and traffic handling still have a chance to help in times such as these, but it must be remembered that most practical ideas are brought out in the process of actually planning and rebuilding. For that reason, if for no other, let's keep going as we have done in the past, continually improving our equipment and telling others what we learn as we go along.

Correspondence Dept.

(Continued from page 43)

new draft, just put this letter in print to show them... I will conclude with this bit of advice to the Young Squirts going into military service. Don't be afraid to let the executive officers know that you are a ham or serviceman. If you know your work and really love it, you will not have a bit of trouble making good. And you will have the pleasure of working at the job that all of us hams are designed for—radio.

—F. A. Lanning, RMAG U. S. N., W6LGR
AIRWAY RADIO was in the experimental stage when this picture was taken of radio engineers and post office officials along with Captain Jack Knight of United (in center with short leather coat).

BUILT FOR WAR, this DeHaviland plane became a mail carrier on the first coast-to-coast airway in 1920. Note open cockpit and ancient Model-T touring car in background.

“TIN GOOSE” was the nickname given the tri-motored Ford when these planes were introduced to the coast-to-coast airway. Note how the mail compartment in the wing was lowered for loading.

4 TIMES FASTER than 1920 is this huge three-mile-a-minute “Mainliner” which carries air mail cross-continent in 16 hours. Burgess Batteries assure positive operation of emergency radio equipment under all circumstances.

BURGESS SALUTES UNITED ON 20th ANNIVERSARY OF TRANSCONTINENTAL AIRMAIL

Coast-to-coast airmail service recently celebrated its 20th birthday, and of course, United Air Lines was “all dressed up” for the occasion. Above is Capt. Jack Knight veteran United pilot, who made the first night airmail flight in history. The Burgess Battery Company is proud of its opportunity to serve airmail development, having supplied Burgess Radio Batteries as exclusive standard equipment for several years on all United Air Lines planes. Below, a United maintenance man installs a Burgess Battery in the auxiliary radio equipment—the “safety” equipment which must operate immediately and unfailingly if the regular equipment should fail.
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Why Not Parallel Feed?

(Continued from page 31)

d.c. supply voltage from the sum of voltages which cause high breakdown peaks across tuning and neutralizing condensers. The first is to connect an r.f. by-pass condenser between the tuning condenser rotor and chassis, thus eliminating the d.c. supply voltage from the arc when the tuning condenser breaks down. Such a blocking condenser, however, will not prevent the arcing, or reduce the voltage causing it.

The second, which allows the use of a smaller tuning condenser, is described in detail in QST for December, 1938.1 This circuit actually removes supply voltage from across the tuning condensers, but leaves room for improvement in two respects. It is necessary to insulate the condenser frame and rotor shaft from chassis and operating controls, and the entire tuning condenser — frame, rotor and stator — is at high d.c. voltage and therefore a safety hazard. The tuning coil and neutralizing condensers also are danger points. No remedy is provided for the d.c. voltage which appears across the neutralizing condensers.

The last step in reducing condenser voltage was taken by B. P. Hansen, in an article in March, 1940, QST on removing d.c. voltage from across neutralizing condensers. The method used, while effective, requires special high-voltage blocking condensers, supported well above the chassis, along with suitable d.c. bleeding resistors. Thus two parts were added to the high-voltage circuits, again increasing operating hazards.

---

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MAY WE SEND LITERATURE?

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With parallel plate and grid feed, the tank condensers, tank coils, and neutralizing condensers are operated with all portions at ground d.c. potential. This provides safety for the lives of those coming in contact with the tuned circuits or neutralizers, allows mounting the tank condensers directly on metal chassis and panels.

1 Ferrill, "How Much Condenser Spacing?", QST, Dec., 1938.
2 Hansen, "Neutralizing Economy," QST, March, 1940
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and provides for use of the smallest parts throughout the transmitter circuits. Although more blocking condensers and r.f. chokes are required, the cost of the parts for the amplifier is considerably lower than that of the series-fed system.

It was stated in the first part of this article that the parallel-fed r.f. amplifier is much safer than the one employing series feed. This fact can be better understood when the high-potential parts of the two amplifier arrangements are compared. The series feed transmitter has plate condenser stators, plate tank coil, and neutralizing condensers at d.c. plate voltage above ground. The grid tuning condenser stators and grid coil are exposed parts above ground by a grid bias voltage ranging from 300 to 800 volts.

The only exposed parts of the parallel-fed am-

(Continued on page 82)

Keying Monitors

(Continued from page 17)

the signal in the headphones be too strong, it may be reduced by connecting successively smaller capacities in series with the coupling line to the phones until the strength is reduced to a satisfactory level. A resistance in series with the line will accomplish the same result, and is probably preferable since its attenuation is more constant with frequency. If connection of the monitor to the headphones causes a.c. hum, the power plug for the receiver supply should be reversed.

If the keyed stage in the transmitter is operating at a plate voltage less than 600 or 700, the audio oscillator may be keyed in parallel with the transmitter, providing the same type of keying circuit is used in both cases. In the circuit diagram of Fig. 1, center-tap or cathode keying is shown. Therefore, if a low-power stage of the transmitter is keyed in the center-tap or cathode, it is merely necessary to connect the keying terminals of the oscillator to the key of the transmitter, connecting the oscillator chassis terminal to the grounded side of the key. When a high-power stage is keyed, a double-pole relay with sufficient insulation should be used to key the transmitter and the monitoring oscillator independently. Blocked-grid keying may also be used. With this system, simply make a connection between the negative of the blocking-voltage source and the grid of the audio oscillator through a resistance of one-half megohm or so, and connect the two chassis together.

In circuits in which appreciable capacity is used across the key to eliminate key clicks, it may be found that keying the monitoring oscillator alone without the transmitter will show tails or a running together of characters. This will clear up when the transmitter is turned on causing a faster discharge of the capacities. The i.f. oscillator of Fig. 2 also uses a 117L7GT and is similar in construction to the audio oscillator. A standard b.f.o. unit is used in the e.c.o. circuit. R5 and C5, form the supply filter, while R4 is a bleeder resistance to cut out chirps when the oscillator is keyed. The plate and screen resistors are of such a value that the cathode current is
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The input of the receiver should be short-circuited or the plate supply removed from the r.f. stages of the receiver while making the tests so that blocking of the i.f. amplifier will not occur. The oscillator tuning is adjusted by the main control on the b.f.o. unit until the beat note is heard in the receiver and from then on any desired changes in pitch are made with the vernier condenser whose control is on the front of the chassis. Do not mistake one of the harmonics of the b.f.o. for the fundamental. The former will be of less stable character and will be tunable on the receiver while the latter will not be tunable. A terminal arrangement similar to that described previously for the audio oscillator is used in this unit and the i.f. oscillator may be keyed in the same manner. The same precautions should be observed in making connections to the key and to the 115-volt line.

The Signal Monitor

The signal monitor, whose circuit is shown in Fig. 3, is somewhat more complicated. A 6SA7 is used as the converter tube. A resistor is used in the input circuit of the converter so that no tuning of this circuit is required. A 2.5-mh. r.f. choke in the output circuit is tuned to the i.f. by means of a small mica trimmer condenser. An external power supply delivering 250 to 300 volts is required for operation of this unit. This may be taken from the receiver supply if desired. A VR150 is connected in the screen-supply circuit to provide a regulated voltage for the screen so that changes in line voltage with keying of the transmitter will not result in a false indication of signal characteristics because of frequency shift of the monitor.

The unit is built in a 5" by 4" by 3" steel case. The sockets for the 6SA7 and VR150 are submounted on top, while the socket for the oscillator plug-in coil is mounted in an inverted position inside the case. The two variable condensers are mounted directly on the front panel. The left side of the case is fitted with a four-prong male plug for the power-supply connections. Pin jacks on either side are provided for input and output connections.

The idea behind this type of monitor is that a small signal from the transmitter output stage will be introduced at the input. The signal is converted to the i.f. of the receiver in the monitor and the i.f. signal fed into the i.f. amplifier of the receiver. The oscillator circuit is, therefore, designed to tune approximately 465 kc. higher than the transmitter signal. The tuning condensers have been proportioned so that the 3.5-Mc. band is spread out over the entire range of $C_s$. Signals in reduced to less than one milliampere. A 25-µfd. midget variable is used for fine adjustment of the beat note. The plate of the oscillator is coupled through a small capacity, $C_a$, to the i.f. amplifier of the receiver. In most cases, this will not require a direct connection to the amplifier, since bringing a lead in the vicinity of one of the i.f. grid leads will provide sufficient coupling for a strong signal. Trial will show the best location for the coupling wire.
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the 7- and 14-Mc. bands may also be monitored, since the harmonics of the monitor oscillator will beat with 7- and 14-Mc. signals.

The value to be used for \( R_a \) will depend upon the voltage of the plate supply. Starting with the full 10,000 ohms, the resistance should be reduced until the regulator tube ignites. In putting the monitor into operation, a check may be made to make certain that the oscillator is functioning by tuning the receiver to the high-frequency end of the 3.5-Mc. band and listening for the signal from the monitor as \( C_5 \) is tuned with \( C_4 \) set at maximum capacity. The arrangement for picking up the signal from the transmitter will depend upon the location of the monitor in respect to the output stage of the transmitter and the power output of the latter. In most cases a few feet of wire within 3 to 5 feet of the final connected to the input terminal of the monitor will be sufficient.

With high-power transmitters, less pickup may be required. If possible, keep the pick-up wire well spaced from exciter stages. Sufficient coupling to the i.f. amplifier will be obtained in most cases by simply running a wire from the output terminal of the monitor to a spot inside the receiver near one of the i.f.-amplifier grid wires. Try to keep it away from the high-frequency circuits as much as possible. A connection should be made between the case of the signal monitor and the chassis of the receiver. As with the i.f. oscillator, the input to the receiver should be short-circuited to prevent blocking of the amplifier by the transmitter.

With the transmitter running and \( C_4 \) set at about mid-scale, adjust \( C_5 \) very carefully until the signal is heard in the receiver. In tuning over the range of the monitor various extraneous beats may be heard. These, however, are much weaker than the main beat between the signal and monitor fundamental oscillations. When the main beat has been located, it will be found that tuning of the receiver has no effect upon it. The length of the pick-up antenna and its position should then be adjusted for the desired signal strength. In monitoring a 7-Mc. signal, the beat with the second harmonic of the monitor oscillator will be found satisfactory. This beat will be found with \( C_5 \) set at a slightly higher capacity than for a 3.5-Mc. crystal. At 14 Mc., \( C_5 \) should be set toward the low-capacity end of the scale so that the beat with the second harmonic of 7 Mc. will be obtained. The beat with the third harmonic of the monitor should also be satisfactory. At the higher frequencies, more care must be exercised in selecting the correct beat, although any beat which is not tunable in the receiver and which gives satisfactory signal strength may be used.

The setting of \( C_5 \) for each of the bands should be marked so that no time will be lost when changing from band to band. If it is desired to increase the bandspread, one of the plates may be removed from \( C_4 \), although this will make it necessary to shift \( C_5 \) to cover the entire 3.5-Mc. band. If it is found that a rough beat is obtained from a transmitter which should produce a stable signal, it is an indication that the mixer is being overloaded and the size of the pick-up should be reduced.
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3 CONVENIENT STORES
Why Not Parallel Feed?
(Continued from page 80)

plifier at high d.c. voltage are the r.f. chokes and blocking condensers. To make this amplifier completely safe, a bakelite tube or small cylinder of other insulating material may be used to cover entirely each combination of plate r.f. choke and plate blocking condenser. The tube should be somewhat higher than the r.f. choke, so that the top choke terminal or blocking condenser could be touched only by special effort; a diameter of 3 inches is satisfactory. A closer fitting form would alter the characteristics of the choke, as would placing other parts too near the choke winding.

The grid r.f. choke and grid blocking condenser similarly are at d.c. grid bias potential, but these parts are so compact and well hidden in the layout that they are difficult to reach, and therefore are safe from operating accidents.

With the same efficiency, same operating voltage, same power and breakdown voltages, then, parallel feed has three major advantages: More compact construction, lower cost, and less chance for loss of human lives!

Hints and Kinks
(Continued from page 48)

GLASS-TUBING FEEDER SPREADER

In trying to make some of the glass-tubing feeder spreaders described in QST for April, I found that the shape was rather difficult to form and also that it could not easily be annealed so as to reduce brittleness at the ends. I thought that a much simpler formation would be satisfactory and this seems to be the case.

The form, shown in Fig. 5, is very quickly made, is easily annealed and simple to install. A 6-inch spreader will be 7½ inches long, allowing ¾ inch at each end as shown. The cost of these spreaders is a cent or two, depending upon what is paid for the tubing. To make the spreader, the tube is heated in the gas flame of an ordinary kitchen-stove burner. When soft, it is laid on one of the hot prongs of the burner grid and then compressed as shown with a warm bit of metal. It should be pressed completely shut so that the tube will be sealed against the entrance of water. To anneal, the tubing is again heated and then withdrawn very slowly.

A 6-inch spreader made from 8-mm. tubing weighs exactly one-quarter as much as the usual porcelain spreader, so that four glass-tubing spreaders weigh no more than a single porcelain spreader. This is an advantage when a center-fed antenna is used with open-wire feeders, since the reduction in weight will eliminate much of the sag ordinarily experienced. The tubing itself is much stronger than porcelain. — Fred Sutter, W8QBW.

Fig. 5 — Simple glass-tubing feeder spreader made by W8QBW.
is the all-purpose volume on radio. Text, data book, operating manual—it is all these, and more. A comprehensive text on radio fundamentals and design, it is probably more used in radio schools and colleges than any other volume. An outstanding collection of practical constructional data, it offers a wide variety of tried and proven designs for all the latest equipment. As an operating manual, it provides information on station operation and procedure available from no comparable source.

In the 1941 edition, the basic arrangement and method of presentation initiated in the 1940 edition has been retained. Dozens of new pieces of equipment of all kinds were built for this edition. There are three new receivers, for example—a two-tube beginner's set, a three-tube superhet covering long waves as well as short, and a 7-tube super. New this year also are a converter and a beat oscillator unit. The transmitter construction chapter describes sixteen different units, including several simple and inexpensive transmitters for beginners, as well as band-switching exciters and amplifiers, a new e.c.o., and a number of antenna systems. Modulation, instruments and measurements, u.h.f.—all these sections are generously sprinkled with new gear not hitherto described. The u.h.f. section, in particular, has been considerably expanded, with a whole new chapter dealing with frequency modulation alone. Add these to all the features of earlier editions—and the 1941 HANDBOOK is now more than ever the “greatest dollar’s worth in radio.”

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<td>SCRANTON, PENN.</td>
<td>Scranton Radio &amp; Television Supply Co.</td>
<td>519-31 Mulberry Street</td>
</tr>
<tr>
<td>WASHINGTON, D. C.</td>
<td>Sun Radio &amp; Service Supply Co.</td>
<td>938 F Street, N. W.</td>
</tr>
</tbody>
</table>

Listings on this page do not necessarily imply endorsement by QST of the dealers or of other equipment sold by them.
BE Good TO YOURSELF

... or be good to the kid down the street with some of that extra Christmas money ... by giving a copy of the License Manual ... or the Handbook ... or a couple of Log Books ... or some Message Blanks ... or, best of all, a membership-subscription to QST. Orders can be sent direct to:

American Radio Relay League, Inc.
West Hartford, Connecticut

AMATEUR RADIO LICENSES
Day and Evening Classes in Code and Theory
HOME STUDY COURSES
Reasonable, Efficient and Thorough, Hundreds of Licensed Students Now on the Air

American Radio Institute, 1123 Broadway, New York, N. Y.

RADIO COURSES
Mid-Term Classes Now Starting
RADIO OPERATING • BROADCASTING • CODE
RADIO SERVICING • TELEVISION
• ELECTRONICS—1 year day course; 2 years eve.
Day and Evening Classes—Booklet upon request

NEW YORK YMCA SCHOOLS
4 West 63rd Street, New York City

RADIO TECHNOLOGY
RCA Institutes offer an intensive course of high standard embracing all phases of Radio and Television. Practical training with modern equipment at New York and Chicago Schools. Also specialized courses in Aviation Communications, Radio Servicing and Commercial Operating.

RCA INSTITUTES, INC. Dept. ST 10-A
A Radio Corporation of America Service
75 Varick St., New York 1154 Merchandise Mart, Chicago

Texas Ice Storm
(Continued from page 99)

through to Amarillo. W5INM immediately contacted W5HVZ at Lubbock, and the message was relayed to W5EYX in Amarillo. This all happened about 9:15 p.m. The result was that an automobile was sent from Amarillo to Happy to flag along the road for the trains en route, the highway running parallel to the railroad most of the way. . . .

Braniff Airlines, with two planes grounded at Amarillo, wheeled one of them from its hangar and used the two-way radio equipment aboard for contact with Dallas when the ground station went off because of power failure.

Full details of the amateur work performed during the Texas flood and ice storm are not available as QST goes to press. But enough is known to make it certain that another chapter of achievement has been added to the annals. —C. B. D.

RADIO OPERATING QUESTIONS & ANSWERS
Nilson & Hornung's new edition covers all FCC commercial license exam elements. Standard hand-

book 20 years. $2.50, postpaid. Money back if not satis-

fied and book returned in 10 days. Send check or money order . . . not cash. Free circular on request.

NILSON RADIO SCHOOL, 51 East 42nd St., New York

RADIO ENGINEERING, broadcasting, aviation and
departmental typist equipment, Morse telegraphy and railway
accounting taught thoroughly. 48-weeks' engineering course, equivalent to three years of college radio work. School established 1874. All expenses low. Catalog free.

DODGE'S INSTITUTE, Day Street, Valparaiso, Indiana

EASY TO LEARN CODE
It is easy and pleasant to learn the modern

way—with an Instructograph Code

Teacher. Ideal for the beginner or advanced

student. Many tapes available, ranging

from alphabet for beginners to typical mes-

sages. S.50, postpaid. Money back if not

satisfied and book returned in 10 days. Send check or

money order . . . not cash. Free circular on request.

INSTRUCTOGRAPH COMPANY
Dept. Q, 4701 Sheridan Road, Chicago, Illinois

COMMUNICATIONS CRYSTALS
90

HOLDERS AND OVENS

Precision Made by
BLILEY

WRITE FOR CATALOG 6-11
BLILEY ELECTRIC CO., ERIE, PA.
HAM-ADS

(1) Advertising shall pertain to radio and shall be of such nature as to be of interest to radio amateurs or experimenters in their pursuit of the art.

(2) The display of any character will be accepted, nor can any special typographical arrangement, such as all or part capital letters be used which would tend to make one advertisement stand out from the others.

(3) The HAM-ADV rate is 15¢ per word, except as noted in paragraphs (4) below.

(4) Rimission in full must accompany copy. No cash or checks will be accepted except as noted below.

(5) Closing date for HAM-ADV is the 25th of the second month preceding the month of publication in which the advertisement will also.

(6) A special rate of 7¢ per word will apply to advertising which is otherwise obviously commercial in nature and is placed and signed by a member of the American Radio Relay League. Thus, advertising of bona fide amateur sales and personal announcements, application for sale of an individual or apparatus offered for exchange or advertising inquiring for special equipment. If a member of the American Radio Relay League takes the 15¢ rate, an attempt to deal in apparatus is in quantity for profit, even if by an individual, commercial and all advertising by him takes the 15¢ rate. Provisions of paragraphs (1), (2), (4) and (5) apply to all advertising in this column regardless of which rate may apply.

Having made no investigation of the advertisers in the classified columns, the publishers of QST are unable to vouch for their integrity or for the grade or character of the products advertised

HELP WANTED


RADIO KITS — $2.50 up. Single band; all-wave. 5-10 tubes. Fluorescent lighting. Save 50%. Catalog — free. McGee Radio, P-2035, Kansas City, Mo.

QSL'S. Free samples. Printer, Corwith, Iowa.

QSL'S — CRYSTALS in plug-in heat dissipating holders. Guaranteed good oscillators. 160-M 80-M at $1.25; 40X at $1.65. 80-vari­


CRystals — unmounted, $1; three blanks, $1. Crystal Manufacturer, Indiana, Pa.

WRITE Bob Henry, W9ARA, for best deal on all amateur re­

QSL'S — SWL's. Colorful, economical. W9KXL, 819 Wyan­


腌TENANTED — Precision variable air condensers; resistance or
decimal bridge; G.R. 224 wave meter or condenser from same;

DOLCE AND SAMPLES, bung and parts. You get best terms (financed by


WANTED: New kits 1 and 2, new. W8KRE, Silver City, N. Mex.

WANTED: Kits 1 to 5, new. W8TRX, Wavelry, Ohio.

WANTED: Kits 1 and 2, new. W8ABC, New York City.

QST'S — February 1931 — March 1939 inclusive. Huston, 172 Concord St., Portland, Me.

QSL'S, Samples, on request. W2AEY, 338 Elmora, Elizabeth, N. J.

Selling — 100 watt fone and FB7 receiver. W1AZ, 1403 Main, Monroe, Michigan.

Selling — 250 watt phone transmitter. Photo and
description. Fred Hofmann, 1445 Aster Place, Cincinnati, Ohio.

Selling — 100 watt phone — CW transmitter. Photo and
description. Fred Hofmann, 1445 Aster Place, Cincinnati, Ohio.

Selling — 250 watt phone — CW transmitter. Photo and
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Selling — 250 watt phone — CW transmitter. Photo and
description. Fred Hofmann, 1445 Aster Place, Cincinnati, Ohio.
HAMS — wholesale prices on new Underwood portable type-writers — regular price $54.50 only $39.50 — $3.05 down. Write Leo W9GFQ.

TRANSMITTING headquarters: 1OP kits wired complete $19.50; Utah Jr. xmtr complete $15; 70 watt xmtrs ready to go $79.50. Write for new bargain 124-page catalog. You get the best deal when you trade with Leo, W9GFQ, Wholesale Radio Laboratories, Council Bluffs, Iowa.

CRYSTALS; commercial or amateur: police, aircraft, marine and all types of low drift units for commercial services at attractive prices — send for catalog or get our bid. For the amateur: these EB, c.w. quaranteed 20 wav., 40, 80, and 160 meter bands $1.60 postpaid. Amateur "spot frequencies" $2. T9 ceramic holder $1. C.O.D.s accepted. Sold by: Kerr's Radio Shops, New York, N. Y.; Frank Anzalone, 375 W. 46th, N. Y. C.; Casa Edison, Havana, Cuba; and Edison's, Temple, Texas.

WHEATSTONE tape automatic transmitters. Also new parts for Creed automatic transmitters. Probor Instruments, 411 Lafayette St. New York, N. Y.

RECONDITIONED receivers all makes, lowest terms, free trial — send for list. New Howard 460 receivers $29.25; SX-23 $27.90. Write for new bargain 124-page catalog. You get the best deal when you trade with Leo, W9GFQ, Wholesale Radio Laboratories, Council Bluffs, Iowa.

SELL: complete station W8CHB 400-watt rack and panel chassis. Original carton thirty dollars. Also complete file Electronics magazine 1930 thru 1938. Best offer. W2HNY.


VE6S — wanted, coils 36 to 42 for SW3, swap parts or buy. VE5YE.


1 kw. fone 250 TIlS final 25 or 60 cy $450. Write W8RYA, Niagara Falls, N. Y.

HT6 xmtr — 180-75-50 meter xtras and coils plus Shure xtal mike. Also Howard 438 rovr with xtal. No reasonable offer refused. W9GFQ.

BARGAIN — 1939 Naional 81-X, $45. 1937 Harvey UHX-10 transmitter, 5-160 coils (except 40), AU power supply, microphone. Cost $118.10. 1938 dynamotor for same, used 10 hours. Cost $5. Make offer. WLBVR.

RCA television deflection and high voltage power supply chassis complete with yoke for nine or twelve inch kinescope. Original carton thirty dollars. Also complete file Electronics magazine 1930 thru 1938. Best offer. W2HNY.

Hear everything broadcast to 10 meters, for $19.95. New Eckhohn EC-1 full bandspread receiver. Appeals to whole family's listening desires. Makes handy portable because of small size, metal cabinet, self-contained speaker, phone­speaker switch, double antenna provision, boat­head switch, stand-by switch. Terms to suit. Write or call today. Scelli's Radio, Hartford, Conn.

**HOW TO LEARN CODE**

Whether you wish to enter radio as a career or as a hobby, the All Electric Master Teleplex Code Teaching Machine will show you how. Teleplex records your sending in visible dots and dashes on a specially prepared waxed paper tape and then sends back to you at any speed you desire. It does not merely show you code. It is code. No experience needed.

While not designated as standard equipment, Teleplex is used at many U. S. Army Posts, Naval Training Stations as well as by the American Telephone & Telegraph Co. Also by practically every private school in the U. S. teaching code; and many police, governments.

**FREE BOOK**

We furnish you complete course, including practice messages, the All Electric Master Teleplex, plus a personal service on a MONEY BACK GUARANTEE. Love cost. Long terms. Without obligation write for booklet "Q1."
# Your Nearby Dealer Is Your Best Friend

Your nearby dealer is entitled to your patronage. He is equipped with a knowledge and understanding of amateur radio. He is your logical source of advice and counsel on what equipment you should buy. His stock is complete. He can supply your needs without delay. His prices are fair and consistent with the high quality of the goods he carries. He is responsible to you and interested in you.

One of these dealers is probably in your city—Patronize him!

### ATLANTA, GEORGIA
Radio Wire Television Inc.
265 Peachtree Street
"The World's Largest Radio Supply House"

### BALTIMORE, MARYLAND
Radio Electric Service Co.
3 N. Howard St.
Everything for the Amateur

### BOSTON, MASS.
Radio Wire Television Inc.
110 Federal Street
"The World's Largest Radio Supply House"

### BRONX, NEW YORK
Radio Wire Television Inc.
542 East Fordham Road
"The World's Largest Radio Supply House"

### BUFFALO, NEW YORK
Radio Equipment Corp.
392 Elm Street
WBPMc and W8NEL — Ham, service and sound equipment

### JAMAICA, L. I., NEW YORK
Radio Wire Television Inc.
90-08 166th Street (Merrick Road)
"The World's Largest Radio Supply House"

### MONTREAL, CANADA
Canadian Electrical Supply Co., Ltd.
285 Craig Street West
Largest Distributors of Radio Parts & Testers in British Empire

### NEWARK, N. J.
Radio Wire Television Inc.
24 Central Avenue
"The World's Largest Radio Supply House"

### NEW YORK, N. Y.
Radio Wire Television Inc.
100 Sixth Avenue
"The World's Largest Radio Supply House"

### NEW YORK, N. Y.
Harrison Radio Company
12 West Broadway
Harrison Has Hf Phone Worth 2-6276 for information or rush service

### PHILADELPHIA, PENNSYLVANIA
Eugene G. Wile
10 S. Tenth Street
Complete Stock of Quality Merchandise

### PROVIDENCE, RHODE ISLAND
W. H. Edwards Company
85 Broadway
National, Hammerlund, Hallicrafter, Thorndarson, Taylor, RCA

### RICHMOND, VIRGINIA
The Arnold Company
Broad at Harrison St.
W3EQO — "The Virginia Ham Headquarters" — W3FBL

### HOUSTON, TEXAS
R. C. & L. F. Hall
1021 Caroline Street (C 0721)
"Specialists in Amateur Supplies"

### SCRANTON, PENNSYLVANIA
Scranton Radio & Television Supply Co.
519-521 Mulberry Street
Complete Stock of Quality Amateur Supplies
You can be sure when you buy from QST advertisers.

"Advertising for QST is accepted only from firms who, in the publisher’s opinion, are of established integrity and whose products secure the approval of the technical staff of the American Radio Relay League."

Quoted from QST's advertising rate card.

Every conceivable need of a radio amateur can be supplied by the advertisers in QST. And you will know the product has the approval of the League's technical staff.
In 1941...

the well equipped amateur station and the efficient commercial installation will use RME receiving equipment exclusively, because:

ONE:

RME offers a specialized design service in the construction of radio apparatus built to individual specifications. Such uncommon units as CRYSTAL CONTROLLED RECEIVERS, OSCILLOSCOPE AMPLIFIERS, and FOREST SERVICE COMMUNICATIONS INSTRUMENTS are only a few of the "special" units which have already come from the RME lab.

TWO:

There is an RME customed unit for operation on every frequency channel in the practical radio spectrum, from 90 kilocycles to 60 megacycles. A complete receiving installation would be one consisting of an RME-99 receiver as the foundation unit, an LF-90 INVERTER for long-wave reception, and a DM-36 EXPANDER for ultra-short-wave operation.

THREE:

There is the assurance that when an RME is purchased, long years of trouble-free operation may be expected from it. Expeditions, governmental agencies, and others where reliability of communication is absolutely necessary KNOW that RME instruments are completely trustworthy.

Radio Mfg. Engineers, Inc.

Peoria, Illinois
**VARITRAN CONTROL UNITS**

For controlling: Rectifier output—Motors—Heaters—Line voltage—Lights

**FEATURES**
- Precise output voltage adjustment
- Voltage independent of load
- High efficiency
- Low temperature rise
- Roller type non-fusing contact
- Oversize heat radiating disc
- Glass insulated wire
- Rectangular lamination and case structure
- Panel or bench mounting

Standard Varitrans are for 115 or 230 Volt service. The respective smoothly adjustable output voltages are 0-130 and 0-260 volts. Universal Varitrans have a 0-30 volt variable secondary ideal for line voltage correction and low voltage equipment. 115 Volt Varitrans are available in 2, 5, 7.5, 11, 17, 30, and 44 amp. stock sizes. Write for Bulletin PS-404.

**UNITED TRANSFORMER CORP.**

Write: Communications Div. 150 Varick St. New York, N.Y.
Export Division: 100 Varick Street New York, N.Y. Cables: "ARLAS"

---

### Varipower Autoformers

The UTC Varipower Autoformer is a universal voltage control device suitable for every purpose where a step type voltage control is satisfactory.

They are designed to effect reduced power for transmitter operation, and they are so arranged that simultaneously with line voltage correction any output voltage from 0 to 130 volts can be obtained in five volt steps. The Varipower Autoformer thus permits control of filament voltage at the tube socket to within 2% of any desired value simultaneously with the line voltage and plate voltage control. These Varipower units may also be used to reduce or increase voltages on filament transformers. Thus an 872 filament transformer can be used for 866 tubes. The Varipower Autoformer has taps at 55, 75, 95, 100, 105, 110, 115, 120, 125 volts.

<table>
<thead>
<tr>
<th>Model</th>
<th>Watt Output Rating</th>
<th>Net Price</th>
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<tbody>
<tr>
<td>VA-1</td>
<td>150</td>
<td>$3.60</td>
</tr>
<tr>
<td>VA-2</td>
<td>250</td>
<td>$4.50</td>
</tr>
<tr>
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<td>500</td>
<td>$6.00</td>
</tr>
<tr>
<td>VA-4</td>
<td>1000</td>
<td>$9.00</td>
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<tr>
<td>VA-5</td>
<td>2000</td>
<td>$12.00</td>
</tr>
</tbody>
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QST for January, 1941, EASTERN Edition
In selecting equipment for his station, George Wies, W2BKX, tells us that he was guided by three requirements — "Dependability, Compactness and Economy." Compactness is self-evident from his photograph, for the portable rack incloses complete receiving and transmitting equipment.

"As for the dependability," he says, "for almost a year we have operated this station and it has never failed us. . . . The Xmitter has done a swell job for us, getting out better than a lot of bigger rigs we have used." On economy — "Correct, it costs a lot of money to buy all this gear at one shot, but we have never had to buy anything since to make it work or to 'improve' it. . . . Real economy is getting the best in the first place as one usually ends up with it anyway."
Small enough to lay comfortably in the palm of your hand, the new RCA-829 Twin R-F Beam Power Amplifier is “big” enough so that a single tube in push-pull class C telegraph service can handle 120 watts power input with less than 1 watt of r-f grid drive—at frequencies as high as 200 Mc. At reduced ratings, it may be operated as high as 250 Mc. And don’t forget! The 829 is a real money-saver, due to the simplifications it makes possible in transmitter design. Neutralization is unnecessary. The twin structure simplifies circuit adjustments. In brief, at the U.H.F.’s the 829 offers exceptional efficiency, high power sensitivity and plenty of power output. The heater can be series-operated from a 12.6-volt supply or parallel-operated from a 6.3-volt supply. Max. CCS (Continuous Commercial Service) Ratings are: d-c plate voltage, 500 volts; total d-c plate current, 240 ma.; and total plate dissipation for both units, 40 watts. At a plate input of 120 watts, typical power output is approximately 85 watts.

RCA-829 Amateur Net Price $19.50

Take the mystery out of ultra-high frequencies! Write today for complete technical information on these three new tubes to Commercial Engineering Section, RCA Manufacturing Co., Harrison, N. J.

RCA-829

HIGHER EFFICIENCY for the HIGHER FREQUENCIES!

"A WHALE OF A TUBE FOR ITS SIZE"

270 WATTS INPUT UP TO 30 Mc WITH ONLY 2.2 WATTS DRIVING POWER!

This new multi-electrode Transmitting Beam Power Amplifier offers, we sincerely believe, more for your money than any other tube of its class. It is tops for r-f applications, especially where band-change without neutralization is desired. More than once it has been operatd at max. ratings as high as 30 Mc and at reduced ratings up to 75 Mc. Two RCA-828’s may be used in class AB1 modulator with 300 watts a-f output and 1% distortion. Maximum ICAS (Intermittent Commercial and Amateur Service) Ratings for class C telegraph service are: d-c plate voltage, 1500 volts; d-c plate current, 180 ma.; and plate dissipation, 80 watts.

RCA-828 Amateur Net Price $17.50

RCA-828

RCA-1628

THIS TRIODE TAKES FULL RATED 50 WATTS INPUT UP TO 500 Mc!

The new RCA-1628 is a general-purpose triode with a tantalum grid and plate. It is capable of operating at maximum ratings at frequencies as high as 500 Mc and at reduced ratings as high as 67 Mc. The three filament leads may be connected in parallel or in series. They may be operated through r-f bypass condensers, thus minimizing the effect of filament-lead inductance at the ultra-highs. Dc grid and plate leads brought out of the bulb through separate seals make neutralization at the U.H.F.’s easy. Max. class C telegraph CCS ratings are: d-c plate voltage, 1000 volts; d-c plate current, 60 ma.; plate input, 50 watts; and plate dissipation, 40 watts; typical driving power under a plate voltage of 1000 volts is approx. 1.7 watts; typical power output, approximately 35 watts.

RCA-1628 Amateur Net Price $32.00