RADIO

A-234

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A REVOLUTIONARY NEW 4 BAND 25 WATT EXCITER, THE "4-25"

The Worldwide Authority of Amateur and Shortwave Radio

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December 1938

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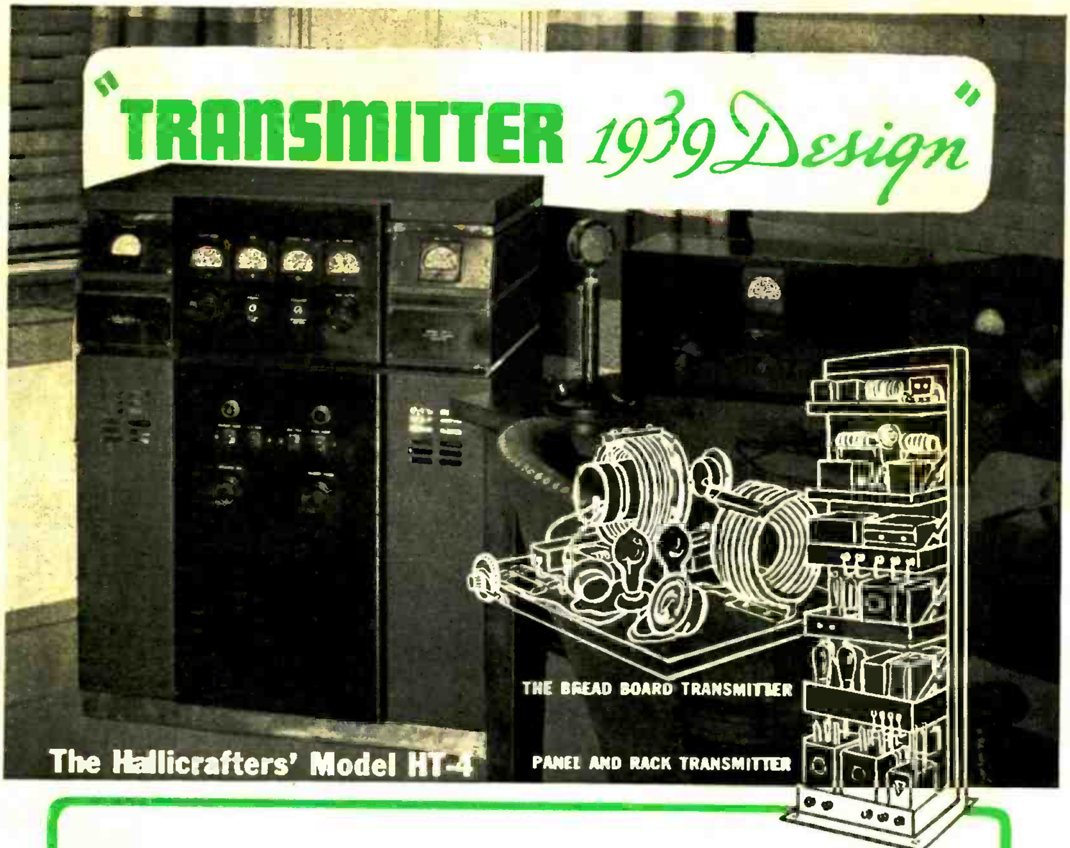

The swift pace of amateur radio provides an interesting study in evolution, and the Model HT-4 a striking example of the development in transmitter design.

Old Timers remember the "bread board" era, when getting a transmitter to operate at all was the first consideration, and convenience and appearance received little thought, if any,—with "hay-wired" parts spread over an entire table top.

The next step in the evolution of the amateur transmitter was borrowed from the telephone exchange. To provide a standardized flexible unit construction that would permit the easy assembly of a great metropolitan exchange or a hundred line rural unit, designers of telephone equipment devised the "rack and panel." Amateur radio borrowed it, and transmitter parts left the "bread-board."

As transmitter circuits have developed in efficiency, the advantages offered by the rack and panel construction are being nullified. Built to impractical and "clumsy" heights, it leaves much to be desired from the standpoint of appearance, not to mention operating convenience. The logical coordination of the transmitter components for the greatest efficiency is difficult if not impossible. Its open construction exposes many leads to accidental contact or short circuit.

The Model HT-4, offers a new conception of transmitter design, a distinct departure from the traditional to the functional. Here is a logical coordination of parts, with the entire R.F. section on a single plane, permitting shorter leads and a reduction of losses that greatly increase overall efficiency. The operating controls are brought within easy reach. All its parts are entirely enclosed and protected, but with ample provision for ventilation. The whole presents a finished "engineered" and planned appearance that leaves an impression of efficiency and dependability.

We present the Model HT-4 as the first of a new trend in Amateur Radio Transmitters.
(left) Model HT-4 with cover removed showing complete Top View of R.F. Section.
(right) Rear View of Model HT-4 with back panel removed. Note orderly and logical placement of components.

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From the PRIVATE LIFE of RADIO

As the spirit moves, we present in this column from time to time a bit of gossip about RADIO, its affiliated publications, and those who produce and distribute them.

—"From the private life of RADIO".

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But a considerable amount is purchased "on the outside." Why? To lend greater variety, pep, and sparkle to our pages, for even with one of the best staffs in radio we cannot think of all the ideas! Yes, we said "purchased," for RADIO pays for all accepted material which is technical or constructional in nature, except shorts and strays. Sometimes payment is made for other types of material, but at a lower rate.

If you or your friends have lately constructed something in which your fellow hams might be interested, or if you have an idea that might interest them, why not do them—and yourself—a favor by sending in the dope for possible publication? You need not be a literary master; get the dope down on paper, make it specific and complete, and we'll rewrite it if necessary.

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December · 1938 No. 234

RADIO

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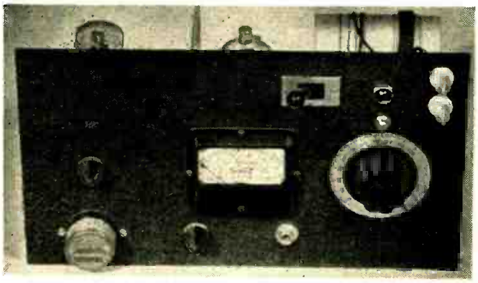
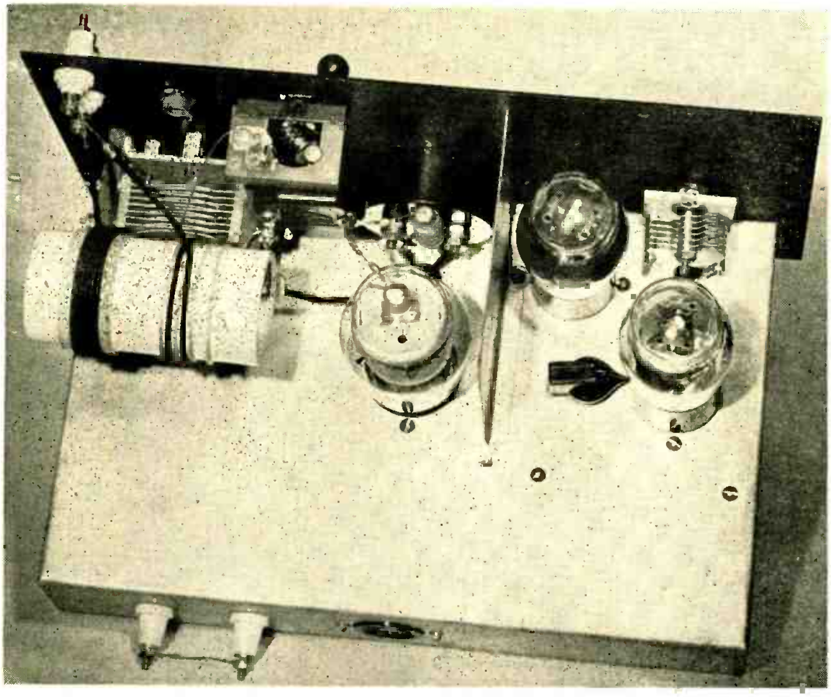
FRONT COVER—THE OPERATING POSITION AT VP3THE

THE WORLDWIDE TECHNICAL AUTHORITY OF AMATEUR, SHORTWAVE, AND EXPERIMENTAL RADIO

The "4-25"



Front panel layout. The pilot light jewel above the main dial merely fills up a hole left when it was discovered a tap switch on the output link circuit was not required.



Looking down on the exciter, showing layout of parts above the chassis. The shield partition is very necessary.

The "4-25" *Exciter*

By W. W. SMITH,* W6BCX

If you are looking for a four-band 25-watt exciter that gives you instantaneous band change, one that is easy to build, easy to get going, and doesn't cost much, the "4-25" is just what you are looking for. It can be plate modulated to make a 25-watt phone transmitter or crystal keyed for c.w.

By making a survey of hundreds of letters from RADIO readers who have written in regarding their exciter problems during the last two years, it is possible to define the "ideal exciter." It should cover several bands with a minimum of crystals, require a minimum of retuning and preferably should not utilize plug-in coils. It should be simple and inexpensive to construct and easy to get going. It should have no circuit requiring critical adjustment and no tendency toward instability or self-oscillation. The crystal current should be low and it should be possible to key the oscillator for break-in operation. The unit should have enough output to deliver a respectable signal when used as a low-powered transmitter and should be capable of being modulated for phone operation.

The exciter illustrated satisfactorily fulfills all of these requirements. The particular model described can be used on 10, 20, 40 and 80 meters and requires but one crystal for operation on all four bands. The output when run at the specified plate voltage is a good 25 watts on 10 meters and approximately 30 watts on the lower frequencies.

A type 42 is used in a conventional pentode oscillator circuit with low screen voltage and light loading. The former results in very low crystal current, and the latter permits clean keying of the oscillator even when sluggish crystals are used.

Another 42 is used as a triode quadrupler to 20 meters. By means of the selector switch S_1 it is possible to excite the 807 on 20 meters from the quadrupler, or, by throwing the switch, to disconnect the quadrupler from the oscillator and feed the oscillator directly into the 807, thus exciting it on 80 meters. Twenty-meter or 80-meter excitation is available to the 807 at the flip of a switch.

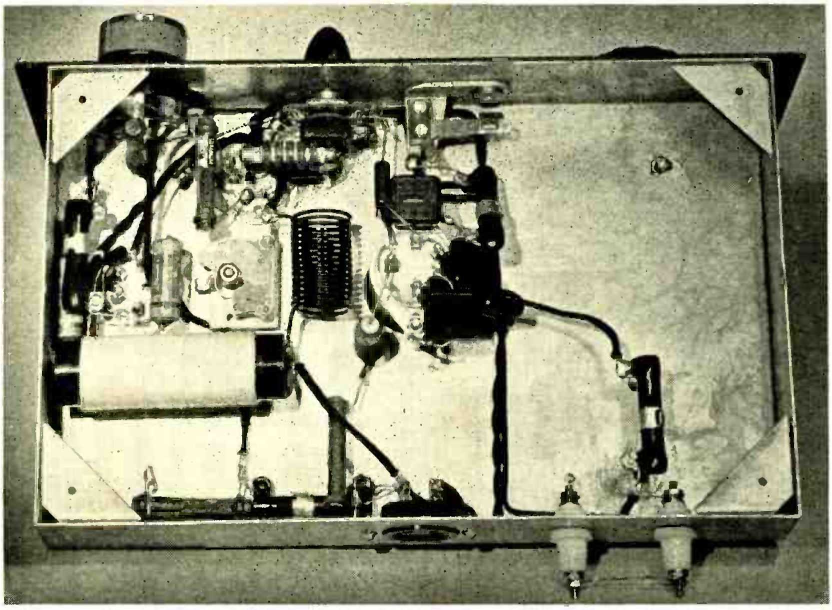
By doubling in the 807 stage it is possible to obtain not only 20- and 80-meter output from the 807, but 40- and 10-meter output as well. The tuning condenser for the 807 is made large enough to hit two bands. This results in a rather high-C tank circuit when the condenser is tuned to the lower frequency band, but as the high capacity setting is used only when the 807 is used as a straight amplifier, this merely tends to make the output more uniform both when doubling and working straight through.

The plate coil for the 807 is wound so that with all of the turns in the circuit it hits 80 meters with the condenser plates nearly all the way in, and 40 meters with the plates nearly out. A tap on the coil makes it possible to short out a portion of the coil, permitting coverage of both 10 and 20 meters with the tuning condenser.

To go from 80 to 40 meters it is only necessary to retune the tank condenser. By throwing the excitation switch to the doubler and closing the switch S_2 it is possible to cover 20 and 10 meters in the same manner. The oscillator and doubler tank condensers need not be touched when changing bands. This permits very rapid band change with a minimum of effort.

The 42 quadrupler is made degenerative at the excitation frequency by putting a small capacity in series with the cathode return. An r.f. choke around the condenser provides a d.c. path for the plate current. The reactance of this condenser is moderately high at the ex-

* Editor, RADIO.



Bottom view of the exciter, showing layout of parts below the chassis. The insulator terminals to the rear of the unit are for connection to a modulator if one is used.

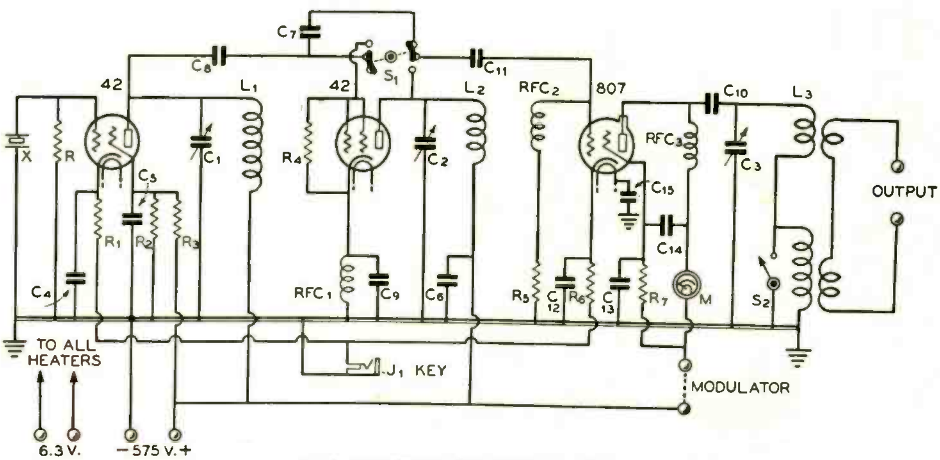
citation frequency and not only lightens the loading of the oscillator but reduces the quadrupler plate current without affecting the output. This increase in efficiency permits the running of more input to the quadrupler without overheating of the 42. The reduced plate current results from a reduction in the amount of fundamental that appears in the quadrupler plate tank along with the fourth harmonic output. This type of circuit has been referred to as regenerative, but it exhibits none of the instability and requires none of the critical adjustments ordinarily associated with true regenerative circuits.

No metering facilities are provided for either of the 42 stages. The reason for this is that regardless of tuning, neither of these tubes will draw sufficient current or run sufficiently hot to damage them. Both oscillator and quadrupler are tuned for maximum output without regard to plate current. For the benefit of the curious, it can be said that these stages each draw in the neighborhood of 30 ma. when tuned for maximum output.

Construction

The entire exciter, exclusive of power supply, is built upon a 7" x 11" x 2" chassis and 7" x 12" front panel. The illustrations show the correct arrangement of the various components. The crystal socket is mounted upon the front panel for the sake of accessibility. This is particularly desirable when variable gap crystals are used. A six-prong socket is used for the crystal, and is so wired that it is impossible to insert the crystal incorrectly. This is done by making one connection to three adjacent terminals and the other connection to the remaining three terminals. The crystal tank condenser C_1 is mounted upon the front panel as it will require slight readjustment when going from one extreme edge of the 80-meter band to the other.

The quadrupler tank condenser C_2 is mounted behind the panel because when once set it is left alone. The quadrupler tunes rather broadly and when peaked at 14,250 kc. will work satisfactorily between 14,000 and 14,500. This permits output from the 807 anywhere between these frequencies or b tween 28,000 and 29,000 kc. without requiring readjustment of C_2. A shielding partition 4 inches wide by 4¾ inches high effectively shields the plate circuit of the 807 from the oscillator and quadrupler. The 807 is underslung by mounting the socket below the chassis on 1-inch bushings or collars. Lowering the socket an inch below the chassis helps shield the input from the output leads of the 807, making a shield "collar" around the lower part of the 807 unnecessary. The underslung socket arrangement also permits a shorter plate lead and keeps the 807



R. F. SECTION OF THE "4-25"

C_1—50-μμfd. midget, .03" spacing
C_2—25-μμfd. midget, .03" spacing
C_3—150-μμfd. variable, low minimum, .03" spacing
C_4,C_5,C_6 — .01-μfd. tubular, 600 w.v.
C_7—50-μμfd. midget mica, 100 v. test
C_8,C_9—100-μμfd. midget mica, 1000 v. test
C_{10}—.002-μfd. standard mica, 1000 v. test
C_{11}, C_{12}, C_{13}, C_{14}, C_{15}—.003-μfd. midget mica, 1000 v. test
R—25,000 ohms, 2-watt carbon
R_1—600 ohms, 10 watts
R_2—25,000 ohms, 2-watt carbon
R_3—50,000 ohms, 10 watts
R_4,R_5—75,000 ohms, 2-watt carbon
R_6—600 ohms, 10 watts
R_7—25,000 ohms, 10 watts
RFC_1,RFC_2,RFC_3—2.5-mh. midget r.f. chokes
J_1—Keying jack, closed-circuit type
S_1—D.p.d.t. selector switch (rotary "tone control" type)
S_2—S.p.s.t 110 v. a.c. switch with good insulation (see text)
M—0-150-ma. d.c.
Coils—see text

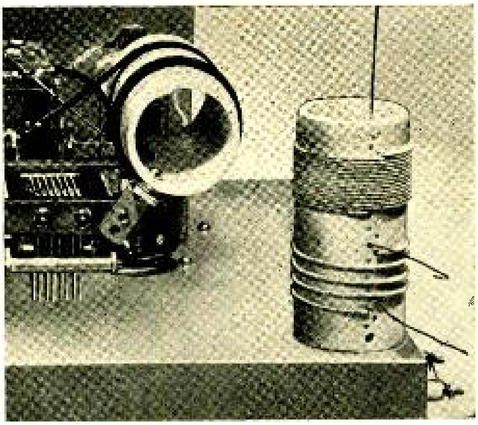
from sticking up above the level of the top edge of the front panel.

The rotor of C_3 is grounded, thus making it possible to mount the condenser directly on the front panel without insulation. The two aluminum mounting brackets supplied with the condenser are fastened to the back of the condenser frame at a slight angle, as may be seen in the end view of the exciter. When the brackets are fastened this way the holes almost line up with the mounting holes in the ceramic coil form. By drilling out the holes with a slightly larger drill the coil form holes can be made to line up well enough for the form to be fastened to the brackets by means of bolts. Fiber insulating washers must be used to prevent cracking of the ceramic form when the bolts are tightened.

The condenser shaft will extend too far for most dials and must be sawed off so that it does not project too far beyond the front panel.

The switch S_1 in the model illustrated is of the inexpensive "tone control" type costing less than fifty cents. It is a rotary type double-pole, double-throw switch and has sufficient insulation for use in this position. Because of the rotary mechanism, the manner of making the correct connections may be confusing, but if a rotary switch is used it is only necessary to wire it exactly as shown in the wiring diagram. Some amateurs may prefer to use the new, lever action switches of the same general type. These switches have more of a "professional" appearance and cost but little more. If the latter type switch is used it will be necessary to figure out the proper connections very carefully. This can be done by studying the mechanism of the switch.

The switch S_2 is a standard 110-volt a.c. switch available at many radio parts dealers and most electrical supply houses. This switch was designed to break 15 amperes at 125 volts and has excellent insulation and a very positive action. The power factor of the insulation used is not particularly good on 10 and 20 meters, but on these bands the switch is closed and there is no voltage on it. Because of the low resistance and heavy current-carrying capacity of the switch, it makes an excellent shorting switch for the tank circuit. The properties of the insulation are such that on 40 and 80 meters the losses are very low even though there is considerable r.f. voltage on one of the switch contacts on these bands. The mounting plate is cut down as shown in the illustration. This gets rid of the "OFF-ON" engraving.



Illustrating method of mounting the final tank coil to the tank condenser by means of tilted brackets. To the right is a coil all ready to be fastened to its mounting brackets.

This switch is commonly stocked with either metal or bakelite handle; the latter type is preferable. The switch is relatively inexpensive, can be purchased almost anywhere and works even better than several more expensive ones tried. The switch is husky enough to be thrown without harm while the exciter is running, though the contacts would probably last longer if the power to the exciter were cut off when throwing the switch. The same applies to switch S_1. Because of the comparatively small amount of power handled by the contacts on S_1, no harm is done if this switch is thrown with the exciter turned on, but it is best to kill the plate voltage when throwing either switch.

If desired, an r.f. relay can be substituted for S_2. The relay should have low resistance contacts and preferably work on 6.3 volts a.c. The switch S1 should in this case have another set of contacts, in order to control the relay. With this arrangement it is necessary to throw but one switch.

The Coils

The oscillator coil L_1 consists of 58 turns of no. 20 d.c.c. closewound on a 1-inch diameter form, the form being 3½ inches long. It is mounted under the chassis as shown in the illustration. The quadrupler coil consists of 17 turns of no. 14 enameled wire. This coil is wound on a ¾-inch diameter hardwood dowel or other form, then removed from the form and spaced to 1¾ inches. When removed from the form the diameter of the coil will be somewhat greater than ¾ inch because of the spring in the wire.

The "cold" ends of both oscillator and quadrupler coils connect to the same tie point, as may be seen in the illustration. The "hot" end of the quadrupler coil is soldered directly to a stator lug on C_3.

The coil L_3 is wound with no. 18 d.c.c. on a standard ceramic form 1¾ inches in diameter and 3½ inches long. The large portion of the coil consists of 15 turns "loosely closewound" (closewound, but not squeezed together tightly). The small part of the coil (10- and 20-meter portion) consists of 4 turns spacewound as shown in the illustration of the end view of the exciter.

Setting on the chassis is a finished coil all ready for bolting to the condenser brackets. The coil is constructed as follows:

Insert one end of the no. 18 d.c.c. through the second wire hole from one end of the form (ignoring the mounting hole). Wind 15 turns and then cut the wire off leaving about 5 or 6 inches free. Poke the wire through the ninth wire hole and skin the insulation from all of the wire projecting from the inside of the form. Then pull the wire up through the thirteenth wire hole. This wire lead will fasten directly to the switch.

Insert one end of some more no. 18 d.c.c. in the fourteenth, or next, wire hole and solder it to the other wire inside the coil form. Now spacewind 4 turns in the same direction as the closewound portion of the coil, poking the wire through the third wire hole *counting from the other end of the form,* ignoring the mounting hole as before. Now come back one wire hole, or to the fourth wire hole from that end, to bring this lead through. Space the 4 turns evenly and apply a coat of good coil dope to the whole coil. A dope of the "liquid victron" type is to be preferred for lowest losses on 10 meters. You now have a coil which looks like the extra one in the illustration of the 807 end of the exciter.

The wire extending from the closewound end of the coil goes to ground and simply is wrapped around under the bolt which fastens the coil form to one of the mounting brackets. The lead on the other end of the coil goes directly to the stator of the condenser. The tap is fastened to the top connection of the switch S_2. This arrangement permits very short leads on 10 and 20 meters, an important consideration on 10 and 20 meters when using a bandswitch. With the bandswitch closed this coil will resonate on 10 meters with the plates nearly out and on 20 meters with the plates about two-thirds of the way in. With the switch open the condenser will tune to 40 meters with the plates almost all the way out and to 80 meters with the plates almost entirely meshed.

The output link consists of a series link arrangement permitting uniform coupling on all four bands. For link coupling to another tuned circuit, one coupling turn placed just up from the ground end of the high-frequency section of the coil should be connected in series with two or three turns wound around the center of the low-frequency portion of the coil. Be careful to wind the link turns in the *same direction.* Adding or subtracting a turn from either section has little effect upon the other section. This makes it possible to adjust the coupling independently so that approximately the same degree of coupling is obtained on 10 and 20 meters as on 40 and 80 meters.

For coupling to a high-impedance load such as a 400- or 500-ohm line, it will be necessary to use more link turns. The pickup links shown in the illustration give just the proper loading for working into 450 ohms on all bands. Five turns around the center of the low-frequency portion of the coil were connected in series with two turns around the cold end of the high-frequency portion of the coil. For most purposes the load impedance will be lower than 450 ohms and fewer link coupling turns will be used.

If one turn around the high-frequency coil gives too much coupling on 10 meters, a larger diameter turn may be used to decrease the amount of coupling. The pickup turns may be wound with no. 18 solid push-back hookup wire having good insulation. It is desirable to keep the capacity coupling between the tank coil and pickup turns as low as possible. For this reason, self-supported pickup turns of no. 12 or 14 enameled wire about 2¼ inches in diameter would be somewhat preferable to the arrangement shown.

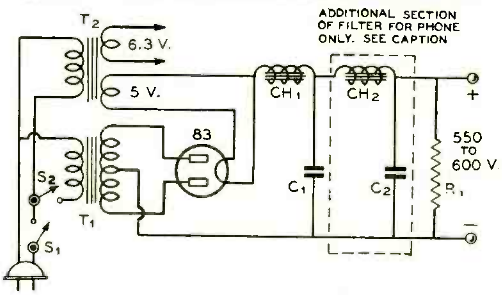
Wiring

All wiring is done with no. 18 solid push-back wire. Condensers C_{12}, C_{13}, C_{14} and C_{15} should be placed right at the 807 socket. A common ground connection is made to a lug under the nuts that fasten the socket. A lug is also placed under the head of the bolt, above the chassis. A wire is soldered from this lug to the rotor frame of C_3. The front panel should not be relied upon for a ground return, because of the long path resulting and due to the fact that the panel is bolted at only a few points. Likewise, a wire is run from the rotor of C_1 to the point on the chassis where most ground returns are made in the crystal oscillator.

Leads to all by-pass condensers are made as short as possible. The resistors, excepting R and R_4, have no r.f. on them and need not be placed with respect to lead length. Instead they are placed wherever room permits and leads are run over to them.

The circuit used permits the mounting of all three variable condensers directly to the panel or chassis. C_1 and C_2 have the plate voltage impressed across them and therefore should have at least .03-inch gap. The condenser C_3 has no plate voltage impressed across it but will be subjected to higher r.f. peaks, especially if the 807 is plate modulated. For this reason this condenser also should have at least .03-inch gap.

If a modulator capable of delivering considerably more power than is needed for 100 per cent modulation is utilized, the by-pass condenser C_{10} should be of 1200-volt rating to prevent its being blown by high audio peak voltages.



POWER SUPPLY

T_1—700 to 750 v. each side c.t., 200 ma.
T_2—5 v. at 3 amp. and 6.3 v. at 3 amp.
C_1,C_2—4-µfd. 600 w.v. oil filled condensers
CH_1—5-25-hy. 200-ma. swinging choke
CH_2—20-hy. 200-ma. smoothing choke
R_1—50,000 ohms, 20 watts
Note: CH_2 and C_2 are required only if 807 is modulated for phone or if the exciter is used to drive a grid-modulated stage.

Other Parts Required for "4-25"

1—Chassis, 7"x11"x 2"
1—Front panel 7"x 12"
1—4"x4¾" shield baffle
1—Type 807 tube
2—Type 42 tubes
1—Ceramic coil form, 3½" long, 1¾" dia.
1—Piece bakelite tubing 3½" long, 1" dia.
1—5-prong ceramic socket
2—6-prong ceramic sockets
1—6-prong panel mount (protruding) socket for crystal
1—4-prong wafer socket (for power connections)
1—2¾" dial
3—Small knobs
4—Small feed-through insulators
2—1" or 4 ½" bushings or collars for 807 socket
2—Single lug "tie points"
1—Grid clip for 807
No. 18 hookup wire
No. 14 enam., no. 18 d.c.c. and no. 20 d.c.c. for coils

Power Supply

The power supply should be capable of delivering between 550 and 600 volts under load and should have very good regulation. The one illustrated in the wiring diagram is especially well suited for use with the exciter. The second section of filter comprising CH_2 and C_2 will not be required except when plate modulating the 807 or when using the exciter to drive a grid-modulated amplifier. When the exciter is used for c.w. work or to drive a plate-modulated amplifier, a single section of filter will be sufficient.

The linearity of the 807 is quite good even when doubling and the exciter therefore makes an excellent phone transmitter. The excellent linearity obtained when doubling is the result of the simultaneous plate and screen modulation. A modulator capable of delivering approximately 25 watts of audio will be required for full modulation. It is very important that the keying jack J_1 not be opened when modulation is applied; *damage to the 807 screen and blown by-pass condensers may result.*

Tuning Up

The initial tuning should be done preferably with a crystal that quadruples close to 14,250 kc. With the switches S_1 and S_2 in their "high-frequency" positions (10 and 20 meters) C_1 and C_2 are tuned for maximum drive to the 807, which should be tuned to 10 meters while initial adjustments are being made to C_2. The ten-meter setting of C_3 will be with the plates almost entirely out. The setting of C_1 should be backed off slightly from the "edge" of oscillation (maximum capacity setting at which the crystal will oscillate). This gives better keying and makes it unnecessary to retune the condenser when changing bands.

To change bands merely throw switches SW_1 and SW_2 and retune the condenser C_3. When going from 10 to 20 or from 40 to 80 it is not even necessary to throw the switches. Just retune C_3 to the high capacity resonance setting.

C_2 need never be touched after the initial adjustment is made, but C_1 may require touching up if a crystal on the high-frequency end of the 80-meter band is used (such as for 75-meter phone). For this reason C_1 was put on the front panel instead of on the chassis like C_2.

As the exciter stands it can be used only with 80-meter crystals. By tapping L_1 at a suitable point and incorporating a shorting switch, 40-meter crystals also can be accommodated. This might be desirable where the constructor already possesses several 40-meter crystals and wants to make use of them for additional frequencies on the three high-frequency bands. Tuning of the exciter will be the same except that there will be no 80-meter output. The second 42 will operate as a doubler instead of a quadrupler when a 40-meter crystal is used.

The exciter can be used to cover 160, 80, 40 and 20 meters instead of 80, 40, 20 and 10 meters by incorporating a 250-$\mu\mu$fd. condenser at C_3 and using larger coils. L_1 would be a 160-meter coil, L_2 a 40-meter coil, and L_3 should be wound accordingly. No. 22 enameled wire could be used for L_1, coil L_2 could be wound on a bakelite form, and L_3 could consist of no. 20 d.c.c. Exact coil dimensions cannot be given because the exciter was not tried in this combination, but there is no reason in the world why it should not work every bit as well.

The 807 should not be loaded to more than 90 ma. For phone the 807 should not be loaded so heavily that it will not modulate upwards. This may happen in trying to load the tube to draw 90 ma. when less than 500 volts is applied to the plate, especially when the tube is operated as a doubler.

Bugs

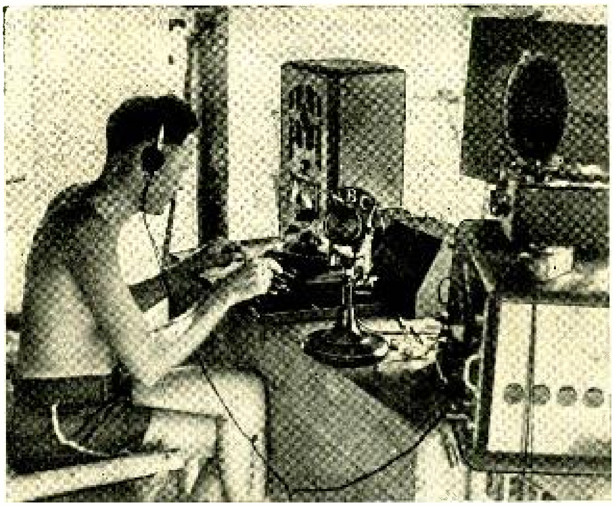
Because an 807 has such a high transconductance and because it is almost impossible to get perfectly isolated return circuits to the cathode, a tendency toward instability may be encountered if the mechanical layout illustrated is not followed in every detail. But unless the design is particularly bad, the instability will be apparent only when both the load and the excitation are removed from the 807 stage. Because the instability will disappear when either excitation or a load is applied to the 807, it should not be bothersome. However, if you so desire, the 807 stage can be made stable as the rock of Gibraltar at a small sacrifice in the 10- and 20-meter output by placing 50-ohm ½-watt carbon resistors in both the control grid and screen grid leads *right at the tube socket* (before connection is made to anything else). This method of taming 807's was suggested by W6BHO and works in all but the most stubborn cases.

●

Ceremoniously, the last rivet to go into the RCA exhibit building at the New York World's Fair was heated by radio waves.

●

It is singular that the calculus expression dIp, meaning a change in plate current, should indicate in many cases a *dip*.



Operating position at VP3THE, with operator attempting to keep as cool as possible.

VP3THE, *the Terry-Holden Expedition*

By O. W. HUNGERFORD*

The scream of the macaw, the growl of the jaguar, the dense, mysterious green of the tropical jungle, the fleeting glimpses of naked, brown-skinned Indians, equatorial heat, and solitude—such was the background of VP3THE.

Back in the 200-meter days I had a rig which, more or less, consisted of a pile of stuff selected from various junk yards, part of which was an old aviation engine spark coil, operated by an E. I. electrolytic rectifier, and other antiques. One piece of apparatus that contributed to its beautification was a pancake helix. I never could tune below 360 meters, because of the fact that I hated to discard it.

Occasionally I got on the air with the apparatus, sending out a series of groans which were supposed to represent the modern version of CQ. I seldom stopped to listen-in as I had a pretty good idea that nobody would hear me anyway. The only way I was ever able to check up and find out that I was on the air was to use a land phone to call up a friend who had equipment down the street and ask him to listen for me. Eventually, he would be able to locate me by synchronizing the crashes coming through his receivers with the flicker of the electric lights.

Far be it from me to elaborate on my accomplishments as an amateur at that time, but possibly it will help you realize how I felt, in comparison, when I first put out a CQ on 20 meters from VP3THE. Many a night I worked this rig from the jungles without having to resort to a single CQ. But I'm jumping ahead a little too fast; let's get back to when VP3THE was merely a pile of equipment in the RCA factory.

Early last summer, the Terry-Holden expedition was organized under the auspices of the American Museum of Natural History in New York City, but not until the last ten days before sailing date were the definite plans for the radio and equipment completed. Between that date and the day that we sailed, it was my job to decide what type of equipment to

* c/o Bowden, 69 Henry St., Binghamton, N. Y.

take, what frequencies to select, what source of power, and how to transport equipment. The only restriction was that no unit could weigh more than 125 pounds.

Equipment

I took my problem to the engineering staff of NBC and RCA, and through their splendid cooperation we were able to select, assemble and pack up the equipment so that all I had to tote on board was one spare transformer, a couple of extra knobs and a handbook. We decided on an RCA ACT 200 transmitter which used a pair of 838's in the output stage. Some of the engineers at NBC were skeptical as to whether this 200-watt transmitter would have sufficient power to put signals constantly into the States; but inasmuch as the transmitter could be dismantled into five units which met our weight requirements, we decided it would have to do. The receiver was an AR 60S RCA communication receiver weighing about 110 pounds.

Our power requirements were such that we had to use two generators. These were 1000-watt generators. By having aluminum castings, each came within the 125-pound limit. The frequencies for communication purposes were decided upon after careful study of the time that I would be using them. Spare tubes and parts were assembled in separate cases, bringing each box up to the weight limit, carefully numbered and listed. Then, on our arrival we would be able to find any particular part. While we were assembling this equipment Mr. Brown, the NBC engineer of the Canton Island expedition for the broadcast of the Eclipse, suggested that I take with me the little standard all-wave b.c. receiver which he had used with his equipment. So, we put it in for luck, feeling that this expedition veteran might come in handy. We later found that it did.

On the Way

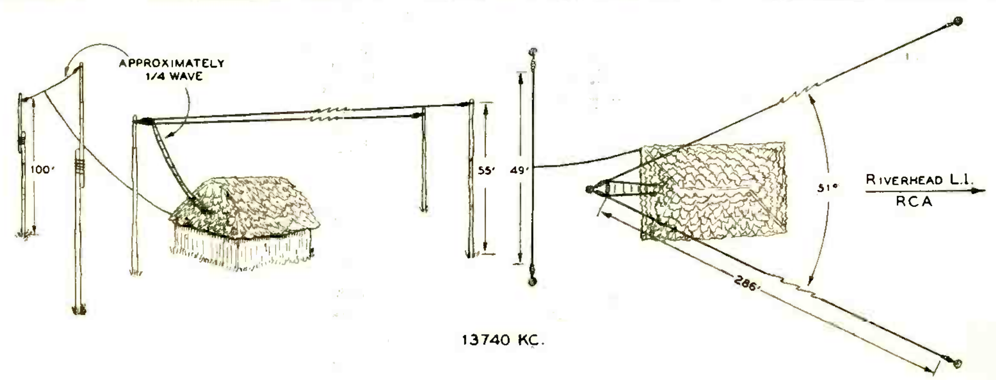
On the morning of November 27, we loaded all 19 cases into a truck and dashed down to the dock. After seeing the equipment carefully stowed away on the *S. S. Van Renssler* of the Royal Dutch Netherlands Lines, I went home to pack my clothes in the four hours left before sailing time.

After about a week at sea I was able to get my wardrobe straightened out. Somewhat to my dismay, I seemed to have an assortment of clothes that didn't fit in very well with the trip which we were on. But between the sea air and the several beautiful islands we visited on our way to Georgetown, British Guiana, my nerves were finally brought into a reorganized state.

After interesting trips in Trinidad, Haiti and Venezuela, we arrived in Georgetown, British Guiana, September 15. We were met at the customs office by one of the members of the local broadcasting company. Through his cooperation we were able very quickly to clear our equipment so that I had an opportunity to test out some of the apparatus before shoving off into the hinterland.

Advance arrangements were made so that when we arrived practically all of our foodstuffs had been purchased. Also the two crews had been hired for our boats. These boats, though, were still under construction, causing a few days' delay. However, all members of the party found enough things to do, so that this delay turned out to be a help. We finally launched the two boats, christening them (with an appropriate bottle of Demarara rum) the *Schomburgh No. 1* and *No. 2.*

Inasmuch as our course lay up the Essequibo, our supplies had been shipped to Bartica, a town at the confluence of the rivers —Essequibo, Mazaruni and Cuyuni. To reach



Bartica we had to travel through open sea. We deemed it advisable to load the boats after arriving at that point.

Mr. Neil MacMillan, the field assistant of the expedition, and I went around by open sea with the native crews and empty boats. This part of our trip was uneventful except for the fact that Neil and myself, each of us being in a separate boat, had a continuous job all day keeping the native engineers from opening the engines up wide in an attempt to race. As these engines were brand new, we knew this would be disastrous.

The following day at Bartica was spent in loading our boats, each boat being 36 feet long and 7 feet wide, and capable of carrying 10,000 pounds and a crew of 14 Indians. As this work progressed we found that it would be necessary to acquire another boat, inasmuch as our luggage, foodstuffs, etc., amounted to over 30,000 pounds. We were finally able to hire a river boat with an old automobile engine in it as means of power to carry the balance of our load. After much excitement and many farewells, we were finally launched on our voyage up the Essequibo—into the unknown.

Along the Essequibo

Our first few days up the Essequibo River were rather uneventful. We were usually able to make port each night at some trader's dwelling or former river station, such as Rockstone. During the World War, when balata was in demand, this was a flourishing town, even boasting a hotel. Today it is merely a ghost of a place with only a few wooden, sun-bleached buildings left standing—mute evidence of a civilization reclaimed by the jungle.

We spent an extra day in Rockstone, inasmuch as the boat which we had hired at Bartica had shed the key from the propeller shaft, and this damage had to be repaired. The remainder of our crews spent the day rearranging the boats, balancing up the loads and making things shipshape, because we understood that having once left Rockstone, we would run into rapids and rough water. The following morning we started out, and it wasn't long before the first evidence of what we were up against in the way of rapids presented itself.

The Essequibo River, which is approximately thirty miles across at the mouth, had been rather placid up to this point, but there the river had narrowed somewhat and was jutted with large masses of saw-tooth rocks and small islands. The water rushed around and over rocks with a continuous, foreboding roar which indicated what might be our fate if our boats should get out of control while passing through the turbulent waters.

The captains of the boats, who seemed to sense the most likely passage through these waters, would handle the large stern paddles which were used to steer the boat, while a bowman would sheer the boat from any submerged rock with a deft twist of his large bow paddle. When we hit swift waters, whirlpools or rapids, the engines would be opened wide and the Indian crews would dig in for all they were worth with their paddles.

In cutting through some of these rapids, our boat was tossed about as if it were a light leaf on the tops of the waves. More than once I expected almost any moment to find myself floating down stream amid parts of our capsized boat. But, fortunately, this did not happen. At times we had to take some of the outlying channels of the river, around some of the large islands. Several times the boats were hauled over the stones solely by man power. The Indians would go overboard, towing the boat lines to some point from which they could pull. Then they would start a chant which sounded like a series of "haul aways," each "haul away" representing a grunt and a tug. The bow rope was called the "Wap," and the stern rope, the "Stern Line." In the excitement of hauling the boats over the stones and rapids, it was amusing to hear the captain shout, "Haul away on de Wap," or "Come around on de Stern."

At certain rapids it was simply impossible to get the boats through with their loads; and it was often necessary to portage entirely our 30,000 pounds of equipment. At one spot, it was merely a case of unloading the boats on one side of a small island and reloading them on the opposite side. At others, it meant carrying overland this entire equipment for miles, sometimes as many as fifteen. Needless to say, on these long portages we lost as much as a day in travel, but it afforded an opportunity for the scientists to make some collections of the zoological and botanical specimens of this river region.

In this work I occasionally helped, but I was rather careful about finding too many snakes. I believe I did find one of the first snakes that we encountered, which turned out to be a coral snake. I almost stepped on it while following one of these portage trails. Not having anything handy to capture him with, I picked up a stick, but like all sticks in an emergency, when I pressed down on the snake's head, it broke, leaving me only a few inches which I immediately brought down on the back of his neck. Then I proceeded to shout lustily for Mr. Snedaker, the herpetologist with the expedition, to come and rescue me from the posibility of being attacked by this ferocious reptile. It was finally captured by a group of Indians that came along the trail in response to my wild shouts. When captured the snake proved to be nearly six inches long. I am certainly glad that I didn't have anything to do with the capture of one boa constrictor our party caught; it measured twenty-one feet.

We Branch to the Rupununi

After several weeks of this river travel, we arrived at our last undertaking with the Essequibo, and branched into the Rupununi River. We were, at this time, about 300 miles into the interior. Here we unloaded quite a bit of our supplies, so that we were able to let the boat which we had hired from Bartica return, inasmuch as it had caused us quite a bit of delay by several breakdowns up the river. Also on this boat we sent back some of the crew, several of whom had been ill.

Going up the river, the Rupununi proved to be quite placid with very few rapids; consequently, we were able to make good time. We did, however, have an unfortunate accident: one of the propeller shafts broke, which meant towing that boat for the balance of our river trip.

Our first night up the Rupununi brought us to Anay. We swung our hammocks on the banks and went to sleep feeling that the worst part of our river trip was over. Several days later we arrived at Tiny McTurk's ranch. We were met by Mr. John Melville, who was to act as our transport manager from this point on. Mr. McTurk's ranch, comprising four hundred square miles, consists mostly of savannah country, at the foot of the Canaku Mountains. These mountains are the home of the aboriginal Mascusie, noted for their skill with the blowpipe and their secret preparation of the deadly poison, *curari.*

We stayed several days at Mr. McTurk's ranch and made our first radio contacts from this point. We set up the transmitter, and were successful in contacting VP3BG, Georgetown, and brought our arrangements up to date. From this position we made no attempt to contact any amateur stations, as we were only on the air for two days, after which we immediately packed up our equipment and started again on our journey.

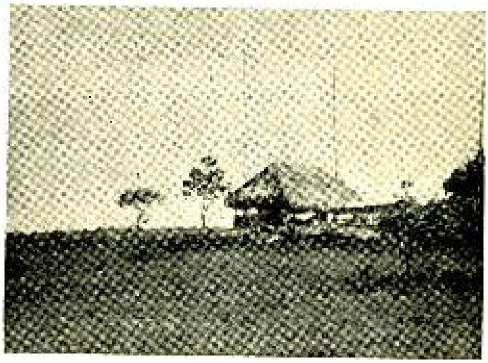
A good deal of our equipment had to be transferred to bullock carts, but the entire radio equipment was left in one of the boats. Mr. Melville and I proceeded up the Rupununi by boat, and the rest of our party started overland by bullock cart and on horseback.

The Rupununi River had been continually getting smaller, and as we progressed we ran into sand banks and rapids, and even had to cut our way through fallen trees. At San Creek, a Wapashannay Village, we unloaded part of our equipment. This was moved overland by bullock carts to John Melville's ranch at Witchabi. Mr. Melville proceeded to bring the boat with the rest of the equipment up the river, while I went on by horseback.

After reaching Witchabi, we waited several days for the rest of our party to arrive overland. After their arrival and a few days' rest, we all started out overland on horseback and by bullock carts, while Mr. Melville continued up the river by boat. Several days' travel brought us again to a point near the headwaters of the river where we waited for Melville. When he arrived, we started the last leg of the trip to Isherton, the site which had been chosen for our base camp. Isherton formerly had been a base camp for the boundary commission, although practically all signs of their occupancy had been obliterated by the devastating action of the tropics.

Journey's End

On arrival, our first problem was that of locating water. This was solved by digging a well in one of the low sections of the savannah country. Under the able leadership of Mr. Melville, and some forty Indians, a shack was soon erected. It was 40 feet long and 17 feet wide, constructed of a pole framework, with a palm-leaf thatched roof. The roof was approximately a foot deep. This type of construction prevented the direct heat of the sun from reaching us, and I am afraid that if I had not had the shack, I would have been far more dried out and would have lost more weight than I did.



This "little grass shack" housed VP3THE while located in the interior of British Guiana, and served as an open air studio.

Getting Ready for Skeds

Our next job was to put up the radio equipment. Neil MacMillan took over the problem of laying out the two poles for the receiving antenna and the three poles for the directional V antenna.

In this job, Mac had the problem of getting the proper direction and apex angle for the V antenna. While he was accomplishing this work, the Indians had been out scouting the nearby jungle for tall trees for the poles.

We used two poles for our receiving antenna system, approximately 100 feet high; and for our transmitting V, three poles approximately 65 feet high. To get the two 100-foot poles, we had to rig on upper sections. These were bolted on and wrapped with fresh cowhide, and as the sun dried it out, it clamped them together as solidly as if they had been bound with wire bands.

After Mac had located the spots for the holes, the holes were dug; and by the cooperation of all hands, we were able to erect the poles and guy them. While this work was going on, I had been busily engaged mounting the panels on the rack and arranging the radio equipment in the shack. I tested the equipment and found it none the worse after its hazardous trip up the river and journey over the savannah by bullock carts.

On November 15, 1937, VP3THE went "on the air" to inform the world of the activities of the Terry-Holden expedition for the American Museum of Natural History, from the jungles of British Guiana. We immediately started to contact amateurs; and through their cooperation we established a schedule with an amateur in New York City. Through his splendid cooperation, we were able to arrange certain matters for the expedition.

After our first contacts on 13,730 kc., we started using 14,100 kc., and 14,300 kc. for our 20-meter band contacts. We certainly enjoyed many a pleasant QSO with amateurs all over the world. If space would only allow, I would like to relate some of the contacts I had; but on some days we covered nigh on to 200 reports. Sufficient to say that we enjoyed every single contact.

Fortunately, we were able to find plenty of things to talk about, such as: our lightning bugs, which were over an inch long and brilliant enough to read by; our Navigation worm with red lights on one side and green on the other; Icky, our Marmoset monkey, was always a subject of interesting conversation. Icky, who had been presented to us by one of the Indians of the local territory, sped the dull hours for Mac and myself. What situations he continually got himself into, and what antics! Icky was extremely fond of grasshoppers and would go to any extreme to capture one. Mac and I would capture a grasshopper just to see Icky go through his tricks to try and get us to give it to him. On one of these occasions I came walking into the shack with a grasshopper in my fingers, and Icky, who was on top of a pile of foodstuffs, spied it. He made one tremendous jump for my hand. But he had not calculated the distance, and much to his surprise, landed in a pail of water which we had brought up to boil for drinking. I've seen woebegone animals before, but I doubt that in all my experience I have ever seen a more dejected-looking little creature than Icky when he scrambled out of the pail. He certainly looked like the proverbial drowned rat.

As time went on, we accumulated quite a zoo. We had Plato, Pluto, Oscillator, three jabbering parrots, a live coral snake, Oswald the Owl, and, of course, the inevitable mosquitoes and bugs, the latter being uninvited guests.

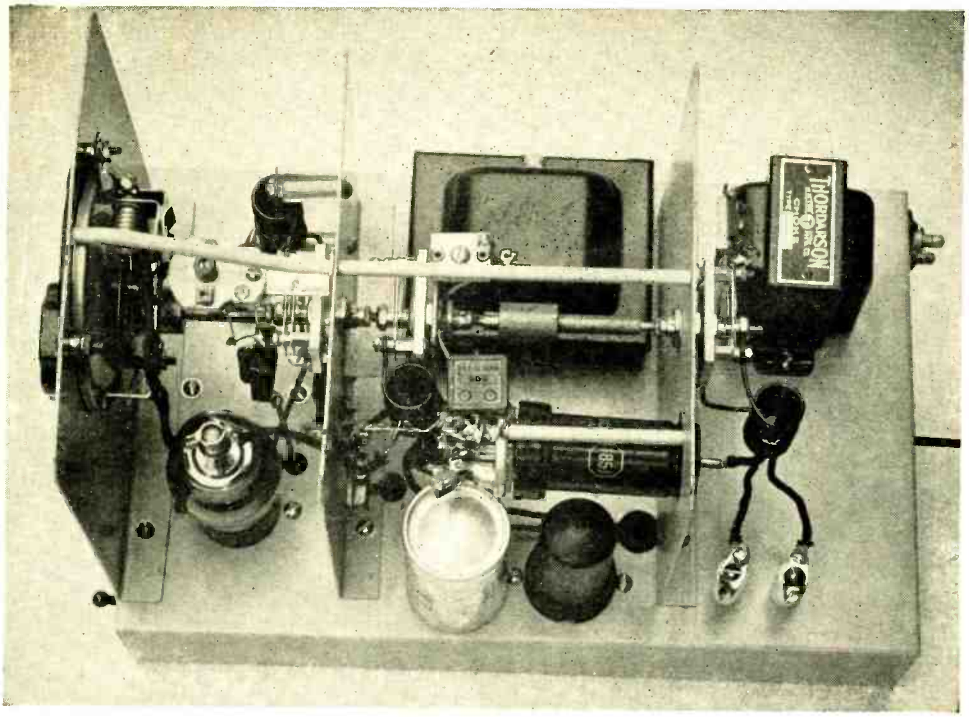
Our broadcasting of programs over the NBC network was always successful. After our first initial contact with RCA we were able to maintain continuous schedules. The programs we were on included the "Magic Key," the "Variety Hour," and a special feature, "Christmas with the MacGregor Expedition, OX2QY." Our families were at the NBC studios in New York City; we were on the equator. On this particular program, we relayed the balance of our party from our small portable transmitter through our system to RCA, inasmuch as by that time they had penetrated the jungles to a point about 100 miles south of us. Needless to say, this program afforded us all a great deal of pleasure.

For a time after our Christmas program, we were unable to keep up our amateur contacts because we had exhausted our gasoline supply. The times that we were "on the air" from then on, we were forced to use kerosene for operation. Usually we fired the engine up on a carburetor full of gas, crossing our fingers in hopes that when the kerosene started to work through that the engines would be hot enough and still keep going.

On one of the evenings that we were scheduled for a broadcast, we had fired up our engine according to this system and were in contact with RCA in a preview of our program. We had been told to stand by for our RQ. Just about this time, one of the sudden tropical storms came up, soaking everything, including the engines, to such an extent that it

[*Continued on Page 76*]

• Top view of the completed unit with the 28-Mc. coils in place. The placement of the components is indicated quite clearly in this photograph.



A Five-and Ten-Meter CONVERTER

By
RAY L. DAWLEY*
W6DHG

In response to a large number of requests since the recent 56-Mc. dx spree for a superhet converter especially designed for use on the 28- and 56-Mc. amateur bands, we offer the model to be described.

There are quite a few important reasons for the need of a good high-frequency converter. In the first place, very few of the commercially available receivers give coverage of the 56-Mc. band; if they do, the inherent losses and inefficiencies, tuning difficulties and instabilities of the receiver make the band almost useless. Second, while nearly all of the commercial receivers cover the 28-Mc. band, only a very few of them are really satisfactory on this high frequency. It is an almost insurmountable problem to design a single high-frequency "front end" which will adequately cover the 160-meter or the broadcast band and still retain some semblance of efficiency on 28 Mc.

To the grid coils (and their switching mechanism, if used) can be attributed most of the inefficiencies of the conventional receivers when used on frequencies above about 20 Mc. To obtain high gain these coils must be compact, wound with large diameter conductor, must be virtually self-supporting, and in the

* Technical Editor, RADIO.

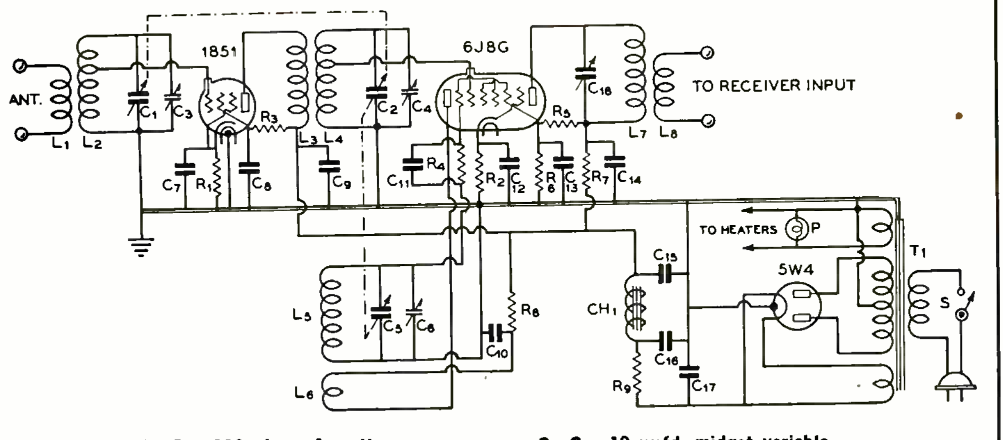
You can operate your present receiver on 5 and 10 meters simply by adding this converter to the "front end." The results will be surprisingly good when the converter is used in conjunction with a "jallopy" receiver; when used with a well-built communications receiver the results will be positively amazing.

clear with respect to surrounding masses of metal. These are in addition to the obvious requirements that the coils be as high in inductance as possible, that their leads to the tuning condenser be short and that they have low distributed capacity.

With these requirements in mind, take a look at the 28-Mc. r.f. and detector coils of your favorite communications receiver. The reason for their lack of sensitivity is immediately apparent; the 28-Mc. coils of one of the most widely used bandswitching superhets consist of two turns of wire, about ⅜-inch in diameter, with long leads up to the bandswitch and then to the tuning condenser.

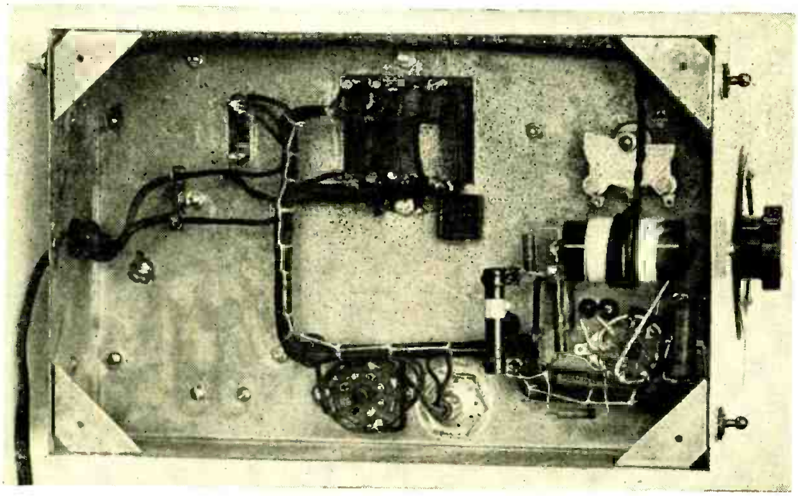
We are not finding fault with these receivers; the compromise between operation on both the low- and the high-frequency spectrum has been very carefully made and it is a credit to the engineers that the receivers operate as well as they do on 28 Mc. But, by designing the high-frequency end of the receiver specifically for frequencies above 28 Mc., it is not necessary that these compromises be made. Notice the 14-turn 28-Mc. coils used in this converter. And, through the principles of double conversion (the operation of a superheterodyne with two frequency converters and two intermediate frequency channels) it is possible to combine a standard low-frequency receiver and an especially designed high-frequency converter to produce an excellent h.f. receiver.

An additional advantage that can be obtained through the use of double superhet operation is the virtual elimination of images. Images are undoubtedly the most annoying fault of most commercial receivers on the 28-Mc. band. If the converter to be described



R_1, R_2—300 ohms, 1 watt
R_3, R_4, R_5—50,000 ohms, ½ watt
R_6—60,000 ohms, ½ watt
R_7—3000 ohms, ½ watt
R_8—5000 ohms, ½ watt
R_9—3000 ohms, 10 watts
T_1—600 volts c.t. 50 ma.; 6.3 volts, 2 amp.; 5 volts, 2 amp.
CH_1—15-hy. 85-ma. filter choke
Coils—See coil table

C_1, C_2—10-μμfd. midget variable
C_3, C_4—3-to-30-μμfd. mica trimmer
C_5—15-μμfd. midget variable
C_6—25-μμfd. air trimmer
C_7, C_8, C_9, C_{10}—.004-μfd. mica
C_{11}, C_{12}, C_{13}, C_{14}—.01-μfd. 400-volt tubular
C_{15}, C_{16}—Dual 8-μfd. 450-volt electrolytic
C_{17}—.001-μfd. mica
C_{18}—50-μμfd. midget variable



Under-chassis view of the converter. The coil, condenser and link circuit to the right comprise the output circuits of the mixer tube.

is operated into a receiver that has no images on the 7-*Mc*. band, and few of them have, the combination of the receiver and the converter will exhibit no images on the 28- to 30-Mc. band or the 56- to 60-Mc. band. That fact in itself is enough to recommend the use of a converter and good low-frequency receiver in preference to a single-i.f. high-frequency receiver. Of course, it is possible to eliminate images in a single-conversion high-frequency receiver if the i.f. is made high enough. But the use of *only* a high i.f. in an h.f. receiver leads to poor selectivity, low gain and high inherent noise level.

While the converter is primarily designed to operate with conventional receivers that do not provide for the 28- or 56-Mc. bands, it gave a very worth-while improvement in both image rejection and signal-to-noise ratio when used ahead of some of the well-known makes that do include the 28-Mc. band. As a matter of fact, the easily noticeable improvement in signals would indicate that the converter is a worth-while addition to most communication receivers that already cover 28 Mc. even if 56-Mc. operation is not contemplated.

The Circuit

The circuit of the converter is more or less conventional and employs an 1851 in a high-gain preselector r.f. stage with a 6J8G combined oscillator-mixer. The power supply is self-contained, making the unit entirely independent of the receiver with which it operates. A low-impedance output link is provided from the plate circuit of the mixer tube to be connected to the antenna circuit of the receiver into which the converter is to operate. This also increases the versatility of the unit.

The 1851 R.F. Stage

The 1851 tube used in the preselector r.f. stage operates at maximum gain at all times to improve the signal-to-noise ratio. Regeneration was tried in this stage but it was found to be unnecessary since the gain of the stage is already very high and no increase in the signal-to-noise ratio was obtained.

The antenna is coupled to the grid coil by a small air supported coil of hookup wire wound on a pencil and inserted into the grid coil. The grid coil itself has a small 3-30$\mu\mu$fd. mica trimmer connected across it in conjunction with the regular tuning condenser. To match the high impedance of the coil to the lower grid impedance of the 1851, the tap for the grid of the tube is taken off one turn above the center of the coil on both the 28- and 56-Mc. bands.

The plate of the 1851 is inductively coupled to the grid tank of the mixer tube by another small coil of hookup wire. The plate coupling coil is changed at the same time that the succeeding grid coil is changed. A 300-ohm cathode biasing resistor is employed on the r.f. stage. It is important that all the by-passing returns for this stage (cathode, screen grid and plate) be made at a common point if oscillation in the 1851 is to be prevented. As can be seen in the photograph, a heavy wire is run from the tuning condenser for the grid circuit of the mixer down toward the 1851; all the by-pass returns are made to this point. It was necessary to make all these returns very short and direct before oscillation in the 1851 could be prevented.

The Combined Oscillator-Mixer

A 6J8G is employed as a combined high-frequency oscillator and mixer. As in the grid circuit of the r.f. stage, the grid of the 6J8G is taken one turn above the center of its associated grid coil. Although this expedient is not required from an impedance-matching standpoint, it does assist in tracking the two stages and ample driving voltage is still available at the tapped point to excite the mixer.

The circuit employed for the oscillator section of the mixer is the conventional tuned-grid tickler-plate arrangement. The use of this circuit puts one side of the tuning condenser and trimmer at ground potential. While only a three-plate tuning condenser is used on the r.f. and mixer grid circuits, a five-plate condenser is used on the oscillator. This allows higher C to be used in the oscillator circuit to give the requisite stability and still allows the band to be covered. The padder condenser on the oscillator circuit is an air-dielectric type in contrast to the mica condensers used on the r.f. and mixer. The air padder condenser contributes greatly to stability over a period of time in the oscillator circuit. Room and compartment temperature variations have little effect on the air condenser. While these variations do affect the mica condensers on the r.f. and detector grid circuits, small variations at these points have no measurable effect on the alignment.

When operating on the 56-Mc. band, the oscillator is operated lower in frequency than the r.f. and detector by the amount of the intermediate frequency. This contributes to the stability of the receiver since the oscillator is operating in the vicinity of 49 Mc. when the receiver is tuning a signal on 56 Mc. However, when operating on the 28-Mc. band the oscillator is operated in the conventional manner, higher in frequency by i.f. than the detector. Since there is very little difference in frequency of the oscillator when operating either on five or ten meters, only the grid coil of the oscillator need be changed; the same tickler coil is employed on both bands.

By operating the oscillator lower in frequency than the received signal on the 56-Mc. band the stability of the receiver is considerably improved over operating the oscillator in the vicinity of 65 Mc. The stability on the 28-Mc. band is ample with the oscillator higher in frequency than the detector.

The plate of the mixer section of the 6J8G is connected to an output circuit that is tuned to the same frequency as the receiver into which the converter is to operate. This tank circuit will tune to any frequency within the range of approximately 5500 to 8000 kc.; hence, the receiver into which the converter is to operate may be tuned to any frequency within this range. Actually, best operation and most accurate tracking was obtained with the output circuit of the converter tuned to approximately 6500 kc. A five-turn link wound over the output coil serves to couple the output of the converter to the input of the receiver.

Power Supply

The power supply employs a 5W4 (an 80 in metal) with a resistor-input filter system. With choke input the output voltage was too low and with condenser input it was too high; so a compromise was made in using a 3000-ohm 10-watt resistor between the filament of the 5W4 and the first filter condenser. With this arrangement the voltage delivered to the plates of the tubes is in the vicinity of 275 volts. In addition to lowering the voltage to the proper value, the input resistor contributes its share to the filtering action of the supply. All the power supply components are placed behind the oscillator compartment where heating will not cause the oscillator to drift. Their heating has no detrimental effect on the r.f. stage. Incidentally, it is important that the shields of both the 5W4 and the 1851 be grounded to eliminate any coupling that might exist.

COIL TABLE

Coil	Band	
	28 Mc.	56 Mc.
L_1, Antenna coupling	7 turns hookup, ¼" dia.	7 turns hookup, ¼" dia.
L_2, R.f. stage grid	14 turns no. 14, ½" dia.	7 turns no. 14, ½" dia.
L_3, Detector coupling	14 turns hookup, ¼" dia.	7 turns hookup, ¼" dia.
L_4, Detector grid	14 turns no. 14, ½" dia.	7 turns no. 14, ½" dia.
L_5, Oscillator grid	7 turns no. 14, ½" dia.	6 turns no. 14, ½" dia.
L_6, Oscillator plate	7 turns no. 14, ½" dia.	Same coil as for 28 Mc.
L_7 Mixer output	34 turns no. 24 d.c.c., 1" diameter form	
L_8, Output link	5 turns hookup wire wound over L_7	

Layout

The layout shown is not necessarily the best one that could be made. However, it is the result of considerable experimentation with the placement of components and has been found to give excellent results. The reasons for this placement of the power supply components have been cited. The antenna input is placed well to the back so that this circuit will be well away from the other circuits of the converter and so that the antenna connection will be short and direct. The 1851 is mounted horizontally with its grid end protruding into the input circuit compartment and with the plate end very close to the coupling coil to the next stage. This results in very short leads into and out of the r.f. amplifier.

The oscillator compartment is placed at the very front with the oscillator tuning condenser the first one to be driven from the dial. This placement of the oscillator tuning condenser is quite important if freedom from backlash is to be had. In one of the preliminary layouts the oscillator condenser was the last one to be driven by the dial and the backlash was, to put it mildly, quite bad. Placing this condenser directly behind the dial cured the trouble. A slight amount of backlash in the r.f. and detector tuning condensers causes no trouble as they tune broadly as compared to the oscillator.

A suggested improvement on the layout as shown would be to slide the chassis into a small but deep cabinet and to mount the dial upon the front panel of the cabinet. This would eliminate any possible tendency for the three shields to move back and forth as the knob is turned. The tendency is but slight in the unit shown but is sufficient to indicate the desirability of the improvement. In addition, the shielding action of the cabinet would be quite effective in reducing the possible effects of extraneous fields as appear in the vicinity of a high-frequency transmitter.

The link from the output tuned circuit is brought out to a pair of binding posts on the rear of the chassis.

Since the converter was primarily designed to be operated as a fixed-band affair on either the 28- or 56-Mc. band, no provision for quick coil change has been made. Each of the coils is bolted in place at one end and soldered at the other to give firm, low resistance connections. If it is desired to change bands rapidly from five to ten meters some sort of a simple plug and jack arrangement could be employed. A set of miniature pin jacks could be mounted on strips of victron or other good high-frequency insulating material and small prongs soldered to the ends of each of the coils.

Tuning Up

Placing the unit into operation is comparatively simple providing proper precautions have been taken to make all leads short and to make all ground by-passing returns for a stage as direct as possible to one point.

Connect an antenna (cut to the band upon which it is desired to operate the converter) to the input terminals. It is suggested that the unit be tuned first in the 28-Mc. band. Then connect the output of the converter to the antenna and ground or the doublet terminals of the receiver into which it is desired to operate the unit. The receiver should preferably have two r.f. stages on the 7-Mc. band, although a single stage, if it is operating properly, will be satisfactory. If the receiver does not have an r.f. stage, images will be apparent on the 28- and 56-Mc. bands. Incidentally, the converter may be operated, if desired, into a *good* t.r.f. receiver, although the selectivity will not be nearly as good as when operating into a superhet and some trouble may be had from images. This latter arrangement (the converter working into a good t.r.f. on 7 Mc.) would make an excellent receiver for the wobbulated type of 56-Mc. signals, providing someone wants to listen to them.

With the receiver tuned somewhat below the bottom edge of the 7-Mc. band to a spot that is free of signals, with the dial on the converter set so that it reads about one-third out from maximum capacity, and with the trimmers on the r.f. and detector closed but not screwed down tightly, tune the oscillator padding condenser until 10-meter signals are heard. Now tune this padder until some signal known to be in the vicinity of 28,500 is being received. Then tune the output tank circuit of the mixer until the signal peaks up (this condenser can be seen in the under-chassis view but the knob above chassis is obscured by the oscillator padder condenser). Then adjust the trimmers on the r.f. and detector of the converter until the signal is at maximum. That's all there is to the adjustment except that the preliminary adjustments can be gone over once to make sure that they are on the nose. A similar tune-up procedure would be used for the 56-Mc. band.

If the results do not sound reasonably "hot" there is probably something out of adjustment and it might be well to check tubes, operating voltages and the various circuits to be sure that everything is in order. With this converter operating a "jalopy" all-wave b.c. receiver that had a poorly tuned r.f. stage ahead of it, really excellent results were obtained on 28 Mc. The all-wave set was tuned just be-

[*Continued on Page 78*]

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Like the aftermath of an aerial bombing raid. Along New London's water front.

HIGH WIND AND WATER
In The East

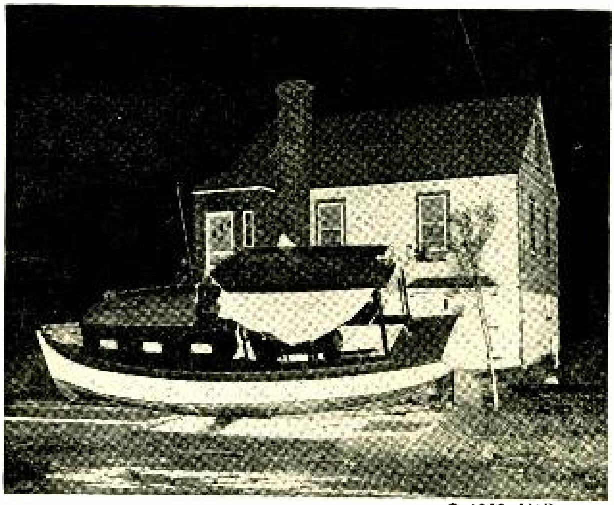
By RUFUS P. TURNER, W1AY/2*

September was a consequential month in the nation's affairs. War scares, political wrangles, labor disputes and television vied for front-page supremacy. Most significant to hamdom, however, was the disastrous eastern hurricane that crept up from the Caribbean on the twenty-first of the month, to strike with the sudden deadliness of a lightning bolt, leaving behind a wake of death and destruction and sparing only amateur radio to convey intelligence from one stricken town to another. In some sections, fire and tidal waves took up where the high winds left off.

The whole affair started innocently enough. Most of the Atlantic coast towns had nearly been deluged by a week or so of steady rain. It was one of those gray weeks when low, drifting clouds obscure the upper quarter of New York's tall buildings. Then came the high wind, falling trees and wires, inside out umbrellas and the mad scrambling for shelter. Before very long *hell wuz a-poppin'* along the east coast. Disaster swept New Jersey, New York and New England.

The regular Boston-New York train schedule was interrupted for many days and was reduced to a combination of train and bus service when it was resumed. Broadcast warnings cleared the interstate highways. At New London, Conn., a "full-grown" schooner was deposited across the main-line railroad. The antenna tower of WNLC there was snapped

* Managing Editor, RADIO.



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Long Island residents were surprised by unexpected visitors from the sea.

off at the middle and the front and back walls of the transmitter house were washed out by a tidal wave. The city looked like the aftermath of an aerial bombing raid. In several New England towns, the national guard was called out for the first time in years.

Regular communications were disrupted very early in the picture. In the New York area fifty thousand telephones were put out of service, and repair crews came from sections as far south as Virginia to restore the service. After nine hours of trying, the writer managed to get a long-distance call through to Boston, and this was a combination wire and radio hookup. Boston-bound telegrams were sent from New York to London by cable and relayed back across the Atlantic by cable to Boston. Amateurs swung into action as soon as the seriousness of the situation became felt.

Providence

Rhode Island's capital was severely stricken. To widespread hurricane damage was added a tidal wave that left six to ten feet of sea water in the city. There was no power in town, as the main plant of the New England Power Co. there was submerged. W1IPU lives close to the uptown power house, and special lines were run to his house, so he was the first ham in the city to get on the air. Most of the hams outside of the center of the city did not realize that there had been any more trouble than a big wind until they were called by their places of business to help "bale out." With many there was never a suspicion of QRR.

W1BES and W1GTN, intent upon offering their services to the Governor, went to the State House as soon as it became possible to move through the fallen trees, wires and water. There they were detailed by the Secretary of State to establish radio communication between the State House, police headquarters and the three national guard armories, with government sets obtained from the armories. At W1GTN's suggestion the A.A.R.S. Emergency Coordinator, W1JEZ was summoned and the police and national guard were dispatched about town to round up amateurs who soon arrived with additional equipment. Upon receiving the call, W1JEZ called in all hams on his list through the police and national guard, there being no telephone service. Later at the State House, he summoned a few hams with a transceiver.

W1JXQ and W1KTH were sent by a guardsman to the plant of the New England Power Co. where they set up a rig and waited two days for power. Meanwhile, the power company's telephone service with its Massachusetts plants was resumed and, since it appeared improbable that power for the rig would be available for another two days, they joined the group at the State House. By this time, Rhode Island's dignified capitol building had become an amateur radio message center. W1GTN and W1JEZ had taken charge and were using W1INM, the call of the Providence Radio Club. With commercial power out of the picture until the afternoon of September 22, W1INM was running on batteries in a room next to the Governor's office. Traffic was cleared to points throughout New England. 1311 messages, including state, military, Red Cross and personal traffic, calls for serums, doctors and embalmers, and organization messages were handled at this location.

The operators kept W1INM on the air twenty-four hours a day, sleeping at the State House four nights. Governor Quinn dismissed the amateurs on September 28, after regular communications were restored, with fluent praise of their work. Mr. Harry D. MacCormack, of the State House Executive Staff, and his son (later dubbed honorary director and assistant director of W1INM) supplied food, batteries, beds and blankets for the gang and put in almost twenty-four hour service themselves. Other non-hams at the State House who gave unstintingly of their services were Daniel Dematties, Mildred McDonald, Mary Moran and Doris Ainsworth. Others elsewhere included Bill Stanek, Comm. of Providence, James McElroy, Bob Nichols and Arthur Wallberg.

The police teletype cleared traffic to all points where there still were connections, and the teletype operators passed to the hams all messages that couldn't be routed via teletype. Many of the official messages throughout the state were concluded "if regular communication channels fail, try ham radio." Many of the messages at the State House were given to the hams verbally and the replies delivered the same way.

Lt. (j. g.) Horace Young, USNR brought his unit into action with N1IZO and N1IPU, handling a large volume of traffic. The chief operator at N1IZO was W1FBR of Attleboro, Mass. and he was assisted by W1GVN, W1KEM, W1GTS, W1BIL, W1KKE and W1IZO, all NCR men. Some of the NCR men, dispatched throughout the state, even served as radio operators for the national guard.

Westerly, R. I.

After activities were under way at the State House, W1JXQ and W1KTH joined W1CBS, W1KOG, and W1KZN who had volunteered to go to Westerly, a badly stricken town about twenty miles airline to the south. W1LDL later replaced W1KZN whose regular employment called him back to Providence. The gang was hurried to Westerly in a state car with the rig the boys had set up at the power house.

The party arrived at Westerly within an hour and found that part of the town had power. Westerly was not hit as hard as was Providence, but nearby Watch Hill and Misquamicut, summer colonies, were nearly wiped out. Westerly was without any communication facilities whatever.

The station was set up quickly in a judge's office in the town hall and the fire department erected the antenna. Within an hour the station was on the air and the gang back at the State House had been raised. The call used was W1KTH, since KTH was the only man who remembered to bring along a log!

This station was Westerly's only means of communication with Providence until 8 p.m. September 25, when the police teletype service was temporarily restored. Telephone service, restored about the same time, proved very undependable. In seven days of operation, the station handled over one thousand messages, including a great deal of the teletype, Western Union and press traffic between Westerly and Providence. Boy Scout messengers were available twenty-four hours a day. The Westerly-Providence traffic was so heavy that the State House gang was tied to Westerly most of the time, and it became necessary to send outgoing traffic to W1BES (by automobile), N1IZO (via five meters) and W1KYK (who lived near the State House and called for it in relays).

The first home station in Westerly to get on the air was W1BDS and the first to work Providence was W1AGJ. Both stations cooperated with the town hall crew by handling much of the traffic not on the Westerly-Providence route.

When power failed temporarily at the town hall, there was much consternation, since a thief had walked away with the twelve emergency B batteries!

Other R. I. Participants

The State House crew at Providence also supplied operators with transceivers to the Red Cross in the Hope Valley area and sent equipment to state police barracks at Lincoln for contact with barracks at Portsmouth, where W1AWE was stationed with Naval Reserve portable equipment.

Other active emergency coordinators (A. A. R. S.) were W1CPI and W1CPV. W1CPI handled over 1100 messages in and around Wakefield. The roster of Rhode Island stations active in the emergency includes N1AWE, W1AGN, W1BBA, W1BDS, W1BES, W1BFR, W1BIL, W1BOY, W1BXZ, W1CAB, W1CBS, W1CPI, W1CPV, W1FAH, W1FHT, W1GOG, W1GPE, W1GTN, W1GTS, W1GVH, W1HCW, W1HEN, W1HFT, W1HJB, W1ICE, W1INM, W1INT, W1INU, W1IPU, W1IST, W1IZO, W1JCH, W1JCN, W1JCR, W1JDX (with the national guard), W1JEZ, W1JFF, W1JFZ, W1JP, W1JRY, W1JUE, W1JUG, W1JXQ, W1KCS, W1KEM, W1KKE, W1KLR,

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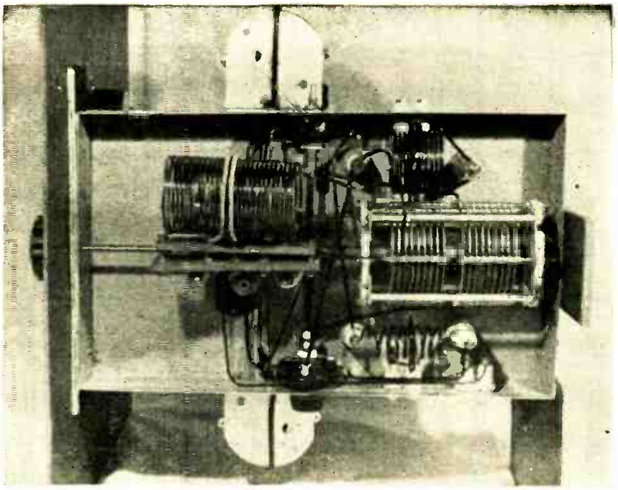
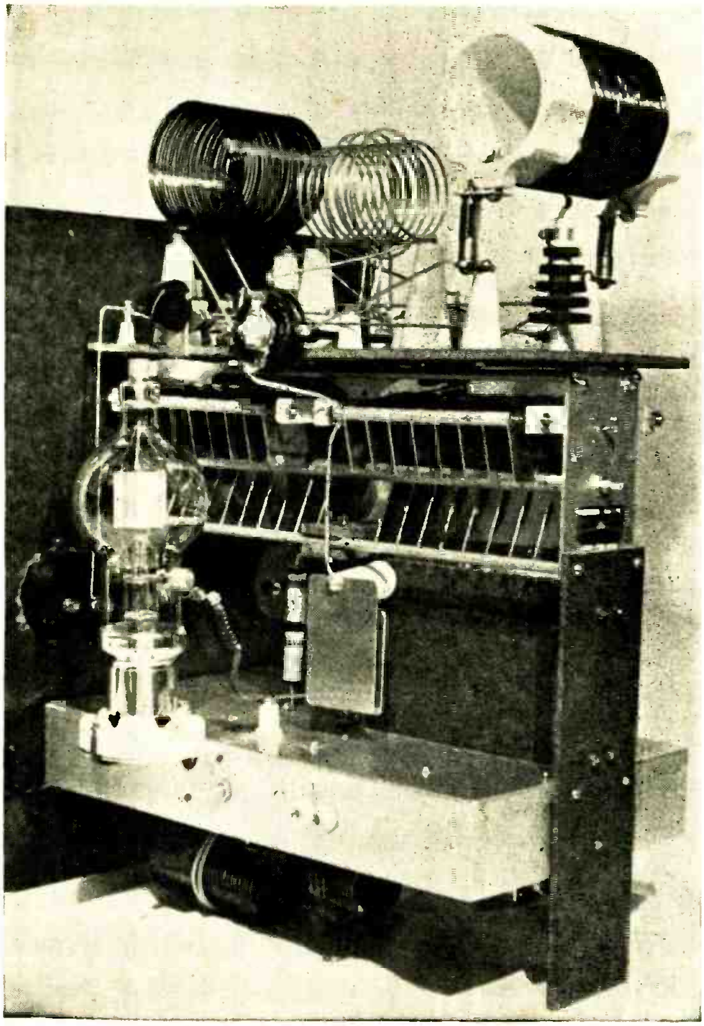
Quick--Easy



Bottom view of the chassis. The 28-Mc. grid coil is below the grid tuning condenser, the 14-Mc. one above, and the 3.5-Mc. coil is mounted on a plug-in form to the left of the grid tuning condenser. The two bandswitches can be seen mounted upon each edge of the sidewall of the chassis with a bakelite shaft connecting them.



Rear view of the kilowatt bandswitching final amplifier, showing the general layout. The parasitic choke wound around a resistor in the grid circuit of the tube that is visible was later found not to be required. The 7-, 14- and 3.5-Mc. coils are shown in place in the plate circuit.

A Bandswitching KILOWATT

By
THOMAS S. CHOW*
W6MVK

To be able to jump from some 20-meter dx to a rag chew on 160, or skeds on 40 and 80, or a Sunday afternoon spree on 10 has been a golden dream to many hams. Yet they stay stuck monotonously on just one or two bands because of the time and effort which must be expended to change coils, adjust the antenna coupling, and to line their rig up on a new band. In their more disgusted moments, hams who find their only band dead have given serious thought to giving up radio or building separate transmitters for each band. These ideas have been abandoned because of the shock caused by the mere thought of the first, and the reality of paying for the second.

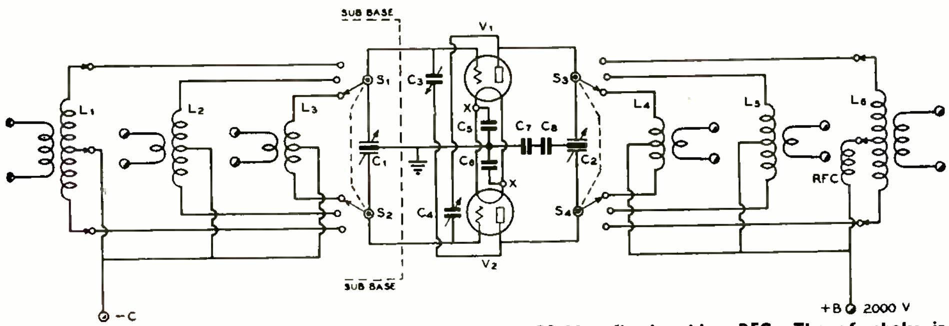
* 701 Eighth St., Modesto, Calif.

A kilowatt transmitter is usually divided into two parts: an oscillator-driver, and the final amplifier. With the flood of new low-priced tubes available, two or possibly three tubes are all that are generally needed for outputs near 100 watts from an exciter. The cost of these units is so low that separate exciters using common power supplies can easily be built for each two bands without overstraining the pocketbook. High-μ or beam-power driver tubes can be used with high bias to double very efficiently for two-band coverage.

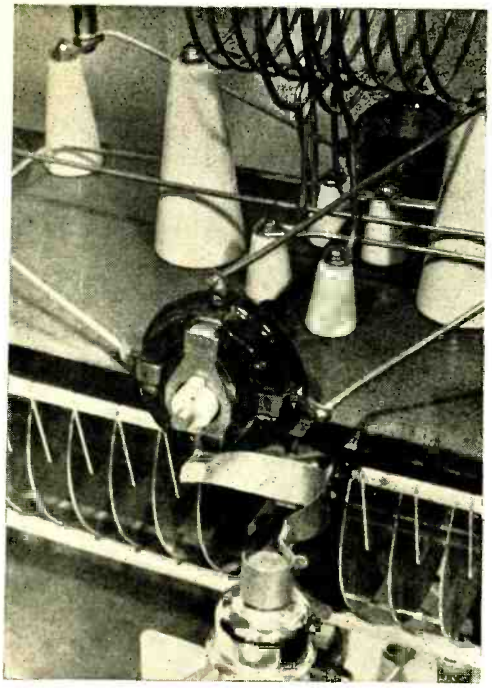
All that the average ham needs to have five bands at his beck and call is a final amplifier that can change bands quickly, work efficiently and require less than 100 watts of grid drive. Four bandswitches are all that will be necessary in addition to the regular kilowatt transmitter.

The final amplifier described in this article is a simple, compact and inexpensive arrangement designed to enable the switching of coils from one band to another within five seconds with practically no loss in the efficiency of the transmitter. Tests using the same tubes in separate final amplifiers built for each band show practically identical outputs and grid drive requirements, with the exception of a ten per cent drop in the output on the 28-Mc. band. Here, with 1-kw. input, the output was 700 watts, or about ten per cent less than the comparison transmitter using a 30-30-$\mu\mu$fd. final tank condenser.

Push-pull arrangement of the tubes was chosen as it would require less C for good Q, something which is sadly lacking in most low-frequency phone rigs.



C1—200-µµfd. per section, 2000-volt spacing, split stator
C2—100-µµfd. per section, 11,000-volt spacing, split stator
C3,C4—Homemade neutralizing condensers
C5,C6—.006-µfd. mica
C7,C8—.005-µfd. 1500-volt tubulars
S1,S2,S3,S4—3-position bandswitches
L1—Plug-in coil for 7, 3.5 or 1.8 Mc.
L2—14-Mc. fixed grid coil
L3—28-Mc. fixed grid coil
L4—7-Mc. fixed plate coil
L5—14-Mc. fixed plate coil
L6—Plug-in plate coil for 28, 3.5 or 1.8 Mc.
RFC—The r.f. choke is only shown in the plug-in plate coil return. Individual designs may require the use of r.f. chokes in the returns of the other coils.



Closeup view of the plate connectors, the bandswitches, and the bottom of the 14-Mc. plate coil. The external link around the 14-Mc. coil can also be seen mounted upon the short conical standoffs.

Since the efficiency of the final is generally determined by the plate circuit design, greatest attention was paid to the reduction of connection points in each circuit on high frequencies as well as to the making of the leads as short as possible in relation to good spacing of the coil from the tank condenser. The coil switches should be insulated with as much care as the ends of the coils, since the insulation (to ground) on the switches is effective only up to 600 volts d.c.

A flexible piece of flat braid can be jumped from the plate lead direct to the connection on the end of the switch arm contact, if it is desired, to reduce the possibility of losses from this rotary contact. The switches should never be moved when r.f. is being generated in the tank circuits. The switches were ganged for convenience with insulated couplers and a bakelite rod.

Coil shorting could not be considered on frequencies above 7 Mc. as the increased losses of the coils would be too great and antenna coupling would cause too much difficulty under such an arrangement. Coil switching allows a separate coil for each band and has the added advantage of not having to disturb the antenna coupling for each band.

The adjacent band coils were mounted at right angles to each other in the plate circuit of the final. The 10- and 20-meter grid coils were permanently mounted to reduce losses which are highest on these circuits. The third coil was a plug-in coil resonating on 3.5 Mc. at the low capacity side and 1.8 Mc. on the high capacity side. The 14-Mc grid coil can be used to cover 7.0 Mc. in the same way.

The two permanently mounted coils were soldered directly to the lugs of the bandswitch, thus keeping losses at a minimum by requiring just a single length of wire from the inductance proper to the switch contacts. The connecting lead from the coil to the bandswitch is merely a continuation of the length of wire used to wind the coil. There is only one connection of the non-soldered kind between the coil and condenser, less than in many one-band transmiters.

The coils are mounted upon the masonite base and then the assembly is mounted on the condenser.[1] The neutralizing connection was made to the same point as the plate coil; tube and plate leads are attached because of the possibility of the larger mass of the condenser affecting the neutralizing condition on 28 Mc. if it were connected at any other point on the same stator. Relay and padding condensers are possible accessories to pad the coils for the opposite ends of the 40- and 20-meter bands.

The Ohmite switches are underslung to bring them closer to the plate tank condenser and they are connected to the plate of the tubes by a thin flat copper strip. The switch-to-plate connectors were constructed by making the copper strip a bit longer, wrapping it around the plate cap of the tube, and drilling two holes in the copper to allow a screw and nut to fasten it to the tube top, resistor-slider fashion.

The tubes are mounted on outboard brackets to allow free circulation of air on both tube envelopes, an important factor if the unit is to be used in an enclosed relay rack. The elimination of the usually full sub-base allows self-ventilation by means of convection currents. High-μ tubes are desirable in the final amplifier since they require less drive for good efficiency.

A sub-base 17" x 10" x 3" is placed lengthwise to accommodate the abnormally long tank condenser. Homemade neutralizing condensers are placed directly below the plate condenser.

[1] Although there was no insulation information available on Masonite, there was no appreciable loss evident on 10 meters.

The grid circuits are shielded from plate circuits by the sub-base. Coils are placed with an eye toward avoiding common coupling. Plug-in feed-through insulators make convenient mounting points for the rigid link couplings.

The grid leads were purposely made longer than the plate leads. One grid lead was made longer than the other to avoid parasitics.[2] The drive did not seem to be affected at all by the long leads, although one grid lead measured 14 inches. Tests showed that the grid drive necessary was no greater than that required with the same tubes in transmitters with short grid leads designed for just one band.

The plate voltage chosen for the amplifier was 2000 volts; although this voltage requires slightly more grid driving power than 3000 volts would, the heavy loading plus low voltage broadens the resonance point, thus allowing greater deviation from the dial setting without retuning. Although many amateurs use 3000 volts in order to run a kilowatt within the ratings of 100-watt tubes, they often lose sight of the fact that the increased cost of the larger spaced tank condenser,[3] the more expensive power transformer, and the higher priced filter[4] would cost more than the saving made by using the smaller tubes. By running the larger tubes at the lower voltage, it becomes almost impossible to injure them. Running a kilowatt becomes a pleasure instead of a worry. Twenty-five hundred volts[5] is the highest voltage that can be modulated when using the 11,000-volt condensers.[6] Three thousand volts can be used for c.w. if the amplifier is always loaded.

Coils can be set on any three bands and tuned by setting the grid and plate condensers at predetermined points. The 10-, 20- and 40-meter bands can be switched on within five seconds by setting the dials at predetermined settings found by referring to a chart. Changes to 160 or 80 meters[7] require that the 10-meter coil be removed and the desired coil substituted.

The arrangement of the final coils can be altered at the discretion of the builder in order to afford the maximum convenience for the individual case. If 160-meter phone is not contemplated, a lower minimum capacity final condenser would give greater efficiency on 28 Mc.

Usually no more than three bands are used and two coils may be permanently mounted with one plug-in coil left as an alternate. In this way, it is necessary to have only a small exciter for 160, with 80-meter output by doubling in the output of the driver; another separate driver for 40 and 20, and one for 28 Mc. alone. Then, it would be only necessary to light the filaments of the desired driver and switch to the correct inductance in the final amplifier.

Coupling to the 600-ohm line on 20, 40 and 10 can be made by winding a few turns of wire spaced away from the tank coil. This saves the cost of blocking condensers which would ordinarily be used when a direct tap is made.

[2] A parasitic choke was tried, but it was not found necessary.

[3] The higher the impedance of the final, the larger the percentage of r.f. that is left in the tank.

[4] The 2000-volt 2-μfd. condenser is the greatest value in filter condensers with regard to energy storage and price.

[5] Three thousand volts can be used on phone, but the load must be over 400 ma., exceeding the F.C.C. rules. A 7500-volt spacing condenser can be used to better advantage in relation to minimum capacity.

[6] A 7500-volt spacing final tank condenser can be used for 2000 volts; preferably one of larger maximum capacity if 160-meter modulation is to be used much of the time. The 100-100-μμfd. condenser as shown is a bit skimpy for this band, but can be used.

[7] Coil shorting may be employed to advantage on the 160-80-meter band. If desired, a shorting strip consisting of a copper clip and a short piece of flexible braid can be used to short out the center portion of the 160-meter coil when it is to be used on 80. Losses at these frequencies are slight. Coil shorting should not be attempted on frequencies higher than 7 Mc.

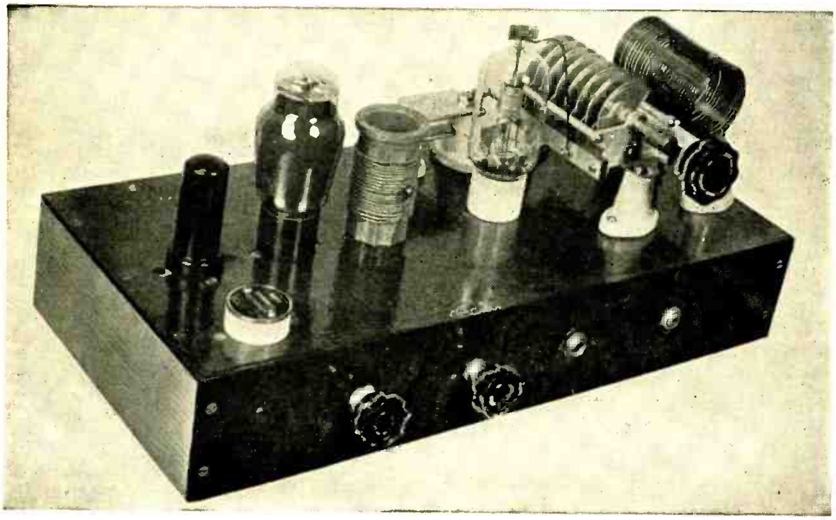
Pickups . . .

The English Air Ministry, as a part of the British war preparedness program, is now training English hams for the Royal Air Force Reserve.

VE9, heard during five-meter dx spasms, is the prefix for the Canadian forestry service.

To demonstrate amateur work, broadcast station KFAC was granted authority to rebroadcast twenty-meter phone QSO's between W6BRD and KA1ZL.

Moapa is a Nevada town.



A Low-Cost Medium Power Transmitter

By ROBERT E. BULLOCK, W6MKP* and

JOHN T. CHAMBERS, W6NLZ**

The average newcomer to ham radio is usually content with a crystal oscillator operating on one or two bands for a transmitter. Sooner or later, however, the desire to try the higher frequencies and the urge for more power begins to assert itself. Usually, after consulting the current magazines, he becomes aware that a power increase of any magnitude involves the outlay of a considerable amount of hard-earned money. Even if he can handle the financial aspect of the proposed QRO, he is usually dismayed by the complexity of the usual layout and of the large array of tuning controls.

With the above problems in mind, we set out to design a transmitter that would be simple in construction, in operation and as low in cost as possible, without sacrificing efficiency or power output. After considering many circuit and tube arrangements, we evolved the layout shown. It is simple and straightforward in construction, does not resort to trick circuits, and is flexible to the extent of allowing operation on three bands with but one crystal.

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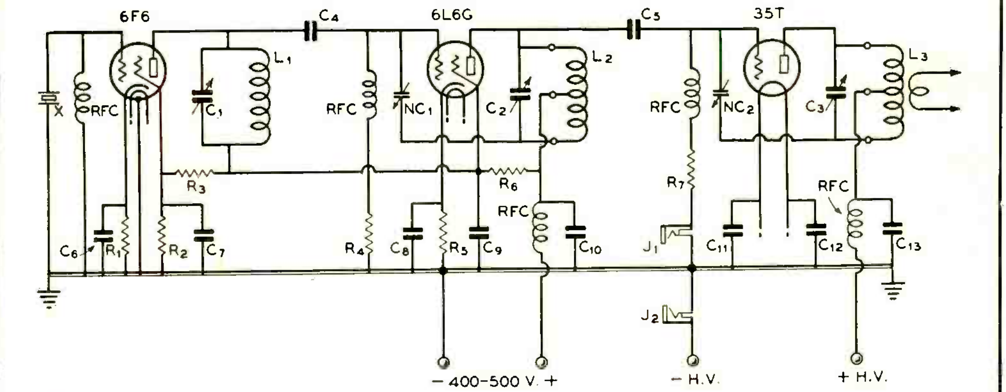
The 6F6 pentode crystal oscillator circuit was chosen because it permits a reasonable power output with a very low crystal current. By using a condenser with a fairly large ratio of maximum to minimum capacity (five to one is sufficient) it is possible to tune the plate circuit of the oscillator to resonance on both 80 and 40 meters with the same coil. This arrangement obviates the necessity of using plug-in coils to utilize both 80- and 40-meter crystals. The output is more than sufficient to excite the following stage to its full output.

The 6L6G was selected for the buffer-doubler stage on its proven ability to deliver a relatively large power output when operating either as a straight amplifier or as a doubler. It was found that it was necessary to neutralize this stage in order to eliminate a tendency towards self-oscillation that existed when the tube was operating as a straight amplifier. Sufficient output was obtained from the 6L6G to drive the final amplifier at its rated grid current of 30 ma. on all bands.

The 35T, used as the final amplifier, may be supplied by voltages varying from 750 to 2000 volts. Slightly greater efficiencies are possible at the higher voltages. For voltages of less than 1000, it is advisable to reduce the value of the grid bias resistor to 5000 ohms.



C_1—100-μμfd. midget variable
C_2—75 to 100-μμfd. variable
C_3—35-μμfd. 6000-volt variable
C_4,C_5—.00005-μfd. mica
C_6-C_{12}, inc. — .002-μfd. mica
C_{13}—.002-μfd. mica, 2500 volts
NC_1—Very low capacity neutralizing condenser; ½-μμfd. min. cap.
NC_2—See text
R_1—500 ohms, 3 watts
R_2—50,000 ohms, 1 watt
R_3—10,000 ohms, 3 watts
R_4—25,000 ohms, 1 watt
R_5—500 ohms, 3 watts
R_6—10,000 ohms, 3 watts
R_7—10,000 ohms, 10 watts
RFC—2.2-mh., 125-ma. chokes
Coils—See coil table
J_1—35T grid milliammeter
J_2—35T plate milliammeter

Constructional Details

The photograph gives a clear picture of the mechanical arrangement of the various components. The 6F6 crystal oscillator is located at the extreme left of the rig. Next in line is the 6L6G buffer-doubler tube. The plate coil for this stage is located between the 6L6G and the 35T. The 6000-volt type tuning condenser, used to tune the plate of the 35T, is mounted on two stand-off insulators. The plate coil plugs into two jack-type stand-off insulators. The mounting of the plate coil and condenser upon stand-off insulators shortens the plate and neutralizing leads considerably.

The homemade neutralizing condenser is located directly behind the 35T. It consists of two plates of 1/16-inch aluminum mounted on stand-off insulators of unequal heights. The bottom plate measures 1½" x 1½" and is mounted on a one-inch stand-off insulator. The top plate is 2 inches long and 1½ inches wide and is fastened to a 1½-inch stand-off insulator. The capacity of the condenser is varied by swinging the upper plate away from the lower one. However, neutralization should occur with very nearly full capacity. The edges of the plates should be rounded and buffed smooth to minimize corona discharge.

All of the other parts are mounted beneath the chassis, including the plate coil for the 6F6 crystal oscillator. This coil is wound on an old type 80 tube base and consists of 20 turns of no. 28 d.c.c. wire. It is fastened to the bottom of the chassis by means of a 6-32 brass machine screw one inch long. The chassis itself is made of masonite and is 8 inches wide by 17 inches long by 3 inches deep. The end pieces are made of 1-inch by 3-inch soft pine.

COIL DATA

	3.5 MC.	7.0 MC.	14.0 MC.	28 MC.
L_1	SEE TEXT	SEE TEXT		
L_2	32 T. #22 DCC 1½" LONG 1½" DIA.	18 T. #16 DCC 1½" LONG 1½" DIA.	10 T. #16 DCC 1½" LONG 1½" DIA.	
L_3	44 T. #16 E. 3¾" LONG 2" DIA.	28 T. #14 E. 3¾" LONG 2" DIA.	12 T. #10 E. 3¾" LONG 2" DIA.	10 T. #10 E. 2" LONG 1½" DIA.

Tuning Up

After the wiring has been completed, the low-voltage supply may be plugged into the four-prong tube socket which serves as the terminal strip at the transmitter. When using an 80-meter crystal, the oscillator plate condenser should resonate at nearly full capacity. The condenser will then resonate somewhere near the minimum capacity when using a 40-meter crystal. When the oscillator and the buffer-doubler have been tuned up, the 35T may be neutralized in the conventional manner. Now connect the high voltage to the 35T and the transmitter is ready for operation.

Break-in operation is obtained by primary keying the entire rig. There will be very little chirp if an active crystal is used. By primary keying the final stage only, this slight chirp may be overcome.

[*Continued on Page* 79]

Getting Ready for the
NEW REGULATIONS

By RUFUS P. TURNER, W1AY/2*

The new regulations make unequivocal provisions for increased amateur technical standards. There are no if's, and's or but's in the matter. The rules regarding stability, adequately filtered final amplifier plate supply, overmodulation and spurious radiations now include the five-meter band, instead of stopping at 30 Mc. as previously. Frequency measuring equipment, apart from the transmitter frequency control apparatus, is not just to be found in the shack of the *advanced* amateur, but is to be as essential as the log in *every* amateur station. The same holds true for overmodulation indicators at all phone stations. Amateur operators employing more than 900 watts d.c. input to the final amplifier must provide means for accurately determining the magnitude of that power.

In the final analysis, which is our actual operation on the air, any increase in amateur technical standards is bound to bear good fruit. It took the narrowing of our bands in 1929 to prove that ham transmitters could radiate sharp signals. In the same fashion, we learned to keep a phone signal reasonably narrow and stable when the regulations outlawed the modulated oscillator in the lower-frequency bands.

Some "advanced" hams already can comply with the new regulations. The few, however, who have enjoyed that operating finesse that dictates accurate measuring equipment and transmitters that operate at peak efficiency are sparsely located. The rank and file must rise *now* to the task of cleaning house and refurnishing.

The writer has heard it said in the past that nobody reads an article on frequency meters, monitors and modulation indicators. If this reflects the attitude of a good cross section of the ham population, then we believe there is going to be a mad scramble for back issues of RADIO and the test instruments chapter of the RADIO HANDBOOK.

The situation will be previewed briefly here and we will make recommendations with regard to complying with the revised regulations.

Five-Meter Stability

As was the plight of many another amateur who read the lengthy new regulations, the writer was in doubt as to the interpretation of the sections indicating five-meter stability. Legal wording is involved and often, so it would appear, non-committal. To clear up the matter, a long-distance call was put through to the F. C. C. at Washington, and from the Engineering Section there it was learned definitely that the modulated oscillator is outlawed from the five-meter band by the new regulations.

The writer receives this news with varying sensations of joy and gratitude, since it was his thankless privilege to assist for three years in a campaign to clean up the five-meter band in and around Boston. The five-meter population in that area is fabulous. One ultra-high fan there reported 250 stations in operation over the greater portion of each year. Crystal-controlled, or at least real good m.o.p.a. transmitters, were a requisite not a luxury there some years ago!

A stable transmitter does not necessarily mean a crystal-controlled rig, if the builder is willing to take the extraordinary measures to make a master oscillator-power amplifier arrangement comparable. Even when he achieves the desired results, he will agree that crystal control would have been a great deal cheaper, and the only worthwhile advantage secured for his large expenditure is the rapid and continuously variable QSY possible with the self-excited master oscillator.

A multi-stage five-meter transmitter utilizing a self-excited master oscillator must be designed, built and operated with the utmost care. The oscillator itself must be the stablest possible version of a very stable arrangement. Generally the electron-coupled oscillator will be satisfactory if (1) the best parts are used, (2) the tank circuit is made very high-C and

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* Managing Editor, RADIO.

insulated with very low-loss materials, (3) all components are mounted rigidly to prevent mechanical vibration or shift, (4) the plate input is run considerably below the maximum ratings of the tube, (5) the oscillator is very lightly loaded, (6) a stabilized oscillator power supply is employed, (7) very loose coupling is employed between the oscillator and the next succeeding stage, and (8) the oscillator frequency is a submultiple of the desired carrier frequency, rather than the fundamental.

In spite of all of these precautions, it is still advisable to temperature-control the oscillator circuit components or to allow the oscillator circuit to "heat up" for a period of at least two hours before operating. The use of the best calibrated frequency meter-monitor is imperative, and even with this accessory edge-of-band operation is not recommended.

Several electron-coupled oscillators were checked at W1AY/2 and it was noted that the frequency creep when starting up from the "cold" state averaged approximately 10 kc. during the first few minutes, the oscillator continuing to creep upward in frequency during the first half-hour and settling itself down during the remainder of the first hour. Waiting an extra hour is a good precaution. Also, the frequency drift, it was noted, was appreciably greater with a 5-meter oscillator than with the 5-meter harmonic (through doublers) of an electron-coupled oscillator operated on 20 meters. Type 24, 57, 807, and 802 tubes were used at reduced plate input.

An electron-coupled oscillator-amplifier block diagram for 5-meter operation, recommended as satisfactory, is shown in figure 1. It will be noted that each stage has a separate power supply. This is essential if interaction between stages is to be prevented. The power supply of the 20-meter electron-coupled oscillator is voltage-stabilized, a requisite. The plate and screen input to the tube in this circuit must be considerably below maximum.

Two doubler stages are employed. The coupling between the oscillator and first doubler must be very loose magnetic or link coupling. Capacity coupling is not recommended. Observe that the modulator also has an independent power supply.

Complete shielding of each stage is strongly recommended, and all leads extending out of the compartments for inter-chassis connections should be adequately by-passed *inside* the compartments or should contain appropriate radio-frequency chokes installed inside the compartments.

Extraordinary measures must be taken to *eliminate* all parasitics (ultra high-frequency circuits are extremely susceptible to these). And inter-stage feedback must be eliminated. The accurately calibrated monitor (various versions of this instrument will be described subsequently in RADIO) is requisite. All tuning adjustments must be made with its aid and the quality of the emitted carrier checked by it. This instrument will not only indicate the operating frequency but will likewise show up a ragged carrier or frequency modulation.

Crystal control for five meters presents a simpler picture. The simplest possible exciter would include a 10-meter crystal oscillator followed by a 5-meter doubler. A twin triode will render the unit more compact. If the builder desires, the crystal oscillator may operate in any amateur band up to 160; remember, however, that drift due to the crystal temperature coefficient must be multiplied

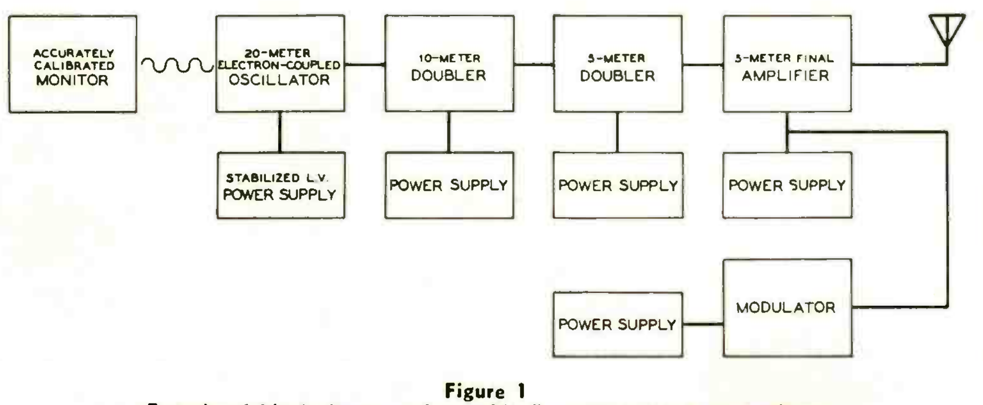

Figure 1
Functional block diagram of a stable 5-meter m.o.p.a. transmitter.

along with its fundamental frequency when considering the 5-meter output of the system. When an exciter starts off with a crystal on 80 or 160 meters, be careful that the natural crystal drift does not take the 5-meter harmonic out of the band. Consider this when selecting crystals for edge-of-band operation on five, or else install temperature control for the crystal.

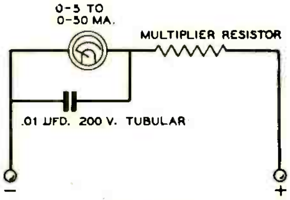

Figure 2

An inexpensive voltmeter can be made by putting a milliammeter of suitable range in series with the power supply bleeder. Wire wound resistors in series, or a single high wattage resistor can be used if the accuracy of the combination is checked against a precision voltmeter.

Measuring the Kilowatt

Section 152.40 requires amateurs operating with a power input to the final amplifier in excess of 900 watts to provide means for accurately measuring the plate power input. This means, of course, measuring the plate volts and milliamperes. Every transmitter has some sort of plate milliameter, but we doubt very much that one in several dozen sports a plate voltmeter.

The voltmeter *and* the milliameter employed must be accurate. It is recommended that both be left permanently connected in the transmitter. If the meters were purchased new, their accuracy should not be questionable. If, on the other hand, they were originally second-hand or if they have been in use for a long period of time, they should be re-calibrated by a meter manufacturer or his authorized service station. It is not advisable to risk the accuracy of these two meters when operating with a full kilowatt input.

The amateur who wants to observe the best practice might well be guided by the F.C.C. Standards of Good Engineering Practice as related to meters and their use. The Standards provide that the linear scales of plate voltmeters and milliameters be not less than 2-3/10 inches. The accuracy must not be less than two percent of the full-scale reading, and the scale must have at least forty divisions. The full-scale reading must not be greater than five times the normal indication. The standard "three-inch" meters meet the above specifications.

The Standards provide additionally that all instruments having more than 1000 volts potential to ground on the movement be protected by a cage or cover *in addition to the regular case.*

Whenever the meters employed to measure the plate power input become damaged, subjected to overload, or when their accuracy becomes questionable, they should be recalibrated by an authorized agency.

Many amateurs will not be able to afford a costly high-voltage plate voltmeter and will prefer to build up one with a d.c. milliameter and multiplier resistor. Such a combination is shown in figure 2. It is recommended that a bakelite case meter be used and that the entire system be enclosed in a grounded metallic case. The meter should not have a "hot" zero adjustment screw.

The accuracy of a multimeter, such as this one, must not be taken for granted. After the unit is assembled, it should be calibrated by an authorized meter service station or meter manufacturer.

When computing the input watts by multiplying the plate voltage by the plate current, the operator must guard against errors in multiplication, otherwise the precautions with regard to meter accuracy all will be to no avail.

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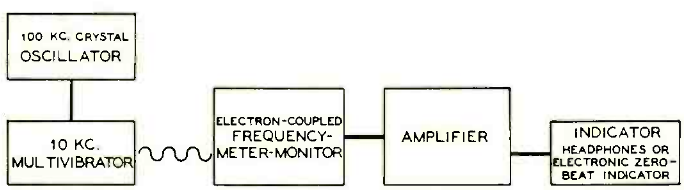
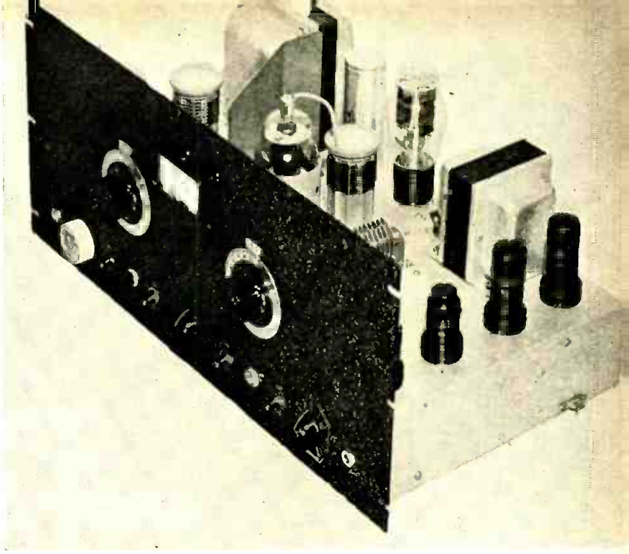


Figure 3

A de luxe freqmeter-monitor and calibrator comprising a secondary frequency standard.



The full-dress version of the tried and proven "Mighty Mite."

THE "MIGHTY MITE" DE LUXE

By JOHN R. GRIGGS,* W6KW

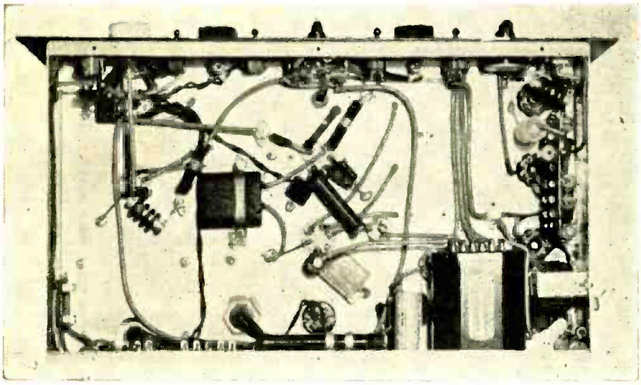
Letters received by the author from all sections of the country, and comment from other sources show that the "Mighty Mite" described in the July issue of RADIO has appealed to a great number of amateurs. Therefore, it is believed that a refined version of the Mighty Mite would be of considerable interest.

As may be seen from the pictures, the Mighty Mite can easily be put into the "de luxe" class by placing a panel on the chassis and by making other improvements in the external appearance, such as using dials, a square meter, panel lights, symmetrical layout of toggle switches and additional circuit refinements.

The panel used is the conventional relay type, measuring 8¾ by 19 inches. It is bolted to the chassis and is sufficiently strong to allow

[*Continued on Page 81*]

* 3575 Boston Ave., San Diego, Calif.



Under-chassis components are arranged for electrical efficiency.

Voice-Operated BREAK-IN

BY J. EVANS WILLIAMS,* W2BFD

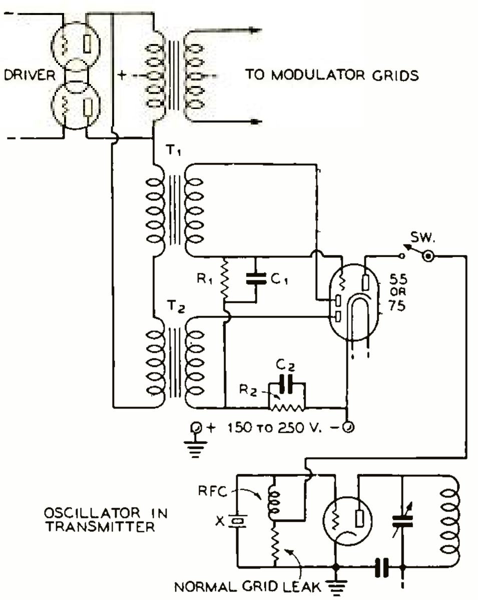


Figure 1

T_1, T_2—Audio transformers, 1:1 to 1:3 ratio
R_1, R_2—500,000 ohms, ½ watt
C_1—.01-µfd. tubular
C_2—0.1-µfd. tubular
SW—S.p.s.t switch to disconnect break-in system
If the circuit does not operate properly, reverse either the primary or secondary connections to one transformer to obtain the proper polarity.

Undoubtedly more phone amateurs would use voice-operated break-in systems with their attendant advantages were it not for the comparative complexity and expense of existing arrangements. The delicate mechanical relays used are prone to false operation unless they are capable of being adjusted very precisely. One serious drawback to most voice-operated transmitter controls is the lag between the first word spoken into the microphone and the application of the carrier.

* 6806 61st St., Woodside, N. Y.

It is the purpose of this article to describe a simple, inexpensive circuit using a minimum of equipment which has been employed at W2BFD for the past eight months. We believe this circuit overcomes all objections to voice operated break-in. Only one tube is needed and no relays are used.

Circuit Operation

The operation is as follows: As soon as the microphone is spoken into, an inconsequential portion of the amplified audio frequency is diverted from the output of the speech amplifier or driver into the primaries of transformers T_1 and T_2 (figure 1). The secondaries of these transformers are connected to the diode plates of the 55 control tube. The diodes rectify the audio frequencies and the resultant direct current creates a drop across resistors R_1 and R_2 which, it will be noted, are in series with each other. These resistors are connected between the cathode and control grid of the triode part

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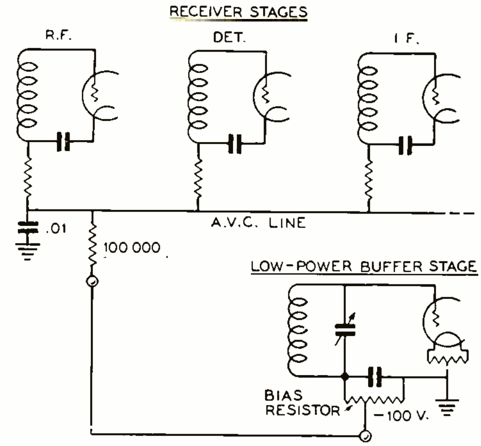
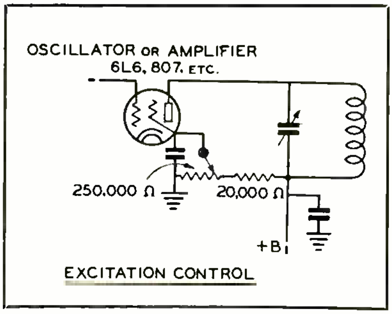


Figure 2. This simple circuit is used to silence the receiver when the transmitter is in operation. The lead to the receiver should be short and well removed from r.f. fields, as an excess of r.f. in the receiver a.v.c. circuit will render the circuit inoperative.



Name Your Grid Current

By STANLEY JOHNSON,* W9LBV

Old timers of the UV tube vintage will raise their eyebrows at the problem of limiting the excitation to tubes; it was accepted practice during amateur radio's lusty adolescence to pour on all of the grid current which could possibly be obtained. There was never one-tenth enough, anyhow, so limiting excitation would have been downright heresy.

However, the tetrodes and their near relations that we have with us demand a critical adjustment of driving power. Not too little grid current, lest the efficiency fall off; and not too much, lest the output be reduced or the tetrode go soft—the new tubes demand a different approach. The writer had the dangers of overexcitation firmly impressed upon him after seeing a perfectly excellent "beam" transmitting tube rest its case after a couple of hours' use, for the simple reason that the exciter was too good and the grid current to the tetrode was higher than the characteristic chart said was desirable. It seemed apparent that to make the world safe for multi-grid tubes, some sort of arrangement should be developed for keeping grid current of buffers and final amplifiers at a reasonable value.

[*Continued on Page 85*]

* 1607 University, Columbia, Mo.

Simply turning the knob allows varying the excitation to the next stage from two milliamperes grid current up to as much as the oscillator will put out.

How to Construct

A SIMPLE TUBULAR ANTENNA

By LEONARD L. NALLEY,* W6CLL

Amateurs who like to "build their own" will find it possible to construct inexpensive, self-supporting radiator elements from standard 10-foot lengths of thin-walled electrical conduit. The biggest problem is that of making joints. Here is how to do a good job with the least effort.

Modern antenna construction involves several considerations peculiar to vertical radiators and directive arrays. Lightness of the conductors is of particular importance in a rotatable array if large and unsightly supporting structures are to be avoided. Vertical antennas, to be easily erected and supported, must likewise have as small a cross section and as light a weight as possible. The most satisfactory type of construction for these antennas is probably that employing telescoping sections of thin-walled steel, brass or hard-drawn copper tubing. Such tubing antennas are available from several manufacturers in knockdown form but some amateurs are always interested in building their own.

The writer has devised a method of joining together short lengths of tubing in such a manner as to form a strong, lightweight, inexpensive vertical radiator. This method is also well adapted for use with tubing sections of shorter lengths to form shorter antenna conductors for use in rotatable arrays. Several simple methods of constructing suitable supporting structures for rotatable arrays have been shown in past issues of RADIO[1] and the RADIO HANDBOOK. The method to be described is that recommended for constructing a vertical self-supporting antenna. The method of assembly for conductors for a rotatable antenna array would be similar but the lengths of the conductors would be different depending upon the type of array and upon the band of operation.

From an electrical or plumbing supply house procure one each of ten-foot lengths of ½-inch, ¾-inch and 1-inch "steeltube" (thin-walled conduit). A five-foot length of ⅜-inch brass or hard-drawn copper tube completes the materials requirement. Make sure that the thin conduit is perfectly straight and not dented.

As the tube sizes are such that they telescope together very loosely, some method must be used to "take up the slack" and give strength to the joints. This is accomplished by slotting the larger tube, thus allowing it to be compressed on the smaller one by a ferrule driven over the joint. This type of joint is very strong and permanent—after two months of heavy winds the antenna (a vertical in this case) was inspected and no slippage or other failure could be noted. Even in the highest winds the antenna bent but very little and showed no signs of weakness at the joints.

Preparing the Tubes for Joining

Put the one-inch tube in a vise and, with a file or pipe reamer, ream the inside down to a thin edge. Then cut this end off to make a ferrule about two inches long. The end of the one-inch tube from which the ferrule was cut should next be beveled on the outside to an angle of about 45 degrees.

Next, by putting three blades in a hacksaw, cut four wide slots to a depth of two inches in the beveled end of the one-inch tube. If

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* 1014 East Lee Street, Tucson, Ariz.

[1] Smith, *Unidirectional Arrays,* RADIO, June 1938, p. 38. Herbuveaux, *Directing Stuff at Things,* RADIO, April, 1938, p. 30. Conklin, *Let's Whip the Twenty-Meter Rotary,* RADIO, February, 1938, p. 56. Roberts, *The Compact Unidirectional Array,* RADIO, January 1938, p. 10

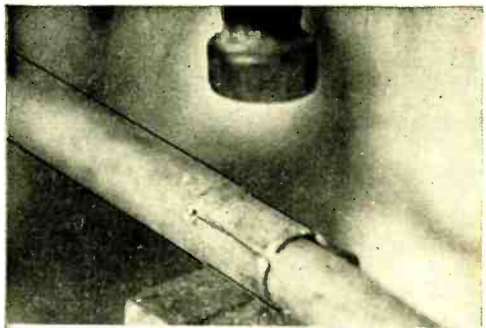


Figure 1.
The 1-inch tube is swedged to fit the ¾-inch tube loosely.

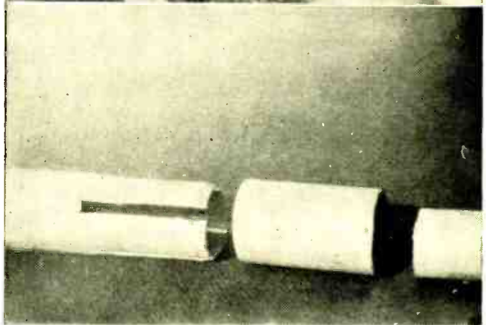


Figure 2.
The method of forming a tight joint between the tubing sections.

Figure 3.
The joint partially assembled. When the ferrule is driven firmly on the larger tube a strong joint is assured.

your hacksaw will not hold three blades, cut two slots close together and break out the thin strip between them by bending it back and forth.

Ferrules are next cut in the same way from the ¾-inch and ½-inch tubes. After the outside edges are beveled, however, use only *two* blades in the hacksaw when slotting the tubes. The ⅜-inch tube is not slotted at all; one end is flattened to keep out the elements, as the inside of the steel tube is not galvanized.

Joining the Tubes

After all the ferrules are made and one end of the tubes beveled and slotted, the "plain" end of the ¾-inch tube should be inserted about three inches into the slotted end of the one-inch tube. The one-inch tube is next swedged down to fit the ¾-inch tube loosely by striking it lightly with a hammer (figure 1). By slipping the one-inch ferrule, beveled end first, over the slotted end of the one-inch tube and using a hammer to drive it on, the two tubes may be joined firmly together (figure 2). This work should be done on a level sidewalk or flat ground. If the tubes are turned while the ferrule is being driven on, they will be joined perfectly straight.

Do not use heavy blows to drive on the ferrule—take plenty of time and do not batter the end or it will be hard to get on. A handy driver can be made by cutting a short piece of one-inch pipe off at an angle and striking the pipe instead of the ferrule directly.

The ½-inch tube is added in the same way. The ⅜-inch section should not have its ferrule driven down firmly until after the antenna has been tried and both antenna and transmis-

[*Continued on Page 86*]

RADIO AIDS *to air navigation*

By JAMES ELLS*

The subject of air navigation by radio has received but little mention in contemporary radio publications. Believing that this highly fascinating and pleasant field of work should be of interest to amateur and commercial radiomen, the writer will attempt in this article to describe briefly some of the details of Bureau of Air Commerce radio work.

After a few years of rolling and pitching on the salty brine as a commercial and Navy operator, this work has proved very enjoyable —though my connection with the Bureau of Air Commerce has as yet been a very short one. The position has innumerable advantages over some other types of commercial radio operating. There are vacations with pay, sick leaves with pay, pensions, possibilities of advancements and transfers, and numerous small things which go toward making life more pleasurable.

A considerable percentage of the men with the service are amateur radio operators and I have no doubt but what some of those reading this article will some day find their way into Air Commerce work.

The Bureau of Air Commerce

The Bureau of Air Commerce operates under the Department of Commerce and embraces all phases of operation of the federal airways. In order to place the responsibility for the vast mileage covered by the airways in a number of hands, the United States is divided into six districts. At the helm of each district is a manager who is responsible for the conduct of affairs on the airways under his supervision. Each airway navigation district covers a large area and includes a great number of airway stations. An operator stationed in a city who would rather be out in the wide open spaces where he could hunt and fish usually can, in time, obtain a transfer or swap with another operator for a locality he prefers. Airway stations are located by the sea, high in the mountains, on the deserts, and near every large city in the country.

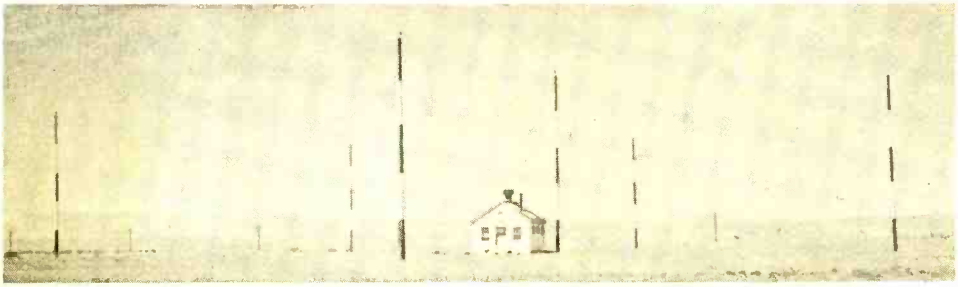
Airways

Before going on, it would probably be wise to define an airway. An airway is an air course between two points and is selected because of its locational advantages to the aircraft flying the course. The airway includes all of the Bureau of Air Commerce aids to air navigation along the route. These aids take the form of beacons, emergency landing fields, radio ranges, radio markers, radio communication stations, etc. Radio ranges and beacons are so located as to guide aircraft between mountains and over the shortest path between points where landings are to be made.

Personnel

Directly responsible to the district manager are the engineers and supervisory officials.

* 221 N. Eleventh St., Miles City, Mont.



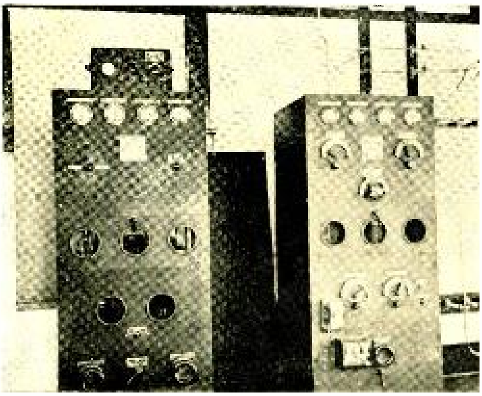
MRL antenna installation. The range transmitter is located in the building at the center of the four loop-type antennas.

Along the airways at landing fields are located communication stations manned by keepers and radio operators. A few of the emergency fields which have no radio or teletype facilities have caretakers. At a few other stations are keepers and assistant keepers. Since a reorganization this last year, however, the majority of the communication stations have four radio operators who are supervised by an assistant operator-in-charge. A few are manned by both Weather Bureau and Bureau of Air Commerce personnel.

Radio engineers and electricians deal with the more technical problems concerning radio equipment. At the Washington, D. C. laboratories the engineers make extensive experiments in the development of new radio aids to air navigation.

Obtaining a Position

To obtain a position as an assistant keeper or radio operator, it is necessary to file an application with the U. S. Civil Service Commission. From these applications the Civil Service Commission compiles a list of available men to call when vacancies occur. In order to have a sufficiently large list from which to choose, the Civil Service from time to time announces by means of publicly posted bulletins that applications will be accepted. After being placed on the list, an applicant must wait until he is called upon to fill a position. To be acceptable for a position as a junior radio operator, a candidate must, among other things, be able to send and receive International Morse in plain English at a rate of thirty words per minute, type at a rate of fifty words per minute and, after a certain length of time in the service, be able to type thirty-five words per minute on a teletype machine from a standard teletype test consisting of weather symbols, map signals (code), and winds aloft (the direction and velocity of winds at certain altitudes). A test is also given covering material taken from a Weather Bureau manual. A new man must also pass a test showing that he is proficient in compiling weather observations.



Type MRL radio range transmitter.

Periodic tests in radio operating, teletype, and station maintenance are also given by officials from the district office who visit the stations during the year.

Operator's Duties

The routine duties performed by the operators are practically the same regardless of their positions. At Bureau of Air Commerce intermediate fields, the keepers and radio operators stand continuous watches, taking weather data and entering this information on the teletype hourly in sequence with other stations on the circuit. The information sent on each teletype machine appears simultaneously on all other machines so that all stations may have a complete set of weather data at all times. Special reports are entered on the teletype if sudden changes in weather conditions exceed a certain variation stipulated by the Weather Bureau.

Operators located at intermediate fields where there are beacons must also change burned out beacon lamps and keep all field lights burning at night. During his watch, the operator must answer all calls from aircraft concerning information as to the condition of his own or other fields, weather reports, and winds aloft.

The teletype can sometimes disrupt operations by going completely wild. When things happen along the many miles of connecting wire it can print unreadable hash, run wide open with a type bar pounding at one end of a line or go completely dead. Frost, extreme changes in temperature, and bad storms can cause conditions which make the teletype useless for short periods of time. Too, one small part of the teletype being out of adjustment can cause garbling. Another source of trouble is the antics of "Little Alice", better known as the Aurora Borealis. I recall one morning while I was on the "mid" watch: the Northern Lights became brighter and brighter until finally the whole sky was covered with surrealistic patterns. Suddenly all short wave transmissions from the air line stations faded out and the teletypewriter started doing everything but the Big Apple. Nothing could be sent or received by teletype for almost four hours that morning. The telephone company was stumped—they had about eighty milliamperes of ground current and could do nothing to relieve the situation. Fortunately such conditions are definitely in the "freak" category. The teletype usually performs like the masterpiece of electrical and mechanical ingenuity that it really is.

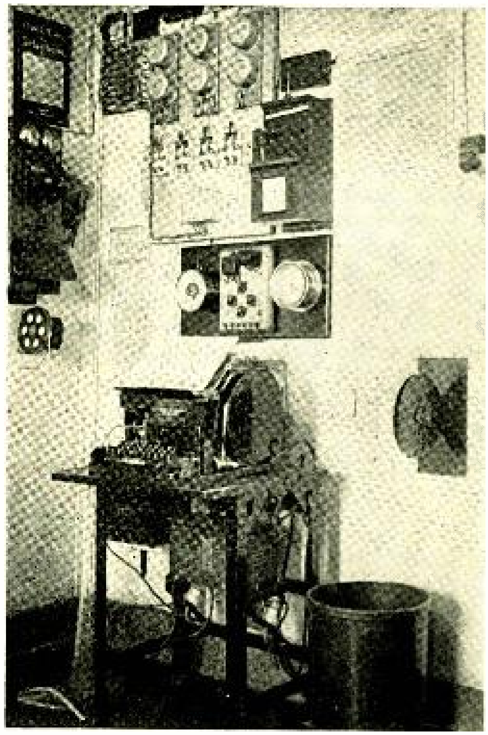
Radio Ranges

One of the most important pieces of equipment at a Bureau of Air Commerce station is the radio range transmitter and its associated antenna system. The radio range stations are given designations based upon the type of antenna and power they employ. For example: RA— with Adcox vertical tower radiator, RL— with loop antenna, MRA— medium power with tower radiator, and MLA— medium power with loop antenna. RA and RL class radio ranges have an effective range of one hundred miles and are located approximately two hundred miles apart. The medium power "M" class ranges have a range of about fifty miles. The medium powered installations are not affected by multiple courses, a bad feature of some of the higher powered ranges in mountainous country. The on-course signals of adjacent radio ranges along an airway intersect each other, thus enabling a pilot to rely on each range for guidance along his course through bad weather.

The loop-type antenna, consisting of overhead horizontal wires supported at the four corners and center of a square, was once used at all radio range stations. This type of antenna has been largely superseded by one using four insulated tower radiators at the corners of a square. The transmitter is connected to the towers by underground transmission lines. Radiotelephone communication with aircraft is accomplished by means of a fifth tower at the center of the square. The antenna is so oriented and excited that the Morse character "A" is sent out in two quadrants while the letter "N" is sent out in the other two quadrants. The characters are so timed that a pilot flying the course hears a steady tone of 1020 cycles (the modulation frequency used on the range transmitter) if he is directly on the course. Should he be off the course, either the "A" or the "N" will predominate, depending upon the quadrant in which he is flying. The range signals are also keyed approximately every thirty seconds by an identifying code group. The identification is sent first in one quadrant and then in the other. This enables a pilot to identify the origin of a range signal even though he is not directly on the course.

Range Transmitters

A typical range transmitter operates on a frequency of 344 kc. with a 211 master oscillator, 211 intermediate amplifier and another



A tape-model teletype machine. Used tape is wound on the reel at the left under the telephone. Between the barometer and clock may be seen buzzers and lights which indicate wind velocity and direction.

211 as a power amplifier. The range signal is modulated at 1020 cycles by an audio signal generator using two 76's as oscillator and amplifier and an 84 rectifier. Should the operator desire to call or answer a pilot he throws a toggle switch which results in the operation of several relays at the transmitter. These relays switch the transmitter to the radiotelephone antenna and connect the speech amplifier and modulator. A line amplifier at the watch house uses a 56 following the microphone into another 56. The output of this amplifier is carried through a line to the transmitter house and there into an amplifier using a 77 in the first stage and a 76 in the second stage. Following this are a 210 speech amplifier and four 211's in parallel as modulators.

As it is necessary to shut down the range signal when using phone on the same frequency, some difficulty has arisen when it has been necessary to broadcast weather information or call a pilot just as another pilot was following the beam and badly in need of it. This sort of situation was taken care of for some time by utilizing a separate transmitter removed from the range transmitter by 30 kc. for the phone transmissions, the pilot retuning his receiver to receive the voice transmissions. The frequencies available for this service are limited, however, and it soon became apparent that something should be done to alleviate the situation.

The solution to this problem involved a unique application of radio engineering. Radiophone and range signals are now transmitted on the same frequency and at the same time. Voice modulation of from 50 to 4000 cycles is used with the exception of a narrow band of frequencies around 1020 cycles (the frequency of the tone modulation on the range transmitter). The elimination of voice frequencies of from 830 to 1252 cycles is taken care of by a band rejector filter. Their removal results in no noticeable loss of intelligibility. A filter weighing only 3¼ pounds devised by the Bureau engineers is used on the airplane receiver to permit the pilot to select, by means of a switch, the range signal, the voice signal, or both signals simultaneously.

Cone of Silence Markers

Another development of the Bureau engineers which is now being put into use is the cone-of-silence marker. The cone of silence is the area directly above the transmitting antenna of a radio range station. In this zone the range signals fade out entirely. However, pilots have sometimes confused fading of range signals over mountainous country with the cone of silence. They have also had trouble locating this zone when flying at low altitudes in turbulent air.

The Bureau of Air Commerce has solved the problem of locating positively the cone of silence by employing an ultra-high-frequency transmitter known as a "Z" type marker. The "Z" marker operates on a frequency of seventy-five megacycles and transmits a beam vertically in the cone of silence area. The signal is tone modulated at a frequency of 3000 cycles to distinguish it from the radio range signals. The "Z" transmitter has an output of about five watts which is fed into an antenna consisting of four horizontal half-wave elements a quarter wave above ground and arranged around a common center like the spokes of a wheel. A special feed arrangement provides balanced currents in all elements and a phase difference of 90 electrical degrees between adjacent elements. This antenna radiates a field of 4200 feet maximum diameter and extending to a height of approximately 9000 feet.

For receiving the "Z" marker, the pilot uses a lightweight detector and audio amplifier receiver with 954, 6F7 and 85 tubes. The receiver output circuit has a bandpass filter tuned to 3000 cycles to avoid erroneous indications from off-frequency signals. A relay in the output also controls a pilot lamp on the instrument panel, this enabling the pilot to "see" when he is directly over a marker station.

Blind Landing Systems

Thorough tests have been made of two systems for making blind landings and several other systems are still under consideration. One of the systems tested gives both vertical and lateral guidance by using two separate beams. A beam along the proper glide path to the airport runway gives vertical guidance, while a low powered beam similar to the radio range marker gives lateral guidance. The outputs of the two receivers are applied to a meter which has two pointers on a single dial. By keeping these pointers crossed at the center of the dial, a pilot may make a perfect approach to the landing runway. A low-powered marker transmitter is also located so as to flash a light on the instrument panel of an airplane at a point about two miles from the field boundary. Another marker transmitter flashes a light in the plane when it is 1500 feet from the airport.

Other New Developments

Other new radio aids to air navigation are being developed at present and may find use in the near future. The Bureau has developed a system of radio teletype transmission which threatens to displace the wired teletype system for airway use. The airway operator types his message on a typewriter which perforates a tape with a special set of characters corresponding to wire line teletype impulses. The tape from the radio typewriter keys the transmitter and the characters thus transmitted are converted back into print by another radio typewriter which is connected to the output of an ordinary receiver. To allow simultaneous reception by all stations, the transmitter at each station relays the message coming in over its receiver. The relaying is accomplished by having part of the receiver output operate a relay which keys the transmitter.

Another new development is that of radio facsimile transmission. In this system the sending unit is connected to the transmitter in place of the microphone while the receiving unit is connected in place of the headphones on the receiver output. A message to be sent is typed or written on a piece of paper tape. The

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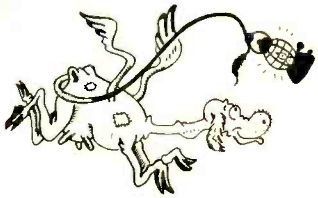


Tracking Down

• The Decibel

H. BURGESS,* W9TGU, Tells You All About It

As one progresses from the "how-to-build-it" hobby side of radio to the engineering end of the art, more and more use is made of the decibel. This is another one of the many terms the radio engineer has borrowed from other branches of physics, one that has proved to be quite puzzling and awe inspiring to the laymen. It is one of those terms that, when the opportunity presents itself, we can spring on the uninitiated, terrifying them with the wonders of science.

All too often those who use the term daily are not quite sure what it is all about; and the poor unsuspecting beginner is frightened away from an understanding of it without even a struggle.

Definition of the Decibel

The purpose of this article is to try and make a little clearer what a decibel is and why it acts the way it does. The average person seems to encounter difficulty when studying the subject. It is sometimes difficult for some to grasp the decibel because of its "nothingness." It has no weight, cannot be seen, and its taste and smell are negligible. Before going further it might be well to state that the decibel is a *ratio,* nothing more and nothing less. It merely represents the relationship between two quantities of energy. Unlike the meter, pound, or quart, it has no counterpart in wood or metal in the bureau of standards. It is an arbitrary standard set up by telephone engineers for their convenience in making measurements or calculations.

The decibel is similar to the old "transmission unit" which was used for measuring the efficiency of telephone and associated circuits. The original unit was equal to the loss in a mile of standard telephone cable. This mile of cable was used to compare the losses or gains in a circuit.

The mile of standard cable is too bulky to keep hanging around for measuring purposes; so it was replaced by its electrical equivalent, which is an artificial line with a resistance of 88 ohms and a capacity of .054 microfarads.

* Elliott, Iowa.

For measuring purposes the combination of these units was equal to a mile of standard cable. If the input to a circuit was increased, the amount of increase could be measured by the number of mile units which had to be inserted to bring the output back to the original level.

Now the greatest defect of the mile of standard cable is that the cable, having a certain amount of inductance and capacity, does not have a flat frequency response and the transmission efficiency depends upon frequency as well as power. In working with new types of circuits there was a great need for a new unit of transmission which was *independent of frequency.* One was needed which was based on power alone, since the gain or loss in power is the true index of efficiency.

Another measurement scale was devised and the basic unit of transmission, by agreement of the engineers, was made the bel. It was given this name in honor of Alexander Graham Bell, the inventor of the telephone. In common practice one tenth of this fundamental unit is used; it is called the decibel and goes by the abbreviation db.

The decibel is a natural unit based upon the way our ears respond to various sound levels. We rate the efficiency and power output of apparatus in watts, but our ears do not respond to sound energy the same as a meter. Instead of responding in direct proportion to the wattage, our ears respond *logarithmically* with respect to the power.

For those who may have become a little doubtful about their algebra, a little review may be in order before continuing with the discussion.

Use of Logarithms

The common system of logarithms uses ten as a base. The logarithm of a number is the power to which ten, the base, must be raised to equal the number. Example: ten squared or raised to the second power equals 100. Thus the logarithm of 100 is 2. If we raise 10 to the third power we have 1000 and so the logarithm of 1000 is 3. The number which we have just found is called the characteristic of the logarithm and always has a value of one less than the number of digits in the given number. 1000 has four digits and so the characteristic of its logarithm is 3, or 10 raised to the third power is 1000. Unless the given number is a direct power of 10, its logarithm consists of the characteristic followed by a decimal known as the mantissa, which must be found from a table of logarithms. If we want to find the logarithm of 775 we know that the characteristic is one less than the number of digits so that makes it 2. By referring to a logarithm table we find the mantissa to be .8893 and so the logarithm of 775 is 2.8893. This means that if 10 is raised to the 2.8893 power, it will equal 775. Numbers may be multiplied by adding their logarithms or they may be divided by subtracting their logarithms.

Returning to the discussion of the decibel, suppose we had an amplifier with an even 1000 milliwatts output. If the output were reduced the least amount detectable by a sensitive ear and the output then measured, we would find that it had been reduced to about 794 milliwatts, or to 0.794 of the original power. If once again the power were reduced the slightest amount detectable to the ear (a *good* ear) and the output again measured, we would find that the power had been reduced to 0.794 of 794 milliwatts or to 0.630 of the original. If we go so far as to reduce power another step we find that the power has been reduced to 500 milliwatts, or to one-half of the original amount in three steps.

The decibel, which is the new unit of transmission or power ratio, is supposed to be the smallest change in power that is audible to a trained ear. The formula for finding the decibel of a ratio between two power levels is given as:

$$\text{db} = 10 \log_{10} \frac{\text{power}_1}{\text{power}_2}$$

Power 1 and 2 represent the power before and after it has been reduced or increased. When substituting, if the larger of the two is always placed on top it will simplify the solution. If we substitute 1000 milliwats for p_1 and 794 milliwatts for p_2, we will have the following:

$$\text{db} = 10 \log_{10} \frac{1000}{794} = 10 \log_{10} 1.259,$$

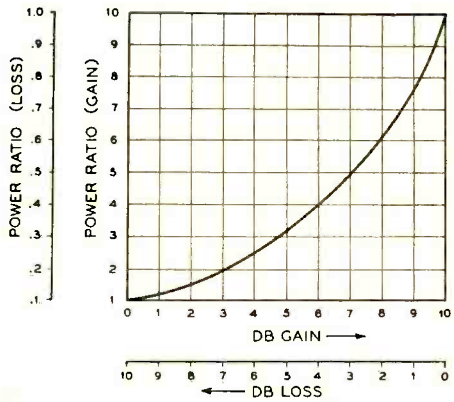
and the logarithm of the power ratio, 1.259, is 0.100 so

$$\text{db} = 10 \times 0.1,$$
$$\text{db} = 1.0$$

In substituting for the second and third reductions we find that we have reductions of 2 and 3 db respectively. This then gives us an approximate scale that is easy to remember: one db reduces the power to 4/5 of the original, two db reduces it to 2/3 and a reduction of three db brings the power down to ½.

Practical Examples

If these three power ratios are memorized, almost any db loss or gain can be quickly



figured. For example, what power ratio would be represented by a loss of 9 db? A 9 db loss would be the same as three 3 db losses. Remembering that a 3 db loss equals a power ratio of ½ and also remembering that when the logarithms of a number are added the numbers are multiplied, we find the following:

$$3db + 3db + 3db = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$$
$$9db = \text{power ratio of } \frac{1}{8}.$$

To find the ratio of a 7 db loss we have the same as a 3 db, 3 db and 1 db loss so:

$$3db + 3db + 1db = \frac{1}{2} \times \frac{1}{2} \times 4/5$$
$$7db = \text{power ratio of } 1/5.$$

When solving for a gain, the problem is figured for an equivalent loss and the resulting power ratio inverted. For example, to find the power ratio of a gain of ten db, we have a change of 3 db, 3 db, 3 db and 1 db so it follows that:

$$3db + 3db + 3db + 1db = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times 4/5$$
$$10db = 1/10.$$

Inverting: 10 db gain = power ratio of 10.

This is another common ratio that should be committed to memory, and is easy to remember: 10 db equals a power ratio of 10.

Voltage or Current Ratios

The formula so far has been for finding the decibel direct from the power measurements. When voltage or current readings are to be used in place of power, the formula must be changed to read:

$$db = 20 \log_{10} \frac{V_1}{V_2}$$

The power in a circuit is proportional to the square of the voltage or current. As stated before, adding of the logarithm of a number to that of another multiplies the numbers, so two times the logarithm of the voltage or current ratio squares it and gives us the power ratio. Current values may also be substituted for V_1 and V_2. When using voltage or current values in the formula it is considered that the *input and output impedances are the same.*

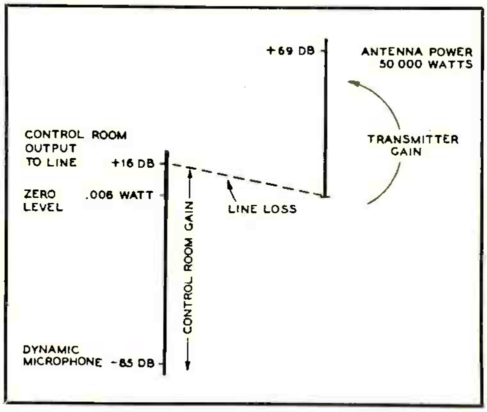
By substituting in the formula for power we can work out the following table.

Decibels gain	Power ratio
0	1
1	1.25
10	10
20	100
30	1000
40	10,000

By this we find that each time the level in decibels is increased by ten, the power is multiplied by ten. To increase the audio output of any apparatus by 40 audible steps or 40 db, the power output must be increased 10,000 times.

Practical Application

Any knowledge of the decibel is useless unless we can apply it to everyday work, so let us see if it can be of any benefit on a very



common problem. Suppose that the spirit has moved us to replace the type 45 audio tube in the old super-what's-it with a nice new 6L6. We wonder how much more volume we will have. The old 45 has an output of 2 watts and the 6L6 has an output of 6.5 watts. With an increase in power like this, the old blooper should have a new lease on life; but

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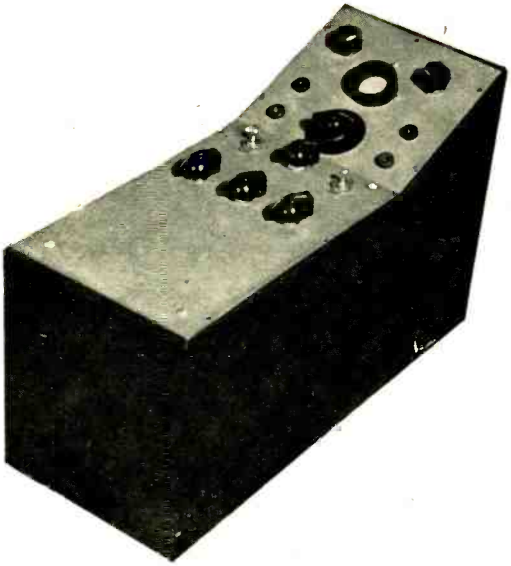


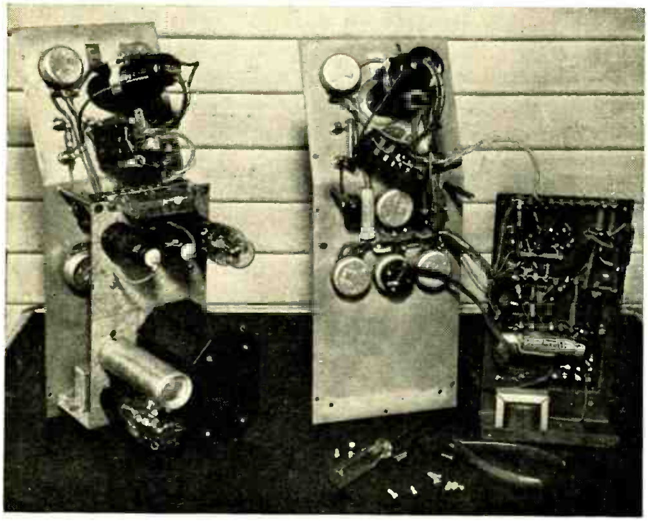
An interesting layout for a table - mounted oscilloscope that combines convenience with neat appearance.

A 'SCOPE *of Unusual Mechanical Design*

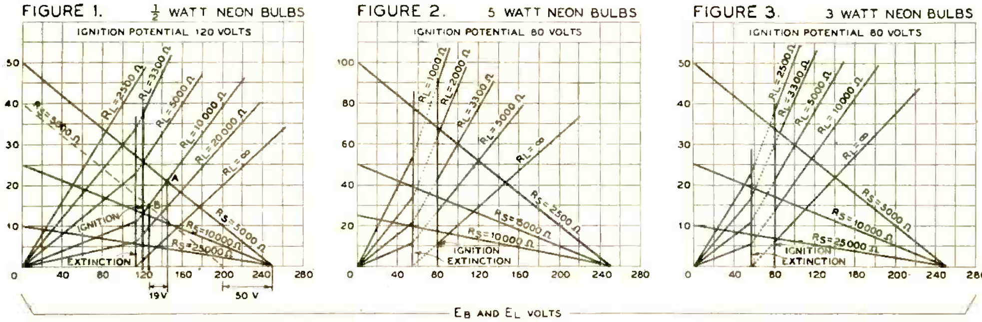
The accompanying photographs show a unique cathode-ray oscilloscope designed and constructed by S. Leibowitz, W8BXN. The mechanical layout of this 'scope is such that the most used controls are conveniently grouped on the lower portion of the panel. The c.r. tube is placed in a "no stoop, no squat, no squint" position on the upper sloping portion of the panel. As the focus, intensity and sweep frequency controls are used only occasionally, they are also placed on the upper portion of the panel along with the horizontal and vertical input jacks. The knobs on the lower section of the panel control the linear sweep amplitude, fine linear sweep frequency variation and the beam centering.

The chassis construction presents a distinct departure from the conventional for this type of equipment, employing, as is seen below, a sort of dual subpanel style. This permits all parts to be mounted conveniently and wired and at the same time gives a compact, neat looking assembly when the two units are secured together.

Electrically the oscilloscope is similar to that described by Boyd in April, 1938, RADIO; its principal interest lies in the unusual mechanical construction. With a few modifications to allow for the larger tube and increased voltage, this type of construction would be well adapted for use with a 902 or XH-24 two-inch tube.



As it looks inside the cabinet: At the left the unit is completely assembled. At the right, the two decks are separated to show the unit-type subpanel wiring.



Neon-Bulb VOLTAGE REGULATORS

By RUSSELL BERG,* W1CIW

Several voltage regulating circuits using small neon bulbs in various ways have appeared lately. Little quantitative data on the bulbs themselves have been published, however. Needing a simple regulator and having no design data on hand with which to go ahead, the writer borrowed some experimental victims from his favorite radio dealer and obtained the data shown graphically in figures 1, 2 and 3.

There are several different types of neon bulbs available in radio parts stores. These are of different wattage rating and construction. The higher wattage bulbs have lower ignition voltages and lower plate resistances for given plate voltages. Different bulbs of the same type were found to have nearly identical characteristics. A bulb which has seen a lot of service around a ham station, however, was found to be quite different from similar new bulbs. This may be due to the use of a different gas pressure in their manufacture or to several years' use and abuse checking amateur transmitters.

The Graphs

The data used in plotting the graphs were obtained from the circuit of figure 4. The line $R_L = \infty$ in the graphs shows the useful part of the voltage-current characteristic of these bulbs. This line is surprisingly straight. When the voltage across the bulb is gradually increased, the current remains at zero until a certain voltage called the *ignition potential* is reached. At this voltage the current jumps to a value indicated on the graphs at the point where the line R_L crosses the ignition potential line. If the voltage is further increased, the current rises in a straight line. If, after the bulb has been ignited, the voltage is decreased below the ignition potential, a small amount of current will continue to flow until the voltage is about 75 per cent of the ignition voltage. At this lower voltage the current flow ceases. The voltage at which current flow ceases is known as the *extinction potential*. The portion of the current-voltage lines between the ignition potential and the extinction potential is shown as a dotted line to distinguish it from the solid lines which show the characteristics obtained by increasing the applied voltage. The gas temperature affects the ignition potential; do not, therefore, contemplate operating too close to this voltage.

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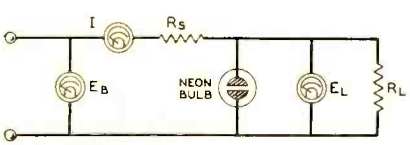


FIGURE 4

* 356 Elm Street, New Haven, Conn.

QRQ?

By NORMAN WEED,* W9JKW

This article should be of interest to the many c.w. operators using a straight key. A better fist, higher speed and less tiring operation are among the advantages of an automatic key, or bug, when used by an experienced operator. The bug described in this article can be constructed of junk-box parts by the average amateur, and will perform to the satisfaction of the most critical.

In general, the instructions should be followed closely, but there are several changes which might be made to suit the individual. If a low-power stage is keyed, such as the oscillator, contacts made from a brass screw will serve as well as special points. Considerable work may be saved by building the bug entirely on wood. This necessitates its being screwed to the desk, but in some cases this might not be an objection. And, finally, the "southpaw" operator can turn the plans around and have a bug that really can be run with the left hand.

Casting the Base

About three pounds of lead are required for the base. The mold is made from a thin sheet of aluminum 4½"x 5½". Cut a ¾-inch square from each corner and fold up the sides, making a rectangular pan 3"x4"x¾". A hole for a small wood screw is drilled in the bottom of the pan ½ inch from one end and halfway between the sides. This screw is to hold a block of dry, hard wood 2¼"x1¾"x⅝" firmly to the inside of the pan. The block is placed so that there will be ¼ inch of lead around the end of the base and ⅜ inch on the sides (see diagram). To anchor it in the lead a few shallow holes should be drilled around the edges. A satisfactory arrangement is shown in the diagram; six holes well spaced between the contacts are used.

The lead should be no hotter than necessary to make it pour easily. Have the mold level, and block the sides if the aluminum is very thin. Pour the lead rapidly around the block first. Continue pouring until the lead fills the pan to a level slightly higher than the block. Any lead that flows over the block can be cut off later. After cooling, remove the wood screw and take out the base.

Finishing the Base

A wood plane set to cut rather thin can be used without harm to finish the base. The surface that was on the bottom of the pan will be the top of the base. Plane this and the four edges flat and square. Bevel off the edges on the top. The bottom of the base need only be flat. Any marks from the planing may be sanded off. With care the top surface may be finished so the wood block will be invisible after a coat of filler, a sanding and a coat of black lacquer. However, it is best to get all the holes drilled before painting.

Mounting the "Works"

The hole made by the wood screw is the location of the pivot. A bushing and a shaft make the simple pivot, but a good fit is essential. There can be no play in the bearing. The shaft should be 3/32 inch or ⅛ inch in diameter and about 1¼ inches long. A nail may be used, but a small brass rod would be better. The bushing should be ¾ inch to ⅞ inch long, and most any outside diameter. A bushing ¼ inch in diameter centered in the hole made by the wood screw would be ⅛ inch from the lead —more than ample. Drill a hole straight through the block slightly smaller than the bushing and pound it in until ¼ inch protrudes. Be careful not to drive the wood block away from the lead when pounding.

The shaft is to be mounted perpendicularly in the center of a 2-inch piece of ¼-inch copper tubing. It may be

* 619 Center St., Elgin, Ill.

soldered in, or the hole and the shaft threaded and the latter screwed in and locked with a nut on the top. A thin washer may be put on the top of the bushing and the shaft slipped in. It should extend just to the bottom of the bushing.

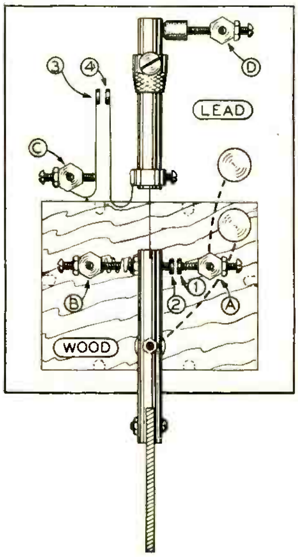
The copper tubing is then cut at the ends perpendicular to the base. One cut is 3/8 inch long and made wide enough to hold the button. One-eighth-inch bakelite is preferable for the button, but use any material available and make the button any size or shape desired. A small bolt holds the button or paddle in the tubing. The cut at the other end of the tube should be narrow and not more than 1/8 inch long. One end of the spring is to be soldered in this slot. Any one of a wide variety of materials might be used for the spring, even part of a razor blade. However, .001-inch brass shim can be found in almost any garage, and it may be used for all the springs in the bug. Cut a piece of shim 3/4"x5/16" and solder it in one end of the tube. To the other end of the spring is soldered another piece of copper tubing 1 3/4 inches long. The soldering might prove difficult, but clean metal and a large iron will make it easy. There should be a 1/2-inch to 5/8-inch length of spring between the tubes, and the whole unit should be straight.

Contacts

The moving dash contact 2 is mounted just behind the spring. A hole is drilled through the tubing and threaded with a 6-32 tap. Cut the head from a 1/2-inch 6-32 bolt. The contact point, if used, is soldered on one end. Model-T Ford coil points are about the cheapest, but any ignition, relay or vibrator points can be used. Four are needed. Screw in the contact and lock it with a nut on one side.

The moving dot contact 4 is soldered to a strip of the .001-inch brass, not more than 1/8 inch wide. This spring is shaped as in the diagram and soldered to a small metal collar which may be broken out of a small tuning knob. It is the right size and already tapped for a set screw. Slip it on the tubing as far as it will go. The weight for adjusting the speed of the bug is also slipped on this tube, and is also a collar removed from a larger dial. It should not be so large in diameter that it interferes with the dot springs.

From the diagram it will be noted that



Constructional diagram of the homemade bug.

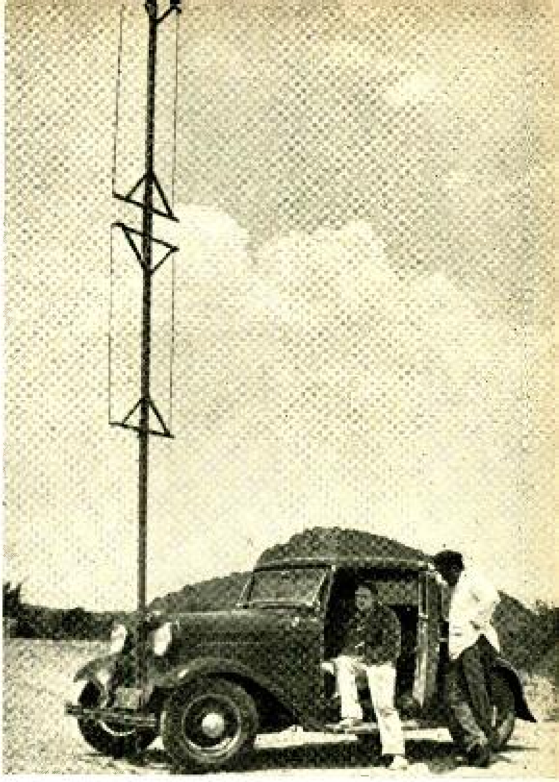
four stationary posts are required (A, B, C and D). These are about 1/4 inch thick but may be square, hexagonal or round. They should be at least 1/2 inch long and threaded inside at least halfway up the center. Most junk boxes contain pieces answering this description. Each of these posts is drilled 3/8 inch from the bottom or threaded end. These holes are perpendicular to the post and are threaded with a 6-32 tap. Next, holes which will clear the screws which run inside the posts should be drilled through the base. The location of the posts should be determined from the diagram. Also drill the holes for the binding posts, one in the lead and one in the wood.

The stationary dash contact 1 is mounted on the post A. The contact point, if used, is soldered to the end of a 6-32 screw, as was the moving dash contact. A lead must be run under the base from this post over to the binding post mounted in lead.

The post B directly opposite the dash contacts contains a screw which acts as a stop for the lever. The dot contact 4 continues to swing when the lever hits this stop. No connection is made to this post.

The post C holds the stationary dot contact 3. This contact is soldered to

[Continued on Page 88]



● Vertical 2-section flat-top beam used by W6MBA for "fixed mobile" work on 56 megacycles.

DEPARTMENTS

- Dx
- Calls Heard
- Question Box
- Postscripts and Announcements
- 56 Megacycles
- New Books
- Yarn of the Month
- What's New in Radio
- Open Forum

"WAZ" HONOR ROLL

C.W.

	Zones	Countries
ON4AU	40	148
G2ZQ	40	143
W6CXW	39	150
G6WY	39	148
W6GRL	39	141
W6ADP	39	140
W6CUH	39	140
W8BTI	39	137
W8CRA	39	135
W4CBY	39	133
W2GWE	39	129
W8OSL	39	125
W6HX	39	123
W3EVT	39	122
G5BJ	39	120
W2CYS	39	117
G2LB	39	115
W6FZL	39	112
ON4FE	39	110
W6FZY	39	109
W3EVW	39	104
XE1BT	39	90
K6AKP	39	67
G6VP	39	
W3ANH	39	
W4DHZ	39	
W2BHW	38	145
W1BUX	38	145
W8BKP	38	138
W6KIP	38	137
W2GTZ	38	136
W6DOB	38	131
W1ZB	38	129
W5VV	38	129
W2HHF	38	127
W5BB	38	126
W3EMM	38	124
W6QD	38	124
W4CYU	38	123
W3EDP	38	121
W8LEC	38	121
W8DFH	38	119
W2AAL	38	118
W8DWV	38	118
W1CC	38	116
W3DDM	38	116
W9UQT	38	116
W3GAU	38	115
W6AM	38	115
W8HWE	38	112
W6GRX	38	111
LY1J	38	110
W6HZT	38	110
W2GT	38	108
W8KWI	38	108
W8OQF	38	108
W8AU	38	106
W8BOX	38	106
W9ADN	38	106
W9GK	38	106
W8LYQ	38	106
W2GN	38	104
W9PST	38	103
W9ALV	38	102
VE4RO	38	95
LU7AZ	38	94
W8QXT	38	92
W9VDQ	38	79
G5YH	38	
G6RB	38	
W4AJX	38	
W9TJ	38	
W7AMX	37	122
W6GAL	37	121
W8ZY	37	114
W2GVZ	37	113
W6LYM	37	111
W2BXA	37	105
W8EUY	37	105
W9PTC	37	103
G6GH	37	102
W6FKZ	37	101
W8KPB	37	100
W9AJA	37	99
W3AYS	37	98
W3EXB	37	98
W6ITH	37	98
ZL2CI	37	97
W6VB	37	97
W6JBO	37	97
ON4T	37	96
W7BYW	37	93
W5CUJ	37	93
W1GDY	37	92
VK2AE	37	90
W6GCB	37	81
W9UBB	37	77
G6NJ	37	
W2BSR	37	
W2DTB	37	
W4AH	37	
VK3EO	36	112
W2BJ	36	111
W9AFN	36	105
W6BAM	36	102
W3GHD	36	102
ON4EY	36	101
W1AQT	36	100
J2JJ	36	100
W8LZK	36	99
G2QT	36	98
W4IO	36	98
W4DMB	36	97
ON4VU	36	96
ZL1HY	36	95
G2IO	36	94
G6YR	36	94
W6KWA	36	92
W9KA	36	92
W9PK	36	92
W5ENE	36	91
W9CWW	36	91
W8MTY	36	86
VK2NS	36	84
G2UX	36	83
W6TI	36	77
W6GCX	36	76
G6CL	36	
U1AD	36	
W2OA	36	
W8KKG	36	
W9ARL	36	
W8OXO	35	107
W8AQT	35	106
W6GHU	35	103
W8CJJ	35	98
W9RCQ	35	97
OK1AW	35	96
W9EF	35	94
ON4FQ	35	92
W3GEE	35	92
W6AQJ	35	92
W6MHH	35	91
W7AYO	35	91
W8AAT	35	87
W9RBI	35	87
G6QX	35	80
W2AIW	35	
W2IOP	35	
W3BBB	35	
W6NHC	35	
SU1WM	34	109
W3EPV	34	106
W6HEW	34	103
W3TR	34	100
W8BSF	34	100
W8DOD	34	96
VK2AS	34	94
W6EPZ	34	93
W8HGA	34	93
W6HJT	34	92
W1BGC	34	90
VE2EE	34	88
W2IYO	34	88
W8JSU	34	83
VK2TF	34	81
W6MJR	34	81
ON4SS	34	80
VK2TI	34	75
W4ELQ	34	74
W8JK	34	74
W6LHN	34	71
VK2EG	34	70
VE5MZ	34	69
VK2VN	34	63
W9QOE	34	56
K6JPD	34	
W2FAR	34	
W3EGO	34	
W8CNZ	34	
W1RY	33	92
W8ACY	33	91
W2BMX	33	90
W5KC	33	88
W6CEM	33	88
W3RT	33	86
W1APU	33	85
W6LEE	33	85
W8DQU	33	85
W9LQ	33	84
W2WC	33	83
W6NAE	33	83
VE4LX	33	82
LU3DH	33	81
W6CVW	33	81
W6LCF	33	78
W6MVQ	33	77
W2FAW	33	67
OK2HX	33	66
VK2RA	33	65
W6KQK	33	63
K6CGK	33	62
ON4TA	33	
W5AXF	33	
W6LDJ	33	
W8LDR	33	
W9LBB	33	
VK2VQ	32	99
W5ASG	32	90
W6DIO	32	90
W3KT	32	85
W6KUT	32	85
G6WB	32	84
W1APU	32	83
W9FLH	32	80
ON4NC	32	79
W9PGS	32	78
W3CIC	32	75
W6AX	32	74
W3GAP	32	70
W6KZL	32	67
W6LPR	32	67
W9DEI	32	66
ZU1T	32	65
W6KRM	32	62
W6OAQ	32	56
W8BTK	32	
W8HYC	32	
W4MR	31	92
W6DRE	31	86
W6GNZ	31	85
W8FJN	31	85
W9LW	31	82
W2FLG	31	80
W6KEV	31	80
W2HVM	31	78
GI6TK	31	76
SM6VX	31	76
W6NNR	31	74
G5VU	31	73
W5PJ	31	71
W9YEG	31	69
W6POZ	31	66
VK2VA	31	62
W6OFC	31	62
W6IES	31	57
W6CLA	31	51
I1TKM	31	
VK2QL	31	
W3DCG	31	
W6HXU	31	
W9YGC	31	
VE2GA	30	84
W4DCZ	30	80
W1APA	30	79
W3CDG	30	78
W3UVA	30	76
W1AB	30	73
W3GHB	30	73
W3GMS	30	72
W2GFF	30	71
W8MFB	30	71
W6NLZ	30	70
W4DTR	30	68
W8MPD	30	66
W9VKF	30	66
W6OEG	30	61
W9VLQ	30	58
W8PHD	30	57
W8DPY	30	53
VE5ZM	30	52
W3EMA	30	
W7AVL	30	
W8DED	30	
W8MAH	30	
W9IWE	30	

PHONE

KA1ME	35	79
W6OCH	34	85
W6ITH	34	83
W3FAM	33	68
W6NNR	32	73
W6CQI	32	70
W9NLP	32	70
W6MLG	31	72
W6LLQ	31	68
F8KI	31	53
W6AM	31	
W4AH	31	
W9QI	30	75
VE1CR	30	68
W4DSY	30	
W2IXY	29	82
G6BW	29	70
W3EMM	29	76
W6EJC	29	64
W9YGC	29	
W2IKV	28	77
W7BVO	28	61
F8VC	28	58
W9BVC	28	58
VE2EE	28	56
W6OI	28	53
W3LE	28	41
W6IKQ	28	45
W8LAC	27	72
W6FTU	27	60
W8RL	27	58
G8MX	27	56
W9ARA	27	53
W9ZTO	27	50
W6GCT	27	49
W9TIZ	27	47
W9BBU	27	45
W2HUQ	27	
W5DBD	27	
G5Z J	26	77
W5DNV	26	60
W8XQT	26	55
W6NLS	26	49
VK4JP	26	32
W6GAL	26	45
W8JK	25	47
W7AMQ	25	40
W6LYM	25	39
W6MXD	25	38
W6LEE	25	34
VK2ABG	25	
W3SI	25	
YV5AK	24	59
W4TS	24	52
W9RBI	24	51
W1BLO	24	50
W6LPR	24	45
W2IUV	24	41
W7EKA	24	34
W6MVQ	24	32
VE5OT	24	
W2HCE	23	62
W1HKK	23	60
W6GRX	23	43
W9ORL	23	38
W7ALZ	23	27
W7ESK	23	
W8QDU	22	48
W8DBC	22	46
W6FKK	22	26
W6NCW	22	23
W7AO	22	
XE1BT	22	
G6DT	21	53
W6NEP	21	53
W8KWI	21	50
G3DO	21	47
W1JCX	21	42
W5ASG	21	42
W6FZL	21	40
W9VYD	21	36
W6HX	21	32
W7BJS	21	25
W6MVK	21	22
W3AKX	20	32
W6IWS	20	24
K6KMB	20	23
W1COJ	20	
W4BMR	20	

DX AND OVERSEAS NEWS

Herb. Becker, W6QD

Send all contributions to Radio, attention DX Editor, 7460 Beverly Blvd., Los Angeles.

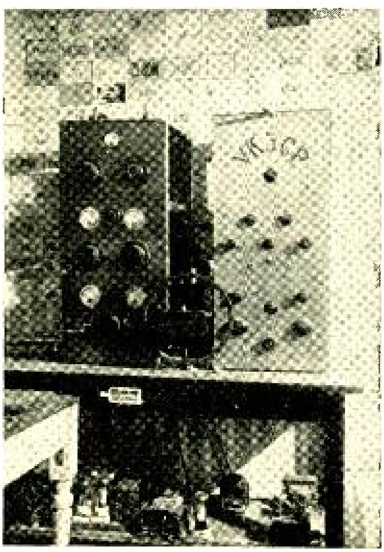
1939 Marathon

1. The "1939 Marathon" will begin January 1 1939, close on December 31, 1939. The purpose is to give the newcomer and the old timer a mor equal chance to show what they can do. Th object will be for everyone to start from scratch and work as many zones and countries as possible in 1939.

2. A separate list will be shown in RADIO every month, listing the 50 highest scorers for c.w. work and the 25 highest for telephony. This means that one must be active over a period of time if he expects to keep in the list; otherwise from month to month the more active ones may be passing him up.

3. The first list of calls to be published for the "1939 Marathon" will appear in the April issue of RADIO, the middle of March. We will need your results by February 10 for this issue. This will give you approximately six weeks from January 1 to get started and accumulate zones and countries.

4. The zone map can be referred to for the zones, while the official country list as shown in RADIO will be the authority for enumerating the countries. No confirmations are required until the contest is terminated. The only requirement to qualify is your itemized list of stations in the zones claimed. Succeeding reports need only list the additions and revised totals.



The transmitter of VK3GP, well-known Australian amateur.

Another view of the station of VK3GP.

5. The list for the "1939 Marathon" will in no way conflict with the present WAZ Honor Roll. This list will be maintained as an "all time" record. In this way if you should work a zone which would be a new one for the "Marathon" list and by the same token a new one for your Honor Roll total, you would be credited accordingly. So that the two lists will not conflict it will be necessary for you to show the additions to each list separately with the revised totals of each.

News from the Phone Men

The latest from G6BW shows that he now has 70 countries and 29 zones. W6MXD, Bud Hoffman, still has 25 zones but has increased his countries to 38. The new ones are HP1A, 14,333; K4FAY, 14,240; VP3AA, 14,110; and PK6XX. Ross Hansch, W9RBI, is one of these versatile fellows that picks 'em off on c.w. or phone, his latest on phone being VP7NU, 14,070; VP7NS, 14,090; VP7NC, 14,260; VP7NA, 14,-260; and TG9BA, a new station in Guatemala on 14,000 kc. He gives his address as Walter Bay, Shalet Krolij, Guatemala City. Ross's present total is 24 and 51. His c.w. activities will be noted a little farther on in the column. W7BVO is elated in hooking VU2BG, which ups Rollie's zones to 28 and countries to 61. In checking over his log recently Rollie discovered he had made WAC 35 times in the last six months. During the same period of time he made 180 contacts with European stations. He said the odd part of it was that these phone QSO's seemed to take place at all times of day and night. Some of the newest stations that W7BVO has worked include CX2CO, CP1BA, HR5C, VP1BA, VP6FO, VP7NS, HH2B, HI6Q, FI8AC, TG5, VS2AS, CT1QG, OZ5BW and PK6XX.

W6ITH has nabbed himself a couple of new ones, namely VP7NS, 14,110, and VP3AA. This brings Reg's total up to 34 zones and 83 countries. Reg says that CR7AK has now moved up to 14,082 kc. and is heard often between 6:00 and 7:00 a.m. p.s.t. Reg has just received a well censored and plastered letter from XU9RP who if you will remember was his contact in zone 23. He had previously asked XU9RP for a complimentary card which he in turn wanted to send to "yours truly." Imagine Reg's surprise when he not only received just one card but three—and they were all blanks. So step right up and make an offer. Of course, W6ITH had received his own QSL card properly filled out some time ago.

Another bit of news gathered by W6ITH says that W6NYQ is operating on 10-meter phone, mobile, aboard a ship that was heard the other evening from Perth, Western Australia. KA1ER is also on 10-meter phone, coming into the west coast about 5:00 p.m. PK3YV may also be heard on 28,250 kc.

VP3THE

Remember him? I'll say you do. Anyway Bill Hungerford has written a nice story on his activities in British Guiana which you will find "up front" in this issue. While speaking of Bill I might mention that should any of you desire to send him a card or contact him in any way he may be reached as follows: Mr. O. W. Hungerford, 69 Henry Street, Binghamton, N. Y. Incidentally, he may be heard on W8CNA once in a while.

VK3GP, the OM himself.

W3LE now has 28 zones and 47 countries. Some of the newest include CN1AF, 14,270; FB8AH, 14,350; SU1MW, 14,100; SU1AX, 14,010; I1MY, 14,020 and 14,390; OX5BW, 14,040; ZB1L, 14,145 and FA3HC, 14,100 and 14,280. By the way, Lou says that W3DEC (also of Baltimore) is now located in Culver City, California, and has just received his new call, W6QIV. He will be on 20-meter phone running about 500 watts. W6IWS is a new one added to the phone list with his 20 zones and 24 countries. These have all been worked with a maximum of 45 watts input on a single T20 in the final.

Another new one is W8KWI, who sends in his list of 21 zones and 30 countries. His final consists of a pair of T200's running 600 watts on phone and 800 on c.w. Grid bias modulation is used. W8DBC finally breaks down and sends in his nice list of 22 zones and 46 countries. He runs 500 watts input to a single T200 in the final. Also he occasionally gets on 75-meter phone, where he has 8 countries to his credit. W8DBC closes with this ". . . . also I work nines once in a while late at night." We are glad to see the Cleveland area represented at last.

The Brass Pounders

W8LYQ has boosted his countries to 106. Some of his new contacts are TA1AA, OQ5AW, VQ3HJP, XU6MK, XU6LT, PJ1BB and VS2AE. W3GHB has landed his 30th zone and 73rd country. W5GWO and a flock of his pals are in Lubbock, Texas, going to Texas Tech. They are mostly 7-Mc. fiends and during the summer have worked VP5SS, VP4TM, VP2LB and KA1CO. The other hams are W5FYZ, W5GWX, W5GOS, W5GMC and W5FZU. They are kicking because they can't locate a bug in town. W8OXO says that West Virginia is still on the map and his countries are up to 107. W3EVW hooked ZD2H, YU7DM, YU7TE and FB8AB.

Speaking of FB8AB, a very interesting bit of information has been passed on by W8FSS. It seems that on the 17th of October, Paul Bour, FB8AB, left on an expedition and will not return home until around Christmas of this year. He told W8FSS he was going to be on some island about 2000 miles from Madagascar and between Africa and South America. While there he will use the call XFB8AB. Any further information will be appreciated about Paul's destination.

W6QAP, now located in Tucson and exW8KZL, worked VQ3ALT on 14,045 kc. He told Bud he is using 10 watts from a generator driven by a 12-volt battery. Bud had only been on the air 17 days and he worked 16 zones and 21 countries. Says his location is swell but conditions generally have been bad. Uses a TZ40 in the final excited by a bi-push. He and his friend W6CVW, also in Tucson, are really anxious to work some VU's and XZ's. They think the mountains block them off from them. Walt Ellis, W6CVW, has 33 zones and 81 countries. Walt isn't claiming any records, but modestly says that he has made WAC over 100 times since last April. W6CVW used to be almost exclusively a 40-meter dx man, but when W6QAP breezed into town I think he must have given him a shot of 20-meter dx and since then Walt has been having a lot of fun. Some of the best that he has hooked up with are CT1CO, CT2BM, HR1UZ, HA3H, YR5ML, U2NE, VQ3ALT, FB8AB, I1KN, CP1AA, VQ2HC, CR7AF, MX3A, VQ3HJP, SU1WM, LY1J, ZE1JG, VQ8AI, ZD2H and TF2X.

Regarding VR3A

During the past few months a number of the fellows have reported working VR3A, who said he was located on Fanning Island. W9UAU was one of these unlucky fellows and in answer to his letter to VR3A I am printing a letter from Fred Harry, who has been postmaster on Fanning Island for the past year. I believe this letter will explain to many fellows just what the score is. You also will remember a note in the last issue of Radio regarding VQ1AD, who also is supposed to be on Fanning Island. Following is the letter:

Fanning Island
July 6, 1938

Mr. Robert M. Lewis
Dear Sir:

Your letter of 15th May reached me on June 29th, which was our first mail since April. We have only a three monthly service between here and Honolulu, which is our nearest port.

I was very pleased to hear that someone to whom I had written had published my remarks about VQ1AD. He has certainly been making a fool of himself and a good many amateurs. Personally I cannot understand anyone being unsporting enough to do such a trick. You say you worked a VR3A, who gave his location as Fanning Island. Well, it seems as though he has broken out in a fresh place. There is a small set on the island used exclusively between Fanning and Washington Islands by the Plantations Company. I believe their registered calls are Washington VR1AS and Fanning VR1AR, but I do not think you would possibly contact with either of these. You can take it definitely from me that unless it is someone on board a passing boat you are not working with Fanning Island. I notice you give the longitude and latitude as 158 L 5 N Lat. These figures are slightly out as the correct latitude is 3 54 38 N and longitude 159 23 27 W.

I sincerely hope the next time you work someone who says he is on Fanning Island you will tell him just what you think of him and add a little for me as well. I have been postmaster here for the past twelve months and every mail a batch of letters and cards arrive similar to yours. I don't mind answering them, but I feel sorry to think some amateur is pleased having contacted with a distant station and then finds out it is only a fake. I am leaving here by the September boat and hope to return to Auckland, New Zealand, my home, but so far the Cable Company has not decided which will be my next station.

Hoping you will not be too disappointed at not having worked with Fanning Island and with kindest regards,

Yours sincerely,
Fred Harry

Tom Casswell, W5BB, has brought his countries up to 126 but still has the same 38 zones. Tom now has confirmations from all 38. Wonder how many others with 38 can do likewise. Some of the new ones are VP8AD, 14,300; VQ2PL, 14,410; ZD2H, 14,280; VK4HN (phone), 14,290. W5BB also worked VS3OL but doesn't like him . . . too loud. W1APU worked KA1FG, bringing him up to 33 zones and 85 countries. W8JSU is still using his pair of T20's with 100 watts input. He says that's plenty of power and he has done right well to get 34 and 83. "Ren" Collins, W8EUY grabbed himself a few new ones in ZD4AB, ZD2H, VQ2GW, 14,120 kc. His countries are now up to 125, and he says he's still waiting for AC4YN.

G2ZQ has upped his countries to 143, the new ones being VP8AD, 14,300; LZ1ID, ZD4AB and HK4LE. John has not made a contact in Nevada as yet. Also G2ZQ brings up a very good point that we plugged over a year ago, to try and get the gang to use the low-frequency end of the band a little more. If we all take a crack at it a little more often, we should soon have 'em pretty evenly distributed. Might help keep the commercials from claiming the LF end too. W2GVZ worked VQ3HJP, 14,380, for no. 111. Congrats are in order at the shack of W3EVW—there is a new Jr. op. there. W3EVW also has a few new countries and this makes him doubly happy. The new ones are CR7AY, YV2CU, VK9VG, ZC6NX, ST2CM and FI8AC. This makes him 39 and 112.

W2BHW is still going strong and now has an imposing total of 145 countries. A few of the latest are ZD4AB; PX1A; G6IA; YA5XX; EQ4BG, 14,425; VS7MB, 28,190; and VQ3TOM, 28,060. Speaking of VS7MB, Lindy had a perfect one-hour QSO with him on 28 Mc.

More from Wilmer "5VV" Allison, this time to say he was fortunate to get VQ2PL and VP8AD, making 129 countries and the same 38 zones. New ones heard: FU8AA, 14,310; PX2D, 14,440; and VK9DM, 7040. W2GTZ is not to be outdone and goes and gets himself six new countries to make 136. Here are the ones Reeve raked together: ZD2H, 14,270; ZD4AB, 14,340; UX1CP, 14,410; VS2AE, 14,340; PK6XX; and VK4HN (phone), 14,260. VK4HN is in Papua. Reeve has been going after Asians and so far this year has worked 83 of them. W5PJ is back on after a long layoff and thinks dx is a cinch compared with three years ago. 5PJ has worked 31 zones and 71 countries, which is a very good start. W4TS has been using his microphone to good advantage lately and in doing so has gathered in VO6D, CN8AV, FA3QV, PK6XX, LX1AI, GI2CC and PA0FB. Hal runs about 100 watts suppressor-modulated 803's, but is building a new rig with quick band change. At present Hal has 24 zones and 52 countries. W3GGE breaks down with a note saying he is just about ready to return to Stanford so won't be doing much more dx from W3GGE for a while. Will help W6HJT keep his filaments burning . . . but on the other hand it seems as though I remember hearing 6HJT has a little romance in progress, so maybe no dx for W3GGE after all. He'll just have to stick to his studies. Anyway, while Hugh has been home all summer he has added a great many to his list and presents a total of 35 and 92. Hugh uses an HK-354 excited by a bi-push. The antennas are an 8JK, Johnson Q and an 80-meter zepp.

Up north, W7AMX has been moving to a new location. He's still in Portland but has not been able to get his rig cranked up at the new spot. He says it looks as though he'll wind up in the basement with his rig, as after the family had been distributed throughout the other rooms . . . there just wasn't any left . . . for the shack. From his description of the general location it sounds as if he would be able to bang out just as well as ever.

W8HWE, who to some will be remembered as "Race Horse" Haas, is getting enthusiastic to get going again. He has dusted off the cobwebs and dust and will soon be blasting away. When Bob was here this summer it appeared as if interest had waned a bit.

G6WY calls our attention to a very good piece of news. It's about ZB2A in Gibraltar. It appears as though ZB2A was on the air only for a short time from September 29 to October 14. At that date he closed down, for a while anyway. Any QSO's with ZB2A outside of these dates should be treated with caution. ZB2A is C. W. Kirk, 3 Transport Lane, Rosia, Gibraltar. The frequency used was a crystal on 14,302 kc. "Ham" has now worked 39 zones and 148 countries. He also relates that he has had a letter from YA5XX who says he is an American operating a portable transmitter. He will take the portable in his car to the tops of hills around Herat, Afghanistan. Apparently the only W he worked was W2BHW and the first G was G5AN. G6WY also lists a few frequencies: OQ5AS, 14,290; OQ5AV, 14,030; VQ8AI, 14,300.

New Pacific Island Prefixes

Just as we go to press we learn that the F.C.C. is beginning to assign new prefixes to the Pacific Islands. Here is the list together with the prefixes for the other possessions:

K4 Puerto Rico
KB4 Virgin Islands
K5 Canal Zone
K6 Territory of Hawaii
KB6 Guam
KC6 Wake Group
KD6 Midway Islands
KE6 Johnstone Island
KF6 Baker Island, Howland Island, American Phoenix Islands
KG6 Jarvis Island, Palmyra Group
KH6 American Samoa
K7 Alaska (including Pribilof Island)

The above will probably explain why not too much has been said before about the grouping of the various islands. The official country list will be printed again next month and will include the above F.C.C. grouping.

Some of the fellows have wondered whether the various LX stations heard have been OK or not. Last year there was a spurt and a couple of them were on the air, and this year there were a few more LX calls floating around. One thing definite that we do know is contained in a letter from W7AMX. He worked LX1AS and apparently he is all right, as Art has his card firmly plastered on the wall. Art says that LX1AS mentioned on his card that there were about 10 stations in Luxembourg but at that time he was the only one working dx. This all happened about a year ago. Just in case it might be of interest to some of you, I am listing the address of LX1AS: Dr. Aug. Schumacher, 4 Bd. Em. Servais, Luxembourg.

W9UZD writes that his friend W9QXG, also in Fort Scott, Kansas, has worked a little dx with his 40 watts in one month's time. Some of the countries he has worked include K4, 5, 6, 7, ZL, VK, CE, LU, HK, PAO, OK, F, D, XU, VQ3, VQ8, FB, OZ, GM, I, ZBI, and LA. W1BUX has boosted his country total up to 145. Doug lost all his poles during the hurricane but says the wind cleared a wood lot for him so now he will have room for V beams. He lost his boat but claimed his home wasn't so badly damaged as most others. G6WB is up one in his zone list and now has 32 and 84. ZD2H helped him get there. W4IO has now gone up to 36 zones and 96 countries. Jim said he thought he had 3 more countries but they turned out to be n.g. W9RBI does considerable c.w. work as well as phone. Recent new ones for his are VQ2GW, U2NE and VQ3HJP. This makes Ross 35 and 87. He also worked on 10 meters a station signing XI1ER. Does any one know anything about him? Of course, he could be I1ER all right, but where?

W8KWI, whose phone activities were mentioned in a previous paragraph, is also very active on c.w., having worked 37 zones and 108 countries. Some of his latest catches on c.w. are YV2CU, 14,425; J8CG, 14,440; J5CC, 14,300; J2KN, 14,370; PJ1BV, 14,410; UK8IA, 14,450; FI8AC, 14,110. Burk lists the QTH of CN1AF as: Jose M. Sierra, 19 Rue Cources, Tangier International Zone. This was of course worked on

[*Continued on Page 91*]

Calls Heard

Numeral suffix indicates "R" strength. Send Calls Heard to Calls Heard Editor, c/o RADIO, 7460 Beverly Blvd., Los Angeles, Calif.

E. B. Vordermark, W4AZB,
25 E. Bay Street, Jacksonville, Fla.
(May 1 to June 1, 1938)
(14 Mc.)

B4UP; CE3AR; CN8MI; CP3ANE; CT1FY. **D**—3DSR; 3FZI; 3GKR; 4EDR; 4HNG; 4LDM; 4NXZ; 4YLI; 4YWM. F3KH; F8AM; F8IZ; F8KH; F8KJ; F8UG; F8VO; F8ZZ; FB8AB; FY8C. **G**—2GQ; 2LU; 2OA; 2ZD; 5BM; 5QY; 5SO; 6GE; 6PD; 6WD; 8EL; 8LT; 8PD. GM6XI; HA5C; I1IU; I1RRA; I1TKM; J2JJ; J2LU; J2ME; J5CC; J8CH; K6AIU; K6LEJ; LA6U; LY1J; OE3AN; OE3WF; OH5NP; OH5OD; OK1XA; ON4CN; ON4FEC; ON4QZ; ON4UX; ON4VW; ON4XS; OZ2XA; OZ7CE; OZ7HL; OZ8E; OZ8JB; PZ0AZ; PZ0JWM; PZ0KK; PZ0OO; PZ0QF; PZ0QQ; PZ0QZ; PA0WD; PY1BR; PY2EG; PY2FY; PY5AK; PY5QG; PZ1PA; SM5QG; SM5UV; SP1AO; SP1DE; SP1GZ; SP1ME; SP1MF; SP1RB; SU1SG; SU1WH; SV1MD; U1ND; U2NE; U3FB; U3QE; U9MI; VK3JK; VK3NG; VK3NN; VK3SA; VK3XU; VO3O; VO3W; VP1GG; VP1TG; VP1WB; VU2CQ; VU7FY; XU8WS; YR5AA; YR5CF; YS6AD; YU7QQ; YV5AN.

●

W. C. Clark, W4BJX,
1420 Boulevard, N.E., Atlanta, Georgia
April 1 to May 1, 1938)

(14 Mc.)

F3CY; F3LI; FB8AB; G5UG; HA1R; HC1JW; HR7W; I1EP; J2CD; J2JJ; J2ZZ; J2KG; J2KJ; J2OV; J2PJ; J3EK; J5AR; K6PTY; K7GIE; KA1CW; KA1ME; KA4LH; KA7EF; LU2CA; LU4BH; OA4Q; OH1NP; OK2PN; ON4VU; ON4ZQ; PA0EA; PA0AA; PA0UV; PA0XN; PK1PK; PK3WI; PY1EL; PY2IL; SP1CD; TF3C; U1AD; U3FB; U9AW; U9ML; UK3AH. **VK**—2AIB; 2AHP; 2ADE; 2AV; 2AFK; 2NS; 2TI; 2VV; 2BR; 2HU; 2OE; 3BZ; 3ES; 3FE; 3HY; 3JA; 3JV; 3QD; 3WK; 3XB; 3ZD; 4BJ; 4MW; 4SD; 4QL; 4UL; 4UR; 4VK; 5GP; 5LG; 5LL; 5LW; 5TR; 6AF; 6WB; 6ZO; 7CM; 7LZ; 9DM; 9VG. VR6AY; VS2AL; VS2AU; VS6AS; XU6LN; XU6PC; XU8OL; XU8XA; XU9MK; YR5CD; YR5HC; YU7XU; ZB1U; ZL1GX; ZL1MQ; ZL2TP; ZL2UL; ZZ2B.

K6LCV.

●

Donald W. Morgan, G2CBG,
15 Grange Road, Kenton, Middx. England
(April 1 to May 1, 1938)

W—1DDX; 1DI; 1ECW; 1HA; 1HSO; 1ICW; 1MX; 2AWW; 2BSR; 2CM; 2CN; 2CQG; 2DPA; 2EDM; 2EDR; 2GM; 2HFM; 2HGS; 2HNA; 2JBS; 2JFG; 2JTB; 2JWG; 2KHI; 2KJB; 2KJE; 2KJY; 2KXA; 2LW; 2UL; 3FIA; 3FXX; 3JUG; 3TR; 3WTU; 4EX; 4PK; 8BFF; 8NAI; 8NWI; 8QLT; 8SR; 9CIA; 9VLG. CT1JU; CT1ZZ; CT2AB; CX1CL. **D**—3BDF; 3DXF; 3FDF; 3FPL; 3GPF; 3HYR; 3VZV; 3ZRA; 4FWC; 4GAD; 4KMG; 4KNG; 4LQM; 4WER. EI3N; ES4D; ES5D; ES6E; ES8D; FT3CT; FT3NG; FT4AK; FT8AM; FT8NP. **HA**—1H; 1J; 2B; 2D; 2G; 2S; 5D; 5X; 6Q; 6Z. HB9BS; HB9CC; HB9XB; I1EY; I1IT; I1IY; I1LT; I1MG; I1MH; I1MQ; I1RT; K4ELV; K4ESY; K4KJ; K4RPD. **LA**—1H; 2L; 4F; 5H; 6C; 7A; 7I; 7K; 7U; 7V; 7X; 8B. LU3AH; LU4BF; LU5AM; LU8DP; LU8EN; LU8RL; LY1H. **OH**—1AC; 1NF; 1NW; 1RF; 1RP; 2PK; 3OC; 3OZ; 4OM; 5OM; 6NG; 6OA. OK1AM; OK1SQ; OK1W; OK2KP; OK2LA; OK2LP; OK2PN; OK2RG. **OZ**—1S; 2CX; 2PX; 5P; 5UU; 7FK; 7S; 7UU; 7Z; 8AG. PY1DS; PY1OZ; PY2KD; PY5AG; PY8AG. **SM**—3UG; 5CS; 5MF; 5QL; 5VV; 5WK; 5YS; 5ZL; 6NG; 6UA; 7MF; 7MY. **SP**—1DC; 1DI; 1DU; 1HS; 1KW; 1LP; 1MG; 1MI; 1MJ; 1SS; 2OC. SU1DX; SU1GT; SU1MW; SU1RO; SU1TM; U1BG; U3BM; U3QT; UK1CC; UK3AH; VE1AU; VE1CC; VE1EE; VE1FB; VK2ADS; VK2AT; XU7LI; YL2CD; YR5AA; YR5HE; YR5ML; YR5PI; YR5VV; YT7MT; YU7LX; YU7MF; ZL3LR; ZL3T.

Bob Everard, "Oakdene",
Lower Sheering Road,
Sawbridgeworth, Herts, England
(3.5 Mc. phone)

W—1BES; 1FCE; 1GR; 2DVU; 3EMM; 4BZX; 8KXM; 8LXV. VE1CO; VE1EI.

(7 Mc. phone)

HC1FG; TI1AS; TI2AV; TI2RC.

(14 Mc. phone)

W—2ABV (portable 6th Dist.); 5AHK; 5AKZ; 5AOH; 5APW; 5AQN; 5ASG; 5AWP; 5BCQ; 5BEK; 5BEN; 5BGW; 5BU; 5BVH; 5CO; 5CTC; 5CWQ; 5DE; 5DNV; 5DQ; 5DVM; 5ECL; 5ECT; 5EEY; 5EHM; 5FDI; 5FFA; 5FFG; 5FHJ; 5GIV; 5JC; 5PP; 5YW; 5YJ; 5ZA; 6AGJ; 6AH; 6AL; 6AM; 6AQK; 6AQO; 6BAY; 6BGH; 6BIC; 6BPM; 6BUQ; 6CAN; 6CLS; 6COQ; 6CQG; 6CQI; 6CQK; 6CZ; 6DKU; 6DL; 6EJC; 6EQI; 6FQY; 6FTU; 6GCT; 6GCX; 6GUJ; 6GXI; 6HOE; 6HOW; 6IDU; 6IRX; 6ISH; 6ITH; 6JPW; 6JZH; 6KM; 6KW; 6LDS; 6LFN; 6LFU; 6LKQ; 6LR; 6LYP; 6MBE; 6MDY; 6MWD; 6NEP; 6NHB; 6NKX; 6NMI; 6OAJ; 6PN; 6RX; 6SJ; 6TT; 6YU; 7AMQ; 7APD; 7BAH; 7BL; 7BME; 7CEO; 7EYD; 7FMR; 7FP; 7IF; 9ADD; 9ADJ; 9AXH; 9BBU; 9DCY; 9DD; 9DIY; 9ESZ; 9FJF; 9FWL; 9GHQ; 9KQM; 9LVZ; 9LZP; 9MGT; 9REF; 9RHL; 9SNL; 9SPS; 9UEL; 9UJS; 9VOO; 9WZW; 9YGC; 9ZBO. CE1AH; CE3DW; CE4AO; CN8AA; CN8AD; CN8AG; CN8MB. **CO**—2HY; 2LY; 2MB; 2QQ; 2RH; 6OM; 7CX; 7OP; 8AK; 8MA; 8OG; 8YB. CT2AB; CX1AA; CX2AK; EA8AF; EA9AH; FT4AA; FT4AD; FT4AG; FT4AI; FT4AL; FT4AN; FT4AR; HC1EC; HC1ETC; HC1FG; HC1FK; HC1JW; HH2B; HI5V; HI7G; HK1JN; HK3JA; HK4AG; HK5DB; HP1A; K6BAZ; K6JLV; K6LJV; K6NTV; K6OQE; K7FST; KA1AK; KA1DL; KA1HS; KA1MD; KA1ME; KA1YL. **LU**—1EX; 1PA; 4BH; 4BL; 5CZ; 6KE; 7AG; 8AB; 9BV; 9KA. NY2AE; OA4AG; OA4AI; OA4AL; OA4C; OA4N; OA4R; OQ5AA; PK1GL; PK1MX; PK1QU; PK1VM; PK1ZZ; PK3WI; PK4AU; PK4DG; PY1DH; PY2BB; PY5AA; PY5AG; PY5AQ; SV1CA; SV1KE; TI2AV; TI2KP; TI2LR; TI2RC; TI3AV; U3BC; U3BX. **VE**—3GS; 3SM; 3XQ; 4AW; 4BD; 4CW; 4EA; 4FD; 4GP; 4JJ; 4KX; 4OF; 4OS; 4SW; 5AM; 5BF; 5DK; 5EF; 5ES; 5HU; 5JK; 5OT; 5PE; 5PJ; 5TV; 5UW; 9EW. **VK**—2ABG; 2ADV; 2AP; 2CE; 2CP; 2DK; 2FX; 2HF; 2IQ; 2QR; 2VB; 2VV; 2XU; 2YW; 3AL; 3HF; 3KX; 3MR; 3QR; 3RW; 3XJ; 4BB; 4BS; 4GG; 4JU; 4JX; 4PK; 5AI; 5AW; 7CL; 7JB; 7YL. VO2Z; VO6L. **VP**—2CD; 3BG; 4TC; 5PZ; 6FW; 6YB; 7NA; 9G; 9R. VS2AK; VS6AB; VS7JW; VU2CQ. **XE**—1AH; 1AK; 1BA; 1BC; 1LK; 2AH; 2FC; 2N; 3AS; 3AW; 3HE. YI2BA; YN1HS; YV1AA; YV5ABE; YV5AE; YV5AG; YV5AK; YV5AM; ZB1H; ZE1JY; ZS1AX.

●

Question Box

I am running fairly high power on 28-Mc. phone and I have in use a number of fixed beams and one rotatable affair. I have noticed that the directive characteristics of these beams, both rotary and fixed, vary considerably from day to day and even from hour to hour as the conditions upon the band change. A number of other 10-meter fellows with whom I have discussed the subject appear to have noticed the same thing with regard to their directive antennas. What is the explanation of this condition?

The cause of the phenomena which you have described lies in the fact that the angle for best propagation of signals between two points is subject to considerable variance on the higher frequency bands. As the reflecting-layer height varies and as the daylight-darkness path changes, the angle for best signal transmission between two

[*Continued on Page 90*]

POSTSCRIPTS... and Announcements

W1XAL Course Broadcasts

The World Wide Broadcasting Foundation, operator of the educational station W1XAL, has notified us that the lectures of the Modern Radio Course will be rebroadcast, by transcription, at 12:00 midnight e.s.t. on Monday evenings for the benefit of west coast listeners. These transmissions are made on 6.04 Mc. and are in addition to the regular 8:00 p.m. Monday broadcasts. These special rebroadcasts are scheduled to follow each of the regular broadcasts of the course throughout its duration until June, 1939. Complete information on the courses may be had by referring to the P.S. Department of the October, 1938, RADIO, or by writing direct to the Foundation, University Club, Boston, Mass.

●

Ninth District Calls

The information contained in the October issue regarding the issuing of calls for the ninth district when the supply was exhausted under the present system was taken from the F.C.C. *Radio Service Bulletin,* issue of June 1, 1938, and seemed authentic. However, we are in receipt of a letter from the secretary of the F.C.C. which states that there is no basis for forecasting that the new system will be used at any particular time or at all. Apparently the only thing to do is to wait until they run out of calls and see what happens.

●

Error in Diagram Caption

In the article, "A Speech-Modulator of Modern Design," there was an error in the diagram caption as it was printed on page 15 of the May, 1938, RADIO. C_4 was inadvertently shown as being a 0.5-μfd. tubular when it should have been indicated as a 0.005-μfd. tubular. Troubles with the amplifier blocking on strong voice peaks may be attributed to this condenser; they may be cured by decreasing its size to 0.005 μfd., or even smaller if operation on the 1.8-Mc. band is not contemplated.

●

Close-Spaced Array

Several amateurs have written in to inform us that the two-element close-spaced array described in the June issue of RADIO seems to tune up better and show improved directivity if the elements are made entirely of tubing or entirely of wire, thus making the conductor uniform throughout its length.

●

Frequency Allocation Chart

Amateurs who can "promote" one of the complimentary frequency allocation charts from the International Telephone and Telegraph Corporation, New York City, will find it quite useful and decorative. The chart lists all services and covers the entire radio spectrum in accordance with the 1938 Cairo conference. It measures two by three feet and is printed in several colors to facilitate interpretation of the symbols.

●

1851 R. F. Tubes

The following paragraphs conclude the article, "Shifting to 1851 R. F. Tubes" which ended suddenly on page 97 of November RADIO.

The simplified circuit of the usual r.f. stage is shown in figure 1. The 1851 circuit in figure 2 differs only in the method of obtaining the screen voltage and the values of the components.

Inasmuch as the input capacity of the 1851 is about 5 micromicrofarads higher, the grid circuit will have to be readjusted. If it is not possible conveniently to reduce the trimming capacity that much, the tuning range may be changed by readjusting the detector grid and the oscillator tuning. This may require the addition of 5 micromicrofarads across either of these circuits if the present trimming arrangement will not permit alignment.

For proper bias when the automatic volume control is inoperative, the cathode resistor in the 1851 stage should be changed to about 235 ohms (200 to 250), instead of the present value of perhaps 100 ohms. This should be by-passed with a *good* mica condenser. If the by-pass condenser has much reactance, the stage will oscillate.

The screen should be disconnected from the present source of voltage and connected through a 60,000-ohm resistor to the plate supply. The screen should be by-passed to ground with a good mica condenser.

[*Continued on Page 80*]

From Taylor Tubes

Sensational

PRICE REDUCTION ON THESE TUBES

203A
WAS $12.50
NOW . . $10.00
OUR GIFT TO YOU $2.50

211
WAS $12.50
NOW . . $10.00
OUR GIFT TO YOU $2.50

204-A
WAS $90.00
NOW . . $60.00
OUR GIFT TO YOU . . $30.00

Announcing

A NEW RECTIFIER

249-B

Filament 2.5 Volts 7.5 Amp.
Peak inverse volts . . 10,000

The 249-B is a half-wave mercury vapor rectifier tube for 1KW to 3KW Transmitters. When used in a single phase full wave circuit with choke input, two 249-B's will deliver up to 1.25 amps at 3,300 volts. Has standard UX base and uses NONEX glass. Ceramic insulator under plate cap.

EACH $5.00

845
WAS $12.50
NOW . . $10.00
OUR GIFT TO YOU $2.50

872A
WAS $12.50
NOW . . $10.50
OUR GIFT TO YOU $2.00

T-55
WAS $7.00
NOW . . $6.00
OUR GIFT TO YOU $1.00

Merry Christmas and a Happy New Year

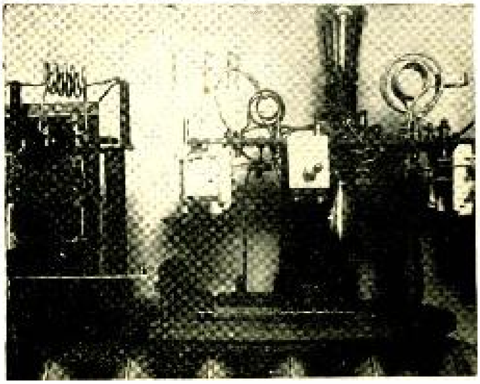
FRANK HAJEK W9ECA — WARREN TAYLOR
BILL BISHOP W9UI — JOE HAJEK — REX MUNGER W9LIP

"More Watts Per Dollar"

TAYLOR TUBES, INC., 2341 WABANSIA AVE., CHICAGO, ILLINOIS

56 MC. . . . .

By E. H. CONKLIN*



Tourmaline crystal oscillator and amplifier used by I1ER in working G2XC on five meters.

Our interest, as this is written late in October, is in the possible results of the dx test in November. Last year, some transatlantic signals were heard in October and November, with little more by way of results until February. Sunspots declined from July, 1937, until this summer when they appeared in large numbers again just as some students had decided that the peak was far enough past to venture the statement that the downward phase of the cycle had begun. Prof. Harner Selvidge, W9BOE, sent us comments made by Dr. Frederick H. Searles of Mt. Wilson observatory which we quote:

"We were inclined to believe the maximum of the normally eleven-year cycle had been reached in July, 1937, until last July and August came along. Now it appears the cycle curve will show a double maximum. And of course there is a bare possibility the maximum yet lies ahead, although this seems unlikely."

The records showed that there have been more spots on the sun for the last two years than for any similar period since 1870. The largest spot groups of the present cycle have been among the six largest ever observed, and the daily average of 9.9 spots for 1937 was the highest in the history of Mt. Wilson. The average for this year up to October 7 has been 10.02, but the sunspot activity appears to be declining now, and the figure for the year may be under that of 1937.

In fact, the other day we were driving westward just before sunset and looked up to see a large group just to the upper left of the sun's center—without even the aid of smoked glass.

To this sort of activity can probably be attributed the great amount of summer sporadic-E layer dx on 28 and 56 megacycles this year. Whether the winter will bring about more F_2 layer 56 Mc. dx remains to be seen. A year ago the National Bureau of Standards reported 51 Mc. as the highest usable frequency, calculated from ionosphere measurements for Wednesday noons only. There was a sharp improvement in October this year (following the September ionosphere storms) up to the 19th, when the Wednesday data showed 46 Mc. usable, calculated from an F_2 layer height of 270 kilometers and a vertical incidence critical frequency of 14,100 km. (meaning no skip at all on 14 Mc.)

DX Comments

VK2NO maintains regular Sunday schedules at 11 a.m. to noon and 3:30 to 4 p.m. Sydney time. This seems to be a little late for 56 Mc. to the eastern U.S., which is most likely to take place just after the ten-meter band opens.

G6DH says that he prefers ten-meter schedules with W's who can shift to "five." He checks the highest frequency U.S. signals above 30 Mc., and if 41 Mc. gets through he feels that it is worth while to have a test on 56 Mc. In October, signals may be best at the ends of the 1300-1800 G.m.t. period, becoming a single peak at 1400-1600 in midwinter. W2JCY heard G6DH at 1400 on November 2, 1937, other reports having been for the previous February and December. Heightman has built up a new acorn superhet that brings in ground-wave signals which were inaudible on the old t.r.f. receiver that he had thought was quite sensitive. A new two-section rotary flat-top beam replaces the H array that was blown down.

Dr. Santangeli, I1ER, says his 56-Mc. work dates back to 1926, but his activity has been affected by local regulations. Schedules with England were successful when on July 2 he

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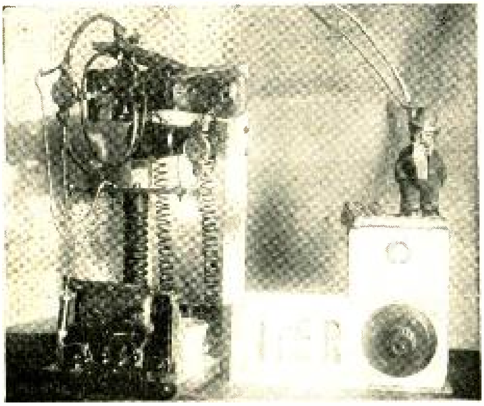

I1ER's experimental transmitter for wavelengths below five meters.

worked G2XC on 28 Mc., switching to 56 Mc. using only a few watts in a two-full-wave antenna. It appears to him that summer dx occurs only when ten-meter signals are heard strongly. Receiver sensitivity has been his limiting factor.

Don Dayton, W8VO, came through with details on some five-meter reception last summer. On July 25, a station signing CM7AC was heard just after the band folded up for W1 and W9. Inquiries of active Detroit and Pittsburgh stations were made, but these had looked around the band for a Spanish accent without success. The signal was stabilized and had the same characteristic fade as did the first and ninth district stations, but was switching frequency quite a bit.

One observation Don makes is that three- and four-way contacts with dx were possible from Akron in July, and also with Detroit at the same time. As a rule, when dx would be coming in, even W8CIR near Pittsburgh, with his usual R9 signal, would drop to a very low level and take on the characteristic fade of the dx, a condition that only came about occasionally. His log shows that dx last summer was best from 9 to 11 a.m. and 5 to 9 p.m.—agreeing with curves of sporadic-E measurements in the summer of 1937.

Recent DX at W8NOR

W8NOR in North Tonawanda, N. Y., wrote about odd conditions that occurred just before midnight on October 7. He found nine carriers on the band, but the speech was distorted and even one i.c.w. station was unreadable. On one transmission, a woman was talking, coming in best with the beam a little south of west. An hour later, this signal was still coming through R2, on about 56.2 Mc., with about a 30-cycle fluttering fa[...] days later, Ralph wrote us again [...] that W3FQS, located three miles east o[...] ing, Pa., had heard one of his transmis[...] that night. This is about 350 miles, with [...] beam broadside to W3FQS! It seems to be [...] little late in the year for sporadic-E work, particularly at that short a distance, and it is a good long haul for a ground wave.

Perry Ferrell, Jr., in Linwood, N. J., says that W2XMN's 40-kw. transmitter on 42.8 Mc., 125 miles away, has undergone practically no change in volume recently. The transmitter uses a horizontal antenna but Ferrell hears it best on a vertical.

W8NOJ sent us a copy of the October issue of *Lake Erie Five Meter News*, sent out free by Bliley. There was another Toronto-Buffalo-Cleveland-Detroit-Pittsburgh field day scheduled for October 16. The first was very successful, but the results of this one have not yet reached us.

W2MO, who has worked 1834 *different* five-meter stations so far, in six districts, reports some antenna experience: "The June 5 contacts were made using my vertical beam antenna some 90 feet in the air—but after that date I erected a horizontal array of two radiators in phase and two reflectors heading west about 25 feet above the ground, which greatly helped during the July contacts both in getting the signal off to a good start and in greatly reducing QRM on reception, since most locals use vertical polarization."

Short Circuits

RADIO's managing editors are never allowed to forget that television is just around the corner. Directly opposite the south window of our New York office, the lofty Empire State Building strains toward the open sky, lifting RCA's television array high above Manhattan's towers.

●

The first television theatre in the United States opened its doors in Boston during the past summer.

●

The figures 2, 7 and 8 are picked on most by the Erie swingsters.

●

A *demivolt* is not half a volt, nor is an *electress* a y.l. electrician.

NEW BOOKS

and trade literature

Catalog no. 161 of the Cornell-Dubilier Electric Corporation, South Plainfield, New Jersey, has been announced. The catalog, like its predecessors, is distributed free of charge to interested parties. It comprises 40 pages and each item is illustrated with a large half-tone clearly depicting the physical characteristics of the capacitor unit being described. Physical dimensions are shown in a reverse blueprint beneath each photographic illustration. A complete listing and description is on the right-hand page facing the illustration. Much thought and time have been given to the assembly of a catalog that would be easy to read and in which it would be an easy matter to find the item required.

Because of the tremendous strides recently made in capacitor development, many of the types illustrated are new. A copy of this new and complete catalog may be had from your local Cornell-Dubilier distributor or by writing direct to the manufacturer.

●

The new catalog of the United Transformer Corporation is now available either from your local jobber or direct from the manufacturer at 72 Spring Street, New York, N. Y. A complete listing of the entire line of the manufacturer is included in the new catalog. The new Ouncer Series, Varitran Voltage Control Units, and new Transmitter and Amplifier kits are featured. Also listed are their well-known lines for broadcast, aircraft, industrial, amateur and replacement service.

●

The Newton Institute of Applied Science, Newark, New Jersey, has issued a catalog of their home-study courses on college engineering subjects. This booklet is available on application and lists complete information on both their three and four year courses on the following subjects: Civil Engineering, Electrical Engineering, Mechanical Engineering, and Radio Engineering. The entrance requirements, textbooks, and study hours required are given for each of the courses. If desired, only special subjects from the courses may be taken for study.

●

Listings of all standard items of the extensive Aerovox condenser line, with the most popular types of carbon and wire-wound resistors as well, are provided in the handy form of the new Aerovox condensed catalog. The new catalog also features three pages of exact duplicate replacement condenser listings and two pages of exact duplicate motor-starting capacitor replacements. A copy may be had either from the local jobber or direct from Aerovox Corporation, 70 Washington Street, Brooklyn, New York.

●

The new Meissner instruction manual, "How to Build Radio Receivers," is now available to those who are interested in constructing their own station receivers.

The new book presents the instruction sheets for all 1938 Meissner receiver kits with complete schematic and pictorial wiring diagrams together with a collection of convenient radio formulas for ready reference. A discussion of the characteristics of many types of r.f. and i.f. transformers, with their advantages and disadvantages in all types of circuits is also given. R.f. troubles peculiar to modern receivers are discussed so that the experimenter or serviceman will have a better understanding of the true causes of such phenomena. The complete book comprises 120 pages, 8½ by 11 inches, and is available for a charge of 50 cents from jobbers or direct from the Meissner Manufacturing Company, Mt. Carmel, Illinois.

By the "Editors of Radio"

Radio's OUTSTANDING LIBRARY

RADIO the world's foremost practical and constructional shortwave, amateur radio magazine, the foundation of the reputation and prestige of "THE EDITORS OF 'RADIO'," known the world over as the outstanding group in radio not affiliated with a definite commercial interest. Intensely practical; profusely illustrated with large photographs on coated paper. Ten issues yearly including double-size annual number. Yearly $2.50 or TWO YEARS FOR $4.00.*

"RADIO" HANDBOOK a $5.00 book for $1.50! Almost 600 pages; complete, authoritative, practical, large illustrations; thoroughly revised annually. Both a text and a reference book. Elementary theory, workshop practice, instruments, laws and operating, plus more new, up-to-the-minute yet tried-in-practice constructional data than in any other book at any price—from beginners' receivers to elaborate 1 kw. radiophones. PER COPY $1.50.*

RADIO DIGEST the ONLY publication covering ALL phases of radio (except business and entertainment), reprints, digests, condenses the outstanding material from the entire radio press including many foreign papers and commercial "house organs" not generally available. Also includes "thumb nail sketches" of all important material in most worthwhile contemporary publications. R. D. is the only way to keep up with the whole, vastly interesting radio field (outside your own "pet" phase) without spending many hours and dollars reading the several dozen radio papers. Published bimonthly. TWO YEARS FOR $2.50.*

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"RADIO" ANTENNA HANDBOOK, over 100 pages on antennas and nothing else; facts, curves, diagrams, tables, charts; no calculations necessary. Intensely practical. The only book of its kind; contains much more antenna data than in any "general" handbook. . . . . Per copy, $0.75*

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"RADIO" NOISE REDUCTION HANDBOOK tells how to stop or greatly reduce all radio "noise" except static. Noise reduction is equivalent to signal increase. Only book of its kind. Per copy, $0.35*

"RADIO" AMATEUR NEWCOMER'S HANDBOOK, written especially for the beginner; simple theory; simple transmitters and receivers. How to learn the code; how to get started; radio laws and regulations. . . . . . . Per copy, $0.35*

"RADIO" ULTRA HIGH FREQUENCY HANDBOOK, devoted exclusively to the simple yet distinctly different equipment and practice of communication at 12 meters and down, including microwaves. . . . . Per copy, $0.50*

***Above prices are for continental U.S.A. only; for rates elsewhere see individual advertisements in "RADIO" or send stamp for catalog.**

RADIO LIMITED *Technical Publishers* **7460 Beverly Boulevard, Los Angeles**

YARN *of the* MONTH

REMINISCING

Thanks for the memory of twenty-seven years of radio. I have had many a headache and many a heartache, but I've never been bored.

Memories of my first earphone and crystal, and the faint signals of a far off navy station (120 miles). Of trees, chimneys and poles used to support long stretches of aerials. Of ships with one-wire aerials, and ships with four masts and an aerial 350 feet long with thirteen wires.

Memories of irate captains and worse passengers, of broadcast listeners as impossible as both. Of storms that battered us for days and days until we ached all over from the very effort of trying to hang on to chairs, tables, bunks, receivers and rails. And a frantic captain demanding weather reports.

Memories of trips I have made across the North Atlantic in midsummer when the whole sea was as smooth as the quietest harbor. Memories of a winter trip from Rotterdam to New York when we took 21 days for the voyage, with provisions for only 14, and the second day out the refrigerator broke down and we dumped all the fresh meat over the side. Twenty-one battered, shaken days they were, when we ran full speed ahead but were pushed back five miles a day.

Pleasant memories of a thirty-two-day run from New York to Buenos Aires, days of calm lazy weather, warm days with sunny skies. When for five days off the eastern tip of South America I couldn't hear a signal on the receiver. Which recalls those funny static-like sounds made by the French Carpentier sets, a twenty-five cycle spark, straight gap. What a honey that was; decrement way up in the thousands.

Memories of the beautiful clear bell-like tones of a Federal Arc on 600 meters, with a chopper. If you listened with a good crystal, it was almost music. Of the powerful blast of those British naval sparks that always started up with a high power warning as they pulled the gap open and turned on the air blast. About fifteen kw. on 600 meters, Malta, Lands End, and Gibraltar. And the broadness of the Telefunken sparks and the Japs. Or maybe it was our receivers. I recall the operator on the Chilean ship who asked me, "Please repeat the last part as my magnetic detector ran down."

With a pet crystal, I have copied press and war warnings from old NAA, 100-kw. spark, at distances of 2000 miles. And that old wartime press. "The American troops have taken hill 61." It had been ten months since we had seen any American newspapers. From old NAA I have copied the time signal off both coasts of South America, when I had to lie in my bunk, put a pillow over my head and hold my breath, praying that a static crash wouldn't knock out the crystal. All that just to get the faint time tick, so vital to navigation.

What a struggle we operators had to sell the idea of the radio compass to the captains. Only when we nearly hit the coast of Ireland was I able to convince one skipper he was two hundred miles north of his dead-reckoning course.

I recall the beauty of the river and its majestic sweep at Buenos Aires, the calm grandeur of the harbor at Rio de Janeiro. And I have lain five miles at sea and loaded oil on tankers from hoses stretched out on the shallow bottom. I recall the wondrous beauty of the Panama Canal, with its green mountains and immaculate cleanliness, in contrast to the heat and dust and winding route of the Suez and the cold and steep sides of the Kiel.

I have ridden camels to the Pyramids, climbed the Andes, visited the Shrines at Kyoto, burned prayers in the temples of China, looked down into the volcano at Kilauea, surf boarded at Waikiki, been to the Lido at Venice, hunted alligators in Florida, and walked up the Mount of Olives.

All because of this radio business, I have gambled at clubs in New York, at Rio de Janeiro, Monte Carlo, Montevideo, Havana Shanghai, Alexandria and Tampico.

I have eaten the finest foods of Europe, and I have been a beachcomber. I have lived at the Adlon in Berlin and the Claridge in Paris

BY AN OLD TIMER

and the Astor House in Shanghai. I have walked among the starving thousands of Europe and Asia, stricken with famine and plagues. I have lived in luxury and I have worn the finest tailored clothes. I have been down to my last dime when I didn't even own a coat.

I can still hear the clatter of heels on the stone streets of the Rio Branco, and the clump of the wooden shoes of Holland and Belgium. I relax at the very thought of the calm, slow movement of the waters of the river at Bordeaux, France, after a war-weary crossing. And the seventeen SOS and ALLO calls we received on our last trip across, just as the armistice was signed. I'll never forget the first great thrill of that armistice message, and then the reaction, "What will I do now?"

So I stuck to radio and traveled, 176,000 miles in the next three years. I recall a Christmas dinner on the Western Ocean (North Atlantic to you), when for three days we ate nothing but cold corned beef and canned peaches and tea. I recall one steward that fed us tapioca pudding for lunch dessert twenty-one days in succession. I hope I never, etc.

Once I grew fat on the elaborate menus of a transatlantic liner. Once I ate the best food on a coal boat. Once I ate the least on a destroyer. (Too seasick.) We once spent sixteen days crossing from Southampton to New York, with 1300 passengers on an old wreck that should have been burned before I was born, and my friends wondered why I drank (so much).

I can remember my first radiophone signal, from an airplane, in 1917. I have heard arc transmitters modulated and sounding presentable. A lot of ham rigs sound worse today. I have zealously guarded the one bit of galena that really worked, and I have just as carefully guarded the one carbon mike at an early broadcast station.

I have memories of long watches at sea, of the listening to distant signals and the feel that they were just next door. Of friends of the air that I knew by their fists but never met. Of friends that I saw die of disease and disaster. I once read the funeral service for a dead passenger when the captain was too drunk and the mate couldn't speak good English. And where the weights came off the sack, the body floated away on the waves.

I have seen the poverty of many of the peoples of the world and wondered at the hopelessness of their fate. I have waded in the Mother Ganges, seen the dead floating down the river at Shanghai, seen the blood of innocent people running in the gutters of Italy, Germany and the Argentine after revolutions. And I laughed at the dignity and seriousness

[*Continued on Page 93*]

What's New . . . IN RADIO

NEW RECEIVING TUBES

RCA has announced four new metal receiving tubes of radically new design. These new tubes have characteristics similar to well-known metal types but are "single ended"—all elements including the control grid being terminated at base pins.

As a result of this new type of construction, the new r.f. amplifier pentodes 6SJ7 and 6SK7 have the same grid-to-plate capacitance as the familiar 6J7 and 6K7 but have lower input and output capacitances. The low grid-to-plate capacitance is made possible by a new type of interlead shielding provided by a conical shield within the tube base. A further reduction in grid-to-plate capacitance is provided by bringing the grid and plate out to diametrically opposite base pins. The control grid pin is also so located as to be shielded from the heater pin by the suppressor pin, which is normally at ground potential. This arrangement minimizes the capacity coupling between the heater and grid, thus reducing the hum voltage picked up by the grid.

To reduce further the interelectrode capacitances, a section of the internal tube base shield is brought down inside the base locating pin. This construction not only shields the diametrically opposite base pins but also reduces the capacitance between opposite socket terminals. In fact, a capacitance of 0.005 $\mu\mu$fd. existing between diametrically opposite socket terminals may be reduced to the extremely low value of 0.0001 $\mu\mu$fd. by inserting the shielded locating pin in the socket.

The principal advantages of the new r.f. pentode tubes as applied to high-frequency receivers are the reduction of fixed shunt capacities across the grid and plate circuits and the reduction of undesirable regeneration in r.f. and i.f. stages made possible by the short, direct grid leads which the new tubes allow.

The new r.f. pentodes also have somewhat higher transconductance than the corresponding capped types, which also adds to their desirability as r.f. and i.f. amplifiers.

6SJ7 and 6SK7

The 6SJ7 and 6SK7 are metal-ended sharp cutoff and remote cutoff. r.f. pentodes, respectively, featuring reduced input and output capacitances and increased transconductance as compared with the 6J7 and 6K7. They both have 8-pin octal bases which fit the standard octal socket.

6SF5

The 6SF5 is a metal single-ended high-mu triode with characteristics similar to those of the type 6F5. It has a 6-prong octal base.

6SQ7

Another new single-ended tube is the 6SQ7, which is a metal duplex diode high-mu triode. This tube has shielding within the base between the grid and heater leads which aids in reducing the hum voltage picked up by the grid. The electrical characteristics of the 6SQ7 are similar to those of the 6Q7 and the 75. It has an 8-prong octal base.

The VR105-30 and VR150-30

RCA has also announced two new cold-cathode, glow-discharge tubes, the VR105-30 and the VR150-30. These tubes are intended for use as voltage regulators where a constant d.c. output voltage is required for varying values of load current. The VR105-30 provides a regulated voltage of 105 volts while the VR150-30 provides 150 volts. The maximum allowable current through the tubes is 30 milliamperes. Both have 6-pin octal bases.

•

ISOLATION TRANSFORMERS

A new line of isolation transformers with plug-in connections to meet line requirements has just been announced by Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago, Ill. These transformers have an electrostatic shield between primary and secondary for elimination of line noises or to keep r.f. energy from traveling from the transmitter back into the supply line. They correct high or low line voltages to 115 volts by the plug arrangement which allows the transformers to be used on lines delivering 105, 115 or 125 volts. The units come in 100, 250 and 500 v.a. capacities.

●

DUAL ULTRA-MIDGET CAPACITORS

The Solar Mfg. Corp. announces that its midget electrolytic capacitor the "Minicap" line now includes dual unit types. A high capacity dual-unit capacitor in this line occupies very little space. Descriptive literature on this line may be had upon request from the Solar Mfg. Corp., 599 Broadway, N. Y. C.

●

NEW LINE OF SEALED TRANSMITTING CAPACITORS

Announcement has been made by Cornell-Dubilier Electric Corporation of the introduction of the new TQ series of transmitting capacitors. Hermetically sealed in round drawn aluminum containers, these capacitors are filled with non-explosive and non-inflammable dykanol. Dykanol is an impregnating medium of exceptionally high dielectric strength and constant and is the same medium as used in the large TJ-U types of capacitors.

The TQ series are available in ratings from 1 μfd. 600 volts to 2 μfd. 2000 volts d.c. rating. Complete details are given in the new catalog no 161 now available at the main office in South Plainfield, New Jersey.

●

Radioddities . . . .

W1LBP is named *Ohm.*

●

W8*CW* is a code speed champ.

●

The one-ohm standard at the U. S. Bureau of Standards is accurate to one part in a million.

●

Approximately one-quarter of the U. S. hams are located in the ninth call area. The fourth and fifth areas are the smallest in population.

●

W1KRB should be FB on phone. The station is located at an *oral* school.

The Open Forum

Little Aubrey

Burbank, Calif.

Sirs:

It makes my blood boil to read the letter of C. C. Stephens, Jr., in the June issue. He knows good and well that there isn't anyone like "his" little Aubrey. And why should he berate newcomers to radio? Just because he was born before the rest of us young hams and prospective hams and therefore could get into radio first, doesn't mean he should have a controlling interest, does it? I dare say he wasn't any good when he started out. I'm afraid I'll have to let the rest of my opinions go unexpressed as far as this man is concerned.

I think A. M. Croft (June, 1938, RADIO) has the right idea about phone and c.w. exams. In fact, I think that would be the ideal way. What is wrong with separate bands for each and special tests for each? Nothing, in my estimation. As Mr. Croft says, "No modulation or speech knowledge should enter the thoughts of the c.w. men, but it most certainly should for the phone men. The same thing applies to things like key click filters, etc." Yes Sir, that's the way to have it.

Roy Wheadon (also in June RADIO) raises the point that c.w. men would be valuable to the army and navy during war time, while phone men wouldn't. This may be true but why should we look forward to war? Dictatorships train people for war, but I certainly hate to think we live in a dictatorship, although I guess we do as far as radio goes. Besides, isn't there enough interest in dx to keep enough c.w. operators in reserve without having to make sure of war material by regulation, through the test?

I think the idea of taxing a station's power is o.k., but the cycle coverage is out! That would just about run a person bankrupt. This might possibly be o.k. if the phone stations were operating right in among the c.w. ones, but with separate bands, you can't figure how many c.w. stations would fit in where that phone is, but figure how many phone stations would fit in where that phone station is. Wouldn't this be logical? Besides that, what he proposed to pay is outrageous!

K. A. Fichthorn (June RADIO) brings up another good point, that of consolidating the phone and c.w. bands, especially on 20 meters.

Move phone to one end and c.w. to the other. His criticism of 80- and 20-m. phones is justified, as anyone listening to this band can tell on nice summer evenings. As for Mr. Fichthorn's idea of a freedom: if we had true freedom, there wouldn't be any license test at all, but a regulation to safeguard the hams.

All in all, though, I don't think there is so terribly much wrong with ham regulations, requirements and restrictions. If we had a wide-awake, fast-thinking and acting F.C.C., we might even be able to eradicate the things that are wrong.

Remember, you can always try something, and if you don't like it go back to the old way.

London Allbright

●

After the SK

Woburn, Mass.

Sirs:

Just a few words regarding Eric Ledin's most illuminating article, "After the SK" (May, 1938, Radio).

The figures quoted certainly are astounding, and if everyone could only read it and do something about it (as I did), such a condition wouldn't exist.

Being just a "church-mouse" ham, such terms as dx, w.a.c., w.a.s., etc., were practically unknown quantities to me, but last fall I was on 10 meters for two days (thanks to W1EHT) and was surprised at the way "outside" contacts could be made. Then I promptly forgot about the "interlude," thus making an aggravating situation worse (very little to be sure).

Upon reading the article, I recalled the splurge last fall, so sent in an envelope, and sho' nuff, a few days later it came back, and when I opened it, was I surprised!

To me (as to most hams, I think), receipt of a QSL, even if it's only from the next town, gives a contact a more or less personal aspect, just as though one were shaking hands with the sender.

The large number of cards awaiting delivery makes the statement (I quote) "That there are hams so blasé as to be bored with foreign cards is hard to believe," only too true, and I'm glad I've done my part toward relieving the situation.

To me, QSL's are just as important as keeping the log, and I always see that a card goes out for every one received; unfortunately, too many hams are very lax regarding QSL's, and I find I've averaged only about 40% on returns, so I don't wonder the situation is as bad as it is.

Iver Paulsen, W1GGH

[*Continued on Page 93*]

VP3THE

[*Continued from Page 21*]

caused them to stall, throwing us into darkness. We had to grab our flashlights and rush madly into the rain in our pajamas—which were our usual evening attire—in an attempt to get the engines dried and back into operation so that we would be back "on the air" before the fatal cue. Might I add that Mac and I were thoroughly drenched and rather cold by the time we were able to get the engines going, which we did in the nick of time.

On the program Mr. Linton Wells asked, "How is the heat tonight?" The answer was to have been, "As usual, about 120° in the shade." But you can imagine just how much quick thinking we had to do when we got back "on the air" and got our contact with Mr. Wells, to let him know that we were soaked to the skin, and so cold we could hardly keep our teeth from chattering. Nevertheless, we went through our program without a hitch.

On January 4, in our contact with the advance party, they informed us that they were breaking up, and inasmuch as they would be on the Essequibo River, there would be no occasion to use the radio further for any contact work, as they were not passing through the territory where we were situated. We were left to ourselves to make our way out of the country back to Georgetown.

We stayed on the air until January 15, making arrangements for foodstuffs to be sent up the Essequibo River, to meet the other party going down, and to make advance arrangements for our own movements. We were fortunate on about the 11th of January to receive a sufficient supply of gasoline so that we were continually on the air in contact with amateurs until the morning of the 15th, when we pulled the big switch. Neil and I then proceeded to dismantle the equipment, pack it up, and make it ready for transportation by bullock cart down to John Melville's place, Witchabi, on the Rupununi.

As to weather conditions in this particular part of the tropics, there is a dry season and a wet season. When we had come up the river, we were on the tail end of the wet season, and all of the rivers were filled with water. However, now we were in about the center of the dry season; and what had once been a large body of water was now a mere stream—just a splash of its former self. This had left our boat high and dry, and not in a position to make the trip down the river for several months, when the rainy season would return again. So we were forced to seek some other means of getting down the river. As Mac and I had suffered somewhat from a continuous diet of canned food, which also had dwindled in the last month to a very limited variety, we felt that if we could spend some time in Mauradi Mountain, which was situated about 30 miles from us in the jungle, we knew that there we would be able to get an abundant supply of bananas and pineapples. So, after seeing our equipment well on its way for Witchabi, Mac and I headed for Mauradi Mountain. There are several miners working gold claims on this mountain, among them Dr. Davison, a canny Scotchman, and Mr. Ashburner, a very likable Englishman.

Possibly some of you amateurs will recall the voices of both of these gentlemen, as we had the pleasure of a visit when we were still operating our station; and they enjoyed several QSO's with amateurs, both in the United States and in England. We stayed as the guests of Dr. Davison for about a month, during which time we consumed a great many bananas and pineapples. Today I do not seem to have quite the fondness for bananas that I had previous to my visit to British Guiana.

While at Mauradi, we discovered that one of the miners had intentions of returning to Georgetown, and also had a small boat situated somewhere down the Rupununi. This seemed a logical way for us to travel out of the country, and we immediately negotiated arrangements with him for passage to Georgetown.

After approximately a month at Mauradi, we heard that the mining party was starting from the Rupununi. So, through the efforts of Dr. Davison, we were able to obtain a couple of pack bullocks to carry what food we had and our hammocks, and Mac and I started out, heading for the Rupununi River and civilization.

Our first day of travel from Mauradi brought us out of the jungle and to the edge of the savannah country. We swung our hammocks resolving that on the morrow we would make an early start, as we had been warned that it would be practically impossible for us to travel during midday because of the tremendous heat of the open savannahs. Therefore, dawn found us on our way. After an uneventful day of walking we arrived at a small Indian village, Asherton, where we spent the night. There was quite a large pool here, which was probably the reason that the Indians had established a village at this spot. A swim in this pool was certainly enjoyable after our hot day of hiking.

The next two days were spent plodding in a northern direction, heading for a mountain which we knew was on the Rupununi River.

Late in the afternoon of the third day we arrived at Dadnew where we were joined by the miner with whom we had made arrangements for our river travel.

The following morning we all started out as a body and that night we arrived at Sand Creek. The next day brought us beyond the landing that I had made from the Rupununi on my way up with Mr. Melville. At this point the Rupununi had practically disappeared, leaving just a large, dry gulch. Two more days were spent walking down the river bank before we came to the miner's boat. This boat proved to be about 21 feet long, 4 feet wide, rounded from end to end, built like a canoe. When I first saw it, I had misgivings as to whether we would all be able to travel in it, since besides Mac and myself, there were ten in the miner's party. But, somehow or other, we were able to pack everybody in; and the following morning found us on our way down the Rupununi.

Our first few days were spent in pushing and pulling the boat over sand bars, and night found us so exhausted that we just tumbled into our hammocks without bothering to erect any shelter. The third night on the river brought disaster because of this practice. Just as we were nicely settled, a tropical rain came up and soaked our entire camp. We put up a tarpaulin as best we could, but secured very little sleep the rest of the night.

The following morning it was still raining. The Indians assured us that this was unusual weather, and they felt quite confident that it would not continue. But I don't believe that for the next ten days we saw more than a few hours of sunshine, just drizzle and rain.

After seemingly endless days and nights of rain, Bartica began to take form in the distance through mist. We pulled into the dock late in the afternoon, feeling that we had at last arrived at "civilization."

A warm shower, dry clothes and a good meal made our 158 days in the jungle a pleasant memory. The following day we took the steamer to Georgetown and thence by plane to Trinidad and Miami. VP3THE had been a wonderful experience, but it surely felt good to have my two feet on "W" territory once again.

A 5- and 10-Meter Converter

[*Continued from Page 26*]

low the 49-meter broadcast band.

All in all, the converter has been tried on about eight entirely different types of receivers of widely different vintages and the results on all of them have been startling. Two of the receivers (jaloppy "skid band" affairs) were almost useless on the 7-Mc. band by themselves, but they seemed to make very good i.f. channels when the converter was worked into them. The converter puts such a strong signal into the receiver into which it is operating that almost any receiver will operate satisfactorily. And when the unit is operating into a really good communications superhet—it will pull in signals you never knew were there.

The converter is quite versatile in that it requires practically no effort at all to connect it to any receiver. Merely disconnect the antenna, connect it to the converter, and connect the output of the converter to the input of the receiver. As a matter of fact, it is not absolutely necessary that the receiver be tuned to the vicinity of 7 Mc.; a lower output frequency may be used providing the oscillator coil is changed, but the image rejection will not be as good.

As the performance of the best receiver can be improved with a good antenna, so will this converter give best results when an antenna worthy of the name is used. The antenna should preferably resonate near the frequency of operation and have a balanced, low-loss feeder system. A transmitting antenna designed for use on the same band usually fulfills these requirements for a good antenna.

Low-Cost Medium Power Transmitter

[*Continued from Page 35*]

Performance

With 1500 volts on the plate of the 35T and a plate current of 150 ma., the output will be about 175 watts when operating the tube as a straight amplifier. When doubling, the efficiency will drop to about 60 per cent. This necessitates reducing the input to about 150 watts. The output then becomes 90 watts.

These efficiencies and outputs are easily obtained on all bands from 80 meters to ten meters. Using a good antenna, the output of the rig should be sufficient to enable the builder to make his WAC without any difficulty. In two evenings all continents were worked by W6NLZ using this particular transmitter.

When the desire for a super-power rig makes itself felt, this transmitter need not be discarded for it has more than sufficient output to do an excellent job of driving a kilowatt final stage.

Getting Ready for the New Regulations

[*Continued from Page 38*]

Frequency Measurement

Section 152.44 requires the amateur licensee to provide means for measuring the frequency of his transmitter and to establish procedure for checking it regularly. The devices must be independent of the regular frequency control equipment in the transmitter. All of which means that the transmitter crystal frequency must not be taken for granted.

A reasonably simple electron-coupled frequency meter-monitor calibrated from the amateur standard frequency transmissions at regular intervals will serve in most cases. The same care must be exercised in the building of the oscillator section of this unit, however, as recommended in the case of the oscillator section of the m.o.p.a. transmitter described earlier in this article. It is advisable to permit such a frequency meter to "warm up" for at least two hours before use. It is exceedingly poor practice to use a receiver alone as a frequency meter.

The advanced amateur who desires an instrument of great accuracy which is serviceable also for general frequency measurements where a high degree of accuracy is required, such as in crystal grinding, experimental and experimental broadcast station use, and general laboratory operations, will find the lineup shown in figure 3 admirably suited.

The frequency meter-monitor section is a well-designed and constructed electron-coupled oscillator run well below the maximum ratings of the tube. It feeds into a resistance-coupled audio-frequency amplifier to eliminate undesirable effects produced by insertion of the indicating device which may be a pair of headphones or an electronic zero-beat indicator. The built-in calibrator section is comprised by a 100-kc. crystal oscillator, preferably temperature controlled, and a 10-kc. multivibrator. This instrument will give calibration points every ten kilocycles throughout the amateur spectrum. The entire unit may be calibrated periodically by checking a harmonic of the calibrator against the 5,000, 10,000 or 15,000-kc. transmissions from the U. S. Bureau of Standards station WWV, or against *any* broadcast station. Broadcast stations remain within a frequency tolerance of plus or minus fifty cycles and are spaced at 10-kc. intervals throughout the broadcast band. They are extremely useful for calibration at all times when WWV is not on the air. Means can be provided for correcting the frequency of the 100-kc. standard during such calibration periods. Such a de luxe frequency meter will be described in a forthcoming issue of RADIO.

Modulation Measurements

The simple diode rectifier type of modulation monitors suitable for the indication of carrier shift or for monitoring the modulation quality with headphones, is familiar to every phone operator. This apparatus is noted for its extreme simplicity and trifling cost.

The amateur who wishes more refined modulation monitoring equipment capable of indicating the actual percentage modulation will find material on this subject in back issues of RADIO[1].

[1] *A Percentage Modulation Meter.* Tucker. RADIO, Feb. 1937, P. 56.
A Broadcast Type Modulation Indicator. Jones. RADIO, Oct. 1938, P. 41.

Postscripts and Announcements

[*Continued from Page 62*]

If a high-impedance primary is used in the transformer that couples the r.f. stage to the first detector, the plate circuit of the r.f. stage may become resonant within the tuning range. In this case, 10 micromicrofarads connected across the primary, or adding a few more turns of wire, should move the resonant frequency out of the tuning range. The primary of the transformer can generally be moved about 5 per cent farther from the secondary, due to there being less load on the primary with the new r.f. tube and consequently a tendency to overcouple.

With the 6K7 in a commercial receiver there was no gain at 56 Mc. Using the 1851, a stage gain of 5 could be obtained in the laboratory and a gain averaging about 3 was obtained in production receivers.

SCRATCHI TO RETURN

The inimitable Scratchi will return next month after a prolonged absence. Don't miss him in the January issue.

The Mighty Mite De Luxe

[*Continued from Page 39*]

rack mounting. The square meter shown is of the same range as described in the original article, 0-100 ma.

Circuit improvements include a variable-impedance modulation transformer which works out very well in this transmitter, effecting a perfect match between modulator plates and the r.f. load.

Other circuit refinements include the addition of a toggle switch, s.p.s.t., (shown just to right of crystal on front panel), which places an additional capacity of .00025 μfd. in a fixed mica condenser across the regeneration condenser in the oscillator circuit. This is used when *less* regeneration is desired in the circuit than on low-frequency bands. A 4000-ohm, 10-watt resistor is also placed in series with the plate circuit of the 6F6G oscillator, between the r.f. choke and the meter switch, to reduce plate voltage for more stable operation. Careful adjustment of the screen voltage will effect perfect control of the oscillator for all-band operation.

In the 807 amplifier stage, the author suggests a change in the size of cathode resistor, originally described as 1250 ohms, to 500 ohms, of the same wattage rating, 10 watts. This permits heavier loading, yet still protects the tube from overload when used as a c.w. transmitter when excitation is intermittent.

Two panel lights have been added; one is connected to the filament circuit to show when a.c. is applied, and another is turned on at the same time the plate voltage is applied, by use of a d.p.s.t. toggle switch, utilizing the other half of the switch to light the panel bulb from filament current. It will be seen that there are four toggle switches on the front panel. These are accounted for in the following order from left to right: first is the added switch for the crystal regeneration circuit, next is the a.c. switch, followed by the d.p.s.t. plate power switch, and lastly the modulator-speech switch which is thus moved from the back part of the chassis to the front panel for symmetry.

This little job has provided a range of 3000 miles on 10-meter phone and is very flexible. In one instance, it is being used as a desk exciter to operate three linear amplifiers on as many different bands.

Voice-Operated Break-In

[*Continued from Page 40*]

of the 55. The d.c. potentials appearing across them cause the triode plate current to decrease to cutoff. The resistor through which the plate current is drawn, is the normal oscillator grid leak in the transmitter. In the no-bias condition the 55 plate current should cause sufficient drop through this resistor to block the oscillator completely. Then when the mike is spoken into, the rectified voice current causes the triode plate current to drop to zero and the oscillator starts instantly. This action is so rapid that reports received tend to indicate that the carrier invariably comes on without losing a noticeable fraction of the first word.

The purpose of the condensers C_1 and C_2 is to introduce a lag of approximately one-half second after the voice has ceased before the carrier is turned off. This prevents the transmitter from going on and off with each syllable; it holds on until the modulation ceases and then disconnects after a short interval. Condenser C_3 can be made larger than 0.1 μfd. for the more leisurely speaker. Two μfd. will delay ceasing of oscillation about three seconds. It is important that C_1 is not made larger than .01 μfd. or the carrier will not come on quickly enough.

Note that the plate supply of the 55 has its *positive* terminal grounded and that the cathode is maintained at a potential of between 150 and 250 volts negative in respect to ground. This plate potential may be obtained from the same power supply that delivers C bias to the transmitter. An old B eliminator might be used just as readily. The current demand is but a few milliamperes and regulation is of no particular importance. The filament supply can be obtained from the speech amplifier power unit or any other available source. Of course, the various stages of the transmitter must employ some form of fixed bias or else must use tubes of the zero-bias type.

Controlling the Receiver

Combined with this hookup is that of a circuit appearing on page 26 of the September, 1935, issue of RADIO and reproduced here in figure 2. This arrangement is used to block the receiver when the transmitter goes on. It has been found to be absolutely clickless in operation.

High Wind and Water

[*Continued from Page 29*]

W1KOF, W1KOG, W1KRF, W1KRQ, W1KSO, W1KTH, W1KUG, W1KWA, W1KXA, W1KYK, W1KXI, W1KZN, W1LAB, W1LCH, W1LDL, W1LDM, W1LKH, and W1LLC.

Boston Area

W1SS reports that Arlington, Mass. lost its power in the afternoon of the twenty-first. Later, he drove through the darkened city among fallen and falling trees to the water tower hill, overlooking Greater Boston, to carry on portable five-meter work. He heard W1LDD, W1LMG and W5CSU/1, learning from the latter that Cambridge still had power and that the Mass. Tech. station, W1MX was in operation.

At W1MX, W1KLV was handling Western Union messages. W1SS installed a 5-meter set at W1MX and he, his son and W5CSU/1 operated steadily until 2 a.m. W1SS and his son stayed on until 8:30 a.m. next morning when relief operators arrived.

Returning to Arlington, W1SS found that power was on at his home station, since it was on the same line as the local hospital. He then organized a five-meter net including W1AR, W1DEI, W1GKA, W1GZ, W1HRE, W1HXK, W1ILB, W1JDO (mobile), W1JLI (mobile), W1JSM, W1KMQ, W1KUD, W1KYZ and W1PI. In addition to operating on five meters, W1GKA-W1HRE routed traffic on 80, W1KMQ on 80 and 160, W1ILB on 20, W1PI on 80 and 160, W1JSM-W1GZ on 80 and W1AR on 75.

Each station collected messages and called W1SS by telephone or on five meters to have them routed. No station had to hold a message longer than forty minutes. Eight mobile outfits were kept in readiness to go to Worcester in three cars, but no call for them was received by W1SS or his co-worker, W1BAQ.

The net covered sections of Massachusetts,

W2ADW handled 230 emergency messages at Westhampton and Montauk, L. I.

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New Hampshire, Rhode Island and Connecticut. A total of 456 messages were handled in fifty-seven hours.

Hartford

During the peak of the emergency, Hartford's power was preserved but East Hartford was in darkness. The radio section of regimental headquarters company, 169th Connecticut National Guard Infantry, was ordered out on the night of the hurricane to contact authorities at New London.

Using the company calls, W1FE and WXAP, communication was established with Brooklyn (N. Y.) Navy Yard, which in turn QSO'd a destroyer in New London harbor for relay. Frequencies used were 4035 (army), 3763, 3640, 3508, 7056, 7094 and 56 Mc. The unit was on duty for six days and nights and handled 677 flood, fire and hurricane messages between Hartford and New London.

A great deal of Connecticut traffic was pushed through on five meters to W1AOK who established a five-meter state net. For some time, W1FE was the only Hartford station in touch with Westerly, R. I. and Norwich, Conn. W1FE had a direct route to Boston through shortwave broadcast station, W1XAL, the latter taking many press dispatches and requests to the Boston Army Base for supplies for the Hartford troops.

W1FOO handled traffic at the state police barracks in Hartford and W1HJW operated at the Red Cross headquarters.

Long Island, N. Y.

Portions of Long Island suffered severely. Fashionable resorts were almost totally demolished. At the time of this writing, extensive public works are being projected to restore Fire Island, dear to hearts of the radio old-timers.

At Westhampton, N2ADW set up an antenna on the town hall in thirty-five minutes on the afternoon of September 22 and QSO'd his headquarters, N2KGQ at the post office in Riverhead. Continuous watch was maintained at the town hall until 8 p.m. September 23, when reliable telephone and telegraph service were restored. 118 Red Cross, state police and Western Union messages were handled with the aid of Boy Scout and Sea Scout messengers.

N2ADW moved to the Montauk railroad station on the morning of the twenty-fourth and in forty minutes had established communication with his headquarters from this point. Almost continuous watch was maintained here until 7 p.m. the following day, when telephone service was restored. 112 messages, including a great deal of railroad traffic, were handled from Montauk.

The men who operated both the portable and headquarters stations were NCR members. The portable transmitter was used previously on several NCR problems and consists of a 6L6 Jones regenerative crystal oscillator powered by a battery-driven 250-volt genemotor. The transmitter has a power output of 7 watts; and transmitter, receiver and genemotor are mounted in the same cabinet. The frequency used was 2744 kc.-allocated for NCR drills.

Rye, N. Y.

W2EOA and his x. y. l. W2HXQ went on the air pointedly on the afternoon of the twenty-first to see if the ninety-mile gale blowing through Rye meant QRR. They operated continuously from that Wednesday until 4 a.m. the following Monday, relieving each other and nursing the two "junior ops" who were both down with chicken pox.

Most of the traffic was cleared on 160 and 75 with W1ADM, W1AR, W1ASD, W1AYS, W1BEJ, W1CBS, W1CPI, W1DAV, W1EL, W1FOF, W1FQV, W1ICY, W1IGS, W1IM, W1IPU, W1KDK, W1KER, W1KSH, W1KTE, W1LGZ, W1SZ, W1ZS, W2IXY, W2JZR, W2KBO, W2KSH, W2KYH and W2LNU. During the interruption of telephone service in New England, W2EOA and W2HXQ ordered typhoid vaccine and other medical supplies for the town of Ware, Mass., which was totally inundated, through W1IGS. They were also the only contact link between seven men marooned in the Ware, Mass. telephone building and their home office in Springfield, Mass. 842 messages were handled for the A. R. R. L., Coast Guard, F. C. C., National Guard and Red Cross.

W2EOA is engineer-announcer for broadcast station WOR and when his station sent a mobile unit (WBAN) into the New England area during the emergency, W2EOA was the medium of contact.

Name Your Grid Current

[*Continued from Page 41*]

The writer's problem was limiting the output of a multiband oscillator which, operating with a forty-meter crystal, had just enough output on ten meters to drive a tetrode final amplifier in a portable transmitter. However, on forty and twenty meters, there was excitation to burn.

The obvious solution, of course, was to limit the output of the oscillator. One scheme is to use a variable condenser for coupling between the oscillator and the following stage. This is unwieldy, mechanically, and usually means long leads. Another scheme is to use a heavy duty variable resistor in series with the plate supply lead to the oscillator, as one of the commercial transmitter concerns did in one of their portable rigs. Such resistors are expensive, however, and are a part of which few "junk boxes" can boast.

A third scheme, and the one chosen, is to control the output of the oscillator by varying the screen voltage. This works very smoothly, and since the screen current is relatively low, a twenty-nine-cent resistor of the "volume control" variety will serve as the control. Simply turning the knob allows varying the excitation to the next stage from two milliamperes grid current up to as much as the oscillator will put out. Thus, when working straight through on the crystal frequency, the control is turned so that the oscillator output is considerably less than that actually available. For second and fourth harmonic operation, the control is advanced. Grid excitation to the next tube can be held at a constant value for three bands; in the writer's transmitter, grid current is held at six milliamperes for ten, twenty and forty meters.

Keeping the oscillator screen voltage at the lowest value which will furnish sufficient excitation to the next stage has several incidental advantages. In the first place, limiting screen voltage limits oscillator plate current, a valuable feature in portable work when an extra ten mils may overload the already groaning vibrator or genemotor power supply. Also, crystal current drops off very rapidly as screen voltage is reduced; thus the oscillator can be operated with a minimum of crystal heating. For example, if you are experimenting with a multiband super-harmonic oscillator, which may be a *little* hard on crystals, you can tune it to resonance with the control retarded so that crystal current remains low. Then, once the thing is tuned up, the control can be advanced until proper output is obtained from the stage while keeping an eye on the dial light bulb in series with the crystal to keep the crystal current below the point where the lamp shows color.

Controlling output by varying screen-grid voltage is by no means limited to oscillators. Amateurs using rigs which have high-power tetrodes in the final can add the control to the driver stage, if it is a pentode or tetrode, and protect the high-priced "bottle" from overexcitation. Few exciters have the same output on different bands; for ideal operation they can be designed for more than ample output on the highest frequency band which it is planned to use and then the output cut down to give the desired grid current to the final on the lower frequency bands.

Simple Tubular Antenna

[*Continued from Page 43*]

sion line have been adjusted to the frequency used.

Supporting the Vertical Antenna

A simple and inexpensive method of supporting a vertical radiator is used at W6CLL. The lower end rests on a 2" x 4" stake driven into the ground and the other support is the roof edge of a small porch. Placed on a roof, it could be supported by light guy wires or cotton rope.

If the steel tube sections are to be used as elements in a rotatable array, any of the conventional methods of support will be quite satisfactory. It may be necessary, however, to use slightly longer ferrules and to telescope the tubing together somewhat more than is necessary when using the sections for a vertical.

Radio Aids to Air Navigation

[*Continued from Page 47*]

sending unit passes a beam of light over this tape and converts the reflected light into impulses which are sent over the usual radio transmitter. The receiving set converts these impulses back into light and exposes a piece of sensitized paper. A speed of 76 words per minute has been attained during tests and, although static sometimes blurs some of the characters, the messages are always readable.

●

Pep 88 (whew!) is a popular Intermountain States gas. *"DX"* is sold in Chicago.

●

Another novel application of radio equipment—a machine for finding real and complex roots in high-degree algebraic equations.

Tracking Down the Decibel

[*Continued from Page 50*]

suppose we substitute in the formula and see just what will happen:

$$\text{db gain} = 10 \log_{10} \frac{6.5}{2}$$
$$= 10 \log_{10} 3.25 = 10 \times .511$$
$$= 5.1$$

By this we find that we will have an increase of only 5 db and unless we compared the two volume levels directly we would not notice any great difference. The change certainly would not justify going to very much expense.

Reference Level

In the true sense, the decibel is a *ratio* and has *no set value*. But by agreement of engineers a power value of 0.006 watts has been set arbitrarily as *zero level*. This means that 0 db is equal to 6 milliwatts and this is used as a reference level from which to work. Any power less than the 0.006-watt zero level is rated in terms of *minus numbers* or "db down." Power levels *above* the zero mark are measured in terms of *positive values* or "db up."

By using a reference level such as this, microphones and other types of generators may be given a comparative rating. A carbon mike may be rated at —45 db and a certain dynamic mike may carry a rating of —85 db level. The output of an amplifier also may be rated in db, which means that the maximum output is that many db above the zero level of 0.006 watts.

The range of hearing of the human ear extends from the *threshold of audibility* to the threshold of feeling, which is the point at which the vibrations can be felt by the nerves as well as heard by the ears. This covers a range of about 80 db or a power ratio of 100,000,000 times. It is possible to increase the sound intensity to the point where the pressure of the waves becomes so great that the sensation becomes one of pain. At this point the range has been extended to about 120 db above the threshold of audibility.

In common speech the sound level ranges from a whisper, which is about 20 db, to common speech at about 40 db. With a maximum of lung power and a minimum of brain power, a level of 50 db above the threshold of audibility can be reached vocally.

Neon-Bulb Voltage Regulators

[*Continued from Page 52*]

Voltage Regulator Applications

Since the tubes are seldom used with $R_L = \infty$, the graphs show the characteristics with various values of R_L that might be encountered in practice. At points where the R_S and R_L lines cross, the voltage supplied to the load, E_L, and the current through R_S are given. For instance: if, as at the point marked A in figure 1, $R_S = 5000$ ohms and $R_L = 10{,}000$ ohms, then $E_L = 144$ volts.

If operation at applied voltages other than 250 volts is desired, a new R_S line is drawn from the new value of E_B parallel with the same R_S line on the graph. This is shown for $E_B = 200$ volts by the dashed line in figure 1.

From these graphs the variations in E_L due to changes in R_S, R_L and E_B may be found. The most important characteristic is the variation of E_L caused by a given variation of E_B. This variation may be determined by projecting lines vertically to the abscissa from the two operating points, A and B, determined by the maximum variation of E_B. Thus, in figure 1 a variation of from 250 to 200 volts in E_B will cause a variation of from 144 to 125 volts in E_L, or 19 volts as against 50 volts. It will be seen that although the regulation is not as perfect as that obtained from more complicated voltage regulators, a definite improvement may be obtained at a minimum cost. Where improvement in regulation is desired and the requirements are not too severe, this method is recommended.

QRQ

[*Continued from Page 54*]

another ⅛-inch strip of brass. The other end of this strip is soldered to the side of the post. The position of this contact is set by a 6-32 screw.

Lead-Pencil Eraser as Stop

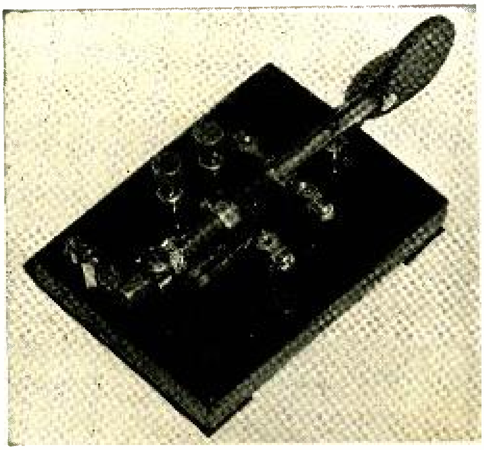
The remaining post D holds the stop for the vibrating shaft. The stop itself is an eraser from a lead pencil mounted on a 6-32 screw. It serves as an insulator and also makes operation quiet.

The pivot must be connected to the binding post mounted in wood. The wire may be soldered to the bottom of the bushing. The two wires under the base and all the screw heads should be made flush with the bottom. The posts should now all be removed and the base given a coat of lacquer, or some other desired finish. They should then all be replaced and tightened up. The bottom may be covered with a piece of cardboard, and a little square of rubber glued to each corner to keep it from slipping on the desk.

Adjustments

Now for the adjustments. The rubber stop is set so that the armature resting against it is right in the middle of the base. Then by adjusting the stationary dash contact 1 you have the old straight key—on its side. For QRS transmissions the bug may be used this way.

A small coil spring is placed around the screws between post B and the lever to return the armature from the dot contact 3. This spring must be rather soft and must be cut or stretched to the proper length. It should return the armature quickly without creating much of a bend in the armature when at rest. It will close the dash contacts to some extent, but the stationary dash contact can be reset. If the end of the contact screw projecting from the lever is short, the spring can be slipped out easily for adjustment. Finding and adjusting the proper spring might be difficult, but once set, it ordinarily need never be changed. If a coil spring cannot be found, a little



How the automatic key looks when completed.

"U" shaped spring of the shim brass might be fitted in and adjusted, or another post with a spring adjustment like that on post C can be mounted beside B with the spring acting against the lever.

The screw stop opposite the dash contact is set with about the same gap as the dash contact, or possibly a little greater. The weight on the bug must receive enough momentum to swing merrily when the lever hits the screw stop.

The stationary dot contact 3 is set so that it will make and break with the moving contact 4. Generally, the two are set so as to make 8 to 10 dots before coming to rest on each other. This adjustment provides the heavy dots preferred by most operators. If after this adjustment the dots are still too light, the contact springs should be made weaker by trimming or filing, or increasing their length.

Now the job is done and the bug should be all set and rarin' to go. Lock nuts should be placed on all the adjusting screws to maintain their setting. A little oil on the bearing is advisable for smooth action and longer life. Additional tension-regulating springs might be placed on each side of the lever, but have never been found necessary by the writer. A shorting switch might be a desirable feature that may be added. Set the weight for the desired dot speed, practice up a little and then kiss that "glass arm" good-bye forever.

Question Box

[*Continued from Page 61*]

measurement points will also change. And, since the directional characteristics of any beam antenna (and especially the smaller rotatable ones) are different at different vertical angles of radiation, the characteristics of the radiating system seem to change as conditions on the band vary.

As an example, the angle of radiation from a three-element rotary antenna is very low in the direction of maximum radiation from the array. But, radiation from the sides and back of the array, although considerably lower in intensity than that coming from the front, leaves the antenna at a fairly high vertical angle. Under certain conditions of the reflecting layers it may be the high-angle radiation that puts in the strongest signal in contrast to the low-angle signal that is usually the stronger. Under these conditions, the rotary array will seem to be pointed in the wrong direction as far as the maximum lobe is concerned; but it will be pointed in the correct direction for the high-angle off-the-back or off-the-side radiation that is putting in the signal. Similar conditions are sometimes noticed, although less frequently, with fixed directive antennas.

Another peculiar characteristic of high-frequency signals that may tend to belie the characteristics of the beam antenna is that these signals frequently tend to follow the daylight-darkness or twilight path between two distant points instead of the usual great circle path. This effect is commonly noticed, however, only on signals travelling over rather long distances, 4000 miles or greater.

For these reasons, the first particularly, it can easily be seen that it is relatively impossible properly to tune a rotatable beam antenna through the help of some other amateur on the other side of town. Signals travelling over such very short distances travel almost optically; hence, the angle of transmission for which the beam is being adjusted to peak will be too low to give best signal transmission for normal working distances. The best procedure is to tune the radiator for the best signal strength and for the best front-to-back ratio with the assistance of some station at the approximate location in which it is desired to lay down the strongest signal. Also, this testing should be made under the normal transmission conditions for the band in use to this location.

I had been using a 40-meter low-drift crystal in the oscillator of my ten-meter transmitter until recently when I put in one of the new 28-Mc. crystals to give more excitation to the final stage. I get more excitation, as expected, but I have received a number of reports since making the change that my signal is drifting. My signal had always been perfectly stable when using the 7-Mc. crystal. What is the cause of this condition and how can it be cured?

A good 7-Mc. crystal has a drift characteristic of about 10 cycles per megacycle per degree Centigrade. The 28-Mc crystals now available on the market have a drift characteristic of about 40 cycles per megacycle per degree Centigrade. There is a mistaken idea prevalent among a large number of amateurs that, although the drift characteristic of the ten-meter crystals is four times that of the good 40-meter ones, since the frequency is also four times as high, the drift on the 28-Mc. band will be the same. This is definitely in error. It will be noticed that the drift characteristic is given in cycles per *megacycle* per degree Centigrade. This term, *per megacycle,* means per megacycle of the output frequency of the transmitter. Thus, on the 28-Mc band, the drift of the 7-Mc crystals will be about 280 cycles per degree C., while the drift of the fundamental 28-Mc. crystals will be about 1120 cycles for the same change in temperature or four times as much. The solution is to run a little less input to the 28-Mc crystal to reduce heating effects.

DX

[*Continued from Page 60*]

phone. Bill Martin, W8QXT, is an old timer, but a newcomer to our family. He used to do a lot of operating at W8CNT but now operates his own station. He has accumulated 38 zones and 92 countries, while his phone work has brought him to 26 zones and 55 countries. Bill lives in Pittsburgh and says that W8HWE has told him all about the very fine horse races he saw while in California. If I remember correctly, Bob "Race Horse" Haas did not see all of every race he attended . . . there were some finishes at which he was afraid to look.

W2GVZ is still at it, and on successive days worked TG9BA and VQ2PL, bringing his countries up to 113. Pat is one of the most consistent go-getters on the air. VK2NX, who needs no introduction to you on either c.w. or phone, has worked 36 zones and 84 countries. He uses a V beam four wavelengths long directed on U.S.A. On phone he uses only 50 watts but seems to have a little trouble in convincing the boys of this fact. W3GHD has been doing all right hooking

Left to right, W6QD, KA1QL, C5SA, ZL2JQ, taken while the latter three were visiting Los Angeles.

CR7AF; PZ1AB, 14,470; TG9AA; VS6AO, 14,-340; VP7NS; PK3EM, 14,375; PK3AA, 14,270; and XU8CM, 14,310. Bob has now collected 36 and 102.

W2GFF is anticipating going to sea, but in the meantime he has not been idle, working a lot of nice new stations which give him 30 zones and 71 countries. Dick says that W2KHY is a new addition to the local gang and expects that he will soon be grabbing off some nice ones. W2JRP is away at school, leaving W2FAW about the most active of the bunch. W1GDY is up to 37 and 92. W6KQK passes along the information that PK6XX is now on 7002 kc. as well as the more familiar bands and he is using both phone and c.w. on that frequency. Andy's countries are now up to 76. W4DMB has added three new zones: FI8AC, VQ3HJP, CR7AF, and YI2BA. This gives him a total of 36 and 97. His countries have also taken a jump, and in addition to the above he has worked the following: PZ1AB, U2NE, SU3HC. W3AYS still has his 37 zones but his countries have shot up to 98. A few of the new ones include XU8RL, VQ8AJ, PJ1BV, K7ETS, YV2CU, and XU6CL.

W6NLS, who works on 10-meter phone exclusively, has two new zones, the stations being PK6XX and CN8AV. These also were new countries as well as VO1D and TG9BA. This gives Jack 26 zones and 49 countries. Incidentally, W6NLS says his hat is off to W6GUQ for working SV1CA a day before he did.

WAZ Honor Roll

For those who may now know what is necessary to qualify for listing in the Honor Roll, this paragraph is written. When you have worked 30 zones or more, simply make out a list of these zones showing the call letters of at least one station worked in each zone and date worked. For your countries it will not be necessary to send in a list; just give the total number worked according to the official country list as was published in RADIO. Please watch carefully the stations that are reported in this column as "phony" so that they will not be included in your list.

For the phone man the same procedure should be followed with the exception that only 20 zones are necessary to qualify for the Honor Roll. When reporting additions to your totals, show the *new* stations worked, together with the *revised* totals. Remember this is not to be confused with reporting for the "1939 Marathon."

Don't wait until the last minute to send in your dx news; send anything you have because there is no law against sending several notes during the month. In this way we can keep the column up to date; whereas if you let it all go until the last minute it might just miss an issue. Don't forget the "1939 Marathon" starts January 1, and your first reports on this should be in by February 10.

●

W2ESK found a message addressed to his own building while copying a flock of messages for relay.

Yarn of the Month

[*Continued from Page 71*]

of a Mexican general and his ragged army at Tampico.

It's been fun to ride the two decker busses on Fifth Avenue, the trams in England, bicycles in France, airplanes in France and Germany, gondolas in Italy, and horse cars in Chile.

I have been a seaman, quartermaster, messman and oiler, but more often a radioman, and it is radio I thank for my most interesting reminiscences. Memories of countries and peoples, of majestic liners on trial trips, memories of the thrills of a new radio record, of standing watch for forty-eight hours at a stretch when the weather was bad or when my assistant was too drunk to sit his.

I have many wonderful memories, but I hope most of all that others will remember me when they hoist one over the bar at the Typhoon Anchorage, the Hong Kong Hotel Bar, Kelly's in Panama, Esmeralde in Buenos Aires. Wherever operators gather, to talk of old memories, I'll be drinking with you and saying, "Thanks for the memory."

The Open Forum

[*Continued from Page 75*]

Virginia Speaks Up On Some Debated Topics

East Falls Church, Va.

Sirs:

I very seldom write letters. I've never before written one of this sort, but one can stand just so much without fighting back in self-defense.

This letter you just published in the June issue by C. Chester Stephen, Jr., W3CM, is typical of the type which has often made my blood boil. I can see where you would want to be broadminded enough to publish everyone's viewpoints, but why choose ones written in such a narrow-minded vein as Mr. Stephen's?

In Mr. Stephen's estimation, there are 25 lids for every real amateur in the United States. According to an A.R.R.L. census, the average age of an amateur in this country is around 27. Spending a week or so on the 7-Mc. band will convince you that there are a lot of lids, but you will find their ages average quite a bit higher than little Aubrey's. Mr. Stephen has had a lot of Old Crow!

However, what I am kicking about is the fact that the so-called, self-styled amateur is always putting the blame for things on the younger members of our ranks. What if some of them are slow at catching on? Everyone has to learn sometime. We are supposed to be amateurs and enjoying radio as a hobby. At least, that is my idea of the situation, though others probably have different viewpoints.

It's too bad that O.T., running upwards to one kw. and possessing an excellent superhet, can't work dx with a little QRM. I have never found a time yet when I couldn't work dx, and there is plenty of high power around me. It is also funny that a real amateur, after all these years, should still need a QSO for w.a.c.!

This is conceited I know, but is part of my case. I'm eighteen. I've had a ticket four years now. Been possessor of w.a.s. and w.a.c. certificates for two years. Made 150,000 points in this year's dx session and need only five more cards for my century certificate. I am the builder of my own receiver and transmitters. Put up my own antennas. This is typical of many fellows around my age.

If it is being "liddish," I'm glad of it.

Clement M. Goo On, W3EVT

●

Flea-Bitten Topic

Phoenix, Ariz.

Sirs:

Many the year and many the argument I have heard on the old and slightly flea-bitten subject of a "no-code amateur, license," and I have remained silent. But—even a worm turns, so please let me have my say even though it may reach many a deaf ear.

I am one of those detestable hybrids, a phone *and* c.w. man. I work all day with code and when I go home to a motorman's rest, I try to work the ham band. With the exception of a few good c.w. ops, forty and twenty c.w. is a perfect lesson of what shouldn't be done with a key. Hence, with my last dime (and a few of the second ops), I try phone for a while and talk to the boys who have raked up enough dinero to buy a factory-made rig and join the adenoid torturers or talk to some guy who has really gone to work and built a nice rig. That limits the phone gang to two classes, the technically inclined and those with the dough.

Now what would be the disadvantage of giving a real stiff technical exam for phone operation, something like the first-class commercial phone ticket? That seems to be the kind the boys are asking for instead of a license exam a half-witted moron could pass, with the only thing keeping everyone from getting a license being a little 13 w.p.m. code exam, which (if all are like 90 per cent of the exclusive phone men I know) will be forgotten within a couple of months. The only argument of any importance is that maybe the government will need trained c.w. ops some day. (May Heaven preserve our government if they depend on phone men for c.w. operators.) Oh, how much better it would be if ham radio would furnish a few good code men, who have a real radio background, and let them train the phone men in the code as it should be sent and received.

Now for a "cure-all-in-one-dose" idea for the c.w. bands. A technical examination worthy of its name, and a twenty w.p.m. code exam, *sending* and receiving.

By keeping the phone bands open only to holders of real phone tickets and real c.w. tickets in the c.w. bands, there would be an absence of "Little Aubreys."

Another little item—how did the A.R.R.L. get all the answers to the license exams word for word when the law strictly forbids it? I must say that is a swell example for little Aubrey.

If a dumb guy like myself can learn code and phone practice without the help of a pony, there is hope for anyone.

BOB HILBUN, WUDD, W6OGP, Ex-5EJM

●

At the new $100,000 studios in Washington's Interior Department building, visitors "sign" an oral guest book by speaking into the microphone of a de luxe recording system.

●

A technical associate at Hollywood's KMTR is named *Robert Taylor.*

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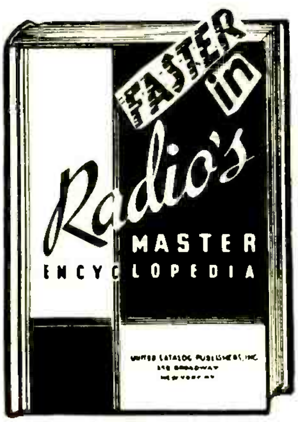

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LISTEN for High Frequency Broadcast Station, W9XA, 26,450 Kilocycles, Kansas City, Mo.

YOU'LL want this new novelty—a card that talks! Hear Charlie McCarthy say "Hello Sweetheart" or "I'll mow you down." Either card 25c postpaid from W6KX. Try one in front of the mike. Money back if you don't think you get two bits' worth of fun—hi. W6KX prints QSL's, too. Keith LaBar, 1123 North Bronson, Hollywood, California.

COMPLETE STATION. 500-watt transmitter, 100TH final. NC100X receiver, typewriter. First $275.00 takes. Swensson, Route 6. Box No. 473. Portland. Oregon.

WANTED—good used 204-A. W5GUX, Signal Office, Camp Beauregard, La.

CRYSTALS AIRMAILED: 160. 80M Lodrift—40 X $1.85. 40M Lodrift $2.75. Holders $1.00. Bugs $4.50. COD's accepted. Air wound coils—all types. Write. C-W Mfg. Co., 1170 Esperanza St., Los Angeles

SACRIFICE: Radio Television Laboratories five-meter sets, one duplex 6A6 and one compact. Make offer. W6NKX.

ROTARY beams—two- or three-element arrays complete or special heat-treated tubing only. Write. INTERNATIONAL ARRAYS, W8NMY.

RADIO Man, 25, single, with radio-telephone first class ticket desires position as operator in broadcast station or other voice station. L. J. Smith, Box 84, Morrison, Illinois.

SELL at sacrifice 80M—160M, 30-watt fone rig complete less Xtal and mike, $75. Consider trading same for new PR 203-Z and Thordarson 500 w. multi-match mod. transformer. Stamp for picture and details. W9EEZ, L. J. Smith, Box 84, Morrison, Illinois.

FOR Sale: Deluxe 100-watt portable. See November, 1937, QST, page 38. W6LCT.

SALE: Dubilier 12,000-volt mica, Weston 5,000-volt d.c., and 0-2 amp. t.c., WE new and used tubes and 700A crystal oscillators, units and panel. Ray Moore, 1627 North Alvarado St., VA 4278.

NAMEPLATES—Bakelite, engraved to order; prices reasonable. List upon request. A. L. Woody, 189-R, West Madison St., Chicago.

BRAND New Jewell meters! Any kind, any range! W2CXY, Hillside, New Jersey.

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Advertising Index

Buyer's Guide

Where to Buy It

PARTS REQUIRED FOR BUILDING EQUIPMENT SHOWN IN THIS ISSUE

The parts listed are the components of the models built by the author or by "Radio's" Laboratory staff. Other parts of equal merit and equivalent electrical characteristics usually may be substituted without materially affecting the performance of the unit.

4-25 EXCITER

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R.F. Unit

C_1—Cardwell ZR-50-AS
C_2—Cardwell ZR-25-AS
C_3—Cardwell MR-150-BS
C_4, C_5, C_6—Cornell-Dubilier DT-651
C_7—Cornell-Dubilier 5W-5Q5
C_8, C_9—Cornell-Dubilier 5W-5T1
C_{10}—Cornell-Dubilier 9-6D2
C_{11} to C_{13}—Cornell-Dubilier 1W-5D3
R_1, R_3, R_6, R_7—Ohmite Brown Devil
R, R_2, R_4, R_5—Centralab carbon type
RFC_1, RFC_2, RFC_3—Hammarlund CHX
S_1—Centralab type 1462
S_2—Arrow (H&H) type 20975, bakelite handle
Crystal—Bliley LD2 80 m.
J_1—Yaxley type 702
Chassis—Bud type 791
Panel—Bud type 1202
Dial—Bud type 713

Power Supply

T_1—United Transformer type S-46
T_2—UTC type S-67
C_1, C_2—Solar type X-104
CH_1—UTC type S-32
CH_2—UTC type S-31
R_1—Ohmite Red Devil

5-10-M. CONVERTER

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C_1, C_2—Cardwell ZR-10-AS variable
C_3, C_4—Hammarlund—MEX
C_5—Cardwell ZR-15-AS variable
C_6—Hammarlund APC 25
C_{18}—Hammarlund SM-50
Tubular condensers—Aerovox 484
T_1—Thordarson—T-70R20
Mica condensers—Aerovox 1467
CH_1—Thordarson T-16C07

BANDSWITCHING KILOWATT

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Final tank condenser—Johnson 100CD110
Standoff insulator cones—Johnson
Sockets—Johnson 211
Bandswitches—Ohmite BC3
Optional padding relays—Guardian R100
Optional padding condensers—Hammarlund Star 100
Plate coil jacks—Johnson 72
Plate coil plugs—Johnson 73A

LOW-COST MEDIUM POWER XMITTER

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C_1, C_2—Cardwell ZU-100-AS
C_3—Cardwell MG-35-NS
All fixed condensers—Cornell-Dubilier Type 9
RFC—Bud 920
Coil forms—Hammarlund XP-53

MIGHTY MITE DE LUXE

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Dials—Bud type 163
Knobs—Bud type 579
Variable Condensers—Bud type 911 and 330
R.F. Chokes—Bud type 920
Modulation trans.—U.T.C. type VM-0
Wire Wound Resistors—Ohmite Brown Devil
Carbon Resistors—Centralab
Potentiometer, Jacks, Switches, Filter Condenser—Mallory-Yaxley
Fixed Condensers (mica and paper)—Cornell-Dubilier
Coil Forms—Hammarlund XP-53

VOICE-OPERATED BREAK-IN

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T_1, T_2—Stancor type A-63
R_1, R_2—Centralab
C_1, C_2—Cornell-Dubilier "Dwarf Tiger"

OSCILLOSCOPE

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Knobs, Switches, Potentiometers, Electrolytic Condensers—Mallory-Yaxley
Power Transformer—U.T.C. C-R type
Mica Condensers—Solar type MW and MO
Paper By-Pass Condensers—Solar Domino and Sealdtite
Carbon resistors—Aerovox 1 watt; I.R.C. insulated ½ watt

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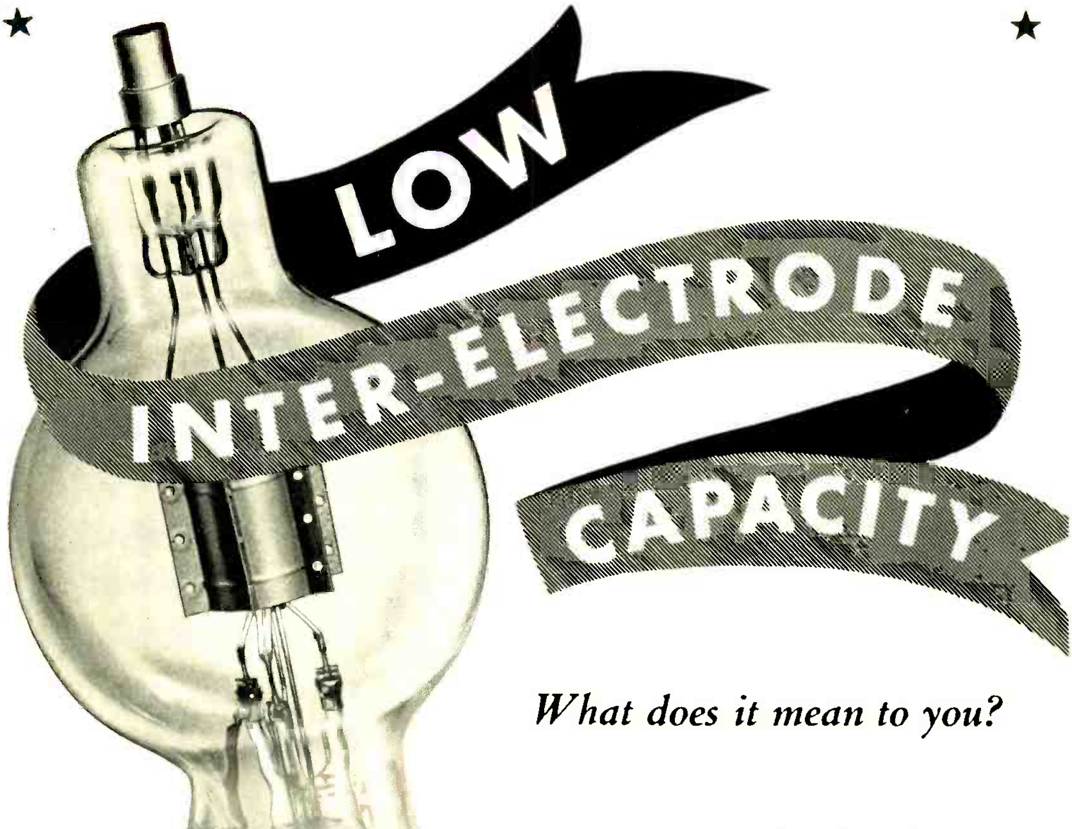

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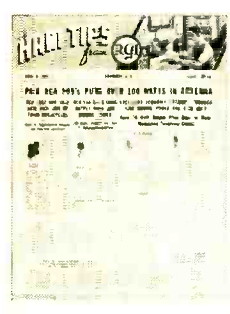

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