CQ

AUGUST, 1948

The Radio Amateurs' Journal

35¢

THIS MONTH

- *CQ*'s World-Wide DX Contest
- Miniature 2-Meter Superhet
- Converter for 75 & 10 Mobile
- TVI Corrective Measures

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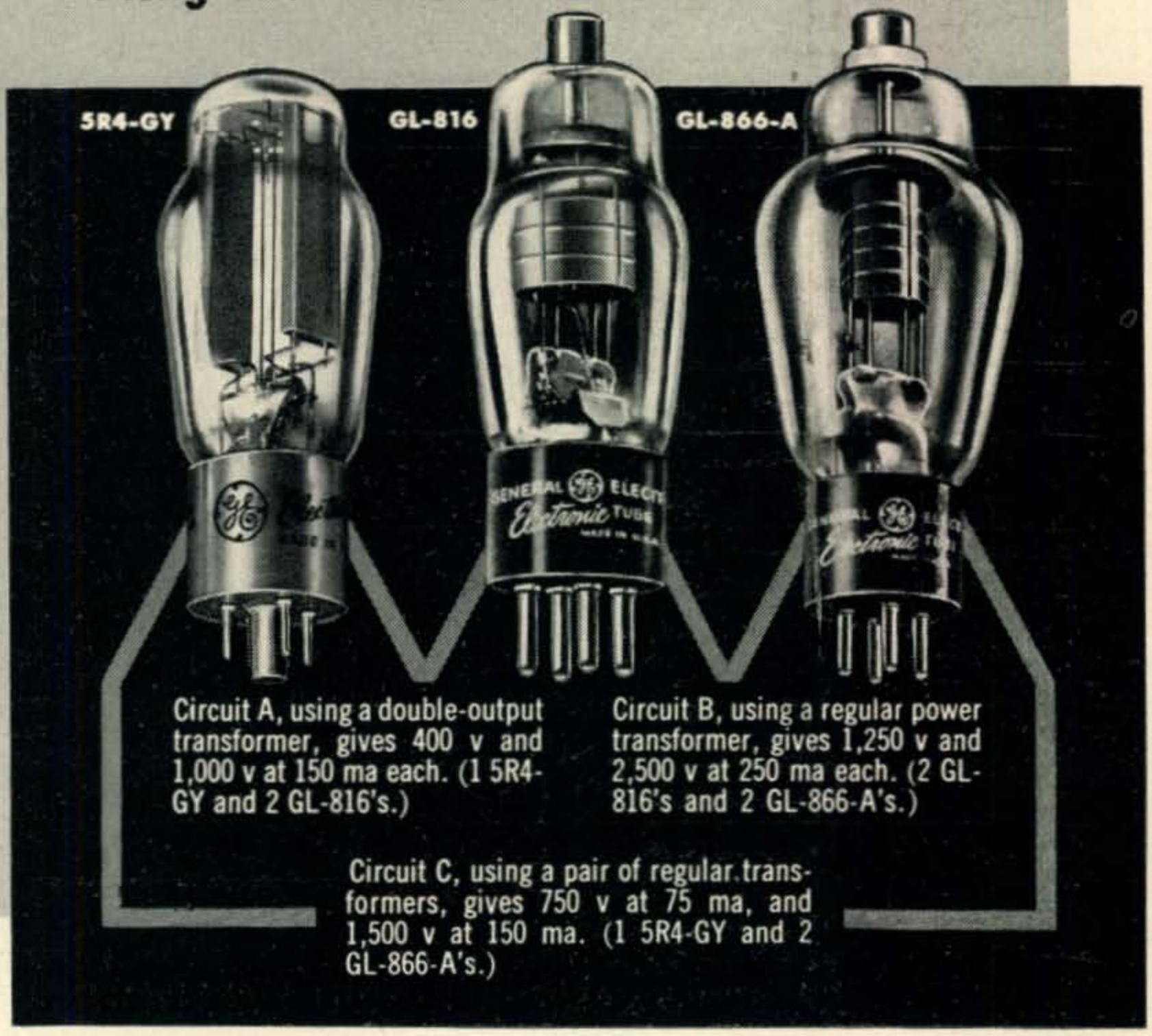

Circuit A, using a double-output transformer, gives 400 v and 1,000 v at 150 ma each. (1 5R4-GY and 2 GL-816's.)

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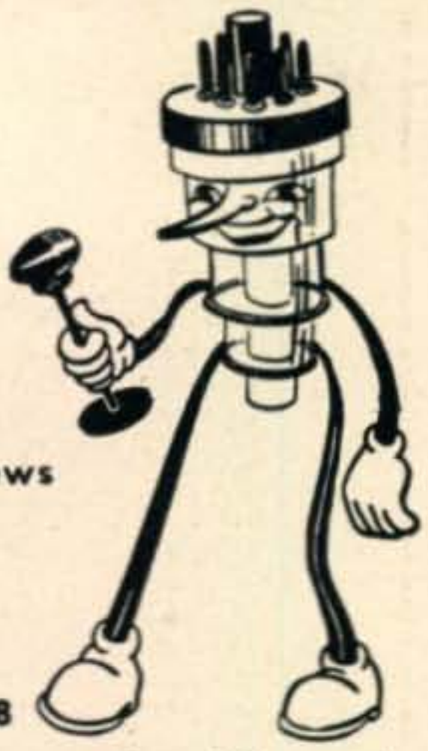

CQ . . . CQ . . .

You are cordially invited to visit the display of Ham-News devices and other up-to-the-minute electronic units at G.E.'s exhibit, 1948 national ham show —A. R. R. L. National Convention, Milwaukee, Wisconsin, September 4 to 6. C U There,

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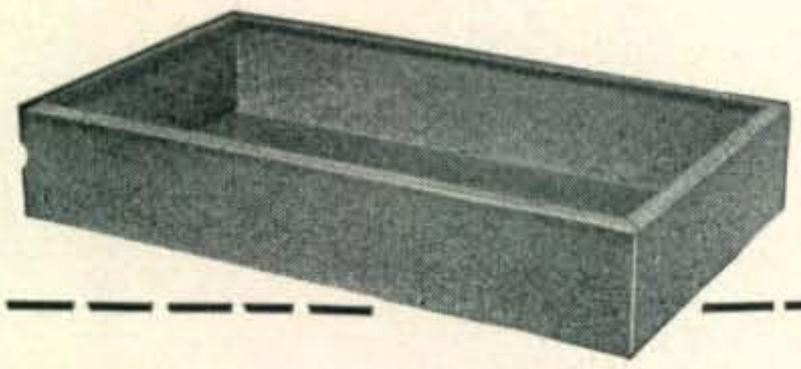

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AC-405	7	7	2	18	.75	AC-415	10	17	2	16	1.38
AC-406	7	9	2	18	.90	AC-416	10	17	3	16	1.55
AC-407	7	11	2	18	.96	AC-417	11	17	3	14	1.98
AC-408	7	12	3	18	1.14	AC-418	12	17	3	14	2.00
AC-409	7	13	2	18	1.08	AC-419	13	17	2	14	2.10
AC-411	7	15	3	16	1.32	AC-420	13	17	3	14	2.31

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The Radio Amateurs' Journal

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Vol. 4 **AUGUST, 1948** No. 8

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COVER—W2KOD on top, with W2IOP lending encouragement, puts the finishing touches on the latter's new rotary. A 3-element tenth-wave spaced 20-meter beam with the driven array a folded dipole, the entire array includes a number of novel mechanical features. Supported on a commercial triangular Trig tower made by Rostan Corp., the beam weighs only 55 pounds despite its battleship construction. Details are scheduled for a Fall issue. (*Photo by William Green*)

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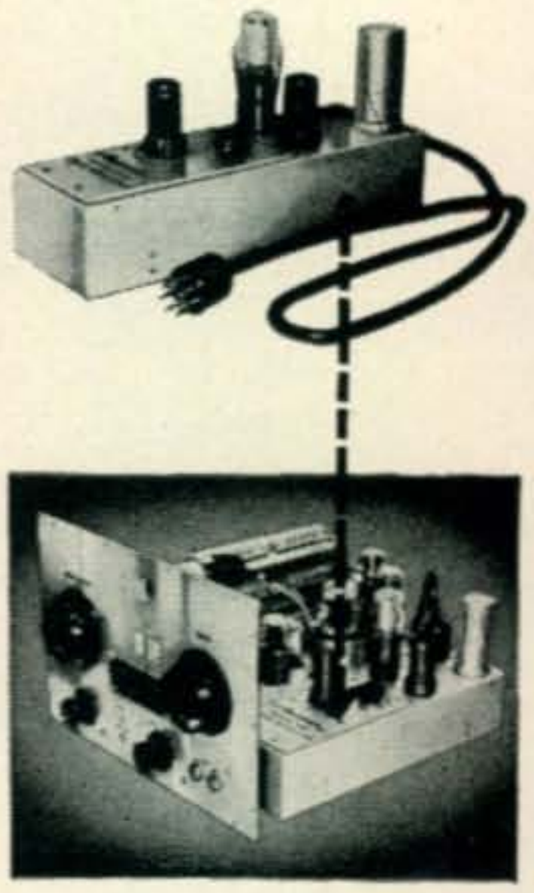

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SIGNAL SHIFTER

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* in complete kit form

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You'll only have to spend one evening — and a highly enjoyable one at that — to completely build the new MEISSNER SIGNAL SHIFTER!

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All you need is a pair of pliers, a screwdriver, a soldering iron — and a desire to have a really superlative eco. Everything else is furnished — including tubes — even down to wire and solder!

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★ ★ ★ Letters ★ ★ ★

The U.N. and Ham Radio

Route 2, Pollock, La.

Editor, *CQ:*

I wonder if you had the privilege of hearing the tribute paid to amateur radio tonight (May 22nd) by "The United Nations Network" as "A Memo From Lake Success" as broadcast from CKCS on 16.84 meters? In their broadcast they gave actual excerpts from amateur broadcasts from amateur station K2UN, and it was beamed primarily to Australia and New Zealand. I wish a similar broadcast could be made on a national U.S. network and beamed toward Europe.

As an instrument of international unity and goodwill, we have a wonderful opportunity, no, an obligation which is shared by no other organization.

C. W. Cook, W5MBE

Our Frequency Problems

Benkenlaan 25, Schilde, Belgium

Editor, *CQ:*

With reference to W7JHQ/Ø's letter which appeared on page 8 of *CQ* for February, 1948, I would like to inform him that I, too, am one of the offenders(?) he mentions.

Mr. Olsen I presume, is aware of the fact that when conditions are right, the portion of the band between 14,300 and 14,200 kc is one solid block of R9+ heterodynes over here or in any other part of the world. Furthermore, that the Americans scattered all over the globe operate phone *outside* the American phone bands! That all D4 stations, for instance, work with anything from a BC610 upwards. That these QRO stations play havoc with our little peanut-whistle rigs, and that *we do not complain.* Also, that if he could read my license he would find that I am permitted to operate phone in *any portion* of the 14-mc band.

Finally, it would be better if he swept in front of his own door because the "14-mc c.w band" as he calls it is as such solely by a decision taken by your F.C.C. for the amateurs of the *U.S.A. only.*

A. De Smet, ON4CC

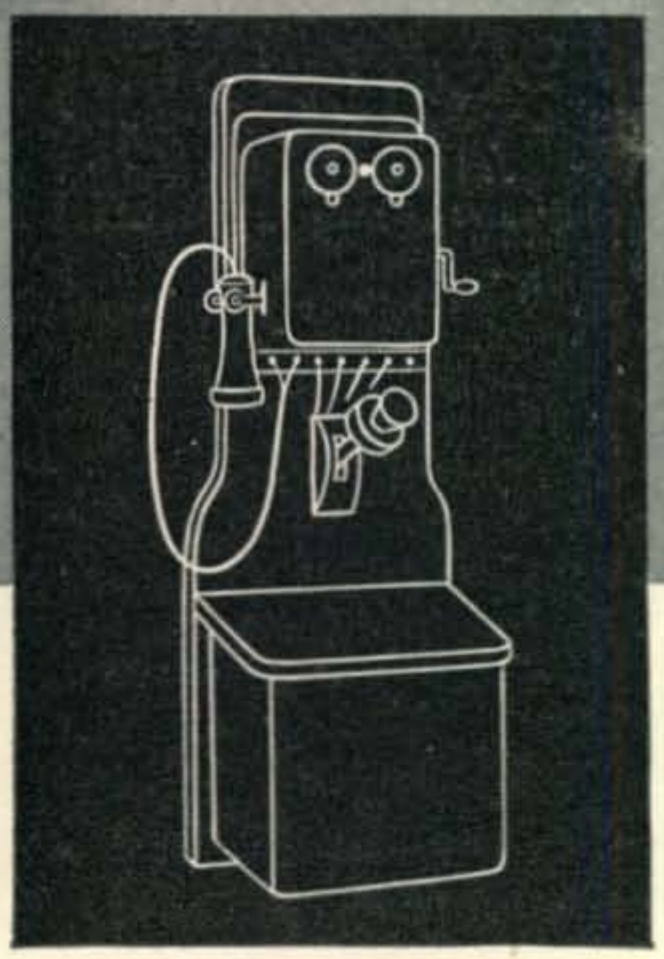
Is QRO the Answer?

Jamaica, New York

Editor, *CQ:*

The response in the June issue of *CQ* to your editorial on shared frequencies, which appeared last December, was interesting, and then a little disturbing. Granted that the influx of foreign propaganda broadcasters on bands used by amateurs is unfair, to say the least, a more practical means might be found to combat it.

What will happen if certain or all amateurs are permitted a 10-kw limit to meet this interference? It is improbable that foreign broadcasters, who will be spending millions to get their messages across to this country via the short waves, will calmly accept amateur QRM. We might well find such situations where the foreign broadcasters would retaliate with increased power, jamming (planned or "accidental") of incoming amateur signals, or restrictions on their local hams. The whole mess would easily revert to



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Ken-Rad miniatures, leading the new trend to smaller tubes, save space by compactness—operate at increased frequencies due to short leads.

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The value-giving 6AU6 is a sharp-cut-off pentode, and its principal application in amateur radio, as in home receivers, is as an i-f amplifier —work for which the tube is ideally suited.

Also, the 6AU6 makes a good frequency multiplier at radio frequencies up to 150 mc, with output of several watts. High transconductance (4,450 micromhos) favors this service; besides, as a miniature, the tube has extremely short leads. Reduced lead inductance thus achieved, helps materially at the higher frequencies.

Whether you plan to use the 6AU6 in a trim, space-saving receiver or converter, or in a compact h-f exciter, its small size singles out this miniature as your logical choice. And performance is "big tube" throughout! Your Ken-Rad distributor or dealer gladly will give you price and full details. See him today!

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Heater voltage (a-c or d-c)	6.3 v
Heater current	0.3 amp
Direct interelectrode capacitances (measured without external shield):	
Grid-to-plate (max)	0.0035 mmfd
Input	5.5 mmfd
Output	5.0 mmfd
Max plate voltage	300 v
Max plate dissipation	3.0 w

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the early BC days in this country where a broadcast station picked his own frequency, was QRMd, increased his power, and then finally ran yelling to the Federal Radio Commission of those days for regulation. In addition, the whole scheme comes dangerously close to a violation of F.C.C. rule 12.159, which prohibits malicious interference of radio signals. . . .

The matter comes down to one of education. If this country is satisfying enough to its citizens in the matter of politics and economics, no amount of foreign propaganda can make any impression on us. If we educate our people to know the truth, foreign talk, on the air or otherwise, won't be worth what it costs. The foreign broadcasters are no fools—they have more than a fair idea of the results that they are getting. When they see that it doesn't pay, the QRM will die soon enough.

Julian N. Jablin, W2QPQ

Shhhh!

Apt. 205, 428 St. James Pl.,
Chicago 14, Ill.

Editor, *CQ:*

Just a line to ask you for a little help via *CQ* for all the hams who live in apartment hotels, apartments, etc. When some of the boys we contact send us QSL cards, they merely address them "Radio W9NN, 428 St. James Pl., Chicago. It so happens that I, like many thousands of others, live in such a place. The people who are in the apartment office sort the mail every day and when they run across a QSL card with no name on it, they either return it to the postman or stick it up on the bulletin board for someone to claim. Personally, I'd rather not receive the cards at all than to have to get them this way. It tells everyone in the building that there is a ham in the building and from then on, they blame every type of radio QRN on the ham. Then the apartment manager gets nosey and the ham has an argument on his hands. It's *so* easy to write the ham's name on the card as well as the call. So, boys, if you *must* QSL, please put the full name on the card! I, myself, won't answer any cards I have to take down off the Crittendon Apt. Hotel lobby bulletin board!

Robert E. Baird, W9NN

British Valves Available

Century House, Shaftesbury Avenue,
London, W. C. 2.

Editor, *CQ:*

We have been very interested to read in your March issue an article by Hilton L. O'Heffernan, G5BY, describing his 6-meter DX man's converter.

This equipment is designed around two types of our v-h-f tubes, which on this side of the Atlantic have found a very extensive and successful application at these and higher frequencies. In view of the care Mr. O'Heffernan has obviously taken in designing his equipment, it seems to us unfortunate that any of your readers who wish to make up such a converter will need to re-design it around locally produced tubes.

As we are not at present represented in the U.S.A., therefore, you may care to inform your readers that anyone interested can obtain these tubes promptly from us at the following prices:

EF54	...	...	U.S. dollars 2.65
EC52	...	...	U.S. dollars 1.50

(*Continued on page 91*)

MALLORY HAM BULLETIN

RECENTLY, we received a request from a fellow amateur for the solution of an interesting DC filter problem which involved cramming several Mfd's of filter capacity into a space already overcrowded with transformers, chokes and other components. His problem, and its subsequent solution, might prove helpful to other amateurs confronted with a similar dilemma. So we are passing along the story for what it might be worth.

Here was his problem: He had designed a 2-stage transmitter consisting of a harmonic oscillator and final amplifier, which required 2 complete DC power supplies, one delivering 700 volts for the plates . . . the other, 300 negative volts for bias and blocked-grid keying potential. His plans included making this rig completely self-contained with power supplies and RF stages mounted compactly on a single small chassis.

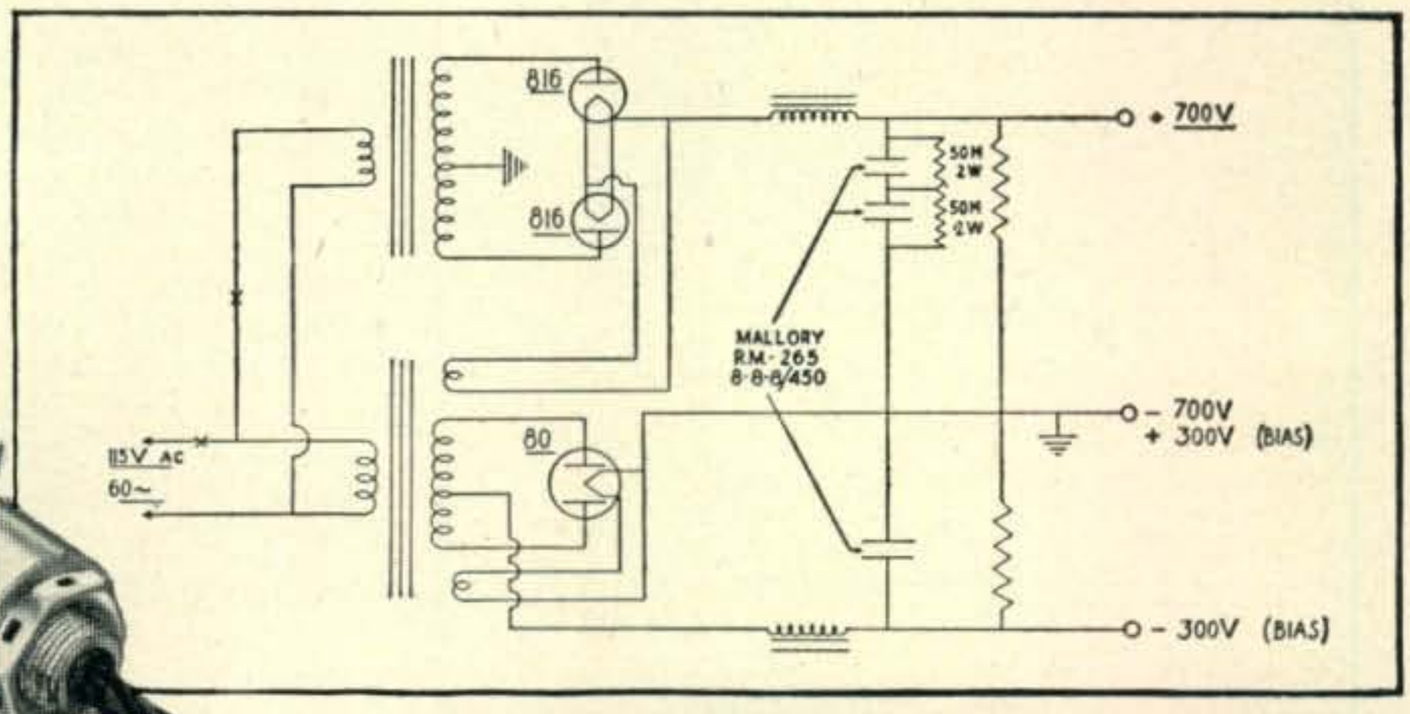
His problem arose when he discovered that it was impossible for him to arrange the other components of his transmitter to provide sufficient mounting area for the DC filter capacitance needed. The best he could do was an area roughly 2″ square by approximately 5″ in height in which to mount 4 Mfd's at 700 volts, and 8 Mfd's at 300 volts.

In pondering his problem, we thumbed through the latest Mallory Catalog looking for a capacitor which might fit his requirement. Frankly a solution didn't appear until we reached page 7. There we found the Mallory RM-265, a triple "c" separate section electrolytic. This capacitor looked as if it might have possibilities. Sure enough, it did the job!

The RM-265 is an electrolytic capacitor consisting of 3 separate 8 Mfd sections rated at 450 volts DC and is mounted in a single aluminum container measuring 1⅜″ in diameter and 4¼″ in height. For this application, 2 of the 8 Mfd sections were connected in series to provide 4 Mfd of filtering at better than 700 volts, while the remaining 8 Mfd section was used as the bias supply filter.

The basic essentials of the power supplies he used are shown in the schematic diagram. Note in particular the 50,000 ohm 2 watt carbon resistors across the seriesed sections of the capacitor. These resistors are employed as voltage equalizers and should not be omitted.

This is one of many examples of how the complete line of Mallory quality parts can help you solve unusual problems. It would pay you to become familiar with the Mallory Catalog. It contains a wealth of special capacitors, controls, resistors and vibrators for unusual applications such as this one. Your authorized Mallory distributor will gladly supply you with a copy.



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MALLORY

Feenix, Ariz.

Deer Hon. Ed:

I are in a very painful position to be writing, but Hon. Doctor are saying that Scratchi should be staying in bed for a weak at least, so I are having plenty time to writing you. There are good possibility that I will be able to catching up on the QSL cards I are owing.

Scratchi are having bad case of sprained back, also badly QRM'ed epidermis where Hon. Doctor are pulling out cactus needles. If you are not knowing it, Arizona are dangerous place to be putting up antennas, especially beer-can antennas.

It are happening when a neerby ham, who are red-hot on high frequency work, are deciding to put up a 32 element six meter beam, beer-can style. He are inviting all the local hams to come to a soldering and erecting party at his ranch. Lots of hams showing up, including yours trulies. We are confronted by a back-yard full of cases of said beer cans, and soldering irons all hot and set to go. Things are reely going along nicely until several peeple are discovering some cases which are still having full beer cans in.

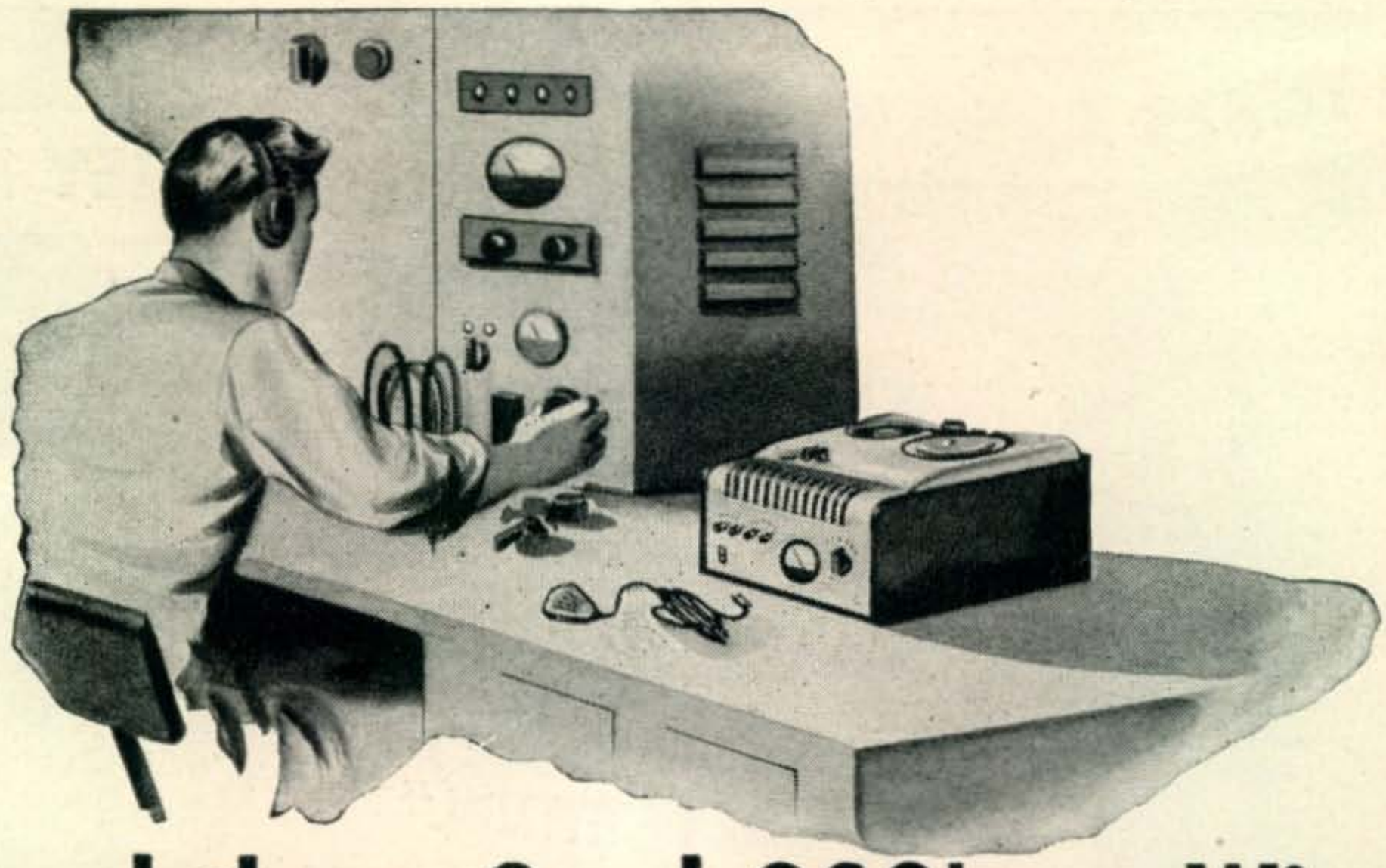
This accidental discovery are natchurally putting crimp in plans, as word are getting quickly around, and soon hole crowd are loosing interest in soldering. Scratchi are getting off to slow start as are punching holes in beer can not noticing that another ham are punching same in opposite end of said can. Net result are messy, but then beer are supposed to be good for the grass. Once underway, Scratchi are holding own on refreshments.

Some time later in the afternoon we are getting back to business and are finishing all soldering. Elements are being arranged on ground and fastened to pole and Hon. Ed., it are a very pretty beam. This are dew mainly to fact that beer cans are not all same kind, and some are very colorful. We are testing beam and finding it pretty strong, so it are tied to rope and pulley and pulled up to top of big high telephone pole. Telephone wires are not being connected to pole, as in hurry to raise beam are forgetting same and accidentally pulling them off.

Feed line are next being run down pole and connected to half-kilowhats transmitter. This are bread-board job which is spread out over half the shack. From number of toobs in it I are suspecting that it uses 160 meter crystals. Proud owner are locating all necessary switches and are getting toob filaments hot, then are throwing on plate power. Final are dipping reel nice, but antenna are not taking load. After much scratching of Hon. Respective Noggins we are deciding that elements are too long.

Scratchi agreeing to go up pole and knock one beer can off end of each element with hacksaw in return for which I am receiving bottle of genuwine aged in glass cactus juice. In order to making sure Scratchi not getting gipped I are taking good-sized

(*Continued on page 95*)



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The Webster-Chicago Model 78 Wire Recorder is a real asset in ham radio operation. It takes input from microphone, phono pickup or direct from your receiver. Outputs for external amplifier or speaker. Push button control makes Model 78 easy to operate while you are on the air, and provides all desirable recording, playback, and erasing combinations.

Record your QSO's. Take down those Dx's for some well-earned gloating when the gang is in. Test your modulation levels and the quality of your rig.

Model 78 Wire Recorder is ideal for handling traffic—no chance of error in relaying important messages.

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ZERO BIAS

EDITORIAL

ONE OF THE MOST perplexing and controversial issues now before the ranks of the amateur is that dealing with the subdivision of the 14-mc amateur band. Those of you who have been following the many ramifications of the problem need little briefing. But we feel that its importance demands that *all amateurs* become familiar with it. We say all amateurs with emphasis because the results of the recent A.R.R.L. poll on this question indicate what we believe is a startling lack of familiarity with this, the most popular of all DX bands.

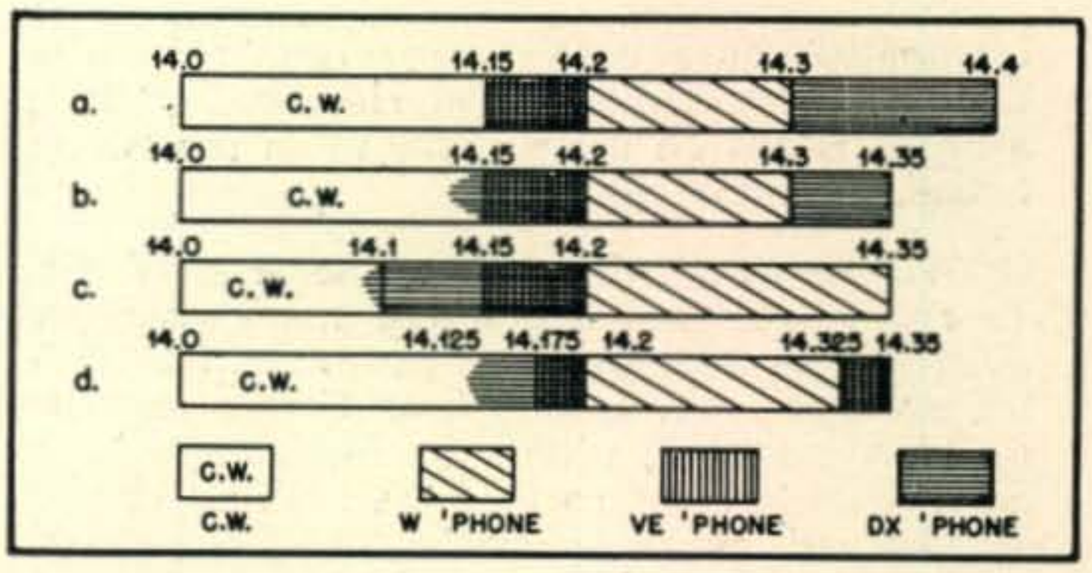
The 14-mc frequency allocation has been 14,000 to 14,400 kc, an over-all band of 400 kc. This has been subdivided into segments which permitted phone operation by American amateurs between 14,200 and 14,300 kc only. Thus, in effect you would come away with the impression that the phone men had only a 100-kc band versus 300 kc for the c-w amateur. While this was never exactly true for reasons which we will go into more thoroughly, it was felt that phone congestion demanded additional space. Before these discussions could be acted upon, the disastrous blow occurred at the Atlantic City conference in which 50 kc of the 20-meter band was lopped off. This placed the entire position in a somewhat different light and the poll was the next jumping off place for a possible change in 20-meter allocations.

The proposal, whatever its merits or demerits, brought an astonishing verdict. Of the American and Canadian amateurs who voted, 76.2% replied "yes" to the proposal that the U.S. 20-meter phone assignment of 14,200 to 14,300 kc be changed to 14,200 to 14,400 kc until the effective date of the Atlantic City allocation, and 14,200 to 14,350 kc thereafter. Thus in effect, of the W and VE hams who voted, 76.2% asked for the virtual extinction of the 14-mc c-w band. How do we arrive at this conclusion, so contrary to the indicated feeling of the majority of amateurs? It is fairly simple arithmetic that might be better illustrated by a couple of simple sketches. Take a look at sketch *a* which shows the appearance of 20 as it stands now. Then take a look at it as it will appear with no other change than the removal of the top 50 kc as shown in sketch *b*. Now let us suppose that we were to move the Americans right up to the end of the band, thus extending the American phone band from 14,200 to 14,350 kc. Foreign amateurs occupying those top 100 kc have already been squeezed either into 50 kc or some of them have gone down to the low-frequency side of the American phone band. They now move en masse down to the low-frequency side. But they get a surprise, because 50 kc of this is already occupied by the Canadian phones. Why invite competition . . . so down they slide a little further. The picture then appears as shown in sketch *c*. The 20-meter c-w band represents a small sliver, totally inadequate for the traffic it must bear.

There can be no denying that the phone men are *now* in the position that the c-w men *would be* in should the proposal put forth by the A.R.R.L. poll be adopted. They might conceivably be in a slightly better position because at least their DX is relatively in the clear. But the c-w operators would find no such solace—so as we see it for all effective purposes the 20-meter c-w band would be unusable.

Is there a solution? Well, we think so, and here it is. Agreeing at the onset that there can be no solution agreeable to everyone, let's try one that will hurt the least number of hams and benefit the most. Our idea is this. Let the American phone band be extended 25 kc, so it covers from 14,200 to 14,325 kc. That immediately gives the American phones 25 kc more in which to operate.

Next, get the Canadians to take their special 50-kc allocation and split it in half, thus giving them 25 kc of U.S. competition-free operation on either side of the American phone band. This will actually benefit them in giving them a chance to work elusive DX ahead of the Ws regardless of which end the foreigner is working. But even more important, it will not extend the low end of the phone band beyond where it is already. Likewise, it will not cause all the foreign DX to move to the low-frequency end of the band. A certain amount of it will; it is going to be forced to with a loss of 75 kc out of 100 kc now used by them from 14,300 to 14,000 (50 kc coming off by treaty, 25 kc to be occupied by Ws). But the pile-up shouldn't be anything compared to the case where the Canadians



A graphic representation of the 14-mc band showing different subdivision proposals for phone and c.w.

and all the foreigners shift. This is clearly evident in drawing *d*.

Now we have a situation where the phone band has been extended, the loss in frequencies has been compromised with a minimum of disruption, and the c-w band suffers a loss not incompatible with the gain of their phone brethren. In fact, it might not be too presumptuous to suggest that this proposal would result in no loss of frequencies and a gain for everyone. By encouraging the DX to work a little closer together and within the Canadian allocation, it might conceivably result in a c-w allocation of 150 kc with an additional 75 kc almost exclusively foreign phone, but still usable to the c-w man desiring to operate in those regions. We think that this compromise is a far better solution than an all-or-nothing attitude by either phone or c-w advocates. We present it as an idea worth chewing over. What do you fellows think?

—*W2IOP*

THE TREND . . . is definitely toward single-sideband operation. Advantages are obvious. Elimination of a continuously running carrier saves power and reduces interference. **In fact,** a signal is put on the air only when something is said.

HOWEVER . . . it does present some problems. To reproduce voice and music the equipment must handle high peaks of power even though the average power is very low. Unlike conventional AM service, where the modulation level must be held down so that the high peaks will not exceed available carrier, single-sideband modulation levels because of the absence of carrier are unrestricted by peaks and in general are limited only by the average power an r-f amplifier can produce.

TUBES . . . which can handle high peak powers in excess of normal rating are a natural for single-sideband work.

EIMAC TETRODES ARE THE ANSWER

REMEMBER . . . the universal use of Eimac tubes in radar? They were specified because of their ability to handle high peak power. Now, this ability enables them to take the lesser requirements of single-sideband service in stride. Eimac tetrodes handle high peaks because of their inherent ability to take momentary overloads, their reserve supply of emission, and freedom from internal insulators.

IT IS FAR EASIER . . . to produce a single-sideband signal at a low power level. Here again Eimac tetrodes fill the bill. Because of their high power-gain, this valuable low-power signal can be built up from the modulator to high power in a single amplifier stage.

IN ADDITION . . . the single-sideband driver must "see" a constant load resistance, and Eimac tetrodes with their low driving-power requirement mean a minimum of swamping action. It is even possible to run up the screen voltage until no grid current is drawn and no changing load is presented to the driver.

DATA AVAILABLE

PICTURED . . . above is the popular 4-65A tetrode. A new complete data sheet on it has been prepared. You will find SSSC ratings and suggestions in it . . . write today. Other Eimac tetrodes suited to SSSC application include 4X150A, 4-125A, 4-250A, 4-400A and the 4-1000A.

Follow the Leaders to

Eimac TUBES

The Power for R-F

EITEL-McCULLOUGH, INC.
199 San Mateo Avenue
San Bruno, California

EXPORT AGENTS: Frazer & Hansen—301 Clay St.—San Francisco, Calif.

A view of the receiver in use as a fixed station unit. Its compact size can be judged by comparing it with the mike and other familiar objects.

A Miniature 2-Meter Superhet

ROBERT B. TOMER, W1PIM*

A receiver designed for mobile or fixed station operation with equal performance.

One of the principle problems encountered in 2-meter mobile work has always been the receiver. In an effort to solve the problem we wanted a superhet designed around the available space in the glove compartment and all of the features desired would have to be fitted into that area.

The receiver which is described in this article actually surpassed the expectations of its builder and, although it is almost exactly one-quarter the scale of an earlier fixed station unit, it surpasses this larger receiver in every respect. A nine-tube superhet, it incorporates a noise limiter circuit and an S-meter circuit. Miniature tubes are used throughout and an a-c power supply is included so that it can serve either as a mobile receiver or as a fixed station receiver.

A 6AK5 tuned r-f stage feeds into another 6AK5 tuned mixer stage. The local oscillator employs a 9002 in a conventional tapped-coil oscillator circuit. No intentional coupling is used between the oscillator and mixer circuits, stray fields serving to supply the injection voltage. This system is far simpler than any method using either capacity or inductive coupling and it avoids the over injection which is frequently encountered with these other techniques. By keeping the coupling between these circuits limited to only that amount which develops from the proximity of the two tuned circuits in the same compartment, tracking is also greatly facilitated. Tracking, of course, means the ability to set all three circuits to resonance at the highest frequency covered by the receiver's tuned mechanism, and then to have them stay in the same relationship throughout the entire tuning range which, in the case of this receiver, is 10 megacycles. Actually, this is really a very simple accomplishment and it will be described in detail later.

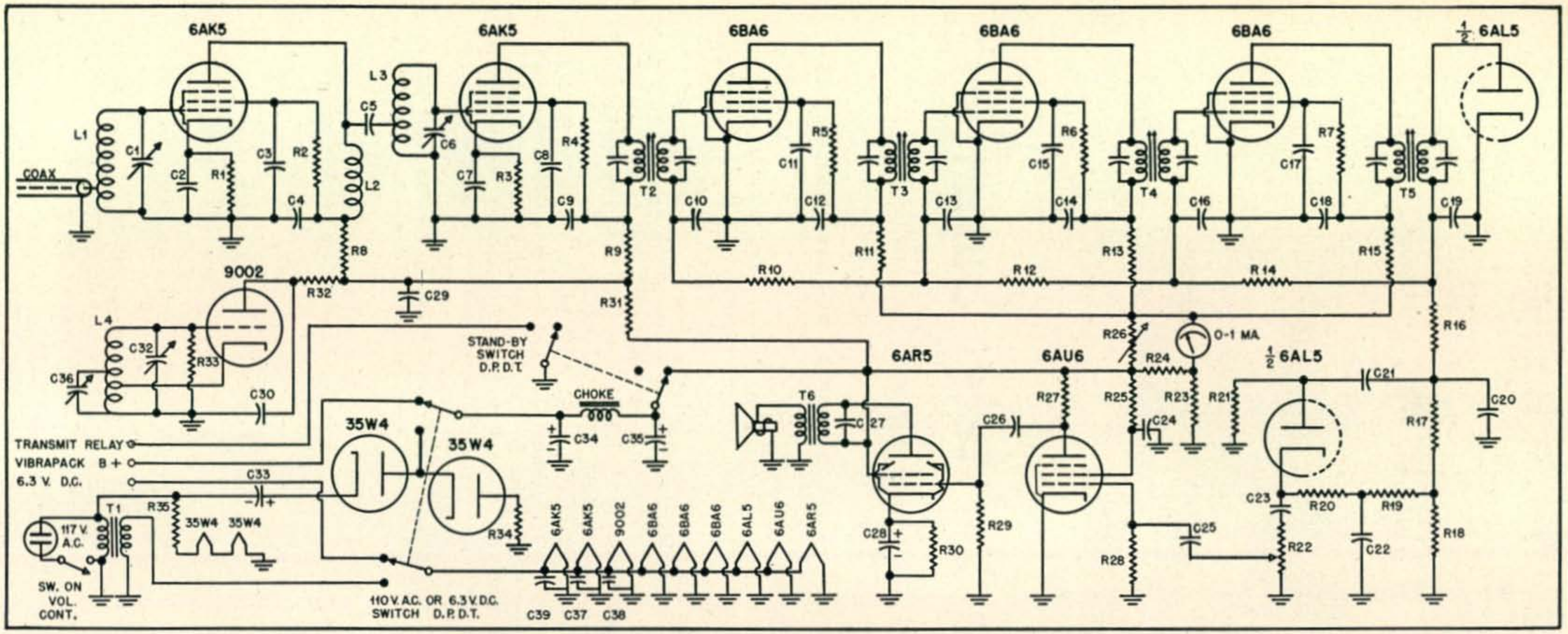
The i.f. in this receiver is 6 mc and about 50-kc wide. This is not as sharp as a communications receiver used at the lower frequencies, but it is quite adequate for most 2-meter mobile work. When used as a fixed station receiver, it is very simple to couple a small amount of this 6-mc energy into the l-f communication receiver and use the miniature receiver as a v-h-f converter.

The particular i-f transformers used in this receiver are from war surplus and were widely available. However, certain of the coil manufacturers are now making a similar unit for use on a somewhat higher frequency and these can be used with equal results.

Three 6BA6s are used as the i-f amplifiers. The 6BA6 provides considerably more gain than a 6SK7, due to its higher Gm rating and low grid-to-plate capacity. The 6BA6 is a remote cut-off tube, making a.v.c. practical, something much more important in a mobile receiver for v-h-f work than in a fixed station receiver.

The use of a.v.c. results in a further circuit simplification by permitting the use of grounded cathodes on all of the 6BA6s. This simplifies wiring and eliminates cathode resistors and by-pass condensers. Actually, even in the absence of input signal the

* *9 Prospect St., Danvers, Mass.*



Schematic diagram of the miniature 2-meter superhet.

C1—See text.
C2, C3, C7, C8, C30, C37, C38, C39—500 μμf.
C4—5,000 μμf.
C5—25 μμf.
C6—See text.
C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, C21, C23, C24, C25, C26, C27—.01 μf.
C19, C20—100 μμf.
C22—.1 μf.
C28—25 μf, 50 v., electrolytic.
C29—8 μf, 50 v., electrolytic.
C31—50 μμf.
C32—See text.
C33—20 μf, 150 v., electrolytic.
C34, C35—20 μf, 350 v., electrolytic.
C36—2-10 μμf, variable.
All capacitors paper, 400 volts, except where noted.
R1—250 ohms.
R2, R5, R6, R7—30,000 ohms.
R3, R24—5,000 ohms.
R4—240,000 ohms.
R8, R9, R32—4,700 ohms.
R10, R12—220,000 ohms.
R11, R13, R15—150 ohms.
R14—2.2 megohm.
R16—47,000 ohms.
R17—100,000 ohms.
R18, R19, R20, R29—470,000 ohms.
R21—1.0 megohm.
R22—500,000-ohm potentiometer.
R23—50,000 ohms, 1 w.
R25—1.0 megohm.
R26—5,000-ohm potentiometer.
R27—250,000 ohms.
R28—10.0 megohm.
R30—750 ohms, 1 w.
R31—4,000 ohms.
R33—10,000 ohms.
R34—27 ohms, 2 w.
R35—300 ohms, 10 w.
All resistors ½ watt, except where noted.
T1—6.3 v. a.c., 3.0 amps.
T2, T3, T4, T5—5.5-mc i.f.
T6—Output transformer.
L1—6½" #12 copper wound on ⅜" dia. form (removed) ½" lead. Tap at ½ turn from bottom.
L2—Same as L1.
L3—Same as L1, tap 1 turn from bottom.
L4— 28 e. wound full on ½ meg. 1-watt Allen-Bradley resistor.
See text for details.

tubes are not run at zero bias because the applied bias voltage to the i-f grids is the sum of the contact potential at the detector diode plus the rectified voltage caused by tube hiss and random circuit noise. The resulting minimum bias is around 1.0 volts, which is just about right for the 6BA6.

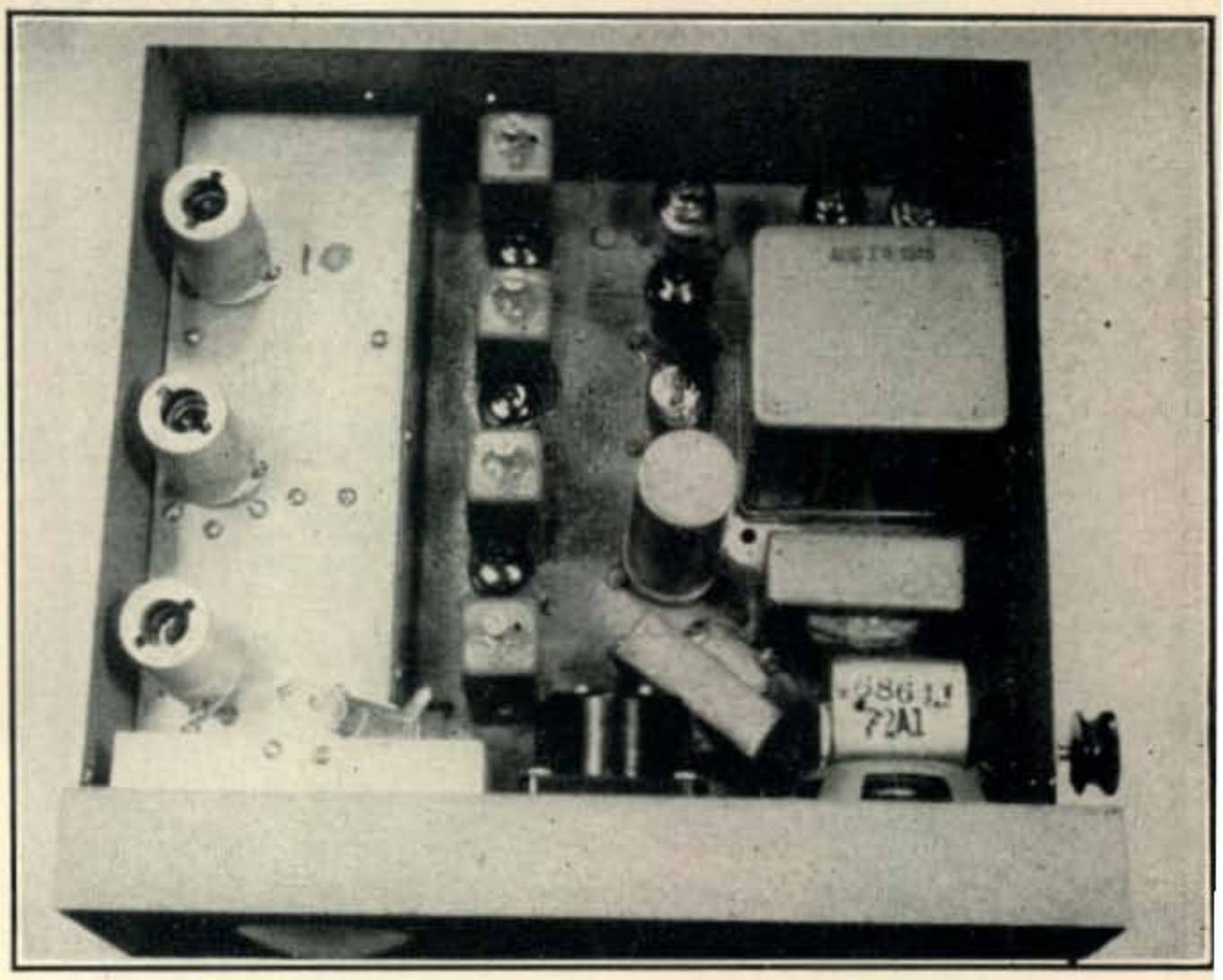
The Automatic Noise Limiter

Following the i-f strip is a 6AL5 dual diode, used as detector and automatic noise limiter. The noise limiter circuit deserves particular attention because it is a little different from those in common use today. The action is identical to that of several other circuits as far as limiting is concerned, but the loss of audio signal is only about 20%, whereas other circuits may lose as much as 50 to 70%. This loss of audio is not too significant in a fixed station receiver because it usually requires only a higher gain audio system to compensate for the loss. However, in the case of this small receiver, the number of tubes was limited and too great a loss of audio would result in insufficient output on weak stations.

The explanation of the limiter action is as follows: The detector diode draws current with a signal impressed on its plate. The action of this current makes the upper end of *R18* negative with respect to ground. The limiter half of the 6AL5 has its cathode connected to the upper end of *R18*, and therefore it assumes the same negative potential with respect to ground. The plate of the limiter half of the 6AL5 is is connected to ground through *R21*, and therefore will be less negative than the cathode.

If the plate is less negative, it may also be said to be more positive (than the cathode) and therefore a condition exists which will permit that diode to conduct. This is the steady state condition under constant signal amplitude. Signal voltage, or audio, appears across the detector load which consists of *R16*, *R17*, *R18*. *R16* is used as an r-f filter in conjunction with *C20*. Audio is taken off at the junction of *R16* and *R17* and is fed to the limiter diode plate through *C21*. If the diode is conducting, audio likewise appears across the cathode load resistor, *R20*, and is transferred to the volume control by means of *C23*. It will be noted that when the diode is conducting, substantially all the audio appears at the output of the limiter; the main difference between this and other limiter circuits where the diode load is tapped at its midpoint and signal for the limiter diode taken off there. This immediately cuts the available audio voltage in half. In the case of the receiver being described, the use of this modified limiter circuit permits utilization of all but about 15% of the available audio voltage.

While on the subject of diode limiters, many amateurs have expressed dissatisfaction with this or that commercially designed limiter. Sometimes the same circuit will work well in one receiver and very poorly in another. Many have been at a loss to explain this fact. Without going into a detailed explanation of all of the reasons underlying the phenomena, a simple cure for most of these eratic conditions is to drop the heater voltage on the 6AL5 or 6H6 to about 5.0 volts. The cause of trouble is a combination of excessive contact potentials as well as heater-cathode and heater-to-plate

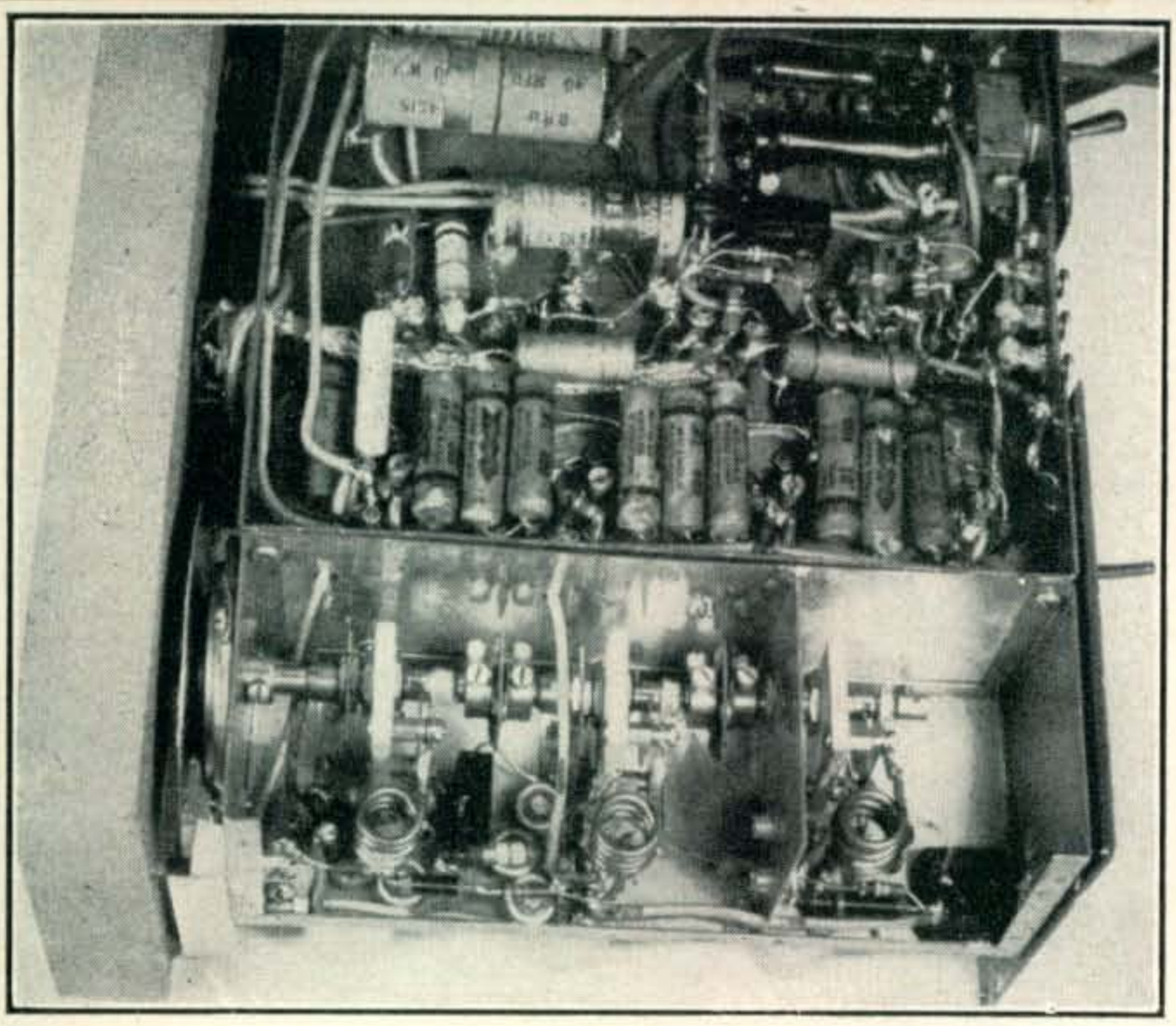


Receiver layout. Left row, front to back: 9002 osc., 6AK5 mixer, 6AK5 r.f. Middle row: three 6BA6 i.f.s. Right-hand row: 6AR5 power output, 6AU6 audio, 6AL5 detector and limiter. Two 35W4s are behind the filament transformer. Filter choke is behind speaker, output transformer is between S-meter and speaker. Knob on right side is S-meter zero-adjustment.

emission. These conditions are all aggravated by high heater potentials and the action of the diode is in no way impaired when the heater voltage is kept around 5.0 volts.

Limiting action takes place when a pulse of relatively great amplitude, but relatively short duration, such as produced by ignition, is impressed upon the detector. The pulse is rectified and causes the voltage across the diode load to increase many fold. The cathode of the limiter remains at the same voltage as previously established by the average signal level because of the long time constant *R19*, *C22*. This period of time is much too long to accommodate the sudden pulse voltage and therefore the cathode potential with respect to ground is unchanged. But the plate circuit of the limiter diode has purposely been designed with a much shorter time constant and therefore the plate is driven suddenly very negative for the duration of the pulse. With the plate highly negative, much more negative now than the small amount of negative voltage appearing on the cathode as a result of the previous average signal level, the diode is cut off and a "hole" appears in the audio output where there would have been a loud ignition "pop." This action of the limiter in removing ignition noise is so successful that signals which are just over the noise level without the motor running are still 100% readable with the motor running. You are conscious of the ignition, but in no way does it reduce the readability of the signals. This is probably due to the fact that you hear the "holes" punched in the signal by the ignition pulses, but since they are "holes" and not voltage peaks, they do not block the audio system or overload the loudspeaker.

The audio system is a typical resistance coupled pentode voltage amplifier driving a miniature power output tube. Actually, any one of three tubes could have been used here depending upon whether maximum output or minimum drain is required. The 6AK6 will deliver a little better than a watt of audio



Detail view of the front end. The oscillator is on the left, mixer in the middle, r.f. on the end. The short piece of wire coming from the r-f coil connects to the coax fitting in the side of the box which was removed to make this view possible. Behind the front end is the i-f strip with the by-pass condensers lying across the sockets to obtain minimum leads.

with a saving in cathode and heater power. The 6AQ5 will do everything that the familiar 6V6GT will do, but takes more current than the 6AR5. The 6AR5 is a happy compromise and provides ample audio without too much battery drain.

The S-meter circuit is conventional. The plate and screen current for the three 6BA6 i-f amplifier tubes is used to control a conventional balanced bridge type of indicating circuit. Changes in signal level cause a change in a-v-c voltage which is applied to these three tubes, thus changing their combined plate and screen currents which are supplied through *R26* from common B+. The other half of the bridge consists of *R23* and *R24*. The 0–1 milliammeter reads the departure from balance of this bridge circuit and this is calibrated in S units using a change in signal of 6 db per S unit.

Front End Design

Perhaps the most important part of any v-h-f receiver is the front end and certainly you can gain or lose most at this point. The mechanical design of this front end permits shortest possible leads, excellent by-passing, adequate shielding and shaft control of all tuned circuits. The tuning condensers are Cardwell ZR-AS-10 units which have been modified so that only one rotor and stator plate remain. If it is desired to cover only the band from 144-148 mc with slight overlap, double space the single plate away from the rotor. Otherwise, the coverage will be approximately 142-152 megacycles. the writer preferred the wider coverage since it permitted eavesdropping on other services.[1]

Each condenser is mounted by a small "L" bracket from the top deck through which the tubes are mounted. The shafts are all connected together with flexible couplings and are brought out to a velvet vernier dial mechanism. A shield separates the r-f compartment from the other two sections completely. All by-passing is done by means of silver-mica stud-type by-pass condensers. These are mounted by means of screws in a small arc around each socket, one being located next to each pin requiring a by-pass. The rotors of all condensers are grounded by means of the wide "L" bracket supporting them and, thus, the inductance in the grid return circuit is kept at a minimum. All of the sheet metal used in the front end is .025 copper, reducing the r-f resistance in the various ground returns to a very low value.

Coupling from antenna to r-f grid coil and also from r-f plate-to-mixer grid is by direct connection, stepped down so as to afford a reasonably good impedance match. The antenna may be fed with any of the popular twin-leads or with coax. In either case, ground one lead or the shield, in the case of coax, and connect the other lead to a point near the ground end of the r-f coil. This point is not critical and should be ½ to 1 turn up from the bottom. All three tuned coils are wound to the same specifications. Cut a piece of 12 solid copper wire 6½" long. Wind this on a 3/8" diameter form, leaving ½" leads or mounting. After removing the form, pull the turns apart so that the coil is about an inch or more long; then compress it again with the fingers as far as it will go. Note that the coil now springs back a little and becomes a spaced coil with each turn spaced away from the adjacent one by about the diameter of the wire. Coils spaced in this manner come out very uniform.

Coupling between the r-f plate and the mixer grid is by means of a 25-$\mu\mu$f ceramic by-pass which is tapped to the first turn up from the ground end of the mixer grid coil. The plate choke used is made by winding as many turns of #28 wire as possible on an Allen-Bradley 1-watt 500,000-ohm resistor. Cutting small "V" notches in each end of the insulated covering on these resistors helps to hold the wire at start and finish. If a ready-made choke is desired, use an Ohmite Z-144.

Tracking the Receiver

Tracking of a superhet front-end seems to be one of the problems that stops many amateurs from building their own receivers. It is really easier than most people think and is more of a system than a science. Tracking a multi-band, extended range receiver has its complications, but not a simple unit of this type.

First step in adjusting any receiver is to test the i-f and audio circuits. Any service oscillator is good enough to set the i.f.s on approximately 6.0 mc. Do not make the mistake of trying to align the i.f. by "ear." When they are all pretty close to the correct frequency, there is a slight amount of hiss or tube noise that can be used to put everything "smack on the nose," but the odds against arriving at this condition by chance or by random tuning of the eight circuits are astronomical. An output meter may be used to insure correct peaking of each stage, but the built-in S-meter will do as well. When the receiver is first turned on, the S-meter will probably go off scale one way or the other. This will not injure the meter and all that is necessary to bring the needle to zero is to adjust *R26*. Simply tune all transformers

[1] Caution should be observed when extending the coverage beyond amateur bands. In many states and cities it is illegal to carry a receiver capable of tuning police service.

for maximum S-meter deflection, reducing the input of the generator as the S-meter reading gets up over mid-scale in order to insure maximum sensitivity to to small changes in the tuning.

With this much of the set working, next check the oscillator to see that it is operating over the entire tuning range. Do this by means of a 0–1 milliammeter placed in series with the ground end of the oscillator grid leak. The current should be 100–200 microamperes and should be reasonably constant from minimum to maximum capacity setting. If trouble is experienced, check the tube by substituting another. Be sure that *C30* and *C38* are good quality by-passes—either ceramic or silver mica or yellow bakelite molded mica.

If the oscillator tunes satisfactorily and the coils are made as stated above, the unit will be capable of picking up some kind of signal, even though it is not tracking. Begin by coupling the antenna into the mixer grid by a one-turn loop held close to the bottom of *L3* or by tapping it directly on at the point where *C5* is connected.

Set the mixer tuning at the middle of the range and tune the oscillator circuit. The set screws in the flexible couplings are backed off during this test. If a signal can be tuned in, leave the oscillator set and tune the mixer condenser to increase the signal to maximum, using the S-meter as an indicator. If the maximum occurs with the mixer tuning condenser all the way in, squeeze up the mixer grid coil and retune. Do this until the signal falls at about the proper place in the range. Now couple on the r-f stage and again peak up the signal; this time using the r-f tuning condenser, leaving both of the others fixed. Some small readjustment of the mixer tuning may be necessary because of the difference in loading caused by removing the antenna from this stage. Adjust the r-f and mixer tuned circuits so that they peak at the same settings and with the signal in the desired spot on the tuning range. If the coils and tuning condensers are made in accordance with instructions, these two circuits will track over the entire range, once they are brought together at any one frequency. They should, because they are operating on the same frequency; the distributed L and C are alike and the lumped L and C are also alike.

The only remaining problem is to get the oscillator to track with the r-f and the mixer stages. This is very easy if one thing is kept in mind. The oscillator, while working at a slightly higher frequency, is still not far enough away to make any serious tracking problem over such a short range; provided that the distributed L and C are the same and the lumped L and C are also the same. The latter was taken care of by making the three coils and tuning condensers identical. The former can be accomplished by adding a small amount of adjustable C to compensate for the fact that the input capacity of the 6AK5s is about 4 $\mu\mu$f, whereas that of the 9002 is about 1.2 $\mu\mu$f. A small trimmer is tapped across a part of the oscillator coil and this is used to set the minimum frequency of the oscillator. By rotating the mixer and r-f tuning condensers to minimum after adjusting them as above, then rotating the oscillator condenser to minimum and tuning the trimmer for maximum backgrou nd noise, the oscillator can be set to the proper high frequency setting. Tuning all three condensers, as a gang now, should produce very little change in the background noise from one end of the range to the other. If there is a marked change, it probably indicates that one or more of the circuits is not tracking as it should.

Using the Tuning Wand

A very useful gadget for determining what circuit is running out and in which direction, is the "tuning wand." This is simply a piece of bakelite tubing about ¼" to 5/16" in diameter. In one end there is a powdered iron slug and in the other end there is a solid brass slug. By inserting first one end and then the other into each of the coils and listening for a change in background noise, it is possible to determine what adjustment is necessary to accomplish tracking. If this is done at several settings of the gang, a fairly good idea of what is going on can be obtained in a few minutes. Inserting the iron end into a coil increases its inductance; whereas, the brass end decreases it. This means that you can tell whether the circuit is calling for more or less inductance at a given setting. Remember that what the wand really shows you is whether the circuit wants more LC or less LC, because when an increase in L is called for, it can also be satisfied by an increase in C. This may mean that a certain amount of plate bending will accomplish what inductance changes cannot. Never change the inductance of a coil in tracking unless the wand indicates that a change is necessary throughout the whole range and that the change is always in the same direction. Otherwise, make the indicated change by bending the rotor plate in or out at the spot indicated to get the desired tracking.

Power for this receiver may be obtained from the broadcast receiver in the car or from any 110 v. a-c socket. The drain from the car receiver will be approximately 250 v. at 60 ma and 6.3 v. at 3 amps. In tests in the car, signals 30 miles away were heard with good strength with the motor running and the car in the side yard at an elevation only 40 ft. above sea level. A quarter-wave dipole in the top of the car was the antenna used for these tests. A superegen receiver under identical conditions had difficulty receiving signals from only 10 miles away.

Dollars for Watts

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TO LOCATE FRANK JUST CREATE A DISTURBANCE IN VICTORIA, B.C.

K2UN - *The*

LAWRENCE LeKASHMAN, W2IOP*

At the official opening K2UN, George Bailey, W2KH, president of I.A.R.U. and A.R.R.L., made the first CQ while Benjamin Cohen, assistant secretary-general for public information (at left) and Brig. Gen. Frank Stoner, chief communications engineer (next to flowers), and others observe.

On the evening of May 17th, with great fanfare, a new amateur station made its official debut. Surely there must be something different about a ham station that requires so formal a proclamation of its opening. There *is* something different about this station, but it is not the unusual call, K2UN, nor the fish bowl location in the main corridor of the United Nations Headquarters at Lake Success. The thing that sets K2UN apart from other amateur stations is the ideal to which it is dedicated—the promotion of international goodwill through amateur radio. It is the hope of the members of the United Nations, the editors of *CQ*, and indeed all amateurs, that in the years to come this singular uniqueness of K2UN will become less and less, as it is joined by amateurs throughout the world in this effort to promote world peace and understanding through amateur radio, the one medium that transcends all national boundaries.

K2UN is the call of the radio station belonging to The United Nations Radio Amateur Club. The club has many objectives, but certainly the most important is its dedication, "To preserve and foster the spirit of fellowship among the United Nations employees and the radio amateurs of the world and to provide an organization through which the traditions of amateur radio operators may be perpetuated." Executive offices of the Club will be located at the Headquarters of the United Nations. The objectives of the UNRAC are emphatically and clearly stated in the formal charter of K2UN. But aside from the lofty ideals behind the formal language, and most important to amateurs everywhere, is the liaison between the U.N., through the Department of Public Information of the Secretariat, and the International Amateur Radio Union.

A joint board has been established consisting of two members from I.A.R.U. and two from the U.N. to formulate the policies, methods and procedures for submission to the Assistant Secretary-General for Public Information, U.N., and to the President of the I.A.R.U. for final approval. In addition to this group a general committee consisting of interested amateurs in the vicinity of U.N. and U.N. staff is being formed to set up and maintain operating schedules for K2UN. As the program for the dissemination of U.N. information is approved, full details will be brought to the attention of amateurs everywhere. It is hoped that through these groups, and the welcome advice and suggestions of interested hams everywhere, mutual problems will be worked out to everyone's benefit.

Operating K2UN

Operation of station K2UN is tentatively set up on this basis. Volunteer amateurs are maintaining supervisory watches on a regular schedule. During these supervisory watches the amateur in charge is responsible for the operation of the station. Anyone desiring to visit may do so, amateur or otherwise. However, only licensed amateurs may take over the controls. Only guests of amateurs, or United Nations' personnel may use the facilities for communicating with other stations. Prearranged schedules and chance contacts are giving many U.N. per-

* *Managing Editor, CQ.*

K2UN as seen through the glass-panel front in the main corridor of U.N. headquarters at Lake Success.

Amateurs' Voice in the United Nations

sonnel, away from home for many months, an opportunity to speak to someone back home. In attempting to describe the effectiveness of K2UN as a goodwill ambassador for amateur radio two instances might be cited. The chief delegate from an Asiatic country, notably hostile to amateur radio, stopped in at the station out of curiosity. This noncommital visit was followed shortly thereafter by another, at which time he announced that upon his return home every effort would be made to authorize amateur radio.

Another instance, and one which is repeated almost daily, was the case of the French delegate who rather tremulously took the microphone and said a few words in his native tongue. The microphone was held two feet away and the U.N. delegate had all the symptoms of a typical case of mike fright. But when the station in Paris came back and the Gallic flavor of his speech boomed out of the speaker you could see the delegate relax and take over like a 14-mc phone DXer. Not only was his own experience thoroughly enjoyable, but you can be certain amateur radio was widely and enthusiastically boosted to the friends and associates of this one individual. Multiply that reaction by any appreciable amount and the benefits are obvious.

K2UN is unique in that it is the only amateur station operating within the continental borders of the United States which is not under the jurisdiction of the F.C.C. By Congressional authority the United Nations area in Lake Success is an international zone, in most respects not under the control of the United States. In the Congressional grant was the right for the U.N. to maintain an amateur radio station. Because of its proximity to American hams the station is being operated strictly in accordance with the laws regulating U.S. citizens, with one notable exception. It is not necessary to hold a U.S. amateur license to work K2UN. A valid amateur license of any U.N. member nation is sufficient. It is contemplated as a future project that if members of the U.N. show sufficient interest to obtain an amateur license that the U.N. may issue one to permit their own personnel to operate K2UN. Should this eventuality materialize, the examination will be patterned after the F.C.C. exam, including a code examination and Class A and B licenses.

Contributing to the Success of K2UN

At this point the average amateur might ask the very logical question, "What can I do to make K2UN a success?" Hams in the neighborhood of Lake Success are cooperating in supplying operators and maintaining the station. Amateurs elsewhere will be doing yeoman service by aiding K2UN get traffic through and generally assisting them in completing contacts. It must be kept in mind by amateurs everywhere that the individuals operating the station will in many instances not be highly experienced operators. Certainly tolerance is in order, tolerance of the very same sort that the United Nations is dedicated to. Already an occasional caustic remark has been heard on 75 and 20 about the "rights" of K2UN. It must be remembered that the United Nations is a member of every international radio conference and as such has an important voice in frequency allocation matters. Considering the selfish motive alone, it behooves every amateur to cheer wildly for the success of this station. From the standpoint of fraternity, a vaunted heritage of amateur radio, Americans should welcome this chance for foreign amateurs to relax at their hobby while in this country (a privilege granted to many Ws residing in other countries).

As a token of appreciation to amateurs assisting K2UN, whether it be in the form of actual operation, the maintenance of schedules, or assistance in clearing traffic, the United Nations is awarding an appointment as a U.N. Amateur Radio Aide. A certificate, bearing the seal of the U.N. and the signatures of the Assistant Secretary General of U.N. and the President of I.A.R.U., is being presented to U.N. Radio Aides.

K2UN is located in a handsome functional room containing an operating console and two dual-final one-kilowatt transmitters. The transmitters were custom built by Temco and give K2UN coverage on 10, 20, 40 and 80. Crystal control was employed deliberately for two reasons, first to avoid the possibility of unnecessary QRM when shifting frequency, and secondly to permit the easy location of K2UN when the station is operating. While final frequencies have not yet been agreed upon, on 14-mc phone at least, 14,296 kc is likely to become the permanent spot for the station. Included on the

(*Continued on page 89*)

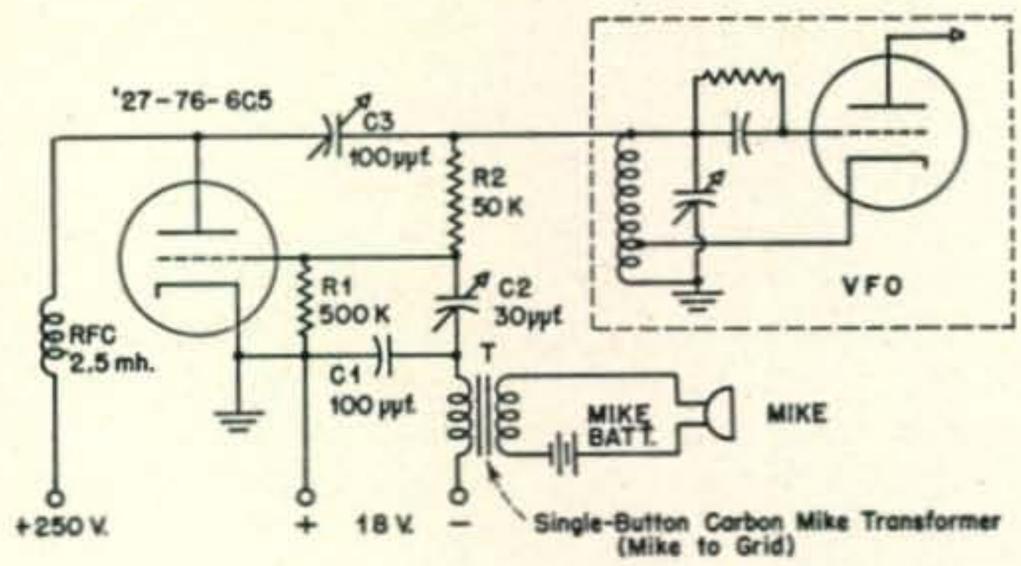
The antenna set-up dominates the temporary U.N. headquarters at Lake Success. Two 90-ft. sticks support center-fed doublets for 80 and 40, and three-element rotaries for 20 and 10.

Inside the SHACK AND WORKSHOP

Conducted by A. DAVID MIDDELTON, W1CA*

Simple NBFM Modulator

The circuit shown in the figure, consists of a triode (27-76-6C5, etc.) biased as a Class B r-f amplifier, a phase-shifting network (R_2 C_2) and a microphone transformer which supplies the audio to grid-modulate the triode.



The circuit functions as follows: R.F. from the oscillator is shifted 90° by action of R_2 and C_2. This is applied to the grid in series with the audio voltage developed across T_1. The resulting modulated r.f. is fed through C_3 back to the oscilator where it combines with the r.f. in the grid circuit to produce a new wave whose phase will shift in accordance with the amplitude of the reactance tube output.

I use this circuit on the 75-meter NBFM band, using a '27 tube, reactance-modulating a 24-A v.f.o., and obtain good results.

The adjustments of C_3 and C_2 are the same as for any conventional reactance modulator circuits. The reactance tube connects to a grounded-grid coil in the v.f.o.

Lawrence F. Marinaccio, W3TTG

Calibrating Check Points From B. C. Stations

Those amateurs living in areas close to one or more standard broadcast transmitters (most any urban area) will be interested in the following simple scheme for checking the calibration of their receivers.

A fixed crystal detecter is connected between the antenna and ground posts of the receiver to be calibrated. A 1N34 or any other type may be used. A good antenna and ground is connected to the same receiver, and the set up is ready for use.

The crystal, being a non-linear element, converts the impressed r-f signal from the broadcast station to a non-sinusoidal wave which is high in harmonic content. These harmonics can then be heard by tuning the receiver to them. A table can be made up of the harmonics of all the near-by stations and their approximate locations on the dial determined. Since these stations are required by law to be within twenty cycles of assigned frequency, and are usually much closer than this, these harmonics can be used as accurate points to check calibrations or to insure in-the-band operation.

At my locality, about two miles from a 250-watt station, I was able to hear up to the 14th harmonic in this manner. In localities where there are several stations operating at the same time, it might be advisable to use an auxiliary receiver tuned to the one desired so as to avoid confusion with the others. Any wanted harmonic can then be identified by the program.

Virgil W. Wall, W3LMS

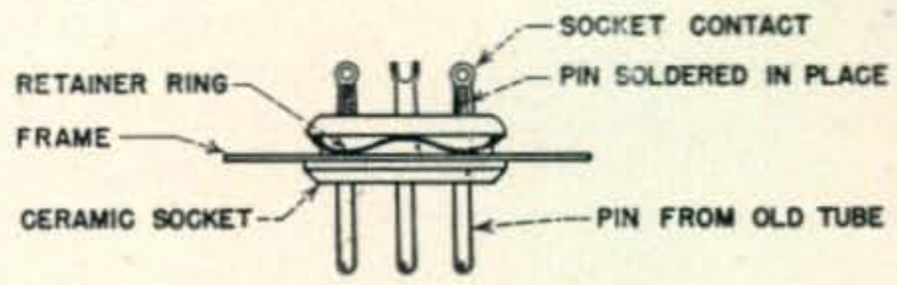
Output Plug for a 274N Receiver

Here is a quick and effective way to obtain the output from one of the 274 type receivers, when used as a converter. Remove the 12SR7 tube and plug a PL-291 (obtainable from the cord on a throat mike) into pins number 4 and 5. The plug fits nicely into these pins, and the line from the plug is fed into the input of your regular receiver.

Alva H. Clark, W4DCB

Ham-made Coil Form Plugs

During the construction of a new receiver, no ceramic plugs were available so we made several from ceramic tube sockets and the pins removed from defunct 5-prong tubes. The old tube's pins were carefully removed from the base and were inserted into the ceramic tube socket (a five-prong type was used here) with the *base* end of the pin pushed up into the tube socket contact. This is



just the reverse of its normal position and a bit of filing may be required to get the pin to fit properly. The pin was then soldered in place.

The metal frame of the socket was used in the normal manner, and the new pins plugged easily into the female socket. For clarity, in the drawing only three of the five pins are shown.

Meyer Birnboim, VE4LT

Home-Made Nameplates

Using a Leroy lettering set or other lettering guide and black India drawing ink, make the letters full size on a sheet of tracing paper or very thin (air mail) stationary. Examine the lettering against a strong light to be sure that the ink lines are uniformly dense and that they do not transmit any light.

Oil the paper thoroughly from both sides (a light grade of machine oil will do nicely), remove the excess oil and wipe dry. Using the drawing as a "negative," make photographic prints on high-contrast printing paper. Cut out the nameplates, blacken the edges with ink, and fasten the finished plates to the panel with Duco cement.

Henry L. Cox, Jr., W3MJC

**Address all contributions to S & W Department c/o CQ, 342 Madison Ave., N. Y. 17, New York.*

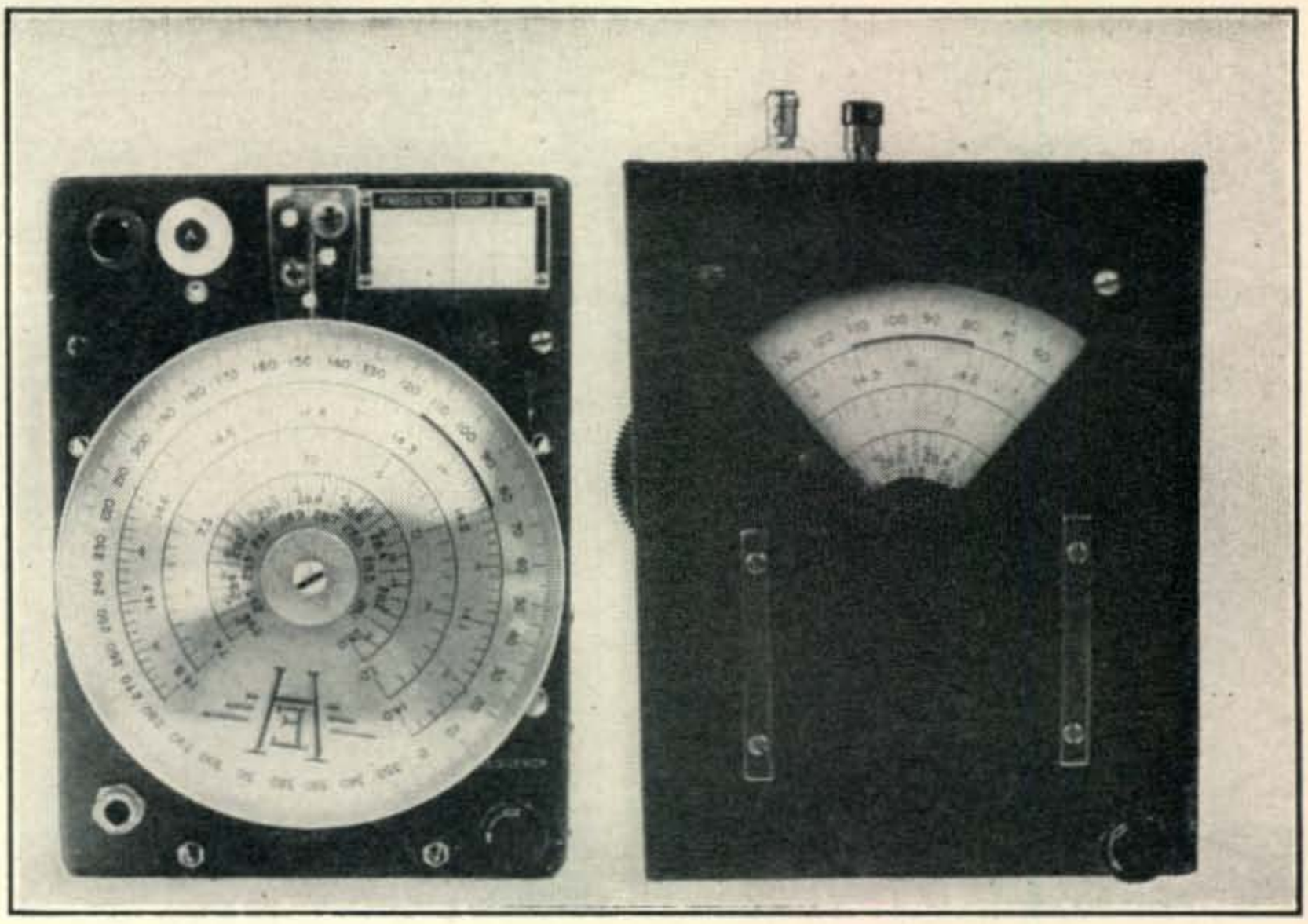


Fig. 4. The SCR-274N with the bandspread dial installed. The model on the right has a front plate exposing only the portion of the dial being read.

E. HENRICH, W8OVL*

Bandspreading the SCR-274N

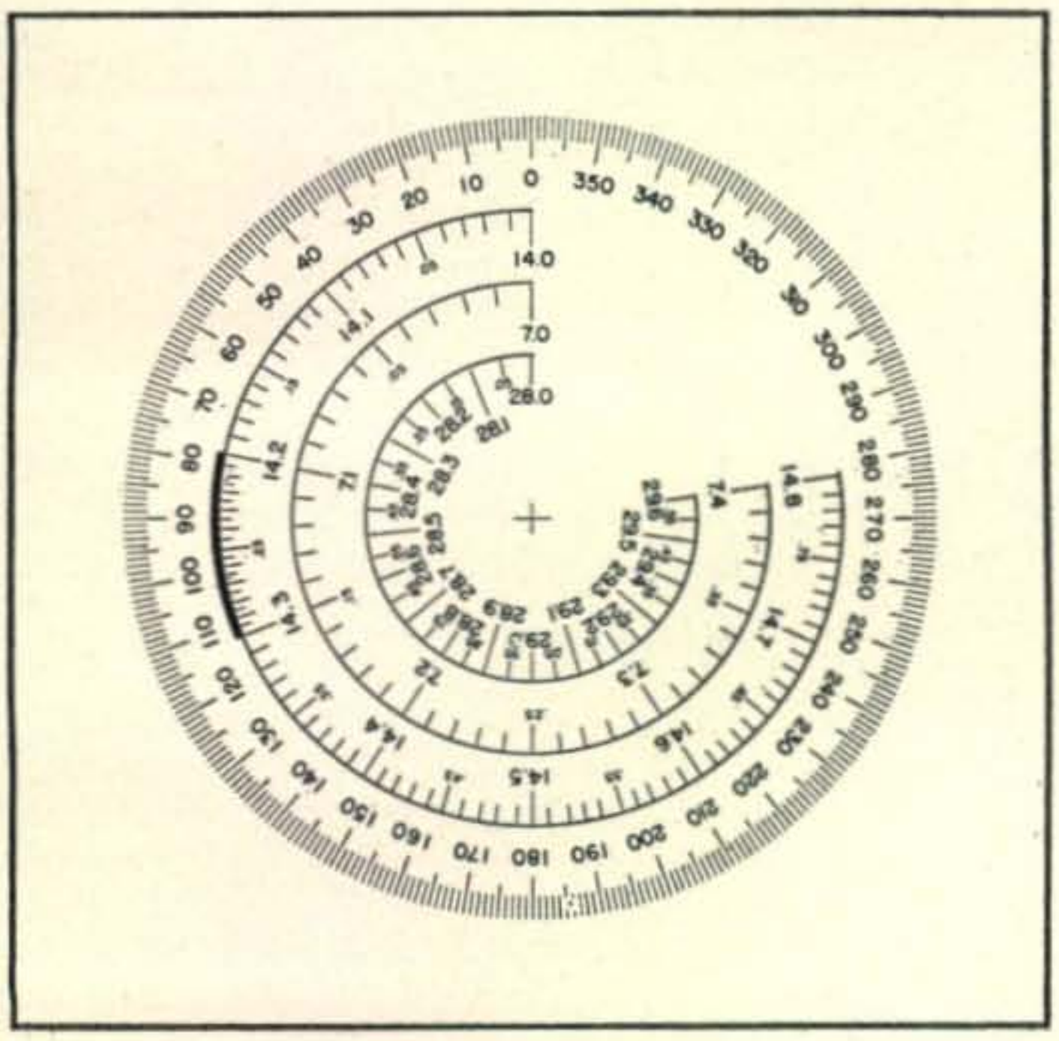
Improving the operating convenience of the command transmitter.

ALMOST EVERYONE speaks highly of the SCR-274N. When the transmitters are converted they make excellent units for v-f-o operation. Mechanically, the one prominent fault that is found with the transmitter is the lack of bandspread and direct calibration at the harmonic frequencies. Since these circuits are initially stabilized, the frequency reset accuracy with a regulated power supply is quite good. In view of these factors the writer decided to attach a bandspread dial to one of the units—thus providing direct readings on all the important amateur bands that are in harmonic relationship to 40 meters.

* *144 Edgar Ave., Dayton 10, Ohio.*

The converted transmitter is the BC-459A that in its original form covers 7.0 to 9.1 mc. The old dial is taken off and a gear substituted in its place to obtain a step-up ratio for the new dial. This gear is similar to the one now driving the frequency dial from behind the panel. It is a 48-pitch 110-tooth gear, and may be obtained from a stripped down BC-459A, or a gear supply house.

The pattern of the bandspread dial is shown in *Fig. 1.* This is the extent of the bandspread obtainable with the 110-tooth gear. Using another gear ratio will result in a change in the amount of bandspread and the calibration. A second pattern is shown in *Fig. 2*, which was obtained by using a gear



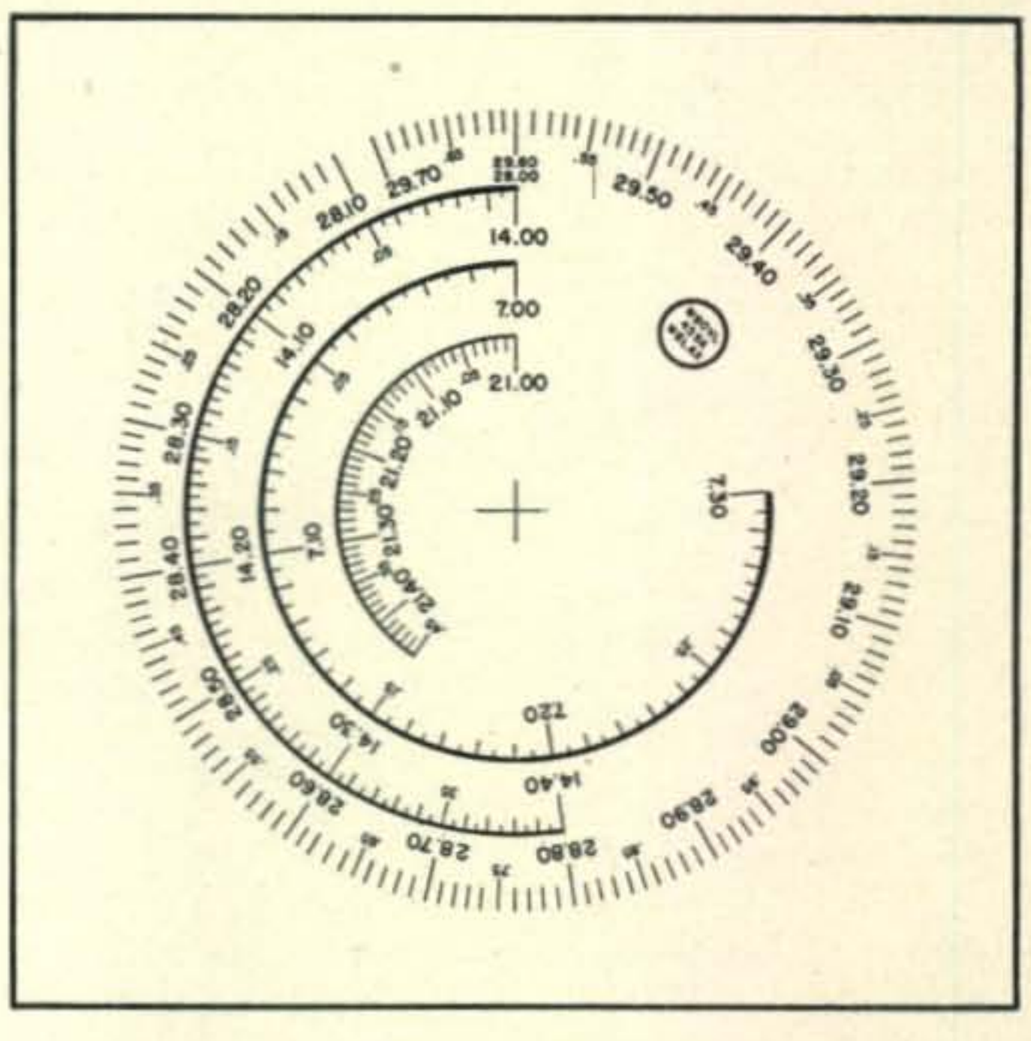


Fig. 1 (left). Bandspread dial pattern for the BC-459A using the 110-tooth gear, and Fig. 2 (right), using a 144-tooth driving gear. Enlarged photostats may be made from these drawings.

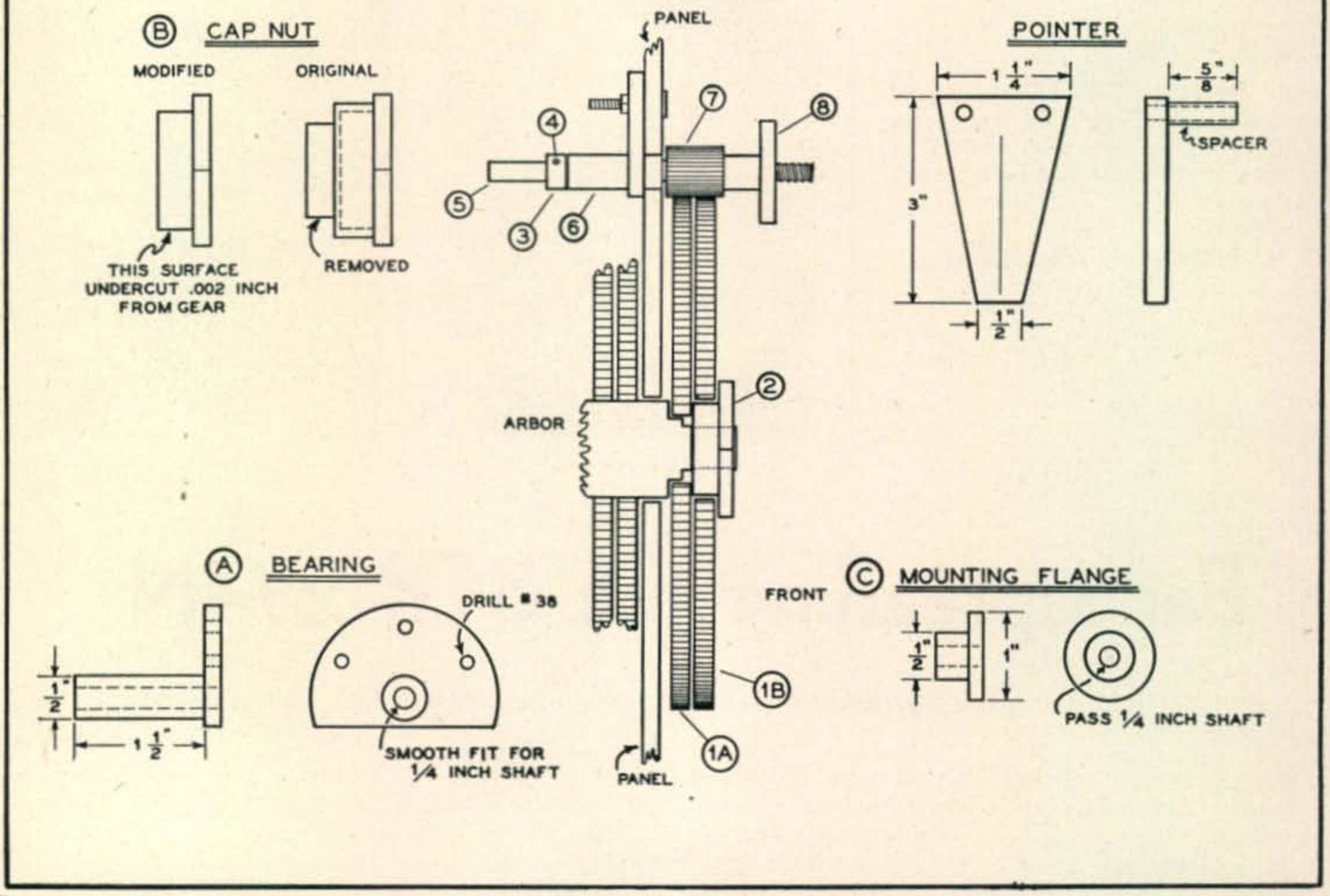


Fig. 3. Additional parts and mounting arrangement for installing a directly calibrated bandspread dial on the BC-459A.

having 144 teeth. In both instances, the calibration is based upon the gear ratio and should be sufficiently accurate for all practical purposes. The pattern may be copied from the page by photostat and enlarged to a diameter of between four to six inches.

Installation Instructions

1) In order to simplify the correct positioning of the tuning condenser and the bandspread dial after it has been installed, it is recommended that the present dial be set to exactly 7.0 mc. Secure the control knob in the lower right corner with adhesive tape to prevent accidental movement during the installation process.

2) Remove the old BC-459A frequency dial. This includes removing the dial, the index spring, rivets, and the locating pin for the dial on the arbor.

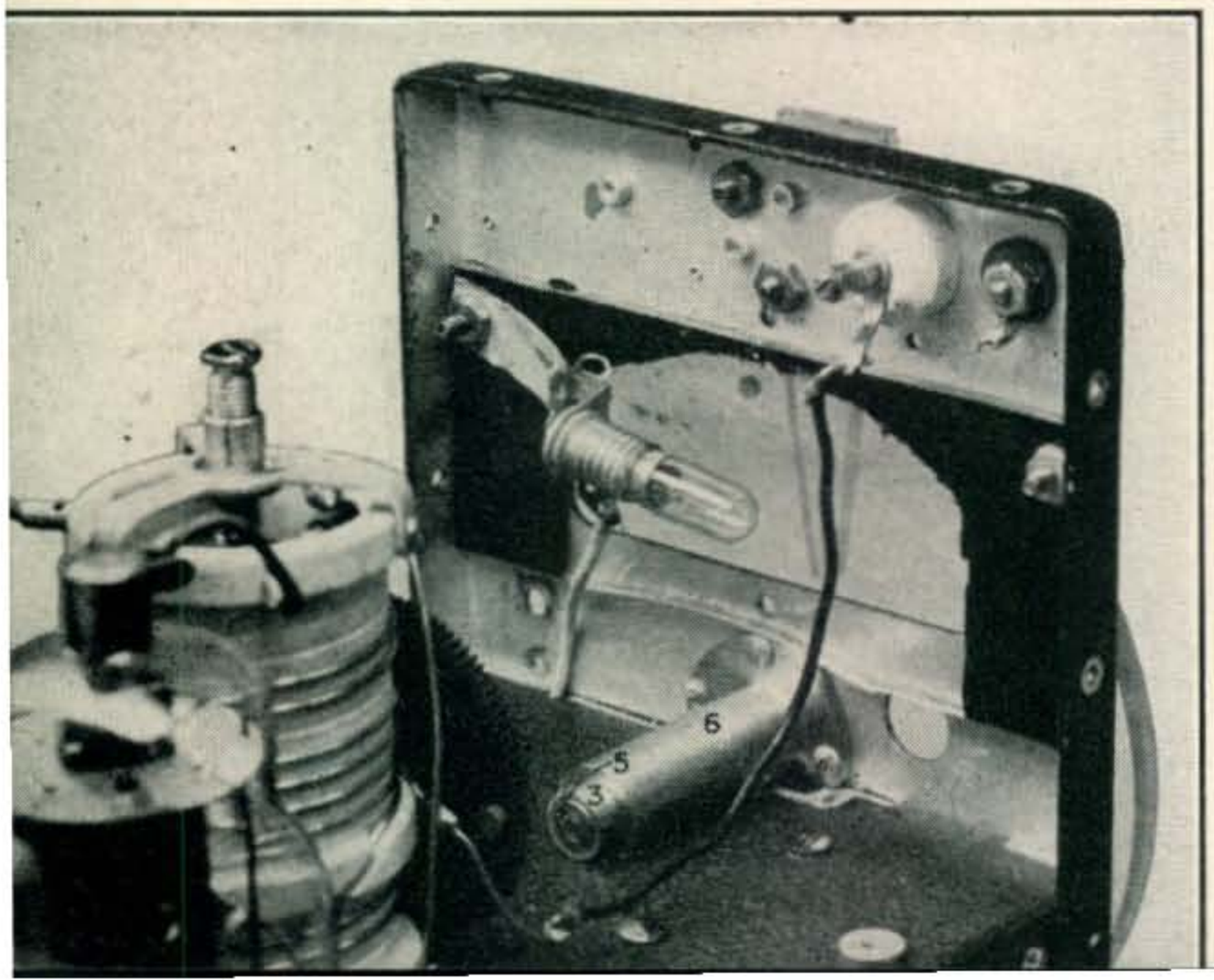
3) Remove the window that looks in on the antenna inductance above the frequency dial. Remove the present antenna coupling knob, shaft, gear and bearing in the upper left-hand side of the transmitter.

4) Set a pair of dividers to 1 7/16". Locate one point in the center of the dial arbor. Swing an arc to scribe a mark directly above and in the same vertical line as the dial arbor. This is the center of the 3/8" hole to be drilled for the bearing that will hold the new bandspread dial. This dimension applies only to the 110-tooth gear. Naturally, if the 144-tooth gear is used the diameter of the gear will be somewhat greater and the location of this hole slightly further (1 25/32") up the face of the panel.

5) Drill out the 3/8" hole in *step 4*. Take the bearing shown as *Part A*, *Fig. 3*, and position it at the back of the front panel in line with the 3/8" hole and with the cutoff flange section at the bottom. Scribe the three holes necessary to mount it to the panel. Drill out with a No. 38 drill. Mount the bearing with binding head 3-48 screws.

6) Set the dividers to 3 3/32". Locate one point in the center of the dial arbor. Swing an arc to

Fig. 5. Behind the panel view showing the location of the new window, pilot bulb and the bearing for holding the bandspread dial.



scribe a mark on the front panel near the lower left corner of the old inductance window. Reset the dividers to 2″. Locate one point on the screw under the antenna binding post and intersect the previous scribe mark. At this intersection drill out for 3/16″ clearance to pass the shaft of the new antenna coupling control.

7) Take the original cap nut used for securing the old frequency dial to the arbor and set it up in a lathe and undercut as shown in *Part B, Fig. 3.* Any local machine shop will do this for very little cost.

8) From another BC-459A unit (or from the local gear supply house) secure a split gear identical to the one that drives the frequency dial from behind the front panel. It is a 48-pitch 110-tooth gear. Unless this particular size gear is used the bandspread dial pattern shown in *Fig. 1* will not be to scale.

9) Disassemble the new gear by removing the tension spring. This leaves us with parts *1A* and *1B*. Ream the center hole of gear *1A* until it is a tight snug fit of the dial arbor. This reaming must be exact to hold the true center of the gear. Gear *1B* is reamed somewhat more than gear *1A* until it has a diameter allowing a 0.002″ clearance between it and the cap nut.

10) Take a ¼″ shaft about 2¼″ long and thread one end for a distance of about ½″. Use the most convenient thread for which you have nuts. This shaft should rotate smoothly in the bearing *Part A, Fig. 3.* It is retained on one end by a collar and pin, or set screw. Sometimes a shaft can be secured with the center pre-drilled and tapped. Such an arrangement is shown in *Fig. 7.* The small gear, part number *7* in *Fig. 7*, is the 26-tooth 48-pitch gear originally used for adjusting the link coupling, removed in *step 3.*

11) Make the small flange for spacing the bandspread dial. It is shown as *Part C, Fig. 3.* There are three possible means of attaching the bandspread dial to the shaft. Two are already described in *step 10*, a third is to drill three small holes in the flange of *Part C, Fig. 3*, and bolt the dial directly to the flange section.

12) Closely examine the cut-away assembly drawing in *Fig. 3.* Assemble the gears and shafts for the dial as shown. Note particularly, that gear *1A* is held tight against the dial arbor by the cap nut. Gear *1B* has been reamed sufficiently to float between the cap nut and gear *1A*. Don't forget to put the spring back between the gears *1A* and *1B* in the assembling process. The fiber washer under the original antenna coupling knob should be inserted on the shaft between the small gear, *Part 7*, and the new bearing, *Part A*. Mesh the two gears with sufficient tension to eliminate any back lash. Do not bottom the two gears as this would cause irregular dial motion.

13) There are several methods of recoupling the shafts of the antenna link from the front and side panels. Our method is shown in *Fig. 6.* We have put a 2″ fiber gear on the shaft passing through the new 3/16″ hole (*step 6*) and this hangs out beneath the new bandspread dial to give thumb control. The bearing is adjusted to make the two fiber gears mesh.

14) The dial pattern is secured between two thin sheets of plexiglas. The pointer is diagramed in *Fig. 3*, and is positioned as shown in *Fig. 4.*

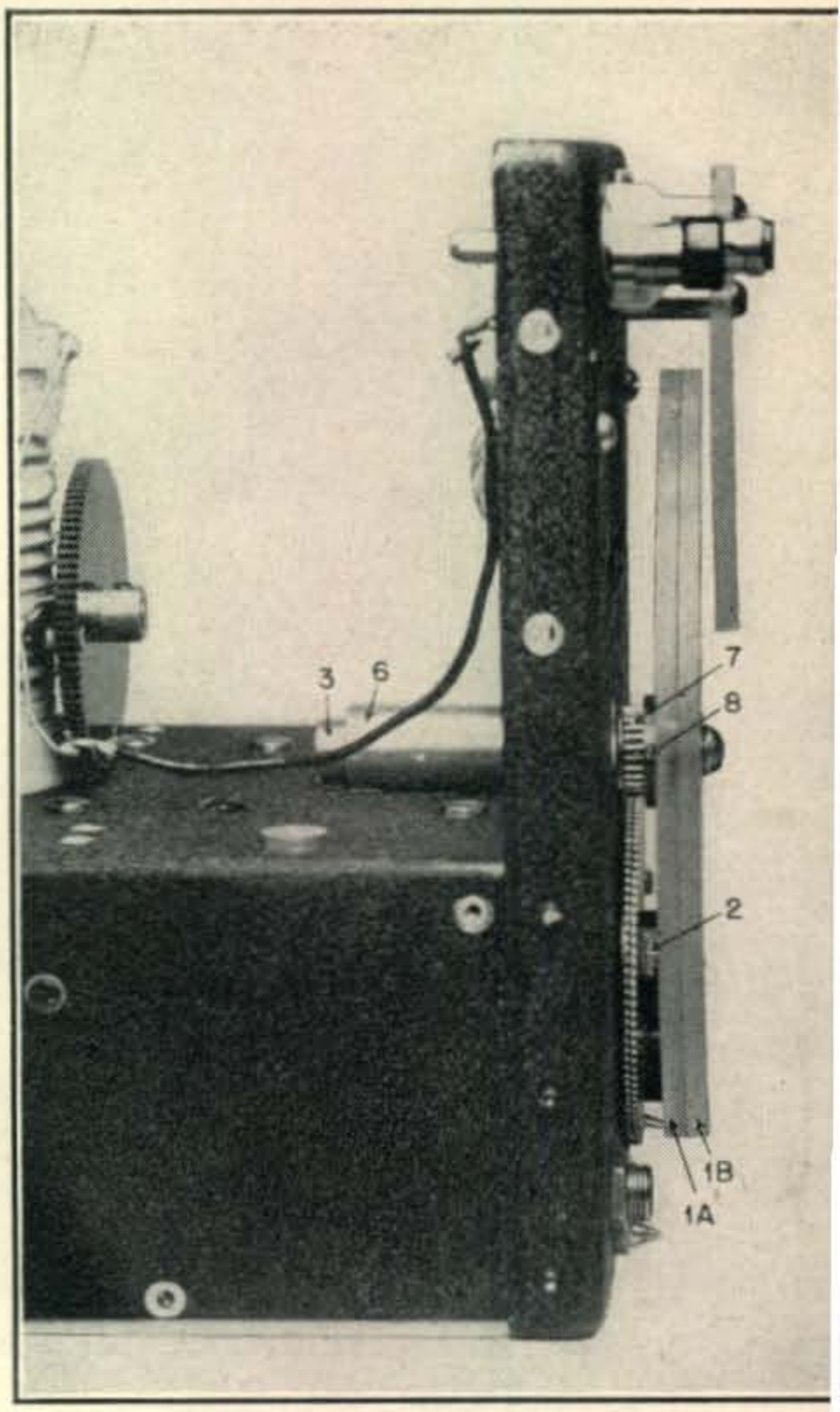


Fig. 7. Side view showing the arrangement of the new gear and bearing for the band spread dial.

Once the dial has been mounted and set to 7.0 mc the unit is ready to be put back into operation. If the tuning knob has not been turned the alignment and calibration should be relatively easy. Check the calibration with a 100-kc standard oscillator. Using the gears as shown, the calibration should be very close. Slight readjustments can be made with condenser *C60* in the BC-459A.

Beautifying may be left to individual taste. A dial light has been installed in most of our models and wired into the filament supply. A sheet of green celluloid may be mounted behind the dial to soften the light. A light metal cover or pan about 1¼″ deep and the size of the front panel can be placed over the entire face. A fan shaped window will allow the dial to show.

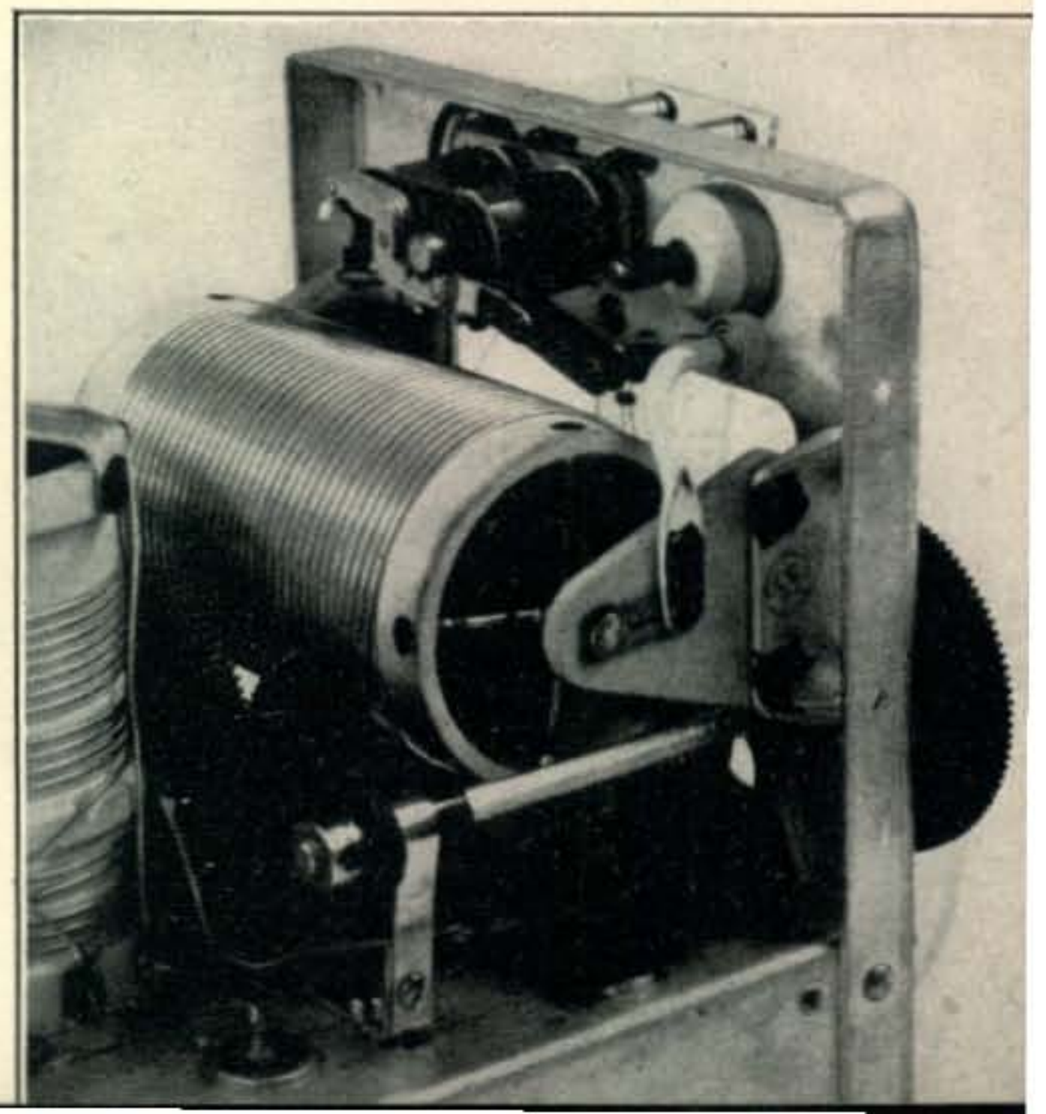


Fig. 6. Method of adjusting the link when the bandspread dial is installed. The fiber gear for thumb control and a new bearing have been used to mesh the gears at the link.

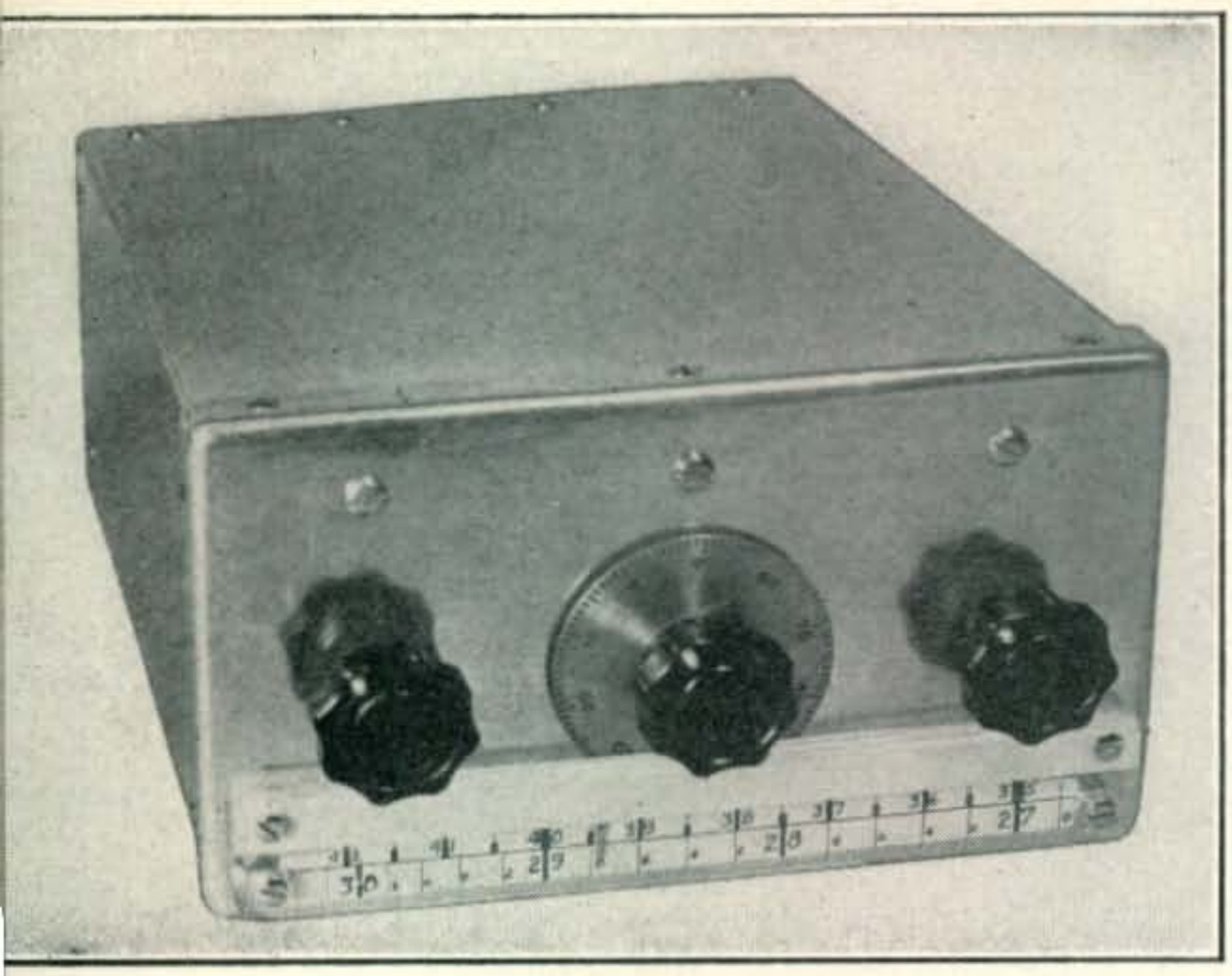


Fig. 1. The completed converter. The tuning dial in the center is read directly in kilocycles, and the slide-rule dial used for counting turns or for approximate readings of frequency. The plate and filament control switch is on the left, band switch on the right.

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GEORGE M. BROWN, W2CVV*

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A Converter for 75 & 10 Mobile

A project for the amateur with adequate shop facilities, this converter offers standard commun ication receiver perform ance both electrically and mechanically.

DURING THE PLANNING of a 10-meter mobile installation at W2CVV, it began to appear extremely desirable to provide for mobile reception on 75 as well as on 10. When the anticipated authorization for mobile operation on 75 comes through, the addition of a 3 to 4-mc 274-N transmitter to the similar 27 to 30-mc unit [1] will permit giving it a try.

A perusal of the various designs for mobile converters which had been published showed none well-adapted to two-band operation, and, in addition, none seemed to possess all the features considered desirable and practical. Accordingly, it was decided to try an entirely different approach. The converter described was the result.

It covers the bands of 3.45 to 4.2 and 26.8 to 30.2 mc. Bandspread and reset accuracy on both bands is distinctly better than on most home-station communication receivers. This feature is particularly appreciated when attempting to maneuver the car in traffic, hang on to the microphone, and tune the converter all at the same time.

The sensitivity and signal-to-noise ratio compare favorably with that of the home-station wide-band converter and Super-Pro. The signal-to-noise ratio, measured with a Measurements Corporation Model 80 signal generator, is better than 6 db with 0.5 microvolts input modulated 30%. This does not mean that all the stations heard at the home station come through in the car, there being definite antenna limitations operating mobile.

With audio gain as cheap as it is with modern tubes, it was decided to incorporate in the converter a preamplifier capable of building the output of a dynamic microphone up to a five or ten-volt level at suitable impedance for feeding a line to the transmitter in the trunk.

Inductive or "slug" tuning appeared to have a distinct edge, and accordingly the design was built around that method of tuning.[2]

Powdered iron cores are customarily used for low-frequency inductive tuning, but the difficulty of obtaining sizes and shapes of cores necessary to provide the desired characteristics prompted the consideration of other materials. Copper and aluminum slugs or adjustable shorted turns have been used for many years for tuning purposes, so tests were made to determine their suitability for the purpose at hand. Both copper and aluminum were found to provide the necessary tuning range without too serious reduction in coil *Q*. Copper was slightly better, as it should be, but not enough to outweigh the far superior machinability of aluminum alloy, so the latter was selected.

Mechanical Layout

The mechanical layout of a device such as this is subject to many variables, including the space in the car in which it is to be mounted and the personal whims of the builder. In this particular case, a rather wide, shallow shape was selected. When installed, the unit is tucked under the center of the dash of the car, with only the dial, knobs and scale protruding.

The photos of the unit out of the case will reveal that it is designed to mount in an inverted position. The use of loctal tubes and miniature tubes with bayonet shields makes auxiliary tube clamping means unnecessary except for the voltage regulator tube.

It is impractical to attempt to provide sufficient information to permit exact duplication of a unit such as this, but *Fig. 2*, a dimensioned view of the bottom of the chassis, shows the location of the major components. A few of the dimensions given

*14 *Kingsland, N. Tarrytown, N. Y.*

1 Brown, "Mobile with the SCR-274N," *CQ*, Jan., 1948.

2 If anyone thinks some of my ideas on inductive tuning were suggested by recent Collins designs, he's right.

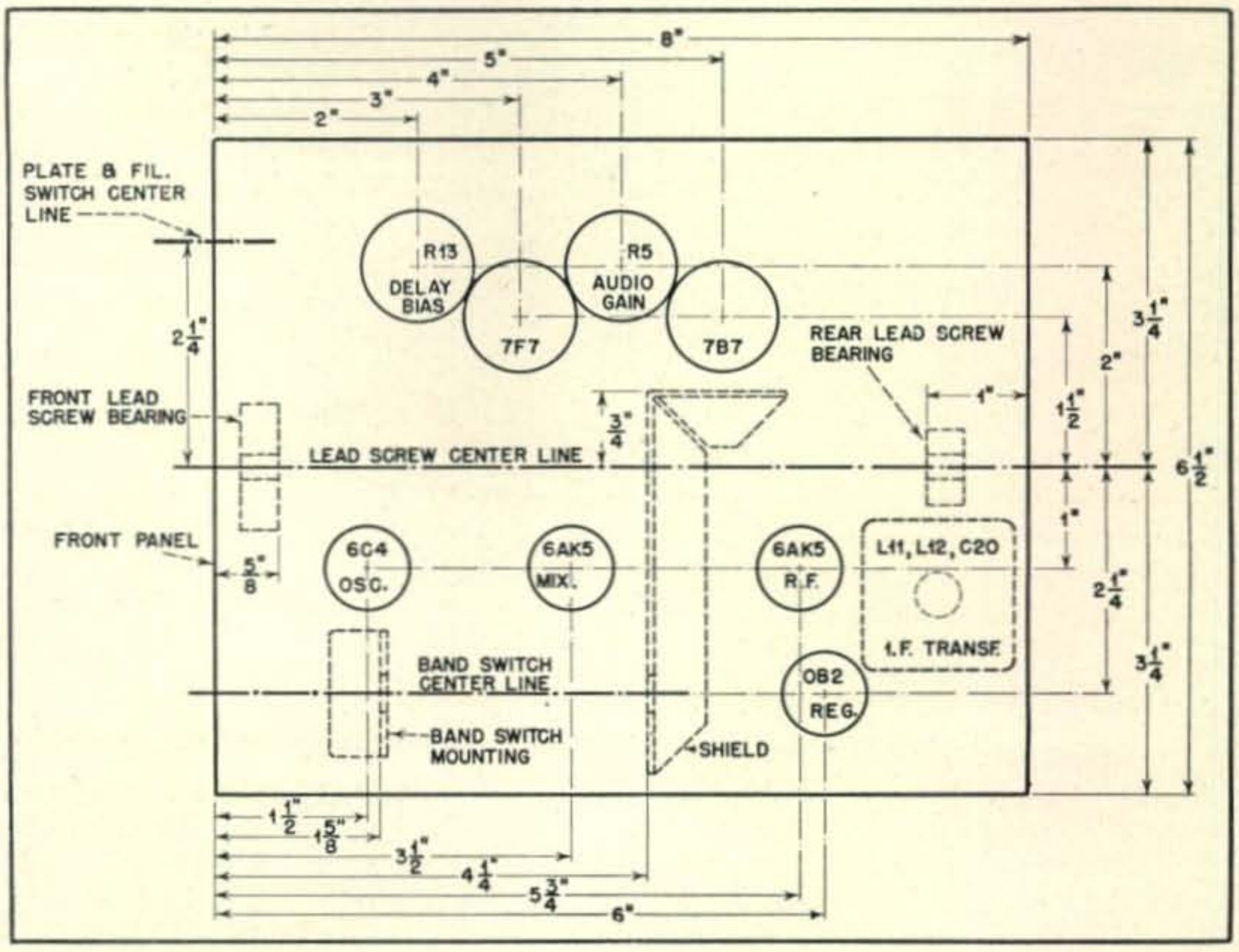

Fig. 2. Converter layout, showing locations of major components. This would ordinarily be a bottom view, but the converter is designed for inverted mounting.

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depart slightly from the model, to improve accessibility, but in general they check with the photograph of the top, *Fig. 3*.

Construction

With the exception of the tuning mechanism, the assembly and wiring of the converter follows a conventional pattern. Smaller items, such as resistors and small capacitors, may be hung from their leads if the leads are kept short and well soldered, but larger ones must be provided with auxiliary clamps or supports. The rather lavish use of Millen 32150 feed-throughs was found advisable, particularly for such leads as the low sides of the r-f coils.

The only inter-stage shielding used is between the r-f coils and bandswitch wafers of the antenna and mixer circuits. The mixer and oscillator circuits are not shielded from each other. As shown in the photographs, the r-f mixer shield also serves as the mounting platform for the tuning coils and antenna trimmers, and as the main support for the bandswitch. The other end of the bandswitch is anchored by a small aluminum bracket.

The i-f transformer, iron slug-tuned to 1500 kc, is shown at the left of *Fig. 4*, with its shield can removed. Winding data for it is given in the parts list, but since it was made from surplus parts it would be difficult to duplicate. However, it is not critical, and any reasonable primary that will tune to 1500 kc, together with a secondary having some 15% as many turns, should do the job.

The complete circuit is shown in *Fig. 6*.

The band switch, *S2*, in addition to switching the various coils for the two bands into the circuit, has a third position for feeding the antenna input straight through for standard broadcast reception.

The r-f gain control, *R2*, was found desirable since the over-all gain of the converter and the broadcast receiver is higher than required. With *R2* on maximum, the inter-station noise is higher than necessary. In practice, it is adjusted by tuning in a very weak signal, and backing the gain down with *R2* until the signal-to-noise ratio just starts to suffer.

It is well to shield all leads associated with the 1500-kc i.f., to avoid the possibility of direct feed-through of broadcast stations. If one gets through on the i.f., it will cause a heterodyne on all signals. Coaxial connectors and shielded cable should also be used for the run from the converter to the broadcast receiver antenna input.

In order to reduce the possibility of overloading and cross-modulation in the first tube, a.v.c. from the broadcast receiver was picked off and fed into the grid of the 6AK5 r-f amplifier. If this is not desired, the lead marked "a-v-c source" should be grounded.

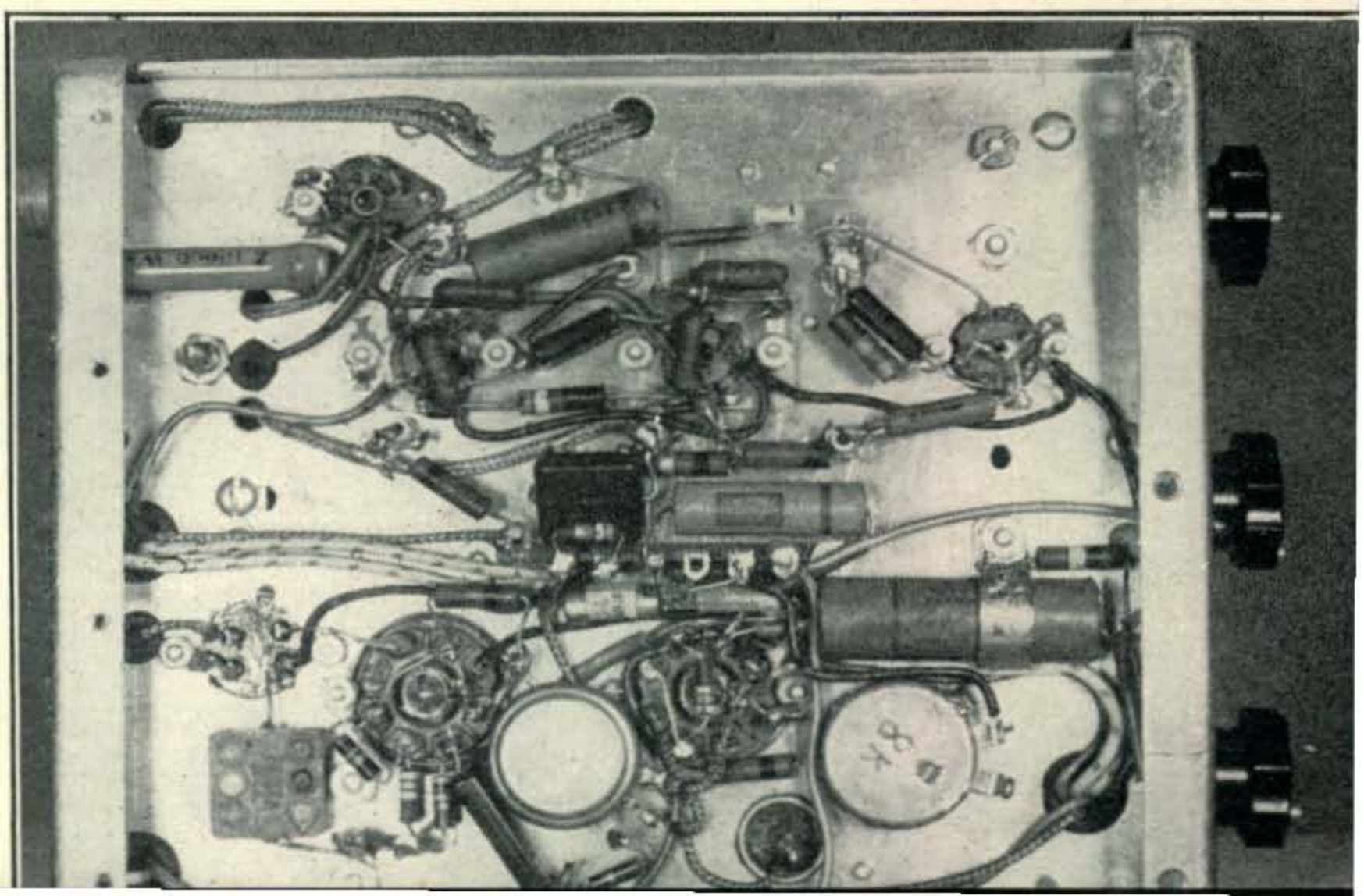


Fig. 3. Top view of the converter. All components must be mounted by short leads or otherwise securely anchored.

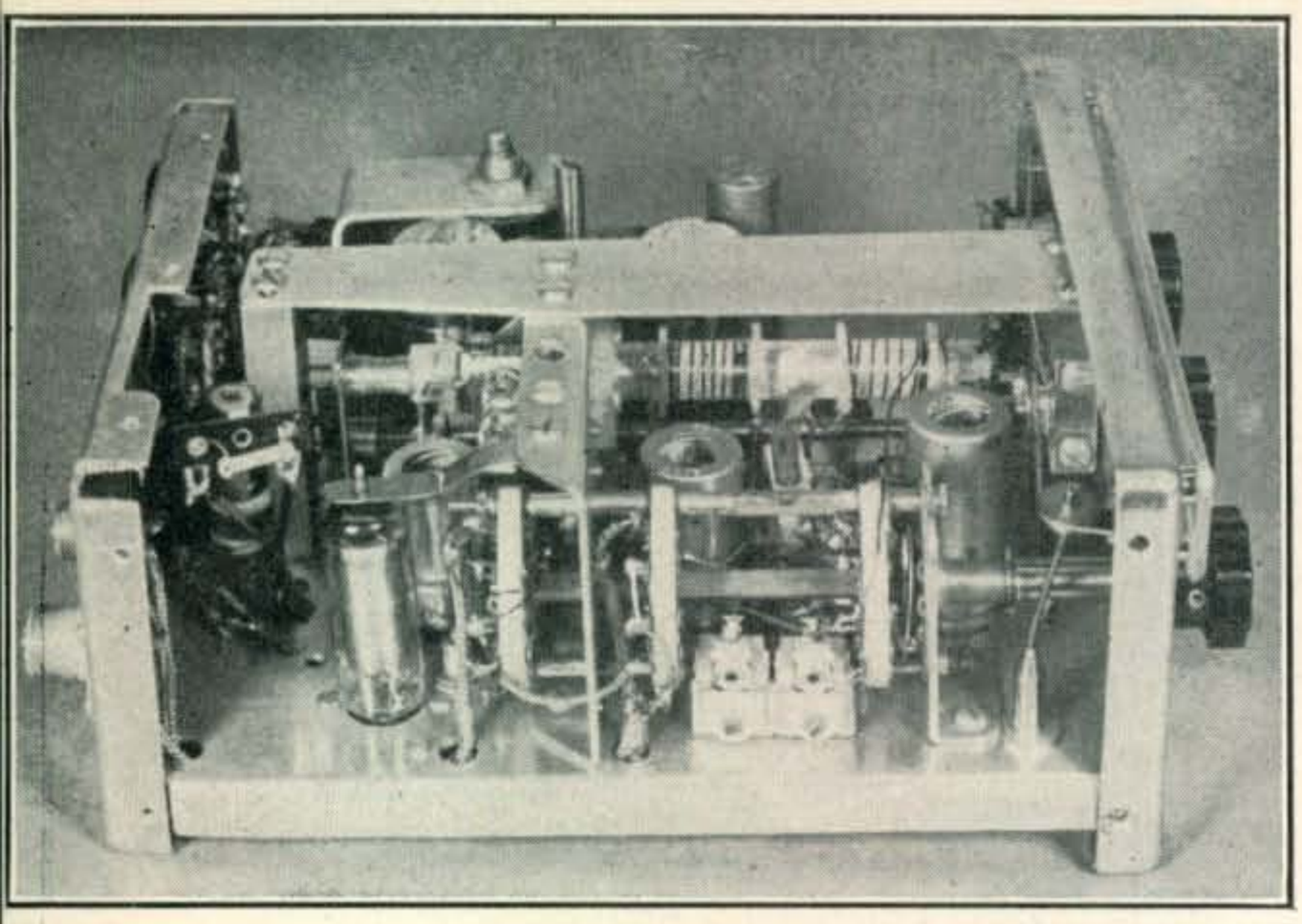


Fig. 4. Bottom view from the r-f side. The shield can has been removed from the i-f transformer to show the windings and tuning capacitor.

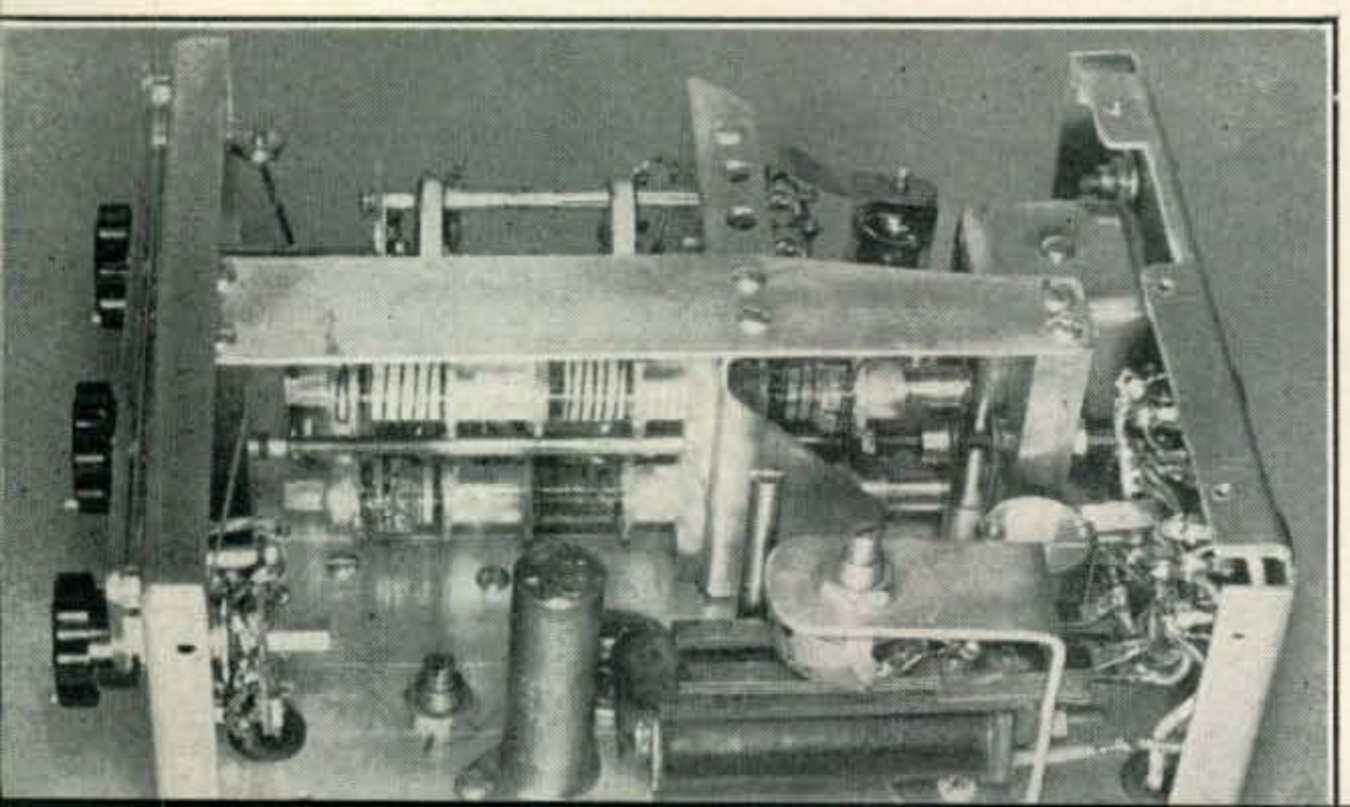
Tuning Mechanism

A small lathe is invaluable in fabricating coil forms and tuning mechanism to this design. By considerable expenditure of ingenuity, it would probably be possible to produce most of the parts without one, but this description is based on the use of a lathe wherever convenient. The builder without one will have to determine for himself which parts to attempt himself by other means and which to sub-contract to the local machine shop.

Figure 7 shows in some detail the tuning mechanism itself, with coils for one band in place. In building this unit, it is important to produce an assembly of high rigidity, to avoid backlash. It should be possible to keep the backlash down to less than two divisions on the 100 division tuning dial (corresponding to 4 kc on 10 and 1 kc on 80). With a lead screw having 24 threads to the inch, this means less than 0.001″ axial movement.

The lead screw used was made from a piece of 3/16″ brass rod, by cutting 10–24 threads for the traveling nut on one end with a die. A piece of threaded rod was first tried, but the rolled threads were not sufficiently good. The traveling nut was turned from a piece of brass rod, with a shoulder on one end for inserting in a hole in the center of the cross-head connecting it to the two tuning rods. An ordinary nut could be used, but the longer special nut has greater bearing surface along the lead screw. It is of course necessary that the threads in the nut and on the lead screw fit accurately without play.

Fig. 5. Bottom view from the preamplifier side. The 7B7 and 7F7 have been removed to better show the slug-tuned coils and tuning mechanism.



The only thrust bearing on the lead screw is in the 3/8″ x ¾″ aluminum alloy post at the rear of the chassis. This thrust bearing is spring-loaded as shown in *Fig. 7* to prevent backlash. The front bearing post is also 3/8″ thick, and is made of bakelite to prevent a short-circuited loop which might have caused noise. Whether this precaution is necessary or not is unknown. The hole in the shield for the lead screw is sufficiently large to prevent touching.

The brace shown connecting the tops of the front and rear lead screw bearing posts and the top of the shield is important. It was not used at first, but adding it reduced the backlash from 10 or 15 divisions to 1 or 2.

The tuning rods are made of ¼″ polystyrene rod with the aluminum sleeves or tuning slugs slipped on and cemented in place when correctly located. The slugs were made 0.350″ in diameter, and aligned in the 0.375″ inside diameter coil forms by means of the polystyrene rings shown on the ends of the tuning rods in *Fig. 7*. These rings were turned to the correct diameter to produce a free sliding fit, without binding, in the coil forms. The aluminum antenna coil tuning slugs are longer than the others, and perform double duty by mounting the polystyrene rods to the cross-head as well as tuning the antenna coils. The clearance holes in the shield must be made large enough to pass the slugs during assembly.

The snug fit of the polystyrene rings in the coil forms, particularly with the slight amount of misalignment which is inevitable between the coils and the moving part of the tuning mechanism effectively prevented any noticeable backlash.

The end of the lead screw that goes through the front bearing and the front panel is enlarged to ¼″ by a sleeve, and a dial calibrated 0 to 100 for 360 degrees rotation mounted thereon. By adjusting the oscillator coils as described later, each revolution of the dial and lead screw is made to produce a frequency change of 200 kc on 10 and 50 kc on 80, or two kc per division on 10 and two divisions per kc on 80. Thus accurate frequency reading is done directly from this dial, and all that is necessary is to provide some sort of a turn counter to tell whether it's set on 28.425 or 28.625 mc. This is done by the linear scale shown in *Fig. 1*, using a dial cord mechanism to drive a pointer.

It was originally planned to wrap the dial cord directly around the lead screw, but when it was found to be so easy to obtain wide frequency coverage and high bandspread, with the result that the lead screw makes over 15 turns to cover the total band, that plan had to be abandoned. It would have resulted in something like a foot of pointer travel, and the panel just isn't that wide. A gear drive, with a small spur gear mounted on the lead screw shaft, driving a larger gear, which in turn drives a small pulley turned to the proper size to produce the correct pointer travel solved the problem. The picture on the cover of *CQ* for July shows the pointer drive mechanism, with the front panel removed. Note the spring-mounted idler pulley on the nearest corner of the chassis, used to take up slack in the dial cord.

The "slide rule" scale on the front panel was

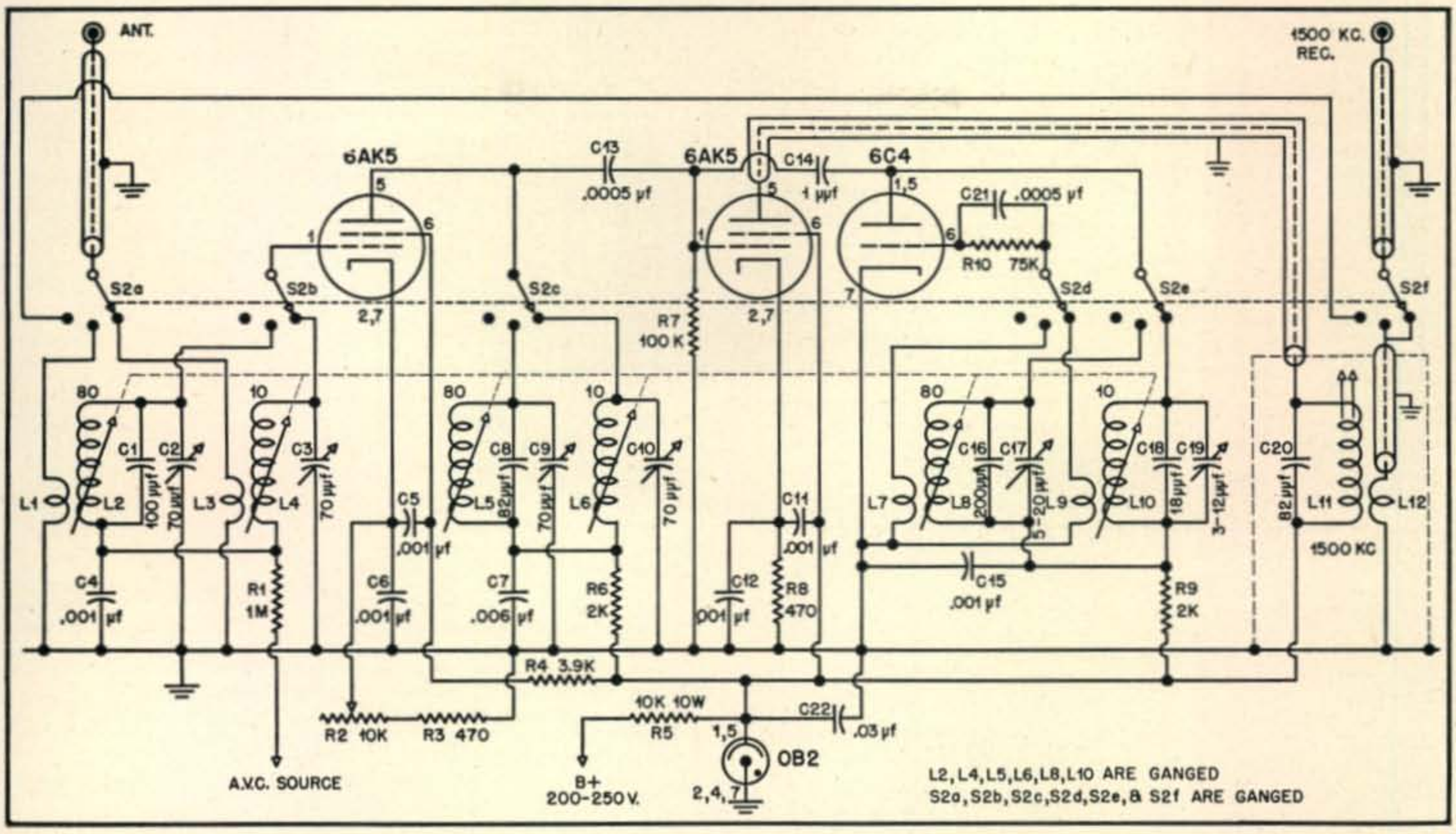


Fig. 6. Circuit of the slug-tuned converter.

C1—100 µµf.
C2, C3, C9, C10—70 µµf max., mica compression type.
C4, C5, C6, C11, C12, C15—.001 µf, ceramic.
C7—.006 µf, mica.
C8—82 µµf, ceramic.
C13, C21—.0005 µµf, mica or ceramic.
C14—1 µµf ceramic (two insulated wires twisted together for ½" to 1" may be substituted.
C16—.002 µf, zero temperature ceramic or silver mica.
C17—5 to 20 µµf, ceramic.
C18—18 µµf, ceramic, zero temperature.
C19—3 to 12 µµf ceramic.
C20—82 µµf, ceramic.
C22—.03 µf, paper.
R1—1 meg., ½ w.
R2—10,000-ohm potentiometer.
R3, R8—470 ohms, ½ w.
R4—3900 ohms, ½ w.
R5—10,000 ohms, 10 w.
R6, R9—2000 ohms, ½ w.
R7—100,000 ohms, ½ w.
R10—75,000 ohms, ½ w.
S1—See preamplifier diagram, Fig. 10.
S2—Band switch, ceramic wafer type, 6 circuits, three wafers, three positions.

lettered on bond paper with India ink, and cemented in place. Note that it is linear, as it should be, except above 29 mc on the 10-meter band. The 10-meter oscillator coil form was found to be a little short to spread the turns far enough to keep linearity in this region, so all coils are shown in *Fig. 7*, 1/16" longer than they were in the first unit. They were originally ¾" long, and *Fig. 7* shows them 13/16". The tuning slugs should do all right with their original length of 5/8". Covering the scale is a piece of 1/8" Lucite, with the edges rounded and buffed. A piece of white paper is cemented to the inside of it, covering the upper half, and hiding the dial cord and the base of the pointer.

The index marks on the knobs and dial were made by pressing short pieces of 0.1" diameter dural rod into drilled holes. The one on the dial is particularly useful, since it permits tuning by feel, without taking the eyes off the road. (No, I didn't have any 0.1" dural rod either—I turned it down from ¼".)

Tuning Coils

The coils must be accurately made and carefully adjusted if stability and tuning linearity are to be achieved. The forms are made of ½" O.D. polystyrene tubing, with 1/16" wall, and they are mounted at the interstage shield only, by cementing their ends into clearance holes in 1/8" polystyrene plates as shown in *Fig. 7*. If possible, the ends of the coil forms should be trued up on a lathe, since it greatly facilitates accurate assembly in their mounting plates.

The washers for anchoring the coil winding ends should be cut from 1/16" polystyrene, and cemented

COIL TABLE

Coil	Designation	Frequency	No. Turns	Wire No.
L1	Ant. primary	3.5-4 mc	8	28
L2	Ant. secondary	3.5-4 mc	50*	28
L3	Ant. primary	27-30 mc	3	24
L4	Ant. secondary	27-30 mc	13*	24
L5	Mixer	3.5-4 mc	50*	28
L6	Mixer	27-30 mc	13*	24
L7	Osc. tickler	3.5-4 mc	7*	28
L8	Oscillator	3.5-4 mc	25*	28
L9	Osc. tickler	27-30 mc	2*	24
L10	Oscillator	27-30 mc	10*	24
L11	I-f transformer primary	1500 kc	95 ½" dia., iron slug tuned	34
L12	I-f transformer secondary		17 wound outside low end of L11	34

Enameled wire used for all coils.
*See text.

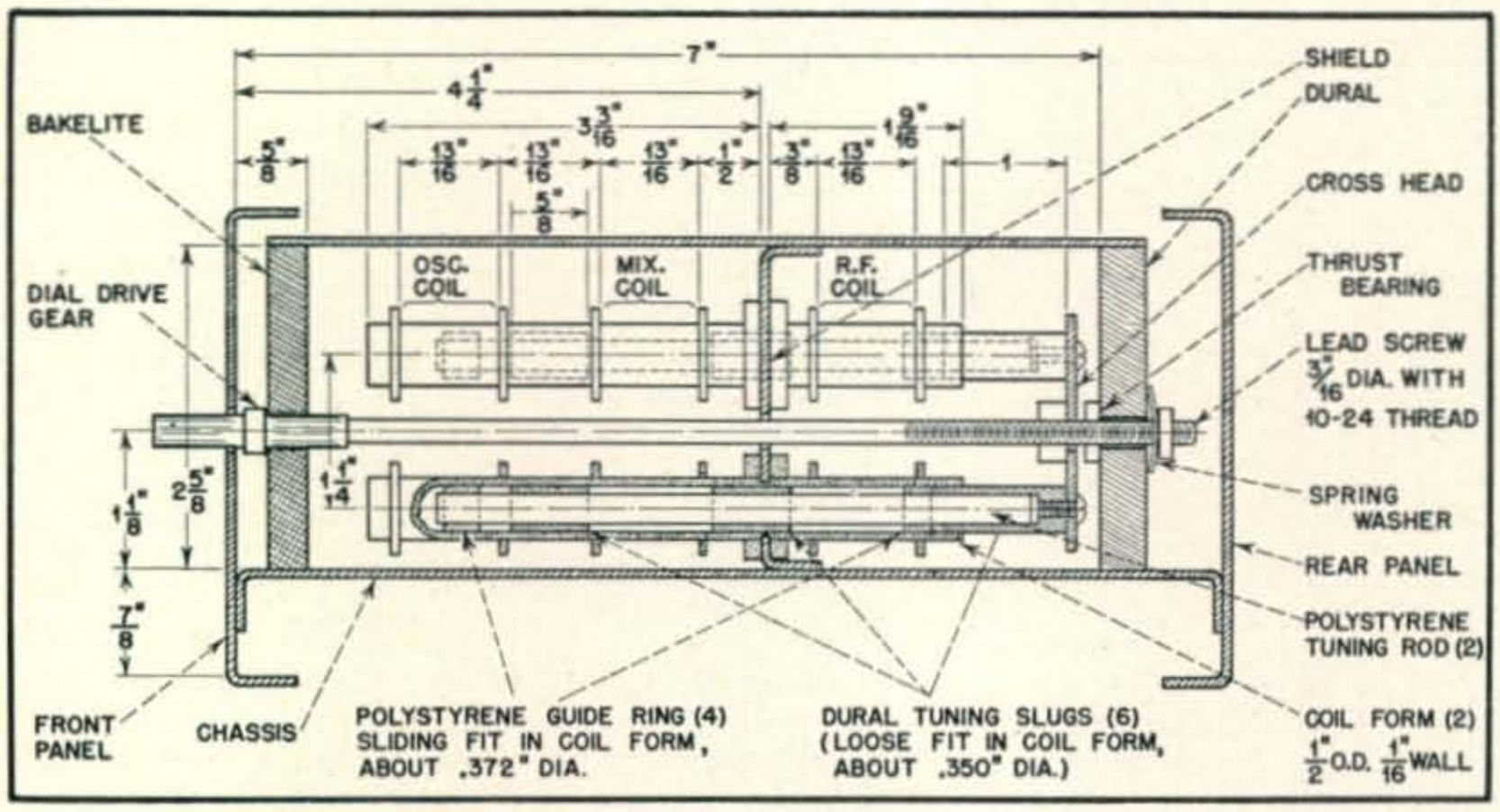


Fig. 7. Part cross-sectional view of complete tuning mechanism.

on the coil forms. Small holes drilled in the washers are used for anchoring the ends of the windings. The best bet is to drill about 6 holes around each ring before assembling, as it is impossible to anticipate just where they should be and hard to drill them after mounting.

Before starting to wind the coils, the coil forms, and the complete tuning mechanism should be assembled and checked. The tuning slugs should lack about 1/16" of entering the cold end of their respective coils with the rods backed out as far as possible (minimum frequency). The tuning mechanism should be run through its complete range (about 15 turns) several times. There must be no binding, jumping or wobbling at any place in the range.

Obtaining linearity of the final tuning curve, so that frequencies read from the linear dial will be accurate is strictly a matter of winding and rewinding oscillator coils, and pushing turns around. Follow the winding data for the total number of turns, and start from there. Perfect linearity is theoretically possible, and can be approached surprisingly closely.

The first coil to be wound and adjusted is the one for the 80-meter oscillator. It is located on the end of the longer form of the lower set. It will be necessary to remove the coil forms in order to wind the coils, but there is no need of reassembling any of the others until this first one has been completely adjusted. It may take several rewindings before it is right, so there is no use making any unnecessary work by assembling all the coil forms each time.

During the process of adjusting this coil, a temporary tickler coil loosely wound of well-insulated wire, so it can be moved around out of the way during turn-pushing, should be used.

The steps in adjusting the 80-meter oscillator coil are as follows:

1. Run the slugs to the minimum frequency (slugs farthest out) position.
2. Set the 100-division dial on the lead screw to read zero.
3. Run the slugs two turns (200 divisions on the dial) into the coil. This will be the setting for the bottom ends of the bands, 3.5 mc on 80 and 27 mc on 10. The two turns overlap at the low end.
4. Adjust the oscillator trimmer to put the oscillator on 5.0 mc.
5. Now check the oscillator frequency at least every 100 kc over the entire band. The best frequency standard for this is a 100-kc crystal, or 200 or 1000-kc crystal and multivibrator. A BC-221 can be used, although it will be much slower to use, since it will require resetting for each point. As a last resort, a well-calibrated receiver may be used, but since the converter can be calibrated to be more accurate than most receivers, use a good standard if possible. In any case, you'll have to measure a lot of frequencies before you're through, so make it as convenient as possible.
In recording data, call the dial setting for 3.5 mc (5.0 mc oscillator frequency) zero, then on the data sheet set down the dial setting for 3.6, 3.7, etc. For each full turn of the lead screw, add 100 divisions to the dial reading. Correct dial settings for both bands are as follows:

Dial	80	10
00	3.50 mc	27.0 mc
100	3.55	27.2
200	3.60	27.4
300	3.65	27.6
400	3.70	27.8
500	3.75	28.0
600	3.80	28.2
700	3.85	28.4
800	3.90	28.6
900	3.95	28.8
1000	4.00	29.0
1100	4.05	29.2
1200	4.10	29.4
1300	4.15	29.6
1400	4.20	29.8
1500	4.25	30.0

These are signal frequencies. In lining up the oscillator coils, oscillator frequencies, which are 1.5 mc higher than these, should be used.
6. After obtaining these data for the oscillator coil being adjusted, push turns in the direction that looks as though it should be right, then check dial readings over the full band again. It is necessary to check the full band each time, because moving a turn at one end will affect the entire curve, although of course not equally. It is, of course, also necessary to readjust the trimmer to put the oscillator back on frequency at zero on the dial after each coil change, before taking data.

An accurate rule as to which turns to push which way to correct for any given nonlinearity can't be given. Below is a list of suggestions. A careful study of results after cut-and-try turn-pushing is the best bet.

1. Start with about 20% of the turns close-wound at the cold end of the coil, then wind about 60% of the turns spaced two to four wire diameters, then the remaining 20% close-wound again. That won't be right, but its a good start.
2. It is extremely important, when pushing turns around, to keep the coil looking neat. Ragged, irregular spacing may give you the curve you want over part of the range, but it is sure to show up as a sudden departure from linearity somewhere else.
3. In general, the spacing of the turns under which the end of the slug is passing at a particular point on the dial determines the rate of frequency change at that point. This rate is also affected by the total inductance, though, so changes at one end of the coil that affect the total inductance will affect the tuning rate at the other end.
4. Keep a careful record as you go along as to just what moving each turn or group of turns does.
5. When you're just about ready to give up, take a good look at the turn spacing that gave you the best curve so far, pull off the old wire, and rewind the coil just like that except just as neat and smooth as you can make it. That worked once, and it might again.

When ycu're all through, each frequency should be within five to ten divisions of the dial setting indicated. If it seems like too much trouble to get it that good over the whole band, considerable time may be saved by concentrating on the parts of the bands that will be used in normal operation, and letting other portions be a little farther off.

When the first coil is satisfactorily adjusted, it should be doped to hold the winding in place, after which it is in order to proceed with a long sigh of relief.

The temporary tickler should be replaced by a permanent one, spaced from the coil by slivers split from a half-inch length of the half-inch polystyrene tubing and arranged around the coil like barrel staves. More dope should be used to make the whole assembly secure.

Contrary to customary practice, the tickler was placed on the hot end of the coil to prevent the slug, entering from the cold end, from affecting the coupling.

Before starting work on the mixer and antenna coils, the i.f. should be checked. Couple the converter output into the antenna circuit of any 1500-kc receiver. One with an S-meter is much to be preferred, since it makes line-up easier. Feed a 1500-kc signal into the grid of the mixer tube, and adjust the i-f transformer for maximum output.

When the i.f. is working, the next step is to wind and adjust the mixer and antenna coils for 80. The form should be removed and the coils wound, using the winding data given but spacing the turns in similar fashion to that found right for the oscillator coil. After reassembly, and with the oscillator covering the right range, set the slugs for the mid-frequency position in the band, and apply a signal at the correct signal frequency (about 3750 kc) to a temporary antenna primary, wound like the temporary oscillator tickler. Adjust the mixer trimmer, *C9*, and the antenna trimmer, *C2*, to maximum response. Readjust the slugs to the 3500-kc position, move the signal generator to that frequency, and check the trimmers. If they peak at the same place that they did at 3750, you're just plain lucky. If it takes *more* capacity to peak at 3500, it means that the slug didn't change the coil inductance enough, and turns should be squeezed a little closer together at that end. But, before you squeeze them, check the other end of the band, from 3750 to 4000 kc, and try to push turns to improve both ends at once. The adjustment of these coils is much less critical and much easier than the oscillator coil.

After the 80-meter coils are completed, they should be doped and the same process should be repeated for the other band.

Preamplifier

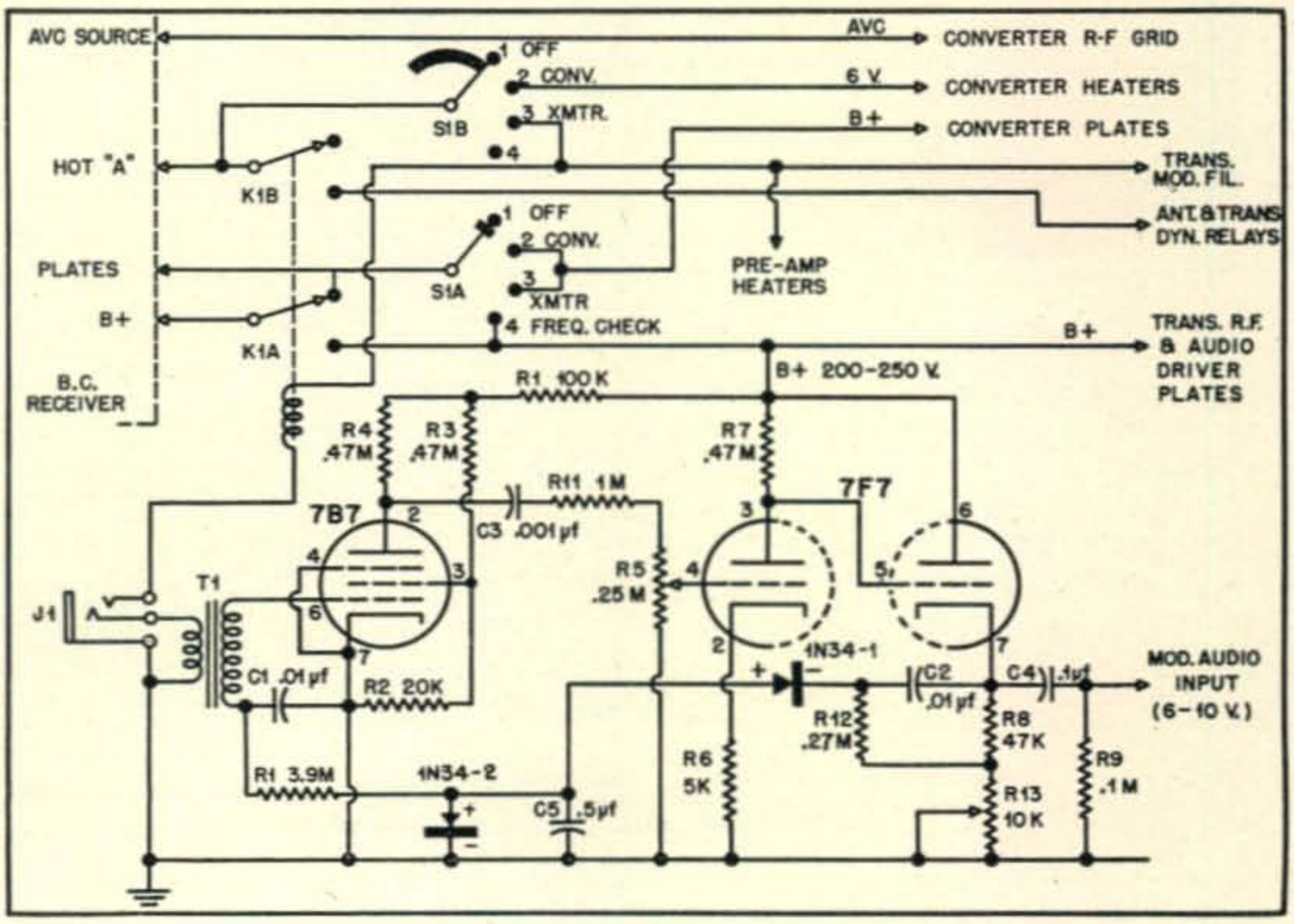
The preamplifier circuit shown in *Fig. 8* is a modification of the one originally described [1] in connection with the transmitter portion of the mobile installation. This version differs mainly in that automatic level control and an input transformer have been added.

Sufficient voltage gain was available to permit operation directly from one of the low-impedance dynamic microphones salvaged from a B-19 tank set without the input transformer, but the high amplification resulted in some microphonic noise from the 7B7 appearing in the output when driving on rough roads. With the addition of the transformer, the gain after the 7B7 could be reduced by using a 250,000-ohm gain control, *R5*, with a 1-megohm resistor, *R11*, in series with it. If it is planned to use a high-impedance dynamic or crystal microphone the transformer may be omitted. If the transformer is omitted, a high value grid resistor should be substituted for its secondary, and a coupling capacitor connected in the grid circuit to avoid shorting out the automatic level control voltage.

(*Continued on page 92*)

Fig. 8. The control circuit and automatic-level-control preamplifier. This equipment is built into the same case with the converter.

C1, C2—.01 μf, paper or mica.
C3—.001 μf, mica.
C4—.1 μf, paper.
C5—.5 μf, paper.
R1—3.9 meg.
R2—20,000 ohms.
R3, R4, R7—.47 meg.
R5—250,000-ohm potentiometer.
R6—5000 ohms.
R8—47,000 ohms.
R9, R10—100,000 ohms.
R11—1 meg.
R12—10,000-ohm potentiometer.
All resistors ½ watt.
K1—Push - to - talk relay, DPDT. Coil, 6 v. d.c.
S1—2-circuit 4-position 1-wafer. See text.
T1—Low impedance dynamic microphone-to-grid transformer.
J1—Three-circuit microphone jack.



Announcing . . .

CQ's World-Wide DX Contest

A new contest over the week-ends of October 29 and November 5—separate week-ends for phone and c.w.—awards for individual and group-operated stations—no limit on the number of contacts—zone and country multipliers on each band.

THE EDITORS OF *CQ* announce the forthcoming World-Wide DX Contest to take place on the week-ends (U.S.A. time) of October 29, 30, and 31, and November 5, 6, and 7, of this year.

While the activity calendar for the amateurs is earmarked for many events during the year, it is felt by DX men everywhere that there is room for a truly international DX contest. The DX committee, in settling on the final rules, feels that this contest should be different from all others. The rules give the average DXer an opportunity to participate on an even footing with his DX friends, and the rules favor no single country. In addition to the usual country multipliers on each band, the rules allow zone multipliers on each band as well. With this added incentive, the low frequency bands should see plenty of use. This goes for the foreign stations particularly, as it makes it very much worthwhile their time to work 40 and 80 meters in order to pick up extra zone and country multipliers. The DX man has a chance to use his own strategy in mapping out which is of the most value. For example, should he keep gunning for a zone or a country he needs on one band, or could he offset this delay in trying to work a flock of 3-pointers. There is no limit as to the number of stations you can work in any one country. This factor should help fill in the less active hours.

Contest Period

The first week-end, October 29 to 31, will be for 'phone, while the second week-end, November 5 to 7 will be for c.w. Because the first week-end of the ARRL Sweepstakes contest, which follows the *CQ* DX Contest, is for phone, the dates were chosen to afford a minimum of conflict. The reaction of participants to the short contest period will determine whether the *CQ* contest should be one or two week-ends for each class (c.w. and 'phone) in succeeding years.

Divisions

Please read thoroughly rule number 3 on divisions and sections. It is absolutely necessary that you enter the correct section that is, either the one-operator section, or the more-than-one-operator section. It has been felt that many DX stations have used more than one operator and yet claimed single operator scores. In this contest, certificates will be awarded to all operators of each winning station in the more-than-one-operator section. Any violation of the rules which is substantiated to the satisfaction of the committee will be grounds for immediate disqualification.

The multipliers for countries and zones worked is the sum of the total number of zones and countries worked on each band. Notice particularly that the zones and countries worked on each band are added together, and their total is used as a multiplier of the contact points. As an example, if operation happens to be confined to 14 mc, and if 85 countries and 34 zones are worked, the multiplier is 119. If operation is on 14 mc, with 50 countries and 30 zones, 7 mc

LOG OF W2BXA ZONE 5 COUNTRY U.S.A. DIVISION C W OP. 1

DATE AND TIME (LOCAL OR GMT)	STATION	COUNTRY	SERIAL NUMBER		ZONE AND COUNTRY MULTIPLIERS								PTS
					3.5 mc		7 mc		14 mc		28 mc		
			SENT	RECEIVED	Z	C	Z	C	Z	C	Z	C	
10-29 1002 DST	J9ABC	OKINAWA	58905	58925							1	1	3
1007	VK2DI	AUST.	58905	57930							2	2	3
1045	PY1DH	BRAZIL	57905	56911					1	1			3
1056	G6QB	ENGLAND	57905	56914					2	2			3
1100	G2PL	ENGLAND	57905	57914					2	2			3
1103	WØYXO	U.S.A.	59905	59904					3	3			0
1110	W6SA	U.S.A.	58905	58903					4	3			0
10-30 1202	ON4JW	BELGIUM	57905	56914			1	1					3
1215	W7AMX	U.S.A.	57905	57903			2	2					0
1218	I1MV	ITALY	56905	57915			3	3					3
1230	XF1A	MEXICO	59905	59906			4	4					1
100	XF1A	MEXICO	59905	59906	1	1							1
				TOTALS	1	1	4	4	4	3	2	2	23

COUNTRY MULTIPLIER 1+4+3+2 = 10
ZONE MULTIPLIER 1+4+4+2 = 11
TOTAL MULTIPLIER 10+11 = 21
CONTACT POINTS = 23

TOTAL SCORE 21 X 23 = 483

CQ WORLD-WIDE DX CONTEST SCHEDULE		
TIME ZONE	STARTING TIME	ENDING TIME
GREENWICH MEAN TIME (GMT)	SATURDAY, OCT. 30, 0200	SUNDAY, NOV. 1, 0200
	SATURDAY, NOV. 6, 0200	SUNDAY, NOV. 8, 0200
U.S.A. EASTERN STANDARD TIME	FRIDAY, OCT. 29, 9:00 P.M.	SUNDAY, OCT. 31, 9:00 P.M.
	FRIDAY, NOV. 5, 9:00 P.M.	SUNDAY, NOV. 7, 9:00 P.M.
U.S.A. PACIFIC STANDARD	FRIDAY, OCT. 29, 6:00 P.M.	SUNDAY, OCT. 31, 6:00 P.M.
	FRIDAY, NOV. 5, 6:00 P.M.	SUNDAY, NOV. 7, 6:00 P.M.

with 30 countries and 18 zones and 3.5 mc with 9 countries and 5 zones, then the multiplier is 142. It should be emphasized that contacts within your own country do not count for contact points, though these contacts do count toward country and zone multipliers just as though they were with DX stations. This should be clear from the sample log. Note that W2BXA gets both zone and country multipliers for working WØYXO, since this is the first contact in both U.S.A. and Zone 4. W2BXA also receives a zone multiplier for W6SA, as this is his first contact in Zone 3, but he gets no contact points for either contact.

In reading rule number 5 on serial numbers, an example might show up something like this: W2BXA might send a contest serial number such as 56905, or 58905, etc. The report would, of course, vary but the zone number would always be 05: C8YR might send 45923, or 59923, etc. Phone stations would, of course, use the same system, only the number would consist of four numerals. For example, on phone, W6DI might send 5803, indicating readability 5, strength 8, Zone 3.

To help you in keeping a contest log, we have prepared a large quantity of blank log sheets, and they are now obtainable by writing to *CQ* Editorial Office, 342 Madison Avenue, New York 17, N. Y. A stamped self-addressed envelope should be enclosed, or sufficient postage to cover a large manila envelope and any number of logs desired. Clubs desiring logs for a large group should send postage

(*Continued on page 86*)

WORLD—WIDE DX CONTEST RULES

1. Contest Period: 0200 GMT October 30 to 0200 GMT November 1 for phone and 0200 GMT November 6 to 0200 GMT November 8 for c.w. (See time chart for local times and dates.)

2. Bands: The contest activity will be confined to four bands, 3.5, 7, 14, and 27-28 mc amateur bands.

3. Divisions and Sections: The competition will be divided into two divisions, c-w and phone. Each of these two divisions will be divided into two sections, the one-operator and more-than-one-operator section. Thus, there will be: (1) one-operator c-w section, and (2) more-than-one-operator c-w section; (3) one-operator phone section, and (4) more-than-one-operator phone section. Stations in each section will compete for awards only with others in the same section. C-W stations must work c-w stations, and 'phone stations must work 'phone stations only; however, stations in the one-operator section, and stations in the more-than-one-operator section of both c-w and phone divisions may contact each other. Stations may enter in more than one section, but logs must be submitted for each section.

4. Equipment: There will be no limit to the number of transmitters and receivers allowed, and competitors may use the maximum transmitter power permitted under the terms of their licenses.

5. Serial numbers: C-W stations will exchange serial numbers consisting of five numerals, the first three being the RST report, and the last two being their own zone number. Stations in Zones 1 through 9 will prefix their zone number with zero (01, 02, 03, etc.). Phone stations will exchange serial numbers consisting of four numerals. The first two being the readability and strength report, and the last two being their own zone number. Phone stations in zones 1 through 9 will prefix their zone number with a zero (01, 02, 03, etc.).

6. Contacts: Contacts between amateur stations on different continents shall count three points; contacts between amateur stations on the same continent but not in the same country shall count one point; contacts between stations in the same country, for the purpose of obtaining zone and/or country multipliers, shall be permitted but no points will be allowed for these contacts.

7. Multipliers: Two types of multipliers will be used: (1) a multiplier of 1 for each zone contacted on each band, (2) a multiplier of 1 for each country worked on each band.

8. Scoring: The contest score will be the sum of all contact points multiplied by the sum of the zone and country multipliers.

9. Awards: Certificates will be awarded to section winners in each division of:

(1) Each U. S. call area
(2) Each licensing area of Canada and Australia
(3) All other countries

Certificates will also be awarded to each operator of each winning station in the more-than-one-operator section.

10. Zones and Continents: The W.A.Z. boundaries as defined in "CQ-DX" and in *CQ* for January, 1947, and the recognized continental boundaries as used for W.A.C. will determine zone and continent boundaries. The W.A.Z. maps are reasonably accurate, but should any question arise as to the positive location of a station, the official definitions will be final. The latest official country list as published in *CQ* for May, 1948, with any revisions announced since then will be used to determine country multipliers. Copies of the country list are also available from the *CQ* Editorial Office upon receipt of a stamped self-addressed envelope.

11. Eligibility: The contest will be open to all amateurs but *CQ* staff members are not eligible for awards.

12. Disqualifications: Falsification of logs or illegal operation in any manner will be cause for disqualification. The decision of the judges will be final in all cases.

TVI Corrective Measures

WILFRED. M. SCHERER, W2AEF*

In-the-field experiences resulting in elimination of TVI.

CONSIDERABLE SPACE has already been devoted to discussing the broad aspects of the television interference problem. The obvious solutions such as the reallocation of existing channels, the observance of quiet hours, maintenance of low power equipment or operation of bands of secondary choice, all leave much to be desired. While the writer, in common with many individuals feels that the TVI problem will lessen as time brings improvements in techniques, it is urgent that something be done immediately to offset the existing difficulties. Until the TV services greatly increase their signal strength, until TV receivers are improved tremendously, or until the TV service moves "upstairs" in the region beyond 200 mc, the burden of TVI reduction will fall on the amateur. Continuing the series on the subject this article deals with the corrective measures taken at various amateur stations which proved to be very successful.

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Bill Scherer, W2AEF, continues the TVI series with this "how-to-do-it" article. As required preliminary reading for this article it is recommended that the three articles dealing with TVI in the June and July issues of CQ be restudied. Field work by many amateurs has shown that much can be done to eliminate interference by work at the receiver itself. Not too much space will be devoted to this phase of the problem since it is not recommended that any amateur work on a TV receiver. Should anything go wrong with the receiver soon after a visit from a ham, regardless of his responsibility he is suspect. The majority of sets are covered by service policies. TV service organizations have by and large indicated a genuine desire to cooperate with the ham and will send a service man to assist in making tests on the receiver. Stubs at the receiver, traps, etc., are proving genuinely effective when employed in conjunction with work on the transmitter. Amateurs are invited to send reports on their successes and failures to our attention. Incidents, substantiated with facts, where amateurs are unjustly blamed for TVI, where cooperation cannot be obtained, etc., are also solicited. But again a word of caution to all amateurs—be tolerant. TV has grown so fast that service organizations are unable to obtain properly trained personnel in every case. If you have a legitimate case where amateur radio is being harmed by ignorance on the part of a dealer, servicemen, or service company, let us know and we'll go to bat . . . or should we say go after them with a bat!

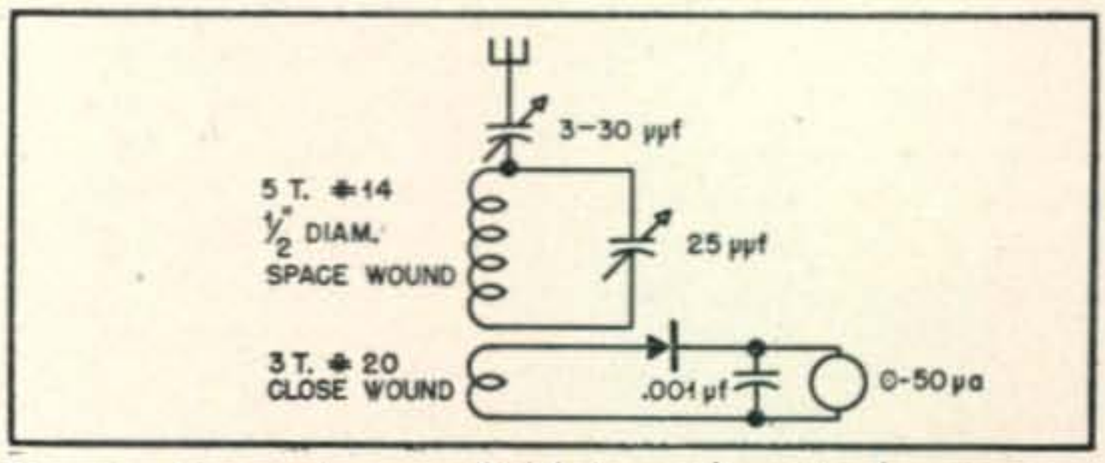


Fig. 1. A simple type field strength meter for measuring harmonic radiation.

Elimination of Harmonics

It cannot be sufficiently emphasized that the most potent source of amateur TVI is excessive harmonic radiation from a ham transmitter. To prevent the generation of harmonics or to prevent the radiation of harmonics is a painstaking process that requires much patience and work. In many cases merely trying one of the suggested procedures will not prove effective and a combination of several may have to be employed. In other cases it may prove difficult or impossible to employ some of the ideas in existing transmitters. Where this is the case, the measures may be kept in mind for new construction.

In order to obtain an accurate indication of how much effect each method of harmonic attenuation attempted will produce, it is necessary to have some sort of signal or field intensity measuring device. Of course, the real indication of a complete remedy depends on the results actually obtained at the TV receiver, but the field intensity meter is indispensable to making accurate adjustments and it will show whether or not the corrective measures are in the proper direction. An improvement in harmonic attenuation may not greatly evidence itself in the TV set at first, but the measuring instrument will show the attenuation of each measure attempted and will facilitate the correct adjustment in each case, so that the total cumulative effectiveness of all the measures will eventually produce satisfactory results.

The field strength meter may be the usual type employed by the amateur. A recommended circuit is shown in *Fig. 1.* Sometimes the crystal and meter are connected directly across the entire tuned circuit although this is not advisable because the resonant circuit is then too heavily loaded and the device will have poor selectivity. This is particularly bad when it is to be used around a comparatively high powered transmitter. Almost always, the fundamental signal will blanket out the harmonic. The meter should preferably have a full scale range of

20 or 50 microamperes for good sensitivity. A range of 200 μa is just passable.

A better field strength meter is a receiver having an "S" meter. It has far greater sensitivity and selectivity making it possible to obtain readings at much greater distances. Unfortunately, most communications receivers do not cover the 60-mc region. However, a simple 60-mc converter consisting of a detector-oscillator mixer combination in conjunction with the receiver is simple to construct and is cheaper than the crystal unit. Either type will show only relative values, but this is essentially the information about which we are concerned. Due to it's lesser sensitivity, the crystal device must be used in close proximity to the antenna or the transmitter itself. This is especially true as the harmonic attenuation becomes greater.

For the moment, set the field meter aside. The first check to make is at the TV set. Turn on the receiver and the offending transmitter (it is assumed that a check has been previously made showing that the TVI is definitely originating at the amateur transmitter and not from some other source). Observe whether or not the TVI is present on all or on any one channel. Channel 2 may be the one most likely affected if the transmitter is on 28 mc. If it is on 14 mc channels 2 or 4 may suffer.

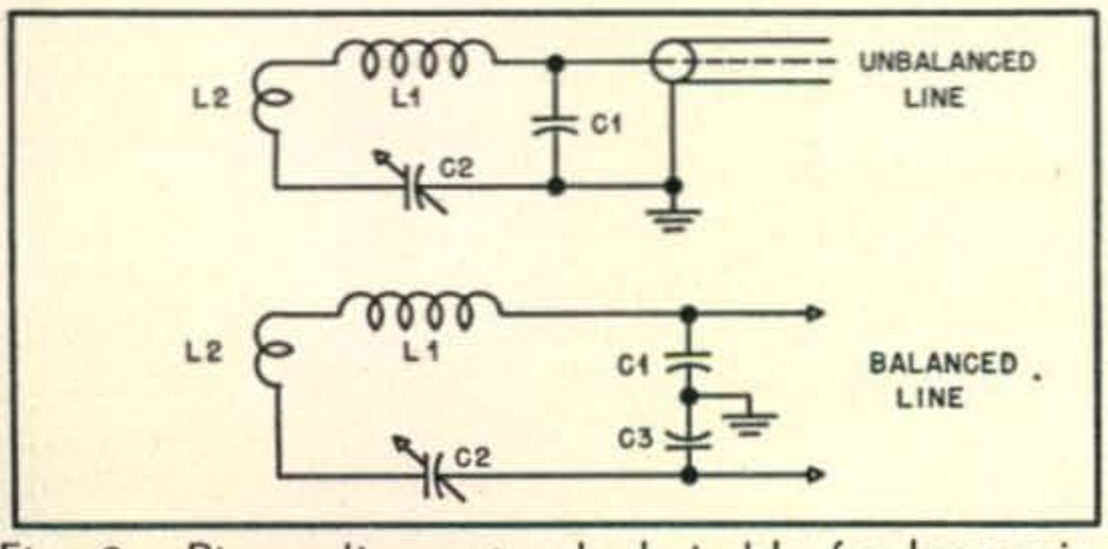


Fig. 2. Pi-coupling network desirable for harmonic attenuation in the link. See text.

Remove the antenna from the transmitter and, if possible, substitute a shielded dummy antenna load. If the TVI disappears, it is obvious that the interference is being transmitted via the antenna n. If the TVI remains, it is being radiated directly from the components within the transmitter itself or through it's associated power leads and such. In some instances the TVI will remain but to a lesser degree showing that radiation is either both direct from the final amplifier and through the antenna system or is directly from the amplifier driver stage.

Having thus had an indication of the path of the signal, one or more of the following remedial procedures may be utilized.

If the TVI Travels via the Antenna System

1. Install an electrostatic shield between the antenna coupling coil and the final tank. No special description of this shield will be made here, but an excellent description appeared in W6WB's article "More Signal—Less Noise!" in December, 1947, *CQ*. Additional data will be found in the various handbooks. Since an electrostatic shield attenuates capacitively coupled energy from the final tank to the link, but does not discriminate against magnetic coupling except where capacitive coupling to the output link is excessive, attenuation by this method is generally not too great (about 3-5 db). But this method is mentioned for cases where the absolute maximum attentuation, in combination with other methods, is required.

2. Install a pi-coupling network as shown in *Fig. 2*. L_1, L_2, C_1, C_2 plus any net transmission line reactance must resonate at the transmitter frequency. Reactance of C_1 (or the series reactance of the equal capacitors C_1 and C_3) at the fundamental operating frequency must equal that of the line impedance. Loading should be adjusted by varying the coupling of the link inductance L_2. The entire coupler should preferably be shielded and the link line should be as short as possible. (Readers are referred to handbook data on pi-couplers for additional information).

3. Install a harmonic attenuating stub across the antenna feeder.[1] This stub may be installed at almost any place along the feeder if the standing wave ratio is low; otherwise it may be placed at an odd 8th of a wave from the transmitter end. It may be of open wire, 300-ohm Twin Lead, or coaxial cable. The coax is very convenient as it may be coiled up and placed out of the way.

Where the transmitter is on 28 mc the stub should be one quarter-wave long and should be shorted at its free end. At 28 mc it will act as an open circuit or high impedance (parallel resonance) and will not hinder the transmission of this frequency, but at 56 mc the stub is equal to a shorted half-wave and will act as a short circuit or low impedance (series resonance) and thus will attenuate the 56-mc signal.

For a 14-mc transmitter the stub length should be one quarter-wave and shorted at its free end. At 14 mc it will present an open circuit but at 56 mc it will be a full-wave and will present a short.

When calculating the physical dimensions for coaxial cable stubs, the velocity constant of the coax must be taken into consideration. For most types the velocity of propagation (VP) constant is approximately 0.65, which means that the normally calculated dimensions must be multiplied by this figure. If the velocity constant of the cable is not known, a multiplier of 0.7 may be used and the coax trimmed about an inch at a time for maximum attenuation as indicated by the field meter.

1 Bach, "You *Can* Live with TV," *CQ*, June, 1948.
Terman, "Radio Engineers Handbook," Section 9 Para. 3.

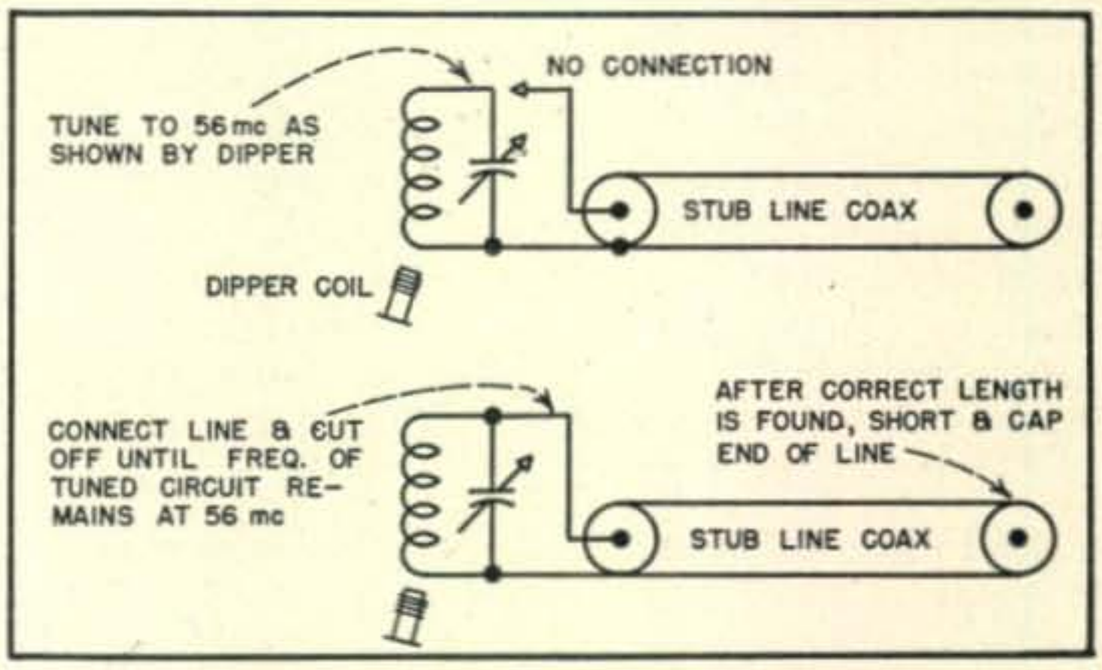
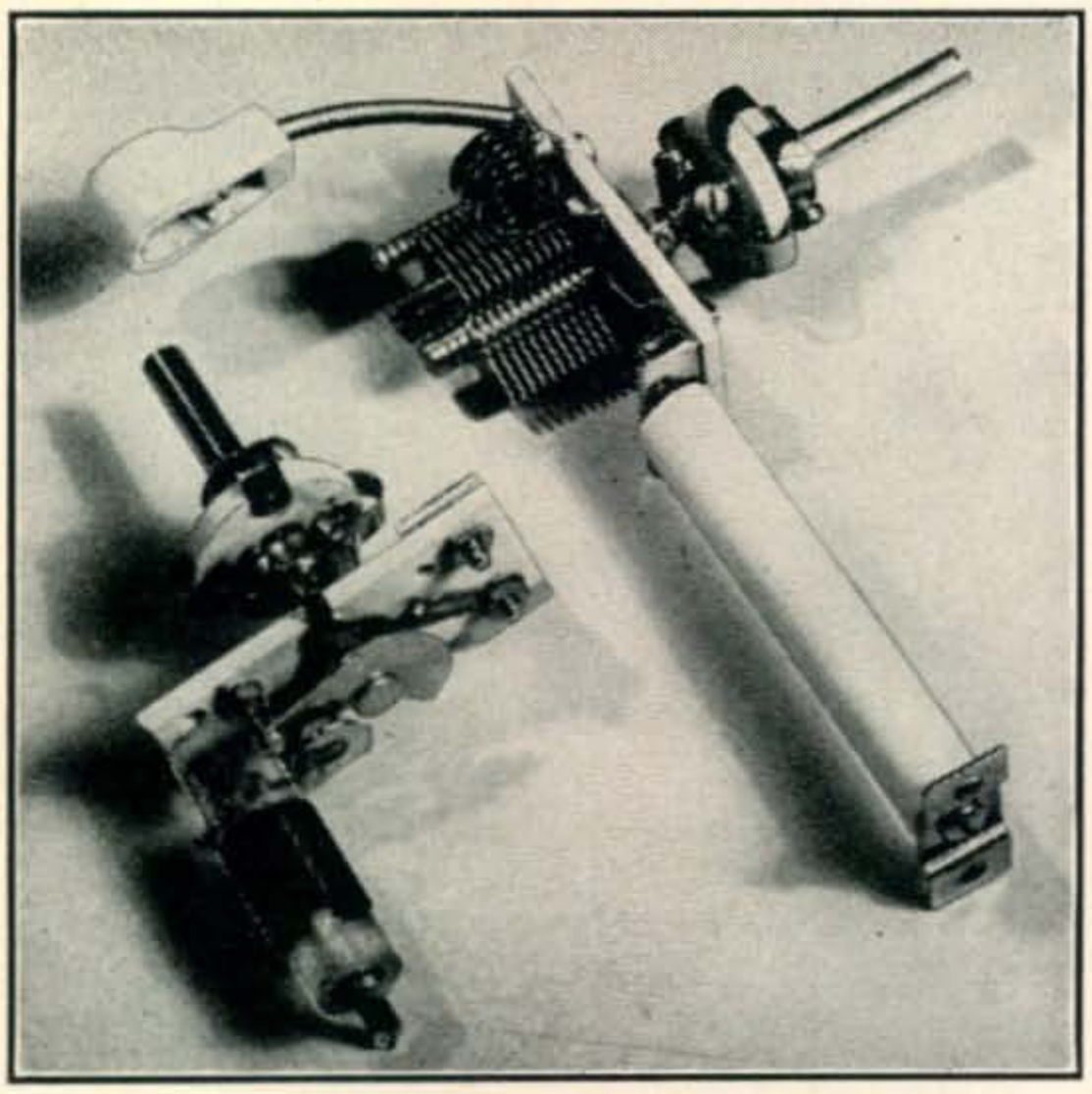


Fig. 3. An alternate method for cutting a stub line to the correct length.



Series resonant (left) and plate parallel resonant (right) traps. Series trap inductance consists of 24 turns of #22 enamel wire close wound of ½" polystyrene rod. One turn more or less may be required where the inductance is altered by the proximity of other components. One end of the coil is connected to the condenser stator through the capacitance created by a washer facing the stator plate. This reduces the maximum series capacitance of the circuit to the required low value (1 $\mu\mu f$) otherwise unobtainable with this type of variable condenser. The washer may be bent back and forth for the initial adjustments. The condenser is a National UM15 with all but 2 plates removed. The trap tunes from 55 to 59 mc. The parallel trap inductance is 5 turns of #14 enamel wire close wound 5/16" i.d. The condenser is a National UM75 mounted on 3" standoff insulator so it may be placed near the plate of the tube. Effective range of the parallel trap is 54 to 85 mc. Both traps have insulated flexible couplings for an extension shaft to the front panel.

The harmonic stub may be easily and accurately adjusted by employing a grid dip oscillator or Dipper as described previously in *CQ*.[2,3]

Another very quick and simple method shown in *Fig. 3* is to set up a parallel resonant circuit and tune it to 56 mc (or exact harmonic frequency) as indicated by the Dipper. Cut a stub line to approximately one quarter-wave of the transmitter fundamental frequency. Then connect the line across the resonant circuit and cut off the far end of the line, about an inch or less at a time, until the resonant frequency of the tuned circuit (with the line across it) is the same as that without the line connected. Place a short across the far end of the line and it will then be correctly adjusted for installation across the antenna feeder. During the above procedure it is advisable to already have whatever connecting fittings which will eventually be used connected to the stub.

If the TVI is Radiated Directly from the Transmitter

Complete shielding of the transmitter together with the filtering and shielding of its associated power circuits may be made. This is quite a tall order for existing units especially since *complete* shielding means just that. The entire unit with all its equipment actually should be contained in a virtually water tight copper compartment. It is amazing to find how much 60-mc r.f. will sneak through such unshielded openings as meter faces, ventilation louvres, etc. Double shielding such as that employed in the best type laboratory signal generators greatly adds to the effectiveness of this measure. All power leads within and to or from the transmitter should be shielded and by-passed or isolated by r-f chokes. Filtering of microphone, keying, control circuits and 117-volt leads should be made directly at the point at which they leave the shielded unit.

Where an existing transmitter is mounted in a metal cabinet, each individual chassis should be enclosed in its own shield and then mounted in the cabinet. Ventilation holes in both the inner shield and the outer cabinet should be covered with fine mesh copper screen. Panel and shields should be of copper, aluminum, or copper screen. Steel does not provide very good electrostatic shielding and therefore is not recommended.

An ideal setup and not too far fetched would be the complete shielding of the room in which the transmitter is located.

If the foregoing remedies are impractical from a constructional standpoint or if they do not provide sufficient attenuation, other measures may be taken within the transmitter circuit itself; in fact, it would seem more logical to first employ those measures which more nearly act upon the actual source of interference. The preceding methods are, in a way, "placing the cart before the horse." They were described first because they apply individually to either direct or to antenna radiation. The following steps apply to both types of radiation.

Parallel Resonant Traps

Probably the most effective solution will be the installation of parallel resonant traps in the plate circuit of the final amplifier. This applies to push-pull as well as to single ended amplifiers. Popular conception of the push-pull amplifier is that the even order harmonics are cancelled out, which theoretically is true, but, in actual practice this is rarely the case.[4]

The effectiveness of parallel resonant plate traps will depend on their Q, ratio of L to C, the type of tubes, and the circuit impedances. L should be wound with large wire (at least No. 14) and have a shape factor of approximately 1:1 between its length and diameter. The value of L should be such that resonance in the 60-mc region will be obtained when L is shunted by a capacitor of at least 50 $\mu\mu f$. In some cases it has been necessary to go as high as 125 $\mu\mu f$. Too low a capacitance will reduce the effectiveness of the trap and will adversely effect the tuning and loading of the final tank, especially at 28 mc. Some very slight plate tank detuning may occur but no material shift should occur unless the trap components are incorrectly proportioned. Some experimentation of L/C ratio may be required in

2 Bane, "About Grid-Dip Oscillators," *CQ*, Mar. 1947.
3 Scherer, "The Dipper," *CQ*, May 1947.

4 Owens, "Down With Harmonics," Feb. 1948.

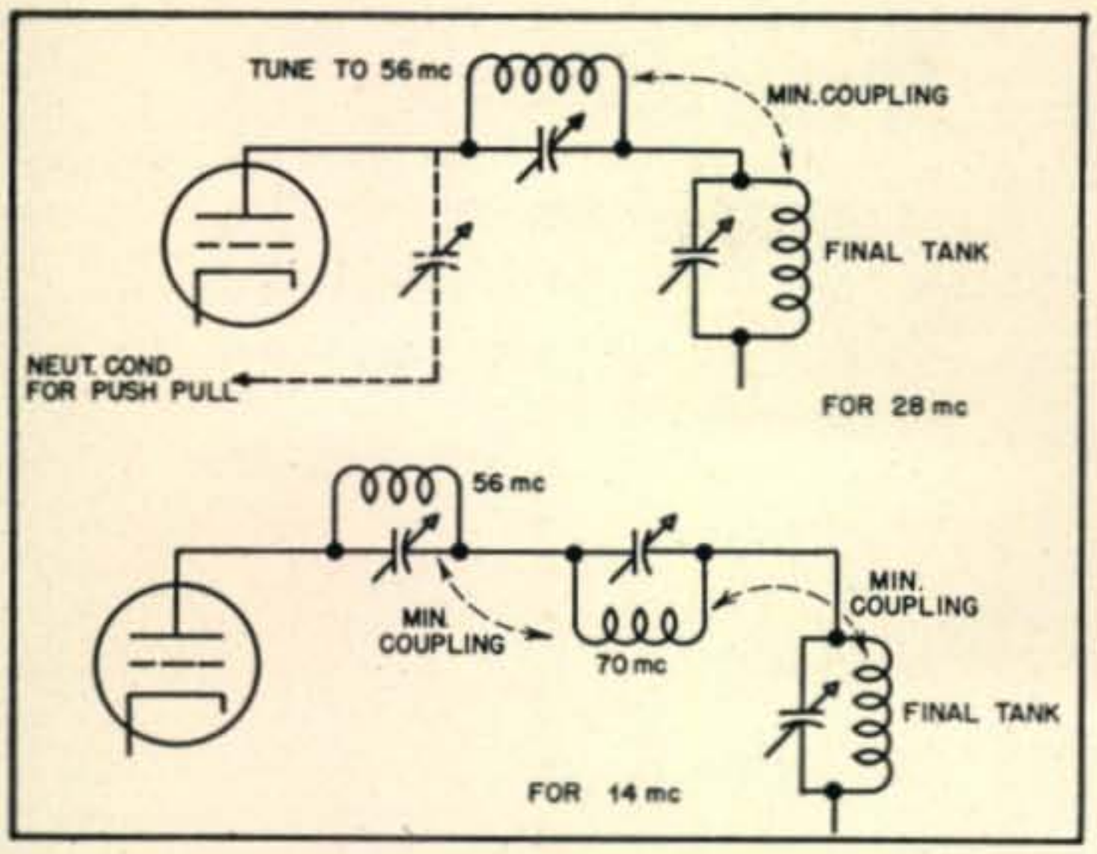


Fig. 4. Method of installing parallel resonant plate traps in power amplifier stage.

certain cases. The trap may be pretuned prior to installation by employing a grid-dip meter or may be left for later tuning under field tests.

The trap should be installed (*Fig. 4*) directly in the plate lead of the tube with all leads just as short as possible and with L at minimum coupling to other inductances. In case a neutralized push-pull stage is involved, the neutralizing capacitor must remain at the plate side of the trap. It is preferable to install an insulated shaft connected to the trap capacitor rotor so that it may be safely and accurately adjusted while plate power is applied. Adjustment from the front of the panel is ideal.

To adjust the traps set the field meter near the antenna or transmitter at a distance consistent with obtaining a good meter reading at the harmonic frequency. Apply power and adjust trap for maximum attenuation of harmonic. If, at this point, either the final tank resonance or the loading has noticeably shifted, L is too large and C is too low. If no dip in field reading is observed, the trap most likely is not resonating at the harmonic frequency. If the field reading goes up, it is because the trap must dissipate some power and it can radiate in the same manner as does the final tank; therefore, direct pickup from the trap can increase the meter reading (and also the TVI). In this case it will be necessary to shield the trap and amplifier unit. Just before the point of trap resonance is reached, the field reading will go up and then will take a decided nose dive. The parallel resonant plate trap should provide an attenuation of 30–50 db.

Where attenuation of fourth and fifth harmonics of a 14-mc signal is required, two parallel resonant traps may be inserted in series with each other in the final plate lead. Each trap should then be tuned to the harmonic to be attenuated.

Despite theoretical considerations to the contrary, attenuation may also be realized by the installation of series resonant traps shunted across the grid of the final amplifier (*Fig. 5*). L must be higher than that of the parallel combination and C accordingly lower. In general, C at resonance should be no more than 2 $\mu\mu$f otherwise the trap will not be too effective and it will have serious effects on the tuning and drive of the grid. The trap grid lead should be made directly to the grid terminal of the tube socket and the ground should be connected to the chassis nearest the cathode return. The variable capacitor may be the type employed for neutralization and consisting of two small circular discs. The general run of the common type of variable capacitor has too high a minimum capacitance unless the scheme shown in the photograph is used. Optimum value of capacitance for series grid trap is usually extremely low, on the order of 0.5 to 1 $\mu\mu$f.

Adjustments should be made as with the plate trap. Tuning is rather critical and it will be found that the normal grid tank (or driver tank) must be tuned slightly off resonance for maximum harmonic attenuation. Therefore, this type of trap is recommended principally for cases where only one transmitting frequency is generally used. Attenuation should be approximately 15–25 db.

Needless to say, it is essential that the amplifier be stable and neutralized when required. Unless this is the case, a combination of grid and plate traps will produce interaction.

Before proceeding further, it might be well to note that unless the transmitter is sufficiently shielded, it is best to make final adjustments while the results are observed at the TV set. Also as corrective measures attenuate the harmonic, a point may be reached at which no further attenuation is evidenced during successive remedial attempts and the TVI, although somewhat improved, has not reached a satisfactory state of reduction. In this case it is possible that the attenuated level may have become equal to that of r-f energy emanating from some other source. In all probability this will be the driver stage and may be checked by removing the final amplifier plate power and noting the change, if any, in the TVI. If some degree of TVI still remains, corrective measures must then be applied to the driver. A parallel trap in the driver plate may then be installed. Shielding of this stage is also in order and, if it is a doubler, changing it to an amplifier and quadrupling in the previous stage should be of some value.

In a few cases, where the TVI has not been too severe, link coupling between the driver and final has done much to improve the situation.

All plate and grid circuits should be of high Q, at least in the driver and final. The broad band amplifier means additional headaches and so does

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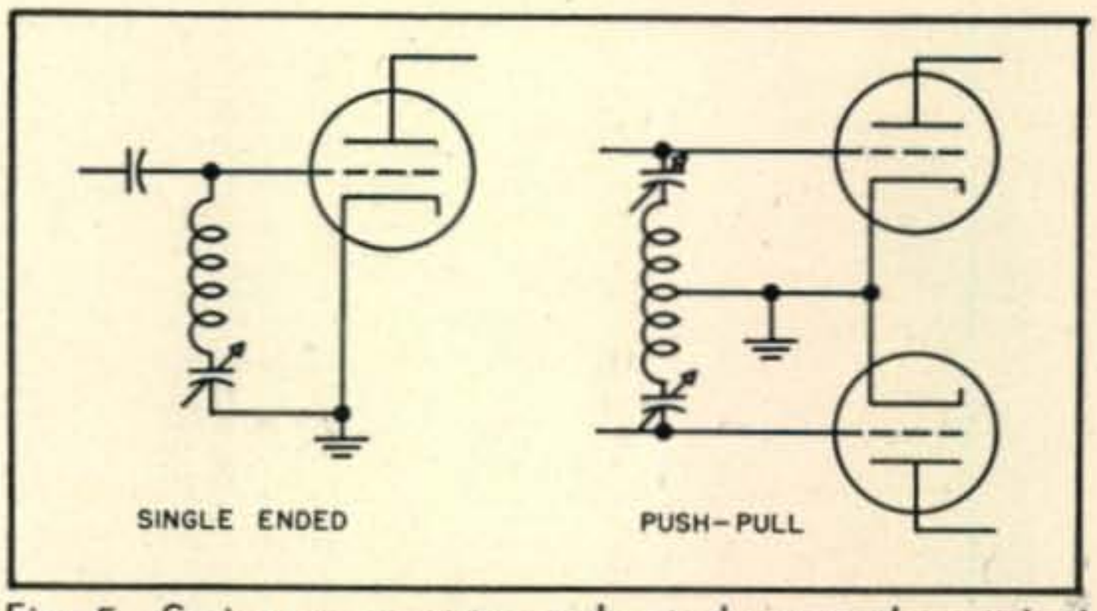


Fig. 5. Series resonant traps shunted across the grid of the final have provided improved harmonic attentuction in some instances.

The Amateur Newcomer

HOWARD A. BOWMAN, W6QIR, and WILLIAM A. GODDARD, W6AKQ

Modulation

IT IS BY VOICE MODULATED (phone) transmissions that outsiders most frequently judge the nature of hams. Thus it is obvious that the beginning ham will do well to learn all he can about voice transmission, its nature and peculiarities, and the steps which must be taken in order to make certain that its use will reflect credit on amateur radio.

Modulation is a process by which intelligence is impressed upon a radio-frequency signal. Since the radio-frequency signal carries the modulation the signal is usually referred to as the "carrier." The simplest form of modulation is that of breaking up the signal into the dots and dashes characteristic of code transmissions. However, by using appropriate modulating means, the voice itself can be impressed on the carrier.

In a later article the writers will show how to build, tune and use a 60-watt transmitter capable of operating either 'phone or c.w. on all bands from 80 to 10 meters. In this article we will explain as much as possible about the various types of modulation and their uses, so that the would-be amateur may gain enough knowledge to carry him through the Class-B examination.

In general, modulation as it is employed by the ham, is divided into two basically different systems amplitude modulation, and frequency modulation. An amplitude-modulated signal remains at a constant frequency, so far as the carrier is concerned, only the amplitude being varied; whereas a frequency modulated signal swings back and forth in frequency about a mean frequency, this swing taking place as modulation is applied, the carrier amplitude meanwhile remaining constant.

In former years amateur radiophone activity was confined exclusively to amplitude modulation, and hams were required to make certain that FM did not occur. It is still necessary to make certain that *unintentional* frequency modulation does not take place when using amplitude modulation, but it is equally necessary to make sure that unintentional AM does not take place when using FM.

Unintentional frequency modulation of an amplitude-modulated signal may occur if an oscillator is plate modulated, because modulation involves a change in the plate power input to the r-f stage, the voltage being varied by the addition of audio voltages in either a positive or negative direction. In the article on oscillators we saw that, in order to achieve stability of frequency, it was necessary to have a stable voltage supply, a condition which may not be met when plate modulation is applied. Moreover, even when an r-f amplifier is modulated there may be an undesirable reaction on the preceding oscillator if the two are closely coupled.

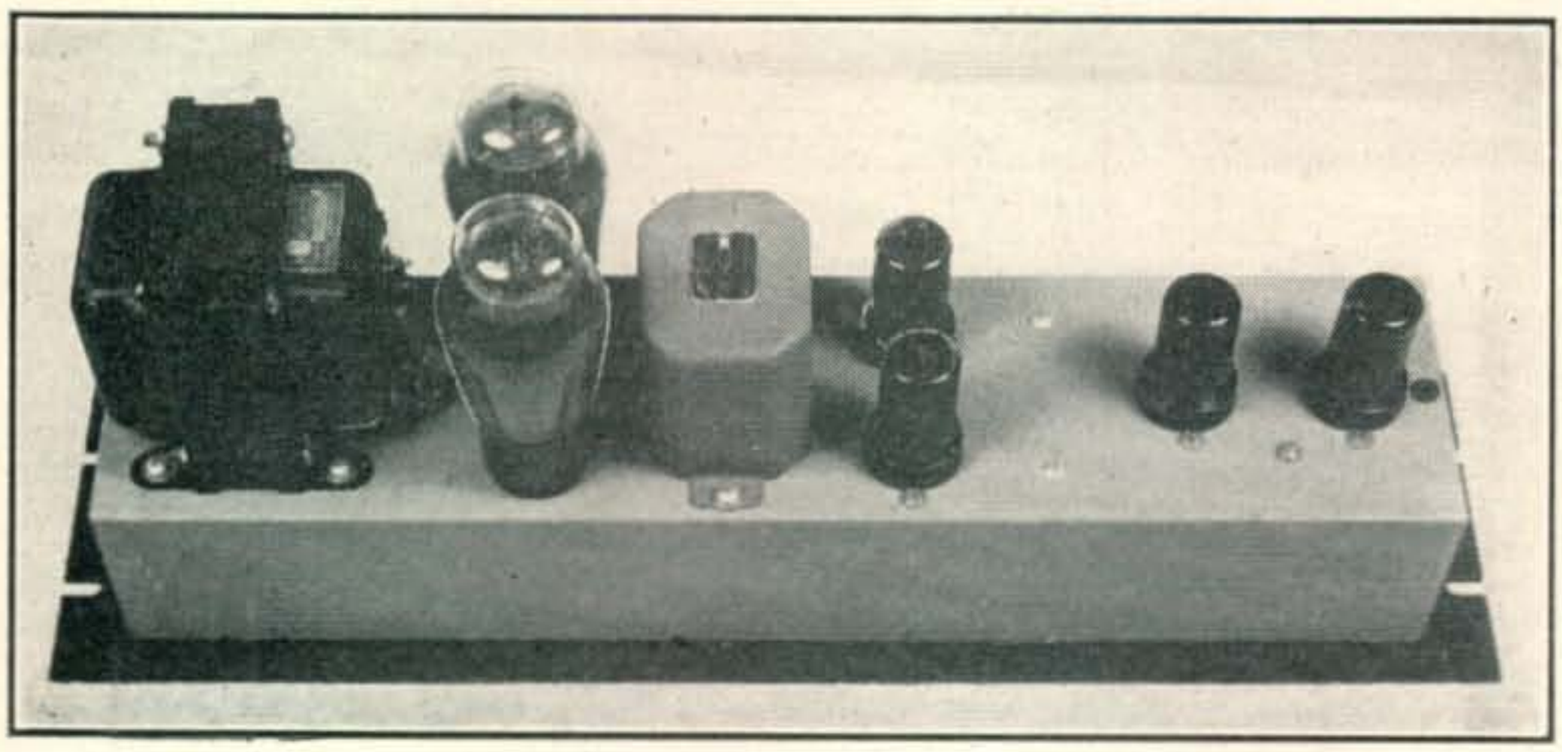
It is well, therefore, to consider the whole problem of modulation in relation to the r-f stages in the transmitter, and with these facts in mind we may proceed to an analysis of the basic systems of modulation.

Amplitude Modulation

A few paragraphs back we spoke of a "carrier," remarking that the transmitted continuous wave which has the modulation imposed upon it actually carries the modulation, and hence has come to be known as the carrier. Actually, the carrier of a radiotelephone transmitter is identical to the signal which would be emitted by a c-w transmitter if it were being operated continuously (i.e., without lifting the key).

If one listens to a c-w band, he will observe that each signal, or carrier, apparently occupies a definite segment of the band. The extent of the segment occupied may appear to be dependent upon the power emitted by the transmitter, its proximity to the receiving location, and other factors. For a given set of these conditions, however, it will occupy a portion of the band which is constant and unvarying.

If voice frequencies are picked up by a microphone, amplified, and properly applied to the carrier, it is possible to alter the width of the spectrum in which the signal operates, varying this width exactly as the audio frequencies supplied by the audio amplifier vary with changes in tone and pitch of the voice actuating the microphone. The microphone acts as an electromechanical device to change the varying intensities of air caused by the voice into



Typical amateur speech amplifier and modulator. This combination will produce 25 watts of audio power. The output tubes are 6L6Gs. The modulation transformer is at the far left.

electrical currents which are amplified by the audio amplifier. The audio amplifier merely serves to make these currents stronger so that they may be applied to the carrier with significant effect.

The alteration of the width of the spectrum in which the signal operates comes about by virtue of the fact that, when two alternating voltages are combined in some manner, the result is not only the two original voltages, but is also a voltage equal to their difference, and another equal to their sum. Thus, if we have a carrier operating at 3,900 kilocycles and modulate it with a 3000-cycle (3 kc) tone, the resulting signal will be equal to 3,900 plus or minus 3 kc, or three signals, one at 3897 kc, the second at 3900 kc and the third at 3903 kc.

The portions of the signal which extend to either side of the carrier are known as the sidebands, and in amplitude-modulated radiotelephone the intelligence conveyed is contained in these sidebands.

Of course, the human voice does not emit one constant audio frequency, but alters its pitch in order to form words; moreover, the human voice is complex in its waveform, and hence the amount of the spectrum covered alters with the tone being emitted, and with the natural characteristics of the voice involved. A voice which is naturally high-pitched will cause the transmitter to emit a signal which extends over a greater portion of the spectrum; and conversely, a low-pitched voice will tend to narrow the signal.

It is also true that the voice sounds which are of lower frequency cause a greater flow of audio power, yet are of less value in conveying intelligibility,and imilarly that the higher-frequency human voice sounds convey more intelligence but cause less power flow. It is, therefore, often desirable to restrict the level of the lower audio frequencies in order to confine the power produced to those higher frequencies which produce greater intelligibility, while simultaneously restricting the latter to some degree to prevent an excessive sideband width. It has been found that transmitting those frequencies lying between approximately 300 and 2500 cycles will result in adequate intelligibility while restricting the sidebands sufficiently to prevent unnecessary adjacent-channel interference.

Figure 1 shows how a carrier looks with and without amplitude modulation. Note that the number of cycles per second (frequency) of the carrier remains constant regardless of whether modulation is or is not applied. Note also that the changes in carrier amplitude are in both a positive and a negative direction. The lines *A* and *A1* indicate the original amplitude of the carrier, and the carrier is constantly of this amplitude when unmodulated.

When modulation is applied, however, the carrier amplitude begins to vary according to the frequency of the audio voltage impressed upon it. It rises in amplitude above its former peaks and drops to a point below them. The degree to which it rises and falls in comparison with the amplitude of the original carrier is determined by the amount of audio voltage supplied by the modulator tube or tubes. If a small amount of audio power is supplied, the amount of power in the sidebands will be small; if large, the amount of power in the sidebands will be large.

When the audio voltage supplied is of a polarity such as to augment the r-f voltage present in the final amplifier, the power present in the sidebands rises to a peak; and when the audio voltage is of an opposing polarity the result will be equal to the difference of the two voltages present, causing the net power output to decrease toward zero. By examining *Fig. 1* it will be noted that under conditions of 100 per cent modulation the voltage peaks are double their extent on the unmodulated carrier. The power in the modulated wave varies as the square of either the current or voltage involved. In this case we have doubled the voltage. Hence the power in a 100 per cent modulated signal is equal (at the instant of peak output) to four times the unmodulated carrier power.

It is obvious that this power increase must be supplied from some source. In the case at point, the added power is wholly supplied from the audio modulator stages.

Methods of Amplitude Modulation

There are three principal methods of amplitude modulation in use among amateurs, all designated with reference to the particular citcuit into which the modulation is introduced. They are (1) plate modulation, (2) control-grid modulation, and (3) cathode modulation.

Plate Modulation—Plate modulation involves the introduction of the modulating power into the plate circuit of the tube or tubes used as the final r-f amplifier in the transmitter. This may be done by either of two commonly used methods. One involves the use of an iron-core choke in the plate circuit of the modulator tube, and is often used when the modulator is a single tube, particularly in low-power applications. The other makes use of a transformer, the primary of which is in the plate circuit of the modulator tubes, and the secondary of which is in the positive high-voltage lead to the final r-f amplifier.

In either case, the requirements for 100 per cent modulation are the same. The voltage at the plate of the modulated stage must vary from twice the amount of the d-c plate-supply voltage to zero. Although the peak power output of the transmitter

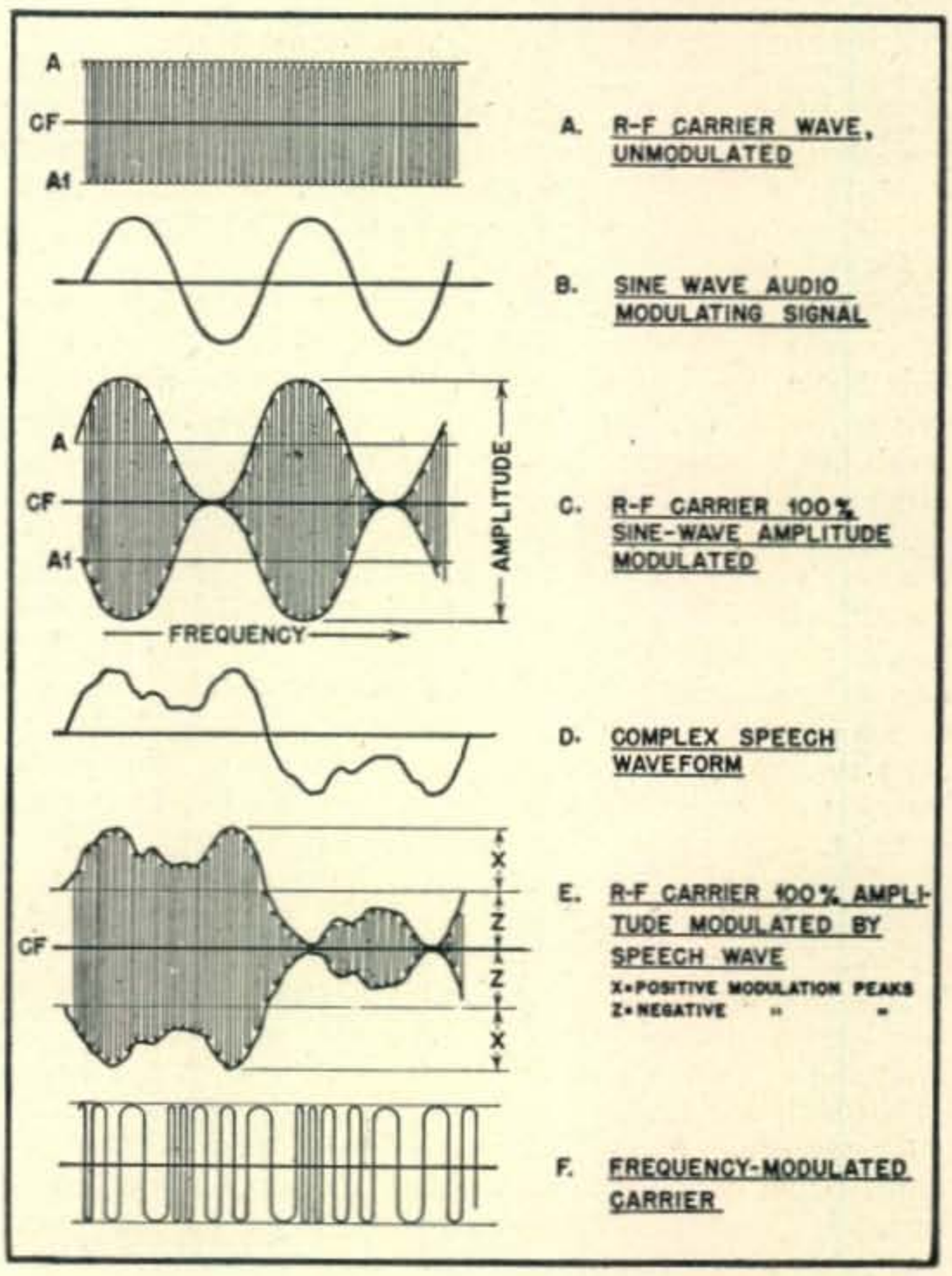


Fig. 1. Varying waveforms under different conditions.

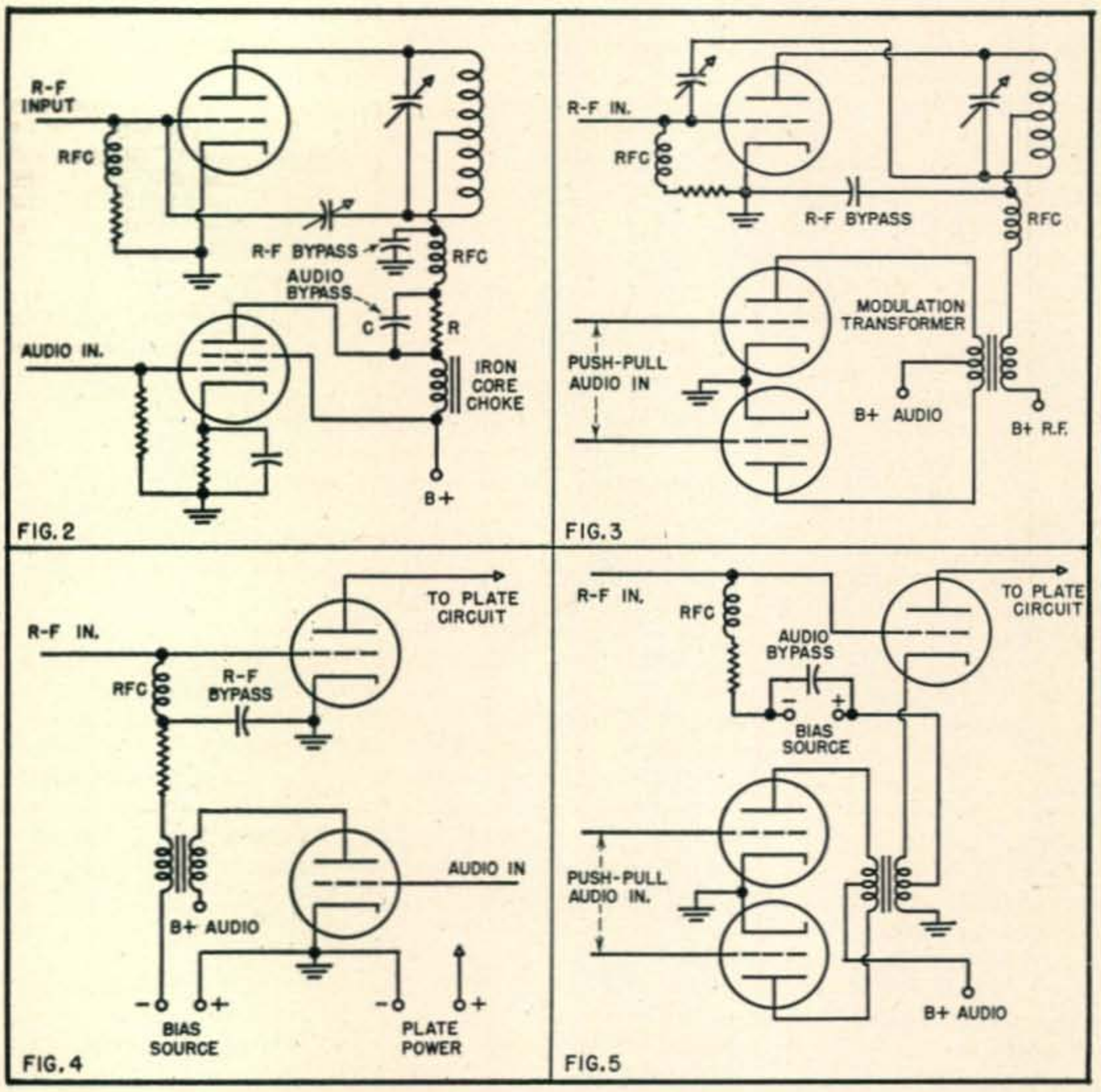


Fig. 2. Constant current (Heising) modulation.
Fig. 3. Plate modulation, transformer coupled.
Fig. 4. Grid modulation.
Fig. 5. Cathode modulation.

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is four times the carrier output, the average output under conditions of 100 per cent sine-wave modulation, is equal to but 150 per cent of the unmodulated carrier output. The added 50 per cent must be supplied by the modulator tube or tubes and their associated power supply, and for this reason the modulator must be capable of a power output of one-half the power input to the final amplifier.

In the type of modulation employing a choke in the plate circuit of the modulator tube (Heising or constant-current modulation), this condition is met by adjusting the power input to the final amplifier until it is twice the power output of the modulator stage. Both operate from a common power supply. The method of doing this and the necessity for it may be seen in *Fig. 2*, where a resistor, by-passed with a capacitor of rather large capacitance, has been placed in the lead from the modulator tube to the r-f amplifier. If we examine the characteristic conditions under which the two tubes operate, we see that the modulator tube operates under Class A conditions. That is, the plate current does not vary under any condition of power output. Any variation in modulator plate current would alter the plate voltage to both the modulator and the modulated stage, producing an undesirable effect.

Since the modulator tube operates under Class A conditions, the plate of the tube is being constantly fed all the power it may safely dissipate in the form of useful output and plate heat. The modulated r-f amplifier, however, is operated under Class C conditions, which means that it is biased and excited in such a manner as to cause plate current to flow for but a small fraction of the excitation cycle. During the remainder of the excitation cycle there is no plate-current flow, and the plate has a chance to cool. Since this variation in plate current occurs at time intervals of the order of the frequency of operation, it is obviously not observable on a meter. Because it occurs, the plate is permitted comparatively long time intervals in which to cool, and hence may be operated at an initially greater amount of power input.

Thus the modulated stage can be fed a considerably greater amount of power without exceeding the ratings of the tube than can the modulator stage. Moreover, because of its heat-dissipating capabilities, and because of other operational factors, the Class C amplifier is inherently much more efficient than the class-A amplifier. That is, it converts a greater portion of its input into usable output.

Let us take a concrete example to point up the theory. A type 6L6 tube employed as a Class-A audio amplifier with 300 volts on the plate and 200 volts on the screen will develop a power output of 6.5 watts if suitably biased by means of a cathode resistor. It will draw a plate current of 54.5 ma. The power input to the plate is thus 0.0545 times 300, or 16.35 watts. The efficiency is a bit over 39 per cent.

If a similar tube is operated as a Class-C amplifier at the same plate voltage it may be loaded to, say 70 ma., for a plate power input of 21 watts, or considerable more r-f power than the 6.5 watts of audio power will be capable of modulating 100 per cent under conditions of sine-wave input.

Actually, the human voice waveform is far from a sine wave in shape; nevertheless, the conditions for peak power output are the same. If the builder is content with less than 100 per cent modulation, he may connect the modulator directly to the modulated stage. If, however, he wishes to have a modulation capability of 100 per cent he must make some provision for reducing the power input to the final amplifier.

Since the audio power output is known (6.5 watts), we may choose a convenient value of plate current to the final amplifier, and so change the plate voltage as to enable a power input of twice 6.5, or 13, watts at this particular value of plate current. Let us say we choose a plate current of 50 ma. To find the

necessary plate voltage, we divide the plate power (13 watts) by the plate current (50 ma., or .050 amperes) and discover that the appropriate voltage would be 260 volts.

Since we are supplying 300 volts to the modulated stage, it is necessary to drop this voltage by 40 volts before it gets to the modulated stage, and this is done by the resistor *R*. By Ohm's Law we find that it should have a value of 800 ohms. It will be called upon to dissipate some amount of power, depending on the voltage drop across it and the current flow through it, and this should be taken into consideration in choosing the resistor. It is by-passed by a capacitor having a low reactance at audio frequencies so as to allow unimpeded flow of the audio voltage to the modulated stage.

The other method of plate modulation—that which employs transformer coupling—is much more widely used. It is illustrated in *Fig. 3*. It is less wasteful of power than Heising modulation because the modulator tubes are ordinarily operated in push-pull under Class-AB or Class-B conditions, which means that more useful power output is obtained than under Class-A conditions.

Such a modulator develops its maximum amount of power when operated into a load properly matched to the tubes used under a given set of conditions. For example, a pair of 6L6 tubes, operated Class-AB_1, with a plate voltage of 360, a screen voltage of 270, and grid bias of −22.5 volts, will supply 26.5 watts of audio power when operated into a plate-to-plate load of 6600 ohms.

The load impedance presented by the primary of the output transformer is not a direct function of the d-c resistance of the winding. Rather, it is a variable factor, depending upon the load presented to the secondary winding, and the turns ratio of the transformer. If the secondary is unloaded, for example, the primary impedance will become very great, just as if the transformer winding were not present, and if the amplifier is producing power, the voltage peaks may rise to such a point as to destroy the insulation of the transformer.

Since the final amplifier is ordinarily operated at a given d-c current and voltage, the load presented by this amplifier may be determined by using Ohm's Law. If, for example, the final is operating with 80 ma d-c plate current at 600 volts, the power input is 48 watts, and the load impedance becomes 600 (volts) divided by 0.08 (amperes), or 7500 ohms. If we desired to use the 6L6s mentioned above to modulate this amplifier, it would be necessary to match the 6600-ohm plate-to-plate load of the 6L6 to the 7500-ohm impedance presented by the final amplifier. This may be done by choosing a modulation transformer designed to match 9000-ohms primary to 7500-ohms secondary.

The property of matching two dissimilar impedances is obtained by varying the ratio of primary turns to secondary turns in the transformer. Such transformers are ordinarily rated by their manufacturers in terms of impedance match and the amount of audio power the transformer is capable of handling. Most modern transformers are of the variable-match type, having three or four separate tapped windings, with leads brought out to terminals. From data supplied by the manufacturer these transformers may be so connected as to match almost any two impedances closely enough for all practical purposes.

Grid Modulation—In the foregoing paragraphs we have seen that the plate circuit of an r-f amplifier may be modulated by adding power by means of a modulator stage. It is also possible to modulate a transmitter by varying the grid bias which controls the efficiency and output of the modulated stage.

In an earlier article we saw that the plate current of a vacuum tube had a direct relationship to the amount of negative grid bias applied to the tube. If the grid is made more negative, the plate current becomes less, and vice versa. If the plate voltage is held constant and the plate current is varied rapidly by changes in grid potential, it follows that the plate power output of the stage will also vary, directly in accordance with the grid-bias variations. If these grid-bias variations are at an audio rate, then the plate power output will vary at an audio rate, and if this audio variation has been initially supplied by a human voice we will have accomplished the conditions for voice modulation.

Since, under conditions of 100 per cent modulation, the peak power output will be four times the carrier output, it follows that the extra power must come from the final modulated amplifier in as much as it is not now being supplied by a modulator tube or tubes in the plate circuit. The peak amount of power which a given tube may produce is determined by its plate voltage and current input, and by the efficiency at which it operates. Ordinarily, peak efficiency is in the neighborhood of 75 per cent. We noted above that the plate voltage is constant, and that modulation is accomplished by varying the plate current. The plate-current input is limited by the efficiency of the circuit and the amount of heat which the tube plate may safely dissipate. Since this latter item is constant, the efficiency becomes the limiting factor.

In practice, the bias and modulating voltage are adjusted so that the tube is operating most efficiently during modulation peaks in a positive direction, and so that the output from the modulated stage just drops to zero during negative modulation peaks. These conditions correspond to 100 per cent modulation. Since the tube can operate at maximum efficiency only during positive modulation peaks, and must operate at lower efficiencies at all other times, a grid-modulated amplifier has less over-all efficiency than a plate-modulated amplifier, and this efficiency is ordinarily about 38 per cent.

The difference in efficiency and power output is somewhat compensated for by the fact that the grid-modulated stage needs virtually no power output from the modulator stage. All that is needed to accomplish grid-bias modulation is audio voltage swing, plus a very small amount of power, equal only

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Dollars for Watts

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to that consumed in the bias source for the stage as the bias is varied by the audio amplifier.

Cathode Modulation—Cathode modulation is a system often employed to secure some of the advantages of both grid-bias and plate modulation. It also possesses some of the disadvantages of both.

Modulation is applied to the cathode or filament-center-tap circuit of the modulated stage. In order to avoid simultaneously modulating other stages, the modulated amplifier, if it employs a directly heated filament type of tube, must be supplied from a separate filament transformer. Since the cathode circuit is the meeting ground of both plate and grid circuits, it follows that modulation may be simultaneously applied to both these circuits.

With cathode modulation, both grid bias and plate voltage are varied. This means that the modulated stage must operate at less than maximum efficiency, since varying the grid bias necessitates a lowered efficiency under resting (no modulation) conditions. Because the plate voltage is varied, it is apparent that the modulators must supply some degree of power to the final plate circuit.

By proper choice of operating conditions, the cathode modulator may be operated as predominantly grid-bias modulation or predominantly plate modulation, or at any point midway between these extremes. As the amount of plate modulation is increased, peak efficiency and power output increase, but so does the need for audio power from the modulator. With an increased amount of grid-bias modulation the needed modulator power drops, but so does the over-all efficiency of the modulated stage.

The system is a compromise which has its basis in the relative costs of modulator power. Since it is relatively easy and cheap to get 25 watts or so of audio, this system is often used to obtain a higher order of efficiency and power output than might be obtainable with grid modulation.

Modulating Screen-Grid Tubes—Since tetrodes and pentodes are relatively easy to excite, require little or no neutralization, and are capable of handling a considerable amount of power, they are often used as final amplifiers. The screen grid in such tubes imposes rather unusual conditions for modulation. Since the applied screen voltage has a very great effect in determining plate-current flow, and hence power output, it is impossible to achieve linear (i.e., distortionless) 100 per cent modulation by modulating plate voltage because of the limiting effect of the constant screen voltage. If the screen voltage is varied at an audio rate along with the plate voltage, this difficulty is overcome, and the tube becomes, in this respect, more similar in operation to a triode.

This variation of screen voltage may be accomplished in either of two manners. Some modulation transformers are built incorporating a separate winding which carries the d-c screen voltage and superimposes the audio voltage upon it. This system is often used in commercially built transmitters. Perhaps the simplest method is to feed the screen through a dropping resistor from the modulated plate-voltage supply to the final. The dropping resistor used must be by-passed by means of a suitable low reactance capacitor at modulating frequencies so that the audio will pass.

Frequency Modulation

In considering amplitude modulation, it was stated that the carrier frequency remained constant, but that its amplitude was varied in accordance with the superimposed audio signal. In frequency modulation, the reverse is true. The amplitude of the

(*Continued on page 88*)

Book Reviews

Surplus Radio Conversion Manual Vol. 1, by R. C. Evenson and O. R. Beach. Published by Techno-graphic Publications, P. O. Box 877, Los Angeles, Calif., 115 pages, 6¾ by 9½ inches, including foreword and index. 40 schematics, numerous drawings. Paper bound, price $2.50.

If you are one of those undecided about the time and expense involved in converting surplus material, or are one of those who supposedly bought choice items and are now stumped for what to do with them, you may find an answer to your problems in this book. Fourteen surplus units are "converted" in this first volume. All of the units are very well known (including the BC-221, BC-645, SCR-274, SCR-522, etc.) and when combined under one cover it becomes doubtful that a better or more apropos selection could have been made.

In general, the conversions are straightforward and sufficient information, as well as schematics, are included so that the steps in the process do not require the tedious wire-by-wire discussion. Before each conversion is outlined, the particular unit is described and possible amateur usage with optional suggestions are made. The necessary circuits to be converted are then listed and detailed complete with schematics and sectional drawings. The method is foolproof and all of the conversions appear to have been tested and well thought out in advance.

The last part of the manual incorporates an "Electronic Surplus Index." This is a rather useful item which should have been further expanded to include many more of the available units (such as the BC-639, etc.). However, 125 major items are included along with short descriptions of the intended use, frequency range, power requirements, and tube lineup. Following this section is a cross-index of all 289 Army VT tube numbers and their commercial equivalents. Some special care appears to have been exercised in the preparation of this list and it is probably one of the best available at this time. A table of radio amateur and television channel assignments is included in the last two pages.

An Approach to Radio, by James B. Shrewsbury. Published by Electronic Industries, Princeton, Ky. 288 pages, 5½ by 8½ inches. 180 illustrations, price $4.50.

The first impression of this book is the appropriate nature of the title. This is a new approach to the radio hobby or profession taken without resorting to complicated mathematics. Many old-timers will be surprised to find even Ohm's Law in Chapter 8, the very last chapter in the book. Naturally, reversing the usual procedure and introduction to radio can only be made by including many generalities. However, author Shrewsbury has written and devised a system which does not fail to get its point across without violating sound technical theory.

The secondary purpose of this book is the integration of radio fundamentals and the manipulative skill to put simple circuits together. After explaining the basic electrical terminology by a unique comparison system the second chapter describes the method of constructing a single-tube audio oscillator. This is somewhat of a radical departure, since many radio technical schools and text-books require weeks of study before the student becomes able to handle

(*Continued on page 90*)

Chief Radioman Robert C. Oehmer (W2SNP) operating the Naval Reserve Radio Station (K2NR) located at the New York Naval Shipyard, Brooklyn, N. Y.
U. S. Navy photograph

The United States Naval Reserve

W. H. SMELAND, COMMANDER, USNR*

An opportunity to learn ham radio while serving your country.

THIS ARTICLE IS written not only for the information of the radio amateur, but also for those men between the ages of 17 and 40 who desire to obtain an amateur license. If you are one of the latter, you are probably having difficulty in studying and practicing alone. By joining the Naval Reserve in your community, you will have the use of regular Navy equipment to work and practice on, and you will have instructors, who for the most part, will be veterans of the armed forces and radio amateurs. You will work and study with other members of the Naval Reserve who are interested in electronics and radio communications, and through this association you will be qualified to take your amateur test and get your license in much less time. In addition, the road will be open to you for becoming a petty officer in the Electronic Warfare Component of the Naval Reserve.

To give the reader a clearer picture of electronics in the Naval Reserve, it is felt that a brief resume of the program is in order.

The Naval Reserve Program

The personnel of the Naval Reserve whose duties will involve research, design, production, installation, maintenance, and operation of the equipment and techniques of modern Naval electronics are members of the Electronic Warfare Component of the Naval Reserve.

As part of its mission the Naval Reserve will provide personnel, officer and enlisted, in accordance with the Electronic Warfare requirements of the Navy. Electronic warfare as used in this connection includes ASW (Anti-Submarine Warfare), CIC (Combat Information Center), communications and technical electronics, as well as electronics as related to such subjects as the guided missiles, infra-red and nuclear physics programs.

When it is brought to full strength, the Electronic Warfare group will include more than 150,000 reservists in a training status—meeting weekly in cities and towns throughout the country. More than 300 training centers are being erected for housing the Organized Reserve units in the larger cities. A quota of 900 Electronic Warfare Companies and a large number of Electronic Warfare Platoons have been established. Companies and Platoons can be associated with the Organized Reserve in our larger cities and use the facilities of the training centers. In other communities they will have their own facilities and equipment. Space is generally found in public buildings such as post offices, and city and county buildings.

These meeting places for Companies are called Electronic Warfare Drill Quarters, and for Platoons, Electronic Warfare Stations. Each Naval Reserve Training Center, Electronic Warfare Drill Quarters and Electronic Warfare Station is being supplied with complete radio transmitting and receiving equipment for use in the Naval Reserve Communication Network. Radar stations and complete electronics laboratories are also being set up. These laboratories are available for basic experiments and also for use by Naval Reservists in building their own gear at appropriate times. The Navy makes these installations and provides major maintenance.

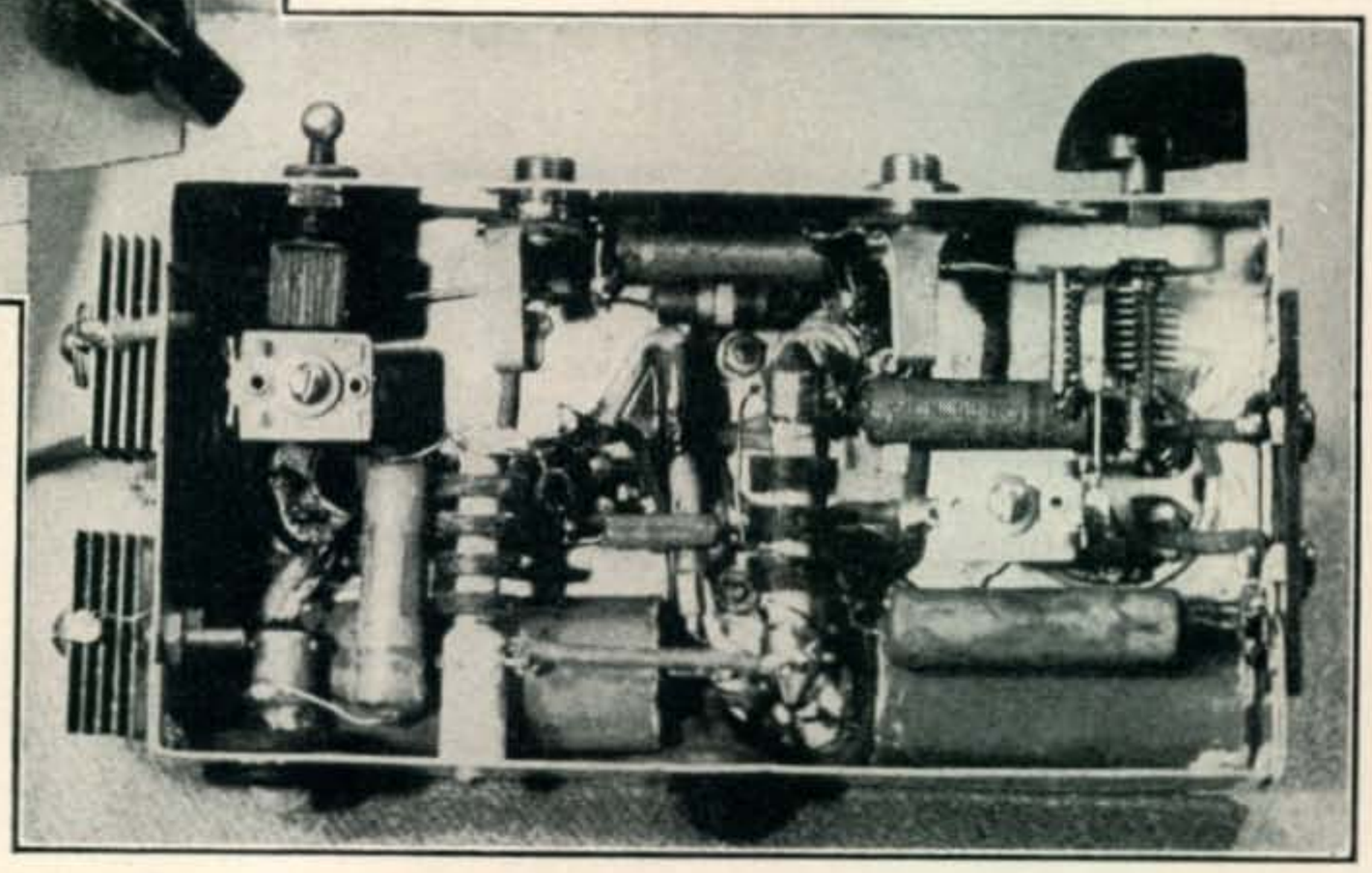
Special Calls and Frequencies

Navy frequencies have been assigned for the use of the Naval Reserve as well as special Navy radio call signs. In addition, provision has been made for each station to procure a special amateur station license, authorizing their amateurs to use the Navy equipment on amateur bands. Cooperating with the Navy in this program, the Federal Communications

(*Continued on page 89*)

*District Reserve Operational Communication Officer, Third Naval District, 90 Church St., New York 7, N. Y.

Left: All components above deck on the cigar-box-size transmitter unplug for easy transportation. Right: Despite the small size there is no crowding of parts below the chassis. The selenium rectifiers for the high voltage are secured outside the end of the chassis.



ROY McCARTHY, W9GEJ/6*

A complete c-w transmitter small enough to fit into a cigar box.

20 WATTS – *Vacation Bound*

IN THIS ARTICLE and accompanying illustrations may be found one "lazy man's answer" to the problems of portable c-w amateur radio operation. Having been subject to continual moving about during the past few years, the writer has grown tired of lugging around transmitting equipment of the usual so-called portable type. Therefore, considerable time was spent working out a suitable transmitter which would occupy no more space than a box of cigars, yet would put enough "soup" into the antenna to make operation enjoyable. The rig described was the final result. It is small enough to be packed, along with its accessories, into an ordinary cigar box. Its total weight is negligible. The power input to the final stages is twenty watts, sufficient for most purposes on the c-w bands.

The r-f circuit is more or less standard; a Pierce oscillator followed by an amplifier using two beam tubes in parallel. The Pierce oscillator was chosen because it will operate with almost any fundamental type crystal, and needs no tuned circuit. It is possible to either double or operate straight through in the final. This gives two-band operation per crystal by changing only one coil and retuning one condenser, and, of course, readjusting the antenna coupling if necessary. The power supply uses the newly developed midget selenium rectifiers in a voltage doubling circuit, and the tube heaters are connected in series, so that no power transformer is needed. No filter choke was found necessary in the power supply, the calculated ripple being approximately 6%. Reports received substantiate this decision.

*Box 429, 530th Group, 24th Air Transport Squadron, Fairfield-Suisun AFB, Calif.

The entire transmitter and power supply is built up on a homemade aluminum chassis measuring approximately 6¼ x 3¼ x 2 inches. All components on top of the chassis are plug-in units, so that they can be removed, while being shipped or carried, and stored in the cigar box with the transmitter. The rectifiers are mounted on the end of the chassis in a vertical position for ventilation. However, they run very cool in normal operation. The location of the crystals (a spare crystal and the one in use), the 6C4 oscillator tube, the two 50B5s in the final, and the final tank coil may be clearly seen in the photograph. On the front panel are a toggle switch, which is connected across the key, the key jack, a meter jack, and the knob for tuning the final tank condenser.

In wiring the rig it is best to hook up the tube heater circuit, the power supply and d-c voltage distribution system first. These wires should be run close to the chassis and in and along corners wherever possible to provide for partial shielding and self by-passing. The radio-frequency circuits should be wired last, keeping these leads short and direct as possible and away from the chassis and other wiring.

Keying

Normally the transmitter is keyed in the cathode circuit of both the oscillator and final, providing for break-in operation, as well as allowing the tubes and crystal to rest when not actually transmitting. However, the key may be plugged into the meter jack, *J2*, and the final keyed alone, with the oscillator controlled separately by the switch, *SW1*. An r-f filter may be necessary across the key to eliminate key clicks resulting from a small spark at the

key contacts. If required, this filter should consist of an r-f choke in each key lead, with the keying line by-passed by a condenser of 100 $\mu\mu$f or so. With the circuit adjusted properly the oscillator will faithfully follow a Vibroplex with the weight on the dot arm at its fastest position.

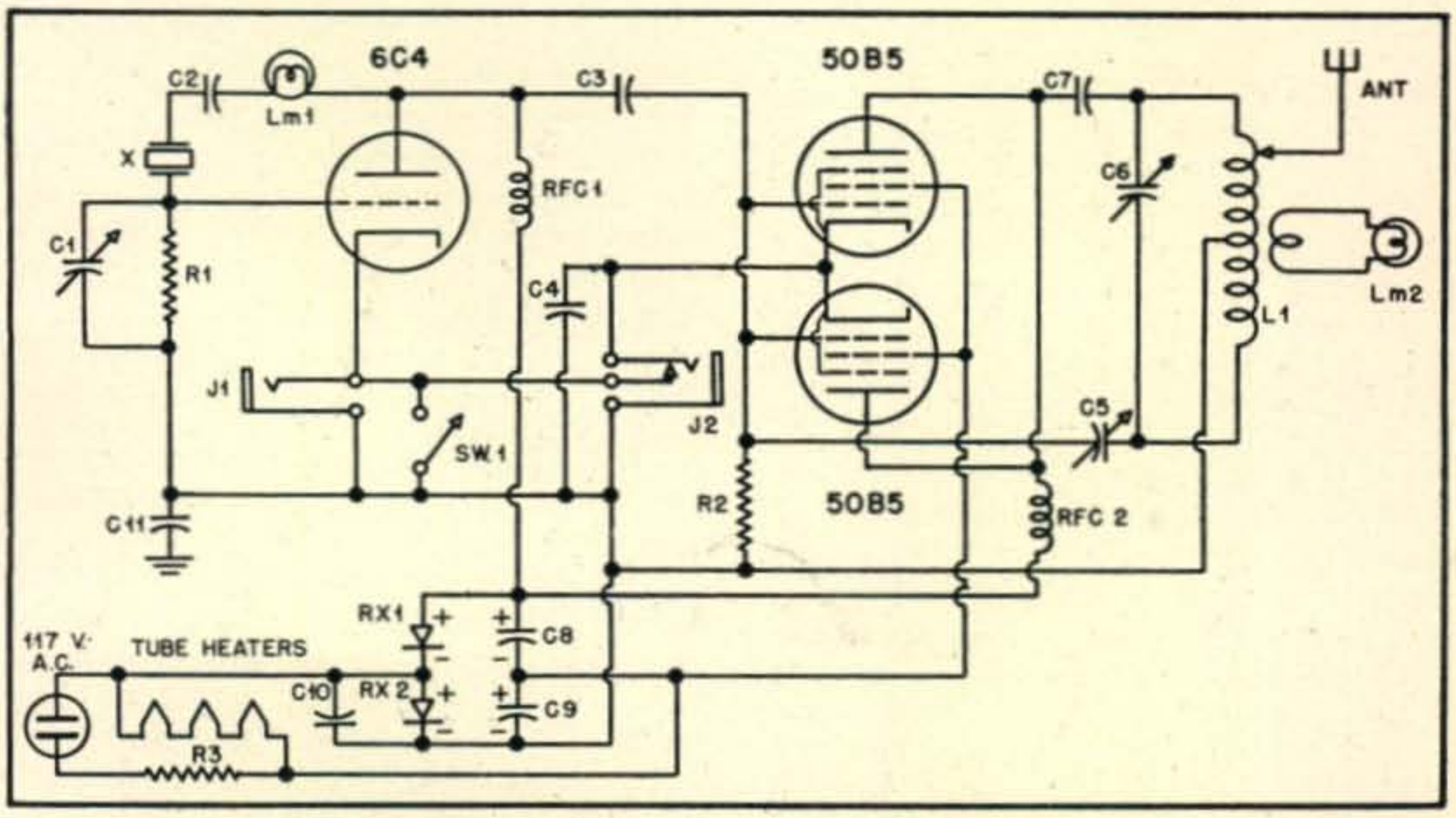
In making preliminary tests it is recommended that the neutralizing condenser and the feedback trimmer in the oscillator circuit first be opened up about 1/16". The oscillator should be monitored on a receiver to be sure of oscillation when the key is pressed or the switch across the key jack closed. During this test the final is disabled by inserting an open plug in the meter jack. If the oscillator is operating satisfactorily, the open plug is removed and a 100 or 150-ma meter plugged in. The final may then be resonated by tuning *C6* for the dip in plate current. Still listening to the signal on the receiver, the neutralizing trimmer is adjusted until, as the final is tuned to and through resonance, there is no appreciable change in the note heard. The feedback trimmer, *C1*, should be tightened up until the crystal current indicator, *LM1*, shows a faint glow. It is important that the final not be operated unless the oscillator is on since no fixed bias is used on the final and the plate current would be excessive without excitation. An antenna load should now be coupled to the final tank coil, and with a bug, or a fast hand key plugged into the key jack, *J1*, the feedback trimmer is readjusted for maximum output consistent with good keying characteristics. Care should be taken to avoid too much crystal current which may result in the crystal overheating and drifting or chirping, or possibly being shattered.

The antenna is coupled directly to the final tank coil (through a blocking condenser) by means of a small copper clip, or if a doublet is used a center link may be used for antenna coupling. Assuming that a single wire is used, the clip is connected to the center of the coil and the tank resonated. Then the clip is moved a bit at a time toward the plate end of the coil, each time re-resonating the tank, until the loading is up to about 80 or 90 ma. A pilot bulb coupled to the tank makes an excellent loading indicator after a bit of practice with its use, since if it is bright with the antenna loosely coupled, it will grow progressively dimmer as the antenna is coupled in more and absorbs more power. This may eliminate the necessity for taking a meter along and risking damage to it. A single turn is sufficient for coupling the pilot bulb indicator.

The power supply voltage doubler circuit gives about 250 volts for the final plate and oscillator plate, and the center tap on the filter condenser circuit gives about 125 volts for the final tube screens. The final plate current, under full load, is about 80 ma. Since the meter in the cathode circuit also indicates the grid and screen grid current, allowance must be made for several additional mills. The oscillator plate draws about 12 ma.

No switch is incorporated in the power supply circuit since it is comparatively easy, and much safer, to unplug the rig when it isn't in use. The power supply negative return should not be connected directly to the chassis; instead a common bus lead should be used for B— and insulated from the chassis. With this type of voltage doubler circuit, the B— is above actual ground potential no matter which way the power plug is inserted. Perhaps an isolation transformer would be the best solution for home use, but this would add unnecessary weight, objectionable to portable operation.

The usual check with a local station should be made to insure operation in the intended band, and against possible spurious radiations, or harmonics which might result from misadjustment. Remember, before leaving on vacation, notify the F.C.C. of intended portable operation.



Circuit diagram of the cigar-box-size c-w transmitter.

C1, C5—3-30-$\mu\mu$f trimmer.
C2, C7—.001 μf, 1600 v.
C3—100 $\mu\mu$f, mica.
C4—.01 μf, 600 v.
C6—50 $\mu\mu$f, variable.
C8, C9—50 μf, 150 v.
C10, C11—.02 μf, 600 v.
R1, R2—100,000 ohms, ½ w.
R3—25 ohms, 5 w.
RFC1, RFC2—2.5 mh, 100 ma.
RX1, RX2—100-ma selenium rectifiers.
J1—Open-circuit key jack.
J2—Closed-circuit meter jack.
SW1—SPST toggle switch.
L1—B & W 25-watt type MC.
LM1—No. 47 pilot bulb.
LM2—No. 47 or 44 pilot bulb.
X—40 or 80-meter crystals.
PL1—Line cord and plug.
V1—6C4. V2, V3—50B5.

Monthly DX Predictions-August

OLIVER PERRY FERRELL *

IN ONE OR TWO of our companion radio periodicals we have noted several rather peculiarly interesting comments on h-f and v-h-f radio propagation. In general, these have proposed new "discoveries" or ridiculed the present fields of endeavor. It will be well worth while for the reader to consider carefully the source of this material before accepting it with any serious intent. Probably it is an instance of the brainchild's author knowing too much for his own good and much too little for anyone elses'. One account of the supposed effect of the moon on v-h-f propagation could scarcely be credited to anyone ever working with either amateur radio or wave propagation phenomena. In the future this department proposes to critically review and expose some of these more flagrant examples.

New Predictions

For some time it has been felt that the accuracy and the coverage of the *DX Predictions* could be greatly improved. In particular, a study has been made of the material utilized at the Atlantic City International Conference and at the allocation meetings in Switzerland. This study has shown that methods are now available for including the *normal* auroral zone absorption and for estimating the noise grade of the receiving location. This is of great importance in working or attempting to work 40-meter DX. A new system of presentation is being ironed out to include these data. It should start in the early Fall issues.

Graph 1 shows the predicted conditions from the W1, W2, and W3 call areas to Japan and Korea. This graph has been corrected for normal auroral zone absorption and for that reason shows a considerably higher value of LUHF than usually predicted by the normal methods. However, also during this month the trans-Pacific MUF will be low and only one opening can be predicted. This opening is forecast for the 20-meter band between 0545 and 0645 hours EST. Signals during this period will be weak and the opening may be erratic due to the long passage of these signals through the auroral belt. Some variation in the opening and closing times may be expected. This will amount to about plus or minus 45 to 60 minutes in each direction.

Graph 2 illustrates the predicted median conditions from the W9 and WØ call areas to the VK2, VK3, VK5, and VK7 call areas. The morning peak in the MUF is now becoming apparent. This corresponds to a good morning opening starting at 0630 hours CST and ending around 0845 hours CST. Peak signals should occur shortly after the opening, particularly between 0645 and 0730 hours CST. Fair to good signals may also be expected from 2315 hours until 0345 hours CST the following day. No 10-meter band openings are predicted as the MUF will probably not exceed 28 mc at any time during the month. 40 meters will be closed due to the high static level, although this is not shown in the graph.

Graph 3 shows the predicted median conditions over the long path from the W6 and lower W7 call areas to central and southern Europe. To a very large extent this graph will also apply to the greater European area extending from England and Ireland to the Balkans. A two part opening is predicted for August. The first opening will begin about 1630 hours PST. Good signals may be expected after 1730 hours until 1930 hours PST. At this time the MUF will be nearly 14 mc. Deviative absorption should be observed and conditions during this period will be erratic. Around 2045 PST conditions should improve and will remain fair to good until band closing around 2230 hours. No 40-meter openings may be predicted although on several occasions this band may open for short periods between 2000 and 2130 hours PST.

Graph 4 depicts the forecast DX conditions from central United States, including the W5, W9, and WØ call areas to South Africa. During the month of August this will probably be the only DX path showing possibilities of a 10-meter band opening. The MUF value between 1000 and 1200 hours CST should be about 28 mc. As this is a median value it may be expected that the MUF will exceed this value about 50% of the time. On some occasions the MUF may reach 32.0 mc over this path. Another two part opening is predicted with the first opening beginning at about 1500 hours CST and ending around 2030 hours CST. Best signals on the 20-meter band may be expected from 1700 until 1900 hours CST. The second opening will probably begin around 2330 CST with the band closing after 0130 hours CST the following day. Although a 40-meter band opening after 1730 hours is predicted by the graph it is doubtful that signals will be heard due once again to the high static level—a factor not presently included in the prediction graphs.

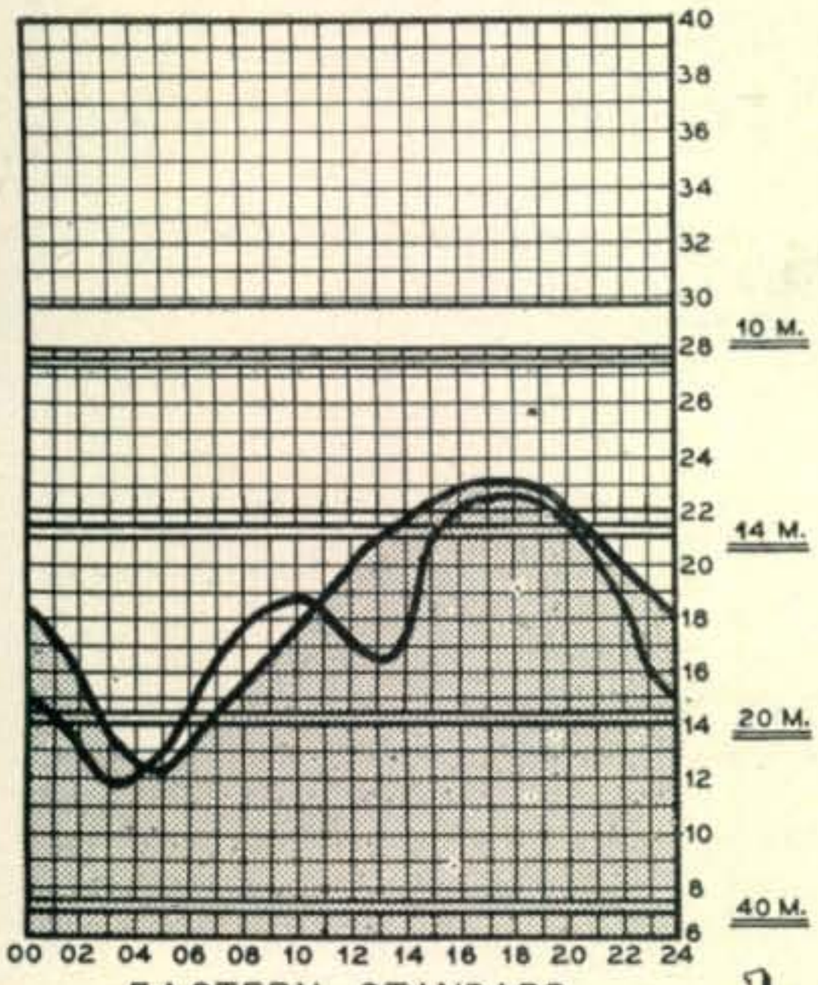
Ionosphere Storms

Prospects of ionospheric storminess during August should follow the pattern already established during the late Spring and early Summer months. This indicates that storms are most likely to occur on the following dates; August 3–5, August 10-12, and August 18–19. Generally, these storms should not be exceptionally severe. However, even a moderate storm will greatly disturb the paths shown in *Graph 1* and *Graph 2*. Least effects will be observed over the paths in *Graph 2* and *4*. It is anticipated that there will be considerable intense sporadic-E during the entire month of August. This will contrast with the small amount of sporadic-E observed during August, 1947. 20-meter operators should especially watch the northeastern and northwestern paths 24 to 48 hours before the predicted ionospheric storm dates. These are the times most favored by lower absorption values, and higher values of sporadic-E and F2-layer densities, thus, extending and improving the DX openings.

The data for the preparation of the MUF curves is derived from the booklets issued by the CRPL of the National Bureau of Standards entitles "Basic Radio Predictions Three Months in Advance." These are available on a subscription basis from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

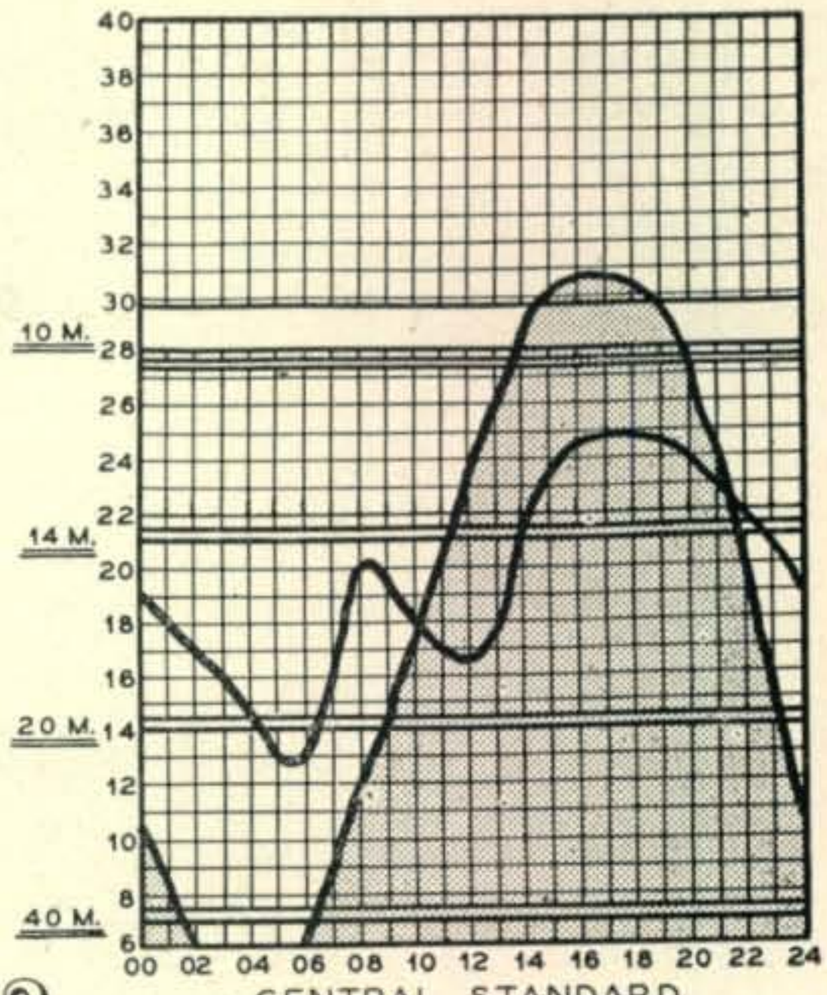
*Assistant Editor, CQ.

Monthly DX Predictions



1

Maximum Usable Radio Frequencies—Charts show the maximum usable frequencies propagated by the F2-layer over the paths indicated in the world map. The abscissa shows the local standard time at the point of origin of the path. The ordinate shows the frequency in megacycles. Amateur frequencies fall within the two heavy parallel lines that indicate the upper and lower limits of the principal bands.



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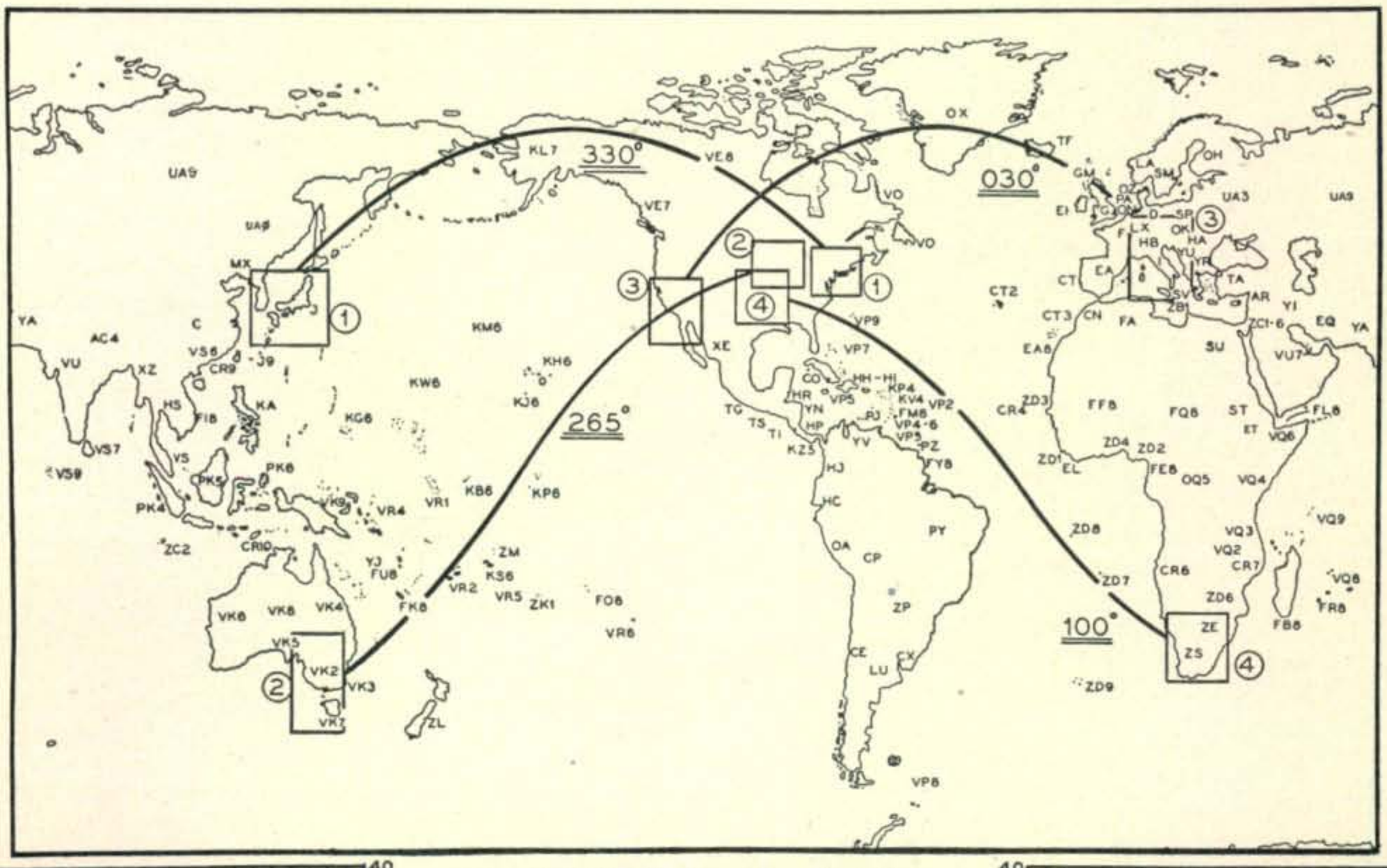
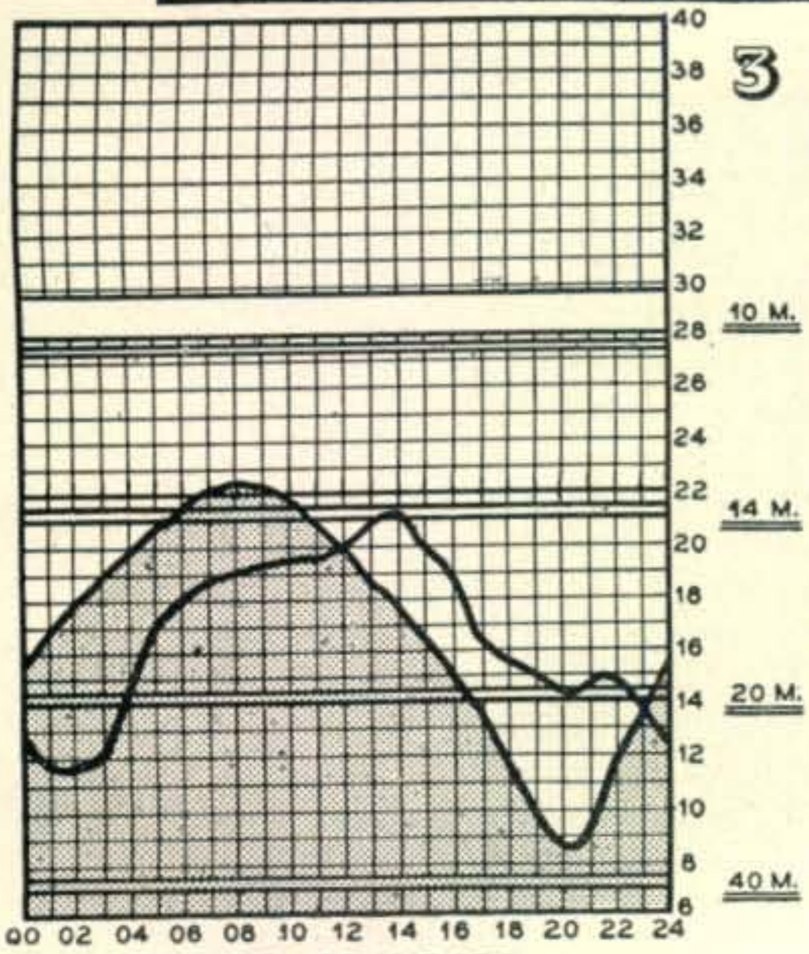


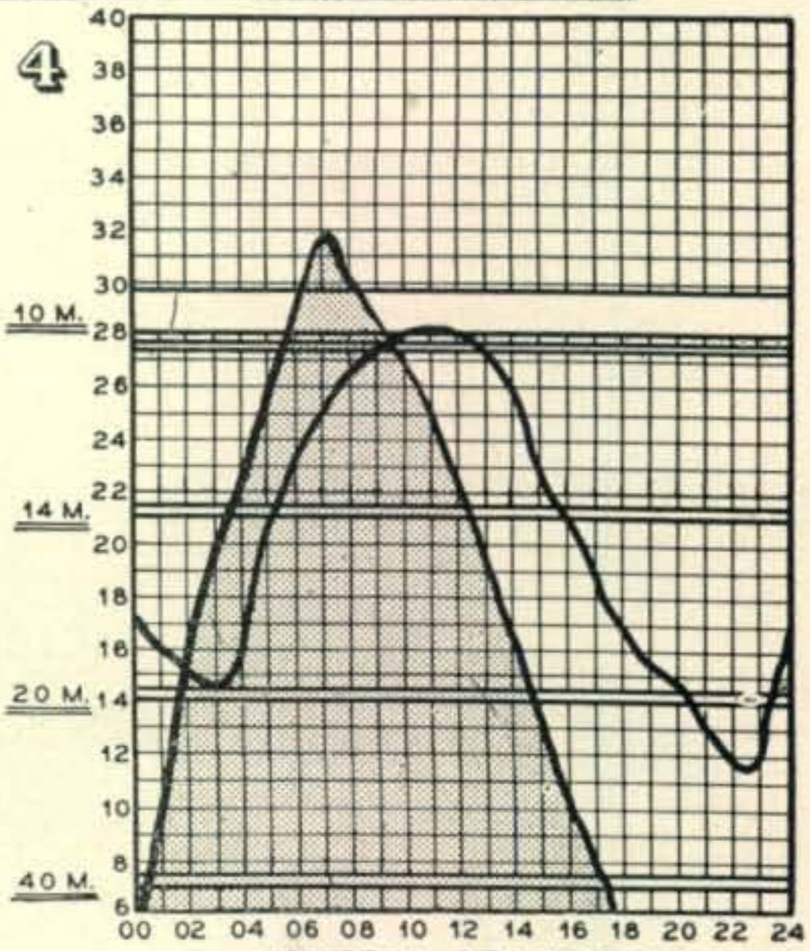


3

Lowest Usable Radio Frequencies—The shaded area in each chart indicates unusable radio frequencies for the illustrated path. The LUF is calculated for an above average amateur location using a good communications receiver. The effective radiated power is assumed to be 1000 watts. The LUF is based upon average monthly signal absorption and does not include the effects of abnormal or auroral zone absorption.

Azimuth—Radio transmission is known to vary considerably with geographic latitude and longitude. Each path MUF and LUF as illustrated is calculated for the "short-path". This is the path shown in the map.

Variations in Forecast—All graphs are monthly predicted average conditions. On ionospherically "quiet" days some variation amounting to less than 15% may be expected. However, a value representing 0.85 of the MUF will be exceeded over 90% of the total time. The graphs do not indicate radio propagation conditions during ionosphere storms or sudden ionosphere disturbances. They are not adjusted for the effects of sporadic-E layer formation or long and short scatter. Radio disturbances of the ionosphere storm type are the most severe for paths which pass through the auroral or polar regions, the effects gradually tapering off towards the equator.



4

VHF UHF

Conducted by VINCE DAWSON, JR., WØZJB*

FORTY-EIGHT in '48 has become a reality! Congratulations are in order for Ed Greybill, W9ZHB, of Zearing, Ill., for being the first to work all 48 states on 6 meters. On Sunday, June 13, W9ZHB contacted W4AVT/4 in South Carolina thus completing the long awaited W.A.S. Those of us who know Ed of W9ZHB can all say that it could come to no finer gentlemen and ardent supporter of v-h-f interests. Ed has long been active on 5 and 6, as well as 2 and 2½ meters. He was the most instrumental station in the mid-west in supporting the move to horizontal beam antennas. This column, and especially this conductor are glad to see W9ZHB heading the list. Congratulations to the powerful postman of Zearing from us all!

Maybe a little disheartened, the runners-up are two W6s of no small ability. W6UXN and W6WNN both lack Vermont which was inactive during the F2-layer DX season. Probably before this goes into print there will be others sitting on the edge of a W.A.S., for the States Worked column is becoming so crowded that it looks like the low end of 6. In any case, this has been one contest notable for its fairness to all and for the fact that quite likely the best man won.

50-mc News

No doubt many of you wondered about the delay in getting the spor-E work group under way. This was due to the large amount of unforeseen complications that arose at the last minute. However, the project in cooperation with the U.S.A.F. did officially get under way in the last week of June. Introductory letters and a letter of instructions with the new reporting forms were sent to 155 known active 6-meter operators. It is quite possible that we have unintentionally left a few names from the mailing lists due to the complex procedure in setting up the triplicate filing system. If so, it is still not too late to join this group. Although the number will be limited there may still be vacancies in the work group by the time this is in print. If you have not received your notification, and if you want to join the group please just drop a card to Vince Dawson, Box 837, Gashland, Mo. 200 observers and 25 foreign associates form the work group on 6 meters.

As usually happens as we go to press many things are hanging fire. One of these involves the granting of awards for participation in the spor-E cooperative research program. Five awards will be given per year—details should appear next month. The second item concerns an additional project now being submitted, which if approved will carry considerable weight in solving one of the biggest amateur problems of the day. This is very much up in the air, but here too, plans should be available next month.

W2IOP of the 20-meter band warns us that AG2AA in Trieste will be on 50 mc with 500 watts and a high gain beam aimed on the U.S. this Summer and Fall. AG2AA will be operated by the U.S. Military Personnel in the Trieste Free State.

PY1DH, in Rio De Janeiro, heard so much favorable comment about the 6-meter band that he built a converter and on the first night (April 19) heard CX3AA, LU1DO, PY2QK and LU4BO. A couple days later a rig was on 6 and Ed is now looking for DX after 1900 EST each evening. The transmitter uses a 75T final doubler with about 75 watts input on 50.088 mc. The antenna is a vertical dipole fed with 70-ohm coax. CX1AQ is now on 50.296 each evening, while PY1AEU somehow is located on 49.608 mc with 400 watts input. Looks like we'll have to tune farther down the band now!

While the W boys complain about activity, we learn from G6DH and G5BY that they have nothing to worry about—over in Europe they have two bands and sometimes three to watch between 5 and 6 meters. Cross-band working 5 to 10, 10 to 6 and 5 to 6 meters is not too uncommon. G5BY had good openings on June 4, 10, 12 and 13. The first one lasted from 1207 to 1519 EST with 13 stations worked in SM, OZ, OK, HB, F and I. Hilton believes that openings have been more frequent in 1948 than in previous years.

The prediction that Ferrell made that the LU-XE openings would be over by May 20 appears to have come true. XE1KE reports the last opening as May 12 when LU1AM and LU6DO were heard working locally. XE1QE reports his last opening on April 25 when LU8DJI, LU6DO and CX3AA were worked. We had been told that the XE1KE 6-meter beam had rusted fast on LU land, but in the space of a couple weeks, B. J. managed to double his number of states worked—so looks like he managed to get it turned around this way. XE2C, Gilberto Quintainila, in Monterrey has been adding on the DX, too. He is mostly on c.w. (remember fellows! the stuff with the hand) using an 829B at 120 watts input. The receiving setup includes an NC-183 and a Lester converter into an HRO.

Unfortunately, this has been a bad season for the 6-meter men personally and few of the better known

Send all contributions to Vince Dawson, Box 827, Gashland, Mo.

Ernie Morgan, W7JPN, Salt Lake City, Utah

Charlie Rowsell, W7EWX, Salt Lake City, Utah.

boys are under the weather. Louie Cox, W7ACD of Shelly, Idaho, suffered a heart attack in May, but is now home and feeling much better. Somewhat more serious is our old friend Bill Copeland, WØYKX of Woodbine, Iowa. Bill has been under the weather for several years and has been confined to the hospital for the past two months. How about you boys who have worked him sending a card to show that the 6-meter gang doesn't forget one of its members? Then on May 3, W8MVG was on his roof looking things over when the edge gave way and Charlie woke up three hours later in the hospital with three broken ribs and a twisted right arm, not to mention being badly shaken up. Charlie is coming along steadily though still pretty lame for an ardent c-w man. Lastly, your conductor in putting up the 6-meter beam managed to mangle his little finger up pretty badly right at press time. Got to watch these people, they want to cut it off—are they kidding?

KW6AG now has a 40-watt rig on 52.0 mc and will be looking for possible F2 layer DX this coming Fall and Winter. . . . May 26 was a strong 6-meter West Coast opening—so strong we hear that when W7QLZ tuned in W7DYD and W7LYA his i-f transformers caught fire. Come now, spook, wasn't it just a coincidence? W7LYA has a BC459A v-f-o on 2, 6 and 10 meters. The new beams are up, including a four element on 6 and another four element on 2, with a three element on 10. All are mounted on one tower and can be rotated from the wheel overhead.

The combination W5JKM/W5AJG now works on a simple system of logic. If you don't hear what you want just yell for it. Anyhow, when Leroy went to work one morning he told the XYL to look particularly during the next opening for Mississippi to bring up their states worked total. When the band opened, Bernice nonchalantly calls W5NLP blind and W5JTI answers. Just goes to show you that you can't trust these women, or was it 5JTI? The Dallas twosome also is back to their two beams, one 35 feet high and the other 75 feet high. Switching from one to the other makes a considerable change in the angle of radiation. Interesting stuff—why not plot the mileage of each contact against the best beam? Using a series of observations it should be possible to estimate the angle of radiation as the spor-E height is generally constant.

Bish, W7HEA, has one gripe that interests us. He has a good point in criticizing these prolonged calls. After all everyone is able to recognize his own call, and is pretty familiar with the sound of CQ—so why call on and on, then as the signal starts to fade a little, softly mutter your own call as if ashamed of it and sign over. 6 meters is noted for its snappy operating and short DX contacts, let's try to keep it that way fellows.

144 MC Honor Roll

	States	Districts			States	Districts	
W1IZY	12	4	VE1	W8QKI	7	4	VE3
W1IPV	11	4	VE1	W8PYY	7	4	
W3GV	8	5	VE3	W3RUE	5	3	VE3
W1JFF	11	4		WØWGZ	4	4	
W9ZHB	9	6		WØDDX	2	1	
W9LWE	8	5		WØMZH	2	1	
W9IPO	8	5		WØRNC	2	1	
W9BBU	8	5		WØZJB	2	1	
W3GKP	8	4					

Spor-E Openings

In the past this column has generally attempted to list the stations heard and worked during spor-E 6-meter band openings. This year, however, due to complications arising from the cooperative observing program with the Watson Laboratories, and particularly the noteworthy increase in activity and the thorough reporting, we find it impossible to obtain the required amount of space to continue this procedure in each issue of *CQ*. Instead, we will give a listing that summarizes the daily openings. The data for the list are drawn from the many reports before they are sent on to be tabulated and analyzed. In this way, unusual modes of propagation will be recorded and each operator will have the opportunity to check back on dates when unusual paths were open, double-hop was observed, etc.

May 16—Some blanketing type spor-E noted during the early evening around 2000 EST. Mostly on north-south paths between W4—W1, W2, W8. Severe ionosphere storm during this period.

May 17—More of the blanketing type spor-E in the early morning between W4—W1 and W2. Probably post-perturbations from the ionospheric storm.

May 18—Ionosphere conditions quiet with a short opening on the West Coast over north-south paths in the morning. Patchy reflecting type spor-E noted from 1900 until midnight EST noted over the northern edge of the Gulf of Mexico with W4 to W5 paths open.

May 19—Poor to fair patchy conditions from 110 until 1600 EST over central U.S. Some W5 to W4 and W6 work during this period. Other small patches during evening with scattered openings of short duration—W2 to WØ, W8 to WØ and W5 to WØ.

May 20—Scattered W4 to W8 opening from 1200 to 1400 EST. Ferrell in Philly heard W9HGE called CQ several times at 1350-1400 EST.

May 21—Apparently a dead day—no reports of any activity. Ionosphere storm.

May 22—Moderate ionosphere storm throughout entire day. W8NQD worked W2RLV and W9PK on aurora in late afternoon. During evening W8NQD heard a clean cut c-w signal from W2AMJ over 45° off great circle bearing. Short opening on north-south paths in late afternoon on West Coast.

May 23—Ionosphere storm continues, though somewhat subsided. Aurora again noted during

50-MC DX HONOR ROLL

Calls	States	Others
W9ZHB	48	VE3, 4, 7-G5-
W6UXN	47	VE1, 2, 3, 6, 7-KH6
W6WNN	47	VE1, 7
WØZJB	46	VE2, 3, 4, 7-G5
W9DWU	46	
W9PK	45	VE1, 2, 3, 4-XE1
W4GJO	45	VE1, 2, 3-OA4
WØUSI	45	VE2, 3, 7
W9ZHL	45	VE1, 2, 3, 4, 7-XE1-KL- G5-HB-8G6, 5-KL7
W1CLS	44	VE1, 3, 7G5, 6-F8-PAØ
W7BQX	44	VE1,3,4,7
W7ERA	44	VE1, 7
W7FFE	44	VE1, 7
WØQIN	44	VE1,2,3,7
WØDZM	43	VE1,2,3,7 HB8-KL7
WØBJV	42	VE2, 3, 7
WØINI	42	VE2, 3, 4- XE2
W3CIR/1	41	VE1
W7HEA	41	VE1-7- XE1
W5ML	41	VE2,3-XE1
W8QYD	41	VE1,2,3,4OA4-G5
W5AJG	40	VE1,2,3-KL7-G5, 6-HB8-PAØ-XE1
W9ALU	40	VE1,2,3,4-KL7-G5-XE2
W5VY	40	VE3, 4, 7-KH6-LU9- XE1-OA4-PAØ-G2, 5, 6,-F8-HB8, 9
W8ZVY	40	VE1, 2, 3-OA4-LU9- KL7 - PAØ, G2, 5, 6
W4QN	40	VE2, 3-OA4
W1LLL	40	VE1 - G5 - G6 - PAØ
W8NSS	40	VE1,4-VP7
WØSV	40	10 VE7
W4GIY	40	VE1
W4EQM	39	VE1, 2, 3, 7-XE1-KL7
WØYSJ	39	VE2, 3, 7
W6ANN	39	VE1,7-KH6
WØDKS	39	VE3, 4-XE1
W5JLY	38	VE3, 7-XE7-OA4-G5, 6-PAØ HB8
W4EID	38	VE1,2,3,7-OA4, LU7
W2AMJ	38	VE1, 3, 7-G2, 4, 5,6F8-PAØ-HB8
W5FRD	38	VE3,7-XE1-PAØ
W8ZVY	38	KL7-G5
W2IDZ	38	VE1, 7-G5-G6-PAØ-F8
W6OVK	37	VE1, 2, 3, 7-KH6
W2RLV	37	VE1, 3, 7KL7-G2, 5, 6-PAØ
W6OYK	37	VE1,2,3,7-KH6
W5JTI	37	VE3 - KL7 - XE1 - OA4
W7DYD	37	VE1, 7
W9UNS	37	
W5VV	37	VE7-XE1-TG9
W7FDJ	36	VE1, 7
W5FSC	35	VE1, 3, 7-XE1 -OA-KL7
W1GJZ	35	G5, 6-HB8-PAØ
W3OR	35	VE1, 7-G-PAØ-KL7
W5HF	35	VE1,3,4,7
W5HTZ	35	XE1-VE2, 3, 4
W1JLK	35	VE7-G5
W9VZP	35	VE1-G5
W2BYM	34	VE1-VP7
WØDKS	34	VE3
WØJHS	34	VE1-2
W7JPA	34	
W6AMD	34	
W4WMI/4	33	VE1, 2, 3-VP7
W1HDQ	33	VE1 - G5 - G6 - PAØ
W6BPT	33	VE1, 2, 3,7-KH6
W4DRZ	33	VE1, 2, 3,
W6PUZ	33	VE3-7
W7KAD	33	VE7
W3MKL	33	VE1, 7-G5
W9ALU	33	VE1, 2, 3, 4-G5-KL7
W6IWS	33	
W9UIA	33	VE1, 2, 3
W1CLH	32	VE7-G5-G6
W3RUE	32	VE1-G2, 5, 6
W6FPV	31	VE1, 2, 3-KH6
W4FBH	31	VE1, 2, 3-XE1
W5LCZ	31	VE3-XE1
W3OMY	31	VE1-VP7
W5WX	31	VE4-XE1
W4HVV	30	VE1, 2, 3
W5ELL	29	VE7-XE1
W4FNR	29	VE3-OA4
W8MVG	29	G5, 6-PAØ-F8
VE1QY	28	G5, 6-VE1, 3, 7
W4EQR	28	
W1CGY	28	VE1 - G 5 - G6 - PAØ
W4FQL	28	VE1
W1ATP	28	VE1, 7-G5
W9FKI	28	VE1, 2, 3-KL7
W5ESZ	28	VE7
W1AF	27	G-F8-PAØ-VE7
W7ACD	27	
W5LBG	26	VE7-XE1
WØDNW	26	
WØYKX	26	VE2, 3
W7BOC	26	VE1
W6NAW	25	VE7
W7QLZ	25	
VE1QZ	24	VE1, 2, 3, 7-G2, 3, 5, 6-F8-HB8-PAØ
W5LIU	24	VE3-XE7
G5BY	23	W1, 2, 3, 4, 5, 8, 9, Ø-VE1, 2, 3-MD5 - SU1-ZS1
W9AB	23	VE1,2.3,4
XE1KE	23	XE-W2, 4, 5, 6, 7, 8, 9, Ø-LU-CX OA
W7CTY	22	VE7
W8YLS	22	VE2
W4JML	20	VE2-3-G5
KH6PP		KH6-W5, 6, 7-KW6-VK5 - LU1, 3, 4, 5, 6, 9-CX3
W4GJO		XE1 - KL7 - VE7 - LU7
W7BQX		VE1, 2, 3, 4, 7

early evening by W8NQD. W9PK works W8LHV on aurora at 2015 EST. Very spotty spor-E opening of the blanketing type between W6—W5 andWØ from 2100 until 2200 EST. Also W6 to W7 and VE7 after 2130 EST.

May 24—Ionospheric conditions still poor. Scattered W6—W5 and lower W7 opening between 1800 and 2000 EST.

May 25—One of the first "big" days. A good W4 to W5 opening from 1030 until 1400 EST. Shifting W8 to W5 from 1430 to 1600 EST. Excellent W4 to W5 between 2030 and 2300, with very good W6—W5 and lower W7 at same time. Result was some good double-hop across from W6 to W4. Unusually high density cloud passed over California during early evening with southern stations below the Los Angeles area working into San Francisco with terrific signals. W6WNN worked W7CX (3 watts) in Nevada for his 46th.

May 26—West Coast activity with W6UOV working W7QLZ at 1500 EST and W7LYA (by now an old faithful) at 1610 EST. Scattered W6—W7 and VE7 from 1800 until 2300 EST.

May 27—Another dead day—no reports received mentioning this date.

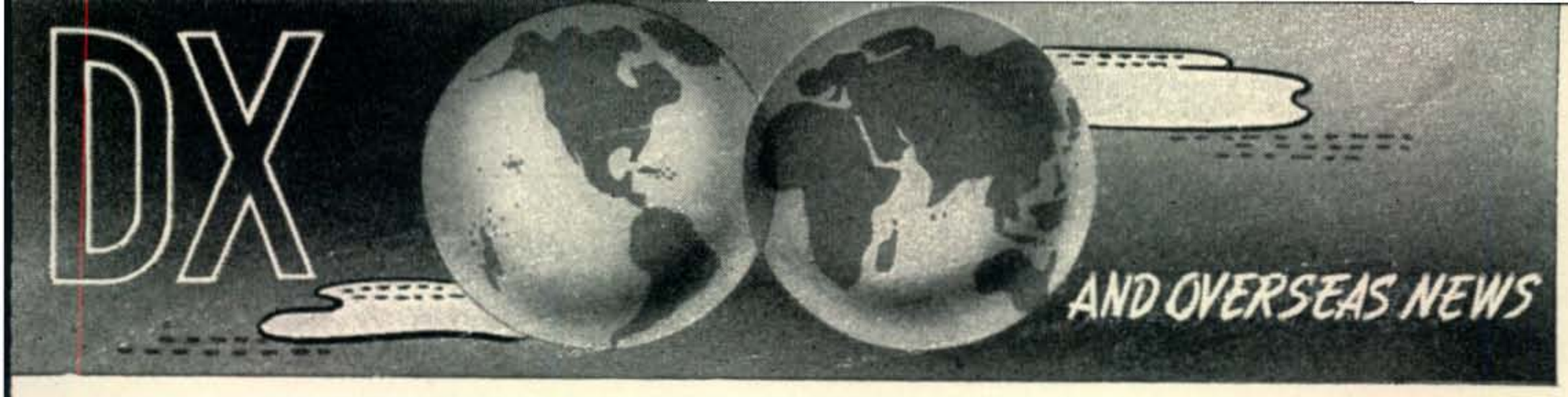
May 28—Only W7HEA working WØBJV at 1458 EST reported. Ionospheric conditions are very quiet.

May 29—Moderate disturbance—no reports of spor-E.

May 30—Weak ionosphere storm—no reports of spor-E.

May 31—Another "big" day. W4 to W8 and W9 from 1030 until 1130 EST. W8 to W5 and W6 to lower W7 simultaneously from 1300 to 1430 EST. Reported evening paths open were W4 to W8 and W9, XE1 to W2, W4 and W5. W6 to W8, W9 and

Continued on page 83)



Conducted by HERB BECKER, W6QD*

AFTER THE SWELL column cooked up by "guest columnist" W6ENV in last month's issue, I decided I had better get the heck out of the land of W9s and back to L.A. When I talked with slave driver LeKashman on the phone, and he said, "Herb, I think Andy did a *swell* job for you." The way he said "swell" made me realize I better get back and protect my interests.

This may be a short column, but I think we have a lot of hot stuff. In the first place, if you haven't already seen it, look at the pages up front and get the complete low-down on *CQ*'s World-Wide DX Contest. The Contest will be held on two weekends; one phone, and one c.w.; October 29, 30, and 31, and November 5, 6, and 7. It will be a "shorty," but we think it will be packed with plenty of activity. When I say "World-Wide," it is really just that. Stations in one country can work stations everywhere else in the world. There will be no limit to the number of contacts, and you'll have zone multipliers for each band, as well as country multipliers. We're dividing the Contest into two sections; the one operator section, and the more-than-one operator section. Each operator of a winning more-than-one operator station will be awarded a certificate. I think, with the additional zone band multipliers available, in addition to the usual country multipliers, this should be enough incentive for a lot more activity on 40 and 80 meters. We especially want to get the overseas boys on 40 and 80.

Just to make it simple for you guys, we are printing up a whole flock of contest log sheets. Each page will log about 35 stations. You figure out how many sheets you might need, and then double this quantity, using the extra sheet as a duplicate for your own records. This will save that last minute burden of recopying your Contest log. Send to the New York office for these. I don't have any here, and, anyway, Larry doesn't have much to do.

**Send all Contributions to Herb Becker, 1406 South Grand Ave., Los Angeles 15, Calif.*

W.A.Z.

We want to extend our heartiest congratulations to the following, as they have been awarded W.A.Z. certificates during the past month:

40	W4BPD	Gus Browning	40–190
41	W9NRB	Francis Smitz	40–146
42	VK2DI	Gordon F. Cole	40–157
43	W6SC	Thomas C. Hall	40–150
44	ON4TA	Fernand Baptiste	40–112
45	W9KOK	D. B. Mitchell	40–150
46	ON4JW	Elias Jules	40–136
47	W6AM	Don C. Wallace	40–153
48	G3DO	Doug Edwards	40–150
49	W2IOP	Lawrence LeKashman	40–135

Well, of all things . . . look who's in the list above. Lawrence made the grade. Who's Lawrence? . . . Pardon me, I mean Larry, W2IOP. Yep, he thought he was pretty smart just sending his cards in without giving us any warning. I guess the guy *does* work DX once in a while. Looks like W4BPD is the first W4, and the Australian honor goes to VK2DI. The first W9 is Smitty, W9NRB. The fact that I met him while in Chicago really had nothing to do with it . . . honestly! I might say, however, that Smitty, after living in W9 all these years, has pulled out and is going to live in, I think, Florida. So fate really smiled on him when it allowed him to make W.A.Z. before going. W6SC found enough cards lying around the place to send in. Although the zone numbers on his list were somewhat bawled up, he had them all there. ('lo Tommy). One of the most enthusiastic was W9KOK, and he really worked hard to corral all 40. ON4TA was the first from Belgium, but he was closely followed by ON4JW. Then we run across a familiar call, W6AM, who managed to roll off of Rolling Hills with 40 cards but had the wrong one for Zone 2. (For a minute, I thought he was as bad as I was!) Anyway, Don said he had a shoe box full of cards in the car, so he plowed through the whole mess of them, and . . . you guessed it—not a Zone 2 card in

◆ ◆

QRM was lighter when this shot was taken. Left to right, front row: VK2ALG, 2NS. Back row: VK2DO, 2WH, 2ALG, 2II, 2ACU, 2OF.

◆ ◆

the lot. So, he rolled back to Rolling Hills, and this time he clinched the deal for Zone 2. He was a bit anxious for a half day, however. G3DO needs no introduction as he is a very versatile DX man. He is the second in England to confirm W.A.Z.

Zone and Country List Revisions

I notice an increasing number of you fellows, when sending in additions and revisions to your zone and/or country list, are using a set of our standard printed forms. Apparently, I did not make myself clear when these forms were first brought out. We don't want to be cheap about this thing, because we'll give you all the forms you need. But, really fellows, it isn't necessary to send in additions on these standard forms. What we want is to standardize on our file of master zone and country lists. When once you have submitted your original zone and country list on our standard forms, and you are entered in the Honor Roll, simply send in your additions on a sheet of paper, and we'll fill in these on your master list in our file. Some of the forms I have received have had nothing more on them than one or two additional countries listed on a four page country list form. Catch? If not, I'll draw a picture next month.

Now let's see what we can put together out of the mail bag. Well, of all things, my old friend Doc Westervelt, W4MZ, who is the changingest guy I know, has had his call changed to W4VE. At least, he is not changing QTH, so his record still stands. You see, Doc had 8VE for years and years before he went into the Army.

Norman Jolly, SV1RX. The outstanding SV, Norm is closing down to go to London.

W9NRB got a letter from *VU2BX* who said he was going back to North Ireland for six months. VU2BX says, for those who do not get a card from him, you can write him in North Ireland. For full QTH, see QTH section at end of the column. VU2BX told Smitty that *AC3SS* told him that he was going up to AC4 with about 100 watts, and would be on sometime this Fall. Let's hope he is on during the World-Wide DX Contest. AC3SS said he has only 500 cards printed, so you better be in there ready to pitch. Not only is that Zone 23, but Tibet. What call he'll sign in AC4, he didn't know.

Up to now, W6EYC has been doing all his DX with about 40 watts to an 807, but, due to rough going against high power, he is putting in a couple of 813s. He says his main gripe is the W6s who continue to work the same rare ones over and over again. It seems like that is a familiar tune, but some fellows around the country have been unjustly accused of working the same guy twice, however all for a very good reason. They may have worked this rare one last year, but they desire to get in the DX Marathon, and they are surely not going to stand by and let somebody pick up a juicy one when they could very well use it to boost their Marathon score. I don't believe that is what 6EYC is talking about in this case, but it has happened.

W9LM, who rides herd on a 50-kw BC station, says he sometimes wishes he had this on 14 mc instead of 780 kc. Since he can't arrange this too conveniently, he built himself a new 20-meter rotary which he hopes will increase his "come-back" percentage. It is 80′ up in the air, and for my money, it looks as though it should do the trick.

The Radio Club of Chile has announced the availability of a "W.A.C.E." certificate. This, of course, is for working all CE districts. If you have worked at least one station in each one of the seven radio districts of Chile, since November 19, 1945, you are eligible for this award. Either A3 or A1 will do the trick. Send your seven confirmations to: Radio Club de Chile, P. O. Box 761, Santiago, Chile.

W9IU has sent a complete digest of his day-to-day DX activities, and here are some of the items. In the first place, his beam blew down, but he got it back up after a few days, and hopes he didn't miss much in the meantime. *ZK1AJ* told him that he was going back to ZL pretty soon. 9IU worked *OX3UG* located at Cape Adelaer, East Greenland, and *OX3WC* on Caroline Amalie Island, East Greenland. He says he could have had several shots at *RV2*, but some W6s seemed to be constantly working him. *YU7UU* says to wait for his QSL card before sending yours. W9IU, all in all, had a good batch of DX over a 30-day period, and I think his totals show it.

PAØFV told W4IMC that he needs Nevada, Wyoming, North Dakota, Idaho, Mississippi, Louisiana, and New Mexico. PAØFV works for a couple of broadcast stations near the center of Netherlands, ten miles south of Utrecht. His rig consists of a pair of 807s with 100-watts input, and most of his operating is done on 14,000.1 kc.

CR9AG is still running 125 watts to an 813 modulated by a pair of 807s. John say she is still using the Bi-Square antenna which is one of the best he has ever tried. He says his XYL has been bitten by the bug. It's good to see VE3ACS in the Honor Roll, and it might be of interest to you to know he is running only 50 watts to an 807. So far, his antenna setup has consisted of long wires and verticals. W5LVD had a visit from W5KC, and while there, Vince grabbed his key and worked a new country for him. LVD says he expects his DX business to pick up pretty soon, as he just completed a new rotary beam as well as a kw-final. He also says that by the time you read this, W5LFM and W5GKI should be on the air in Okinawa.

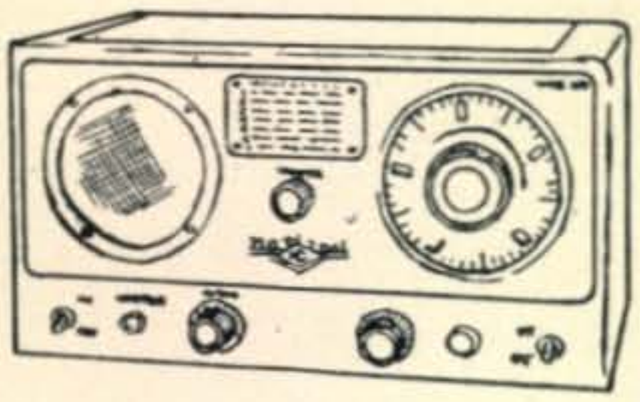
W9KOK has worked a flock of Russians, the juiciest of which look like *UL7BS*, *UAØLD*, and *UH8AA*. Other good ones are *EA5AP*, *EA5BE*, *EA1SA*, *EK1GW*, *OE5GS*, *YU7ZO*, and *CT3AB*. *VQ3HGE* is doing all right in the Marathon. . . . Take a look. By the way, he needs Montana for W.A.S. Bob, W6PBV, one of the operators, sends in a nice list of QTHs which you will find in the usual place. Bob also says that somebody told him there is a station signing *AC4RF/AC3* on 14,080 c.w., but, as yet, he hasn't heard him. UA3KAB passed along word to him that *UN1AO* is off now, but *UF6AA*, *UF6KAC*, and *UF6KAB* are now on the air.

W6ZZ has had the DX gods smiling on him lately, as he has worked *HA8PB*, *C8YR*, *YR5C*, *FE8AB*, and *EL7A*. He also worked something signing *YA3B*, but, so far, we're not counting it as a couple of cards have bounced.

W6PCS worked *AC2MA* 14,007 T9, who said he was in Bhutan. Who knows *what* about him? W3MFM worked *PX2A*, 14,140 T9. So far, most of the PXs have been very much "ungood."

(*Continued on page 64*)

(Number eleven of a series)



In designing a superheterodyne receiver, determination of the best intermediate frequency is by no means an easy task for there are many factors to be considered in order to arrive at a compromise offering the best all around performance. Low intermediate frequencies are desirable from the standpoint of high gain per stage and good selectivity. It is difficult, however, to secure satisfactory image rejection when receiving signals considerably higher in frequency than the i.f. The use o" a high intermediate frequency will improve image rejection but, as is well known, too high an intermediate frequency introduces poorer selectivity and increased thermal noise. Clearly, an ideal v.h.f. receiver should incorporate the advantages of both high and low intermediate frequencies and the disadvantages of neither. One approach to this ideal is the double conversion superheterodyne.

Generally speaking, for v.h.f. work, no increase in equipment is necessary to achieve double conversion, since many of the gang now own both a communications receiver suited for the second or low frequency i.f. amplifier, and the specialized high frequency superheterodyne receiver which may be used for the first intermediate frequency amplifier and r.f. front end.

In a former monthly chat, number 10 in the *CQ* series, we mentioned that the new National HFS v.h.f. superheterodyne may be used in combination with a good communications receiver to form a double conversion receiver. This sort of arrangement is most practical for the serious amateur interested in obtaining the optimum in high frequency performance.

The intermediate frequency of the National HFS receiver is 10.7 Mc., so chosen that both FM and AM may be received with the optimum image rejection consistent with the desired selectivity. However, when the HFS i.f. output is fed into the r.f. input of a good superheterodyne communications receiver, the result is a double conversion receiver. Image rejection capabilities of the HFS are retained in full and adjacent channel selectivity becomes essentially that of the more selective unit, the communications superhet. If the latter receiver is fitted with a crystal filter, noise limiter, a.v.c., S-meter, narrow band FM discriminator, etc. all these valuable features may be used to great advantage in the usual manner, providing still greater versatility and increased performance as compared to a less elaborate single conversion v.h.f. receiver.

We mention the HFS frequency range of 27 to 250 Mc. to strike a note for the ten meter fraternity, long plagued with images, with the hope that the skeptical will give double conversion a try. We're sure the results will be most gratifying indeed.

—Seth Card, W1DRO

W. A. Z. HONOR ROLL

C. W.-PHONE

W6VFR	**40**	**199**
W6PFD	**40**	**192**
W8HGW	**40**	**192**
W4BPD	**40**	**190**
W6ITA	**40**	**188**
W6ENV	**40**	**187**
W2BXA	**40**	**187**
G2PL	**40**	**185**
W6MJB	**40**	**184**
W6SAI	**40**	**183**
W6ADP	**40**	**181**
W6PCS	**40**	**172**
W7AMX	**40**	**172**
WØYXO	**40**	**171**
W6SA	**40**	**170**
VE7ZM	**40**	**168**
W7FZA	**40**	**166**
W6DUC	**40**	**166**
W6AMA	**40**	**165**
W6FSJ	**40**	**161**
WØNTA	**40**	**161**
W7BD	**40**	**160**
W6WKU	**40**	**160**
ZS2X	**40**	**159**
W6TT	**40**	**157**
W7DL	**40**	**157**
VK2DI	**40**	**157**
W3EPV	**40**	**155**
W6AM	**40**	**153**
W6FHE	**40**	**152**
G3DO	**40**	**150**
W9KOK	**40**	**150**
W6SC	**40**	**150**
W6NNV	**40**	**150**
W6OMC	**40**	**150**
W6LEE	**40**	**150**
W6ANN	**40**	**148**
W7DXZ	**40**	**146**
W9NRB	**40**	**146**
W6LER	**40**	**145**
W6PB	**40**	**144**
W6BAM	**40**	**142**
ON4JW	**40**	**136**
W2IOP	**40**	**135**
W6RDR	**40**	**134**
W6TI	**40**	**131**
W6YZU	**40**	**129**
W6MLY	**40**	**126**
ON4TA	**40**	**112**
W3BES	39	188
W8GDZ	39	188
W2GWE	39	188
W8BKP	39	184
W2HHF	39	184
W3JNN	39	183
W6EBG	39	181
W2PEO	39	180
W4CYU	39	180
W5ASG	39	180
G6ZO	39	180
W9ANT	39	175
W6DI	39	171
W2CYS	39	170
F8BS	39	168
W6SN	39	167
W8NBK	39	165
WØNUC	39	163
W3GHD	39	162
W6ZCY	39	161
W3DRD	39	160
G5DQ	39	160
W3EVW	39	159
W9IU	39	158
WØGKS	39	158
W2HZY	39	157
W3JTC	39	156
G8KP	39	156
VE7HC	39	156
W1BIH	39	153
G6QB	39	152
W4INL	39	151
W6GDJ	39	151
G5YV	39	151
G2AJ	39	151
W6KRI	39	151

C. W.-PHONE

W4DKA	39	151
W6MVQ	39	151
PY1DH	39	151
W1NMP	39	150
W2COK	39	150
W6RM	39	148
W9VW	39	148
G2WW	39	147
D2KW	39	147
W8LEC	39	146
W6PKO	39	146
CE3AG	39	146
W2MEL	39	145
W1AB	39	144
W6RW	39	143
W6KUT	39	142
W8SDR	39	141
VK2ACX	39	141
W6SRU	39	141
W9DUY	39	141
G6BQ	39	140
W7BE	39	139
G3FJ	39	139
W6BPD	39	134
W6OEG	39	133
G5RV	39	132
G2VD	39	132
G2FSR	39	130
G5BJ	39	126
G3AAM	39	126
W6QD	39	125
G5VU	39	124
W6PQT	39	123
W6EAK	39	123
G3AAK	39	122
G5WM	39	120
G8RL	39	120
OK1AW	39	120
WØOUH	39	119
G6BS	39	117
G3QD	39	116
W6LRU	39	115
W6EPZ	39	114
W6UZX	39	114
G3TK	39	114
W7GXA	39	106
W6RLQ	39	106
W7ETK	39	105
KG6AL	39	104
W6LEV	39	103
W6MI	39	102
W7ENW	39	101
W6LN	39	101
W6AX	39	93
W6BIL	39	77
G6PJ	39	76
VE3QD	38	161
W3IYE	38	161
W1JYH	38	156
W9RBI	38	154
W4OM	38	149
W8FJN	38	147
W1ENE	38	147
W2CWE	38	147
W2RDK	38	145
W2CYS	38	144
W8CVU	38	142
W2PUD	38	141
W1ZL	38	138
W1KFV	38	134
W4BRB	38	133
W4FPK	38	132
W9VND	38	132
G8IL	38	131
W3ZN	38	130
G5CI	38	130
W2PQJ	38	129
G6LX	38	126
W9TB	38	124
GW3AX	38	123
WØSQO	38	123
W9MZP	38	121
W9YNB	38	117
W8VLK	38	117

C. W.-PHONE

W5CPI	38	113
W8WWU	38	112
OK1CX	38	110
VR5PL	38	109
G3ZI	38	107
G8IP	38	105
W6DLY	38	102
W6ID	38	96
W6UCX	38	94
G3BI	38	75
W3DKT	37	141
W2TJF	37	138
W3JKO	37	138
W3KDP	37	133
KP4KD	37	131
W4ML	37	122
W1KFV	37	121
G4CP	37	117
VE1EA	37	116
W4VE	37	115
WØAZT	37	112
G4AR	37	108
W9FKH	37	104
G5MR	37	100
W2BLS	37	100
G3AAE	37	99
W2SGK	37	95
W7BTH	37	95
W6WJX	37	92
W2RGV	36	134
W9LNM	36	131
W3OCU	36	124
SV1RX	36	119
MD5AK	36	118
OA4AK	36	118
W2CNT	36	115
G2CNN	36	114
G2AKQ	36	112
W2BF	36	108
W4DIA	36	107
TF3EA	36	104
W2GUR	36	102
W5BK	36	101
G2AO	36	100
G6WX	36	95
W8HSW	36	94
GW4CX	36	92
W6MUF	36	90
W7EYS	36	90
W9FKC	36	81
GM2AAT	36	75
CM2SW	35	141
W2DYR	35	123
W3LVJ	35	115
VE3AAZ	35	113
W8AVB	35	113
WØDU	35	111
W9WCE	35	110
W9CKP	35	109
W6ZZ	35	103
G8VR	35	100
W2WC	35	99
W3WU	35	98
W6CTL	35	95
G2AVP	35	89
W8JM	35	86
W2HAZ	35	82
D4ANM	35	80
G8RC	35	78
G3BDQ	35	74
W7FNK	35	72
W4DHZ	34	116
W4HA	34	112
W9FNR	34	103
W2GVZ	34	101
G8QX	34	99
G8KU	34	96
VK4RC	34	91
W8JM	34	89
G6XX	34	89
W3AYS	34	89
WØFWW	34	86
W2EMW	34	85
W2JA	34	84

C. W.-PHONE

W5CD	34	74
J4AAK	34	66
W4LVV	33	109
W4QN	33	104
G2LC	33	85
W5BK	33	79
GM2UU	33	79
W8PCS	33	78
G8VG	33	78
G3BFC	33	77
WØFET	33	69
W6WUD	33	61
W2NXZ	33	61
W1BFB	32	94
W7PK	32	83
HA1KK	32	78
W8QUS	32	75
W2AYJ	31	103
G6QX	30	82

PHONE

W6DI	38	153
W6VFR	38	137
W4CYU	37	149
W1HKK	37	131
W7HTB	37	127
G3DO	37	125
G6LX	37	124
G2AJ	37	121
W8BKP	37	113
W1JCX	36	146
G2PL	36	128
G6BW	36	127
W2BXA	36	126
W3JNN	36	125
W8REU	36	123
W6PXH	36	120
W1FJN	36	119
F8VC	36	110
G5YV	36	106
W6WNH	36	105
G6WX	36	105
W3DHM	36	96
F8DC	36	87
W6SA	36	80
W2DYR	35	126
W1NWO	35	123
W9RBI	35	121
W8BF	35	120
W1MCW	35	119
G3FU	35	115
GM2UU	35	107
W4OM	35	106
W6PCK	35	103
G8QX	35	100
W6CHV	35	100
W9CKP	35	100
W9HB	35	89
XE1AC	34	127
W2RGV	34	108
W8BIQ	34	103
W5ASG	33	118
W2ZW	33	115
W4HA	33	101
W2PQJ	33	99
W5LWV	33	98
W8QBF	33	87
VE3ZM	33	8[illegible]
W2DRH	33	60
W9BZB	32	95
W4INL	32	94
W2HY	32	85
WØHX	32	82
W9GZK	32	72
W4ESP	31	92
W9WCE	31	87
W6UZX	31	82
W6AM	31	80
W9RNX	30	94
W9MIR	30	82
W8SXU	28	59
W2BF	27	52

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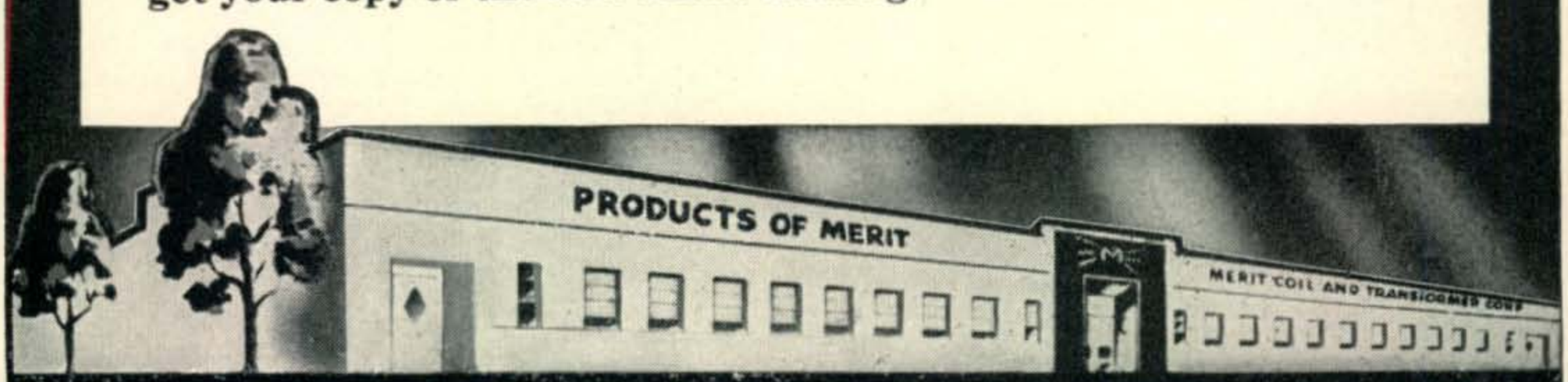

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The YL's Frequency

Conducted by LOUISA DRESSER, W2OOH*

WHO WILL BE our new president and vice-president? Of the U..S., your guess is as good as anybody's—but of YLRL, it's all settled for another year. Until June 30, 1949, YLRL will be presided over by WØDBD, Leta Bush, as president. Vice-president for the new term is W1MCW, Lou Littlefield, and W9ILH, Carrie Jones, has been appointed secretary-treasurer.

We have a whole new list of district chairmen, too, who will be happy to hear from any YLs in their districts. Just to make it easy for you we'll list their addresses as well as names and calls: 1st District: W1OAK, Ann Chandler, Box 108, Barre, Vt. 2nd District: W2OWL, Ruth Siegelman, 1414 Wythe Pl., New York 52, N. Y. 3rd District: W3AKB, Frances Darne, 1420 Tuckerman St., N. W., Washington, D. C. 4th District: W4KMM, Ginny Siegnious, 2361 S. W. 22nd Terr., Miami, Fla. 5th District: W5HYF, Jean Doss, 914 Austin St., Amarillo, Texas. 6th District: W6PJF, Rosemary Robin, 1005 S. Wagner Ave., Stockton, Calif. 7th District: W7LCS, Toddy Nye, 1802 12th St., Seattle, Wash. 8th District: W8WUT, Avis Miracle, 114 S. Hooker Ave., Three Rivers, Mich. 9th District: To be announced later. (Election resulted in a tie.) 10th District: WØPFO, Marie Van Aller, 4960a Mardel, St. Louis 9, Mo. Canada: VE6MP, Maude Phillips, Chancellor, Alberta. England: G8LY, Constance Hall, Restawhile, Clanwilliam Rd., Lee-on-the-Solent, Hampshire.

What do our new top officers look like—or, for that matter, sound like over the air? We wondered, too, so we said, "How about it, gals?"

Leta replied: "I was a surprised gal when I heard that I was president of YLRL! As for pictures—gee, I don't have any very good ones. I do fool around with photography quite a lot, but never considered myself a very good subject. Here is one I had made for a teacher's agency (have been teaching school since I left my job at Scott Field). As for background, I have been a ham since 1930, have Class A, operate 20 phone or c.w., and am secretary of the St. Louis Area Amateur Radio Club Council."

Leta has served YLRL before as an officer, being secretary-editor in 1941. Also of special interest is that she spent four years during the war as a civilian instructor of code and procedure at Scott Field.

When the query was put to Lou, W1MCW, she responded: "Guess it's the same old story, Louisa. I became interested in radio while listening to DX roll in on a new receiver which the OM, W1CRU, had brought home to try out. I was informed that if I studied for my ticket he would build a rig for me, so . . . got my ticket in 1939 and have been active ever since, and it's still DX—hi![As you may see in the W.A.Z. Honor Roll W1MCW currently stands at 35 zones, 119 countries.]

"Certificates include WAS, WAC, DXCC, RCC, and I plan to send cards to England for BERTA award. Have all 25 British Dominion call areas and 15 British Colonial call areas confirmed.

"My rig consists of a pair of 812s running 250-watts input, HQ-129X receiver, HT-v.f.o., and a 4-element close-space rotary beam mounted on a 60-ft. tower. I operate 10 phone exclusively now, but before the war was on 160 phone and 80 c.w. The OM has been licensed since 1921; and is a dyed-in-the-wool c-w man!

Leta Bush, WØDBD, president of YLRL.

"Other hobbies include stamp and coin collecting, and flowers. In fact, I seldom listen on the bands during the summer months as every spare minute I have I am busy in my flower gardens."

Lou also has served YLRL previously—both as publicity chairman and as first district chairman.

THIS SURELY IS A man's world of ham radio—at least quantitatively—as was vividly demonstrated at the Atlantic Division Convention in Washington the first Saturday in June when we discovered that, out of over 600 registrants, only 9 were licensed YLs!

But if we weren't impressive in numbers, we did have fun. The evening before the convention Emzie, W3CDQ, held open house at her new FB QTH, and we had the pleasure of not only meeting her but also Kay, W3LSX, and Fran, W3AKB. The following day we visited with Pat, W6WTR; Helen, W3OLY; Marion, W3NHI; Nancy, W3KOG, and Miriam, W3NPF. Pat, who hails from Santa Monica, is staying in Washington while her OM, W6VHN, finishes his schooling. Pat's brother is also a ham, W6RYY. Nancy keeps a nightly schedule on 80 c.w. with her brother who is W3BTQ. Emzie, a c-w gal, has been working for the National Bureau of Standards since 1921, and at present is in the research laboratory in a responsible assignment. Kay

(*Continued on page 60*)

Assistant Editor, CQ. Send all contributions c/o CQ, 342 Madison Ave., New York 17, N. Y.

Lou Littlefield, W1MCW, vice-president of YLRL.

What hallicrafters MODEL HT-18 variable master oscillator does for improved amateur transmission

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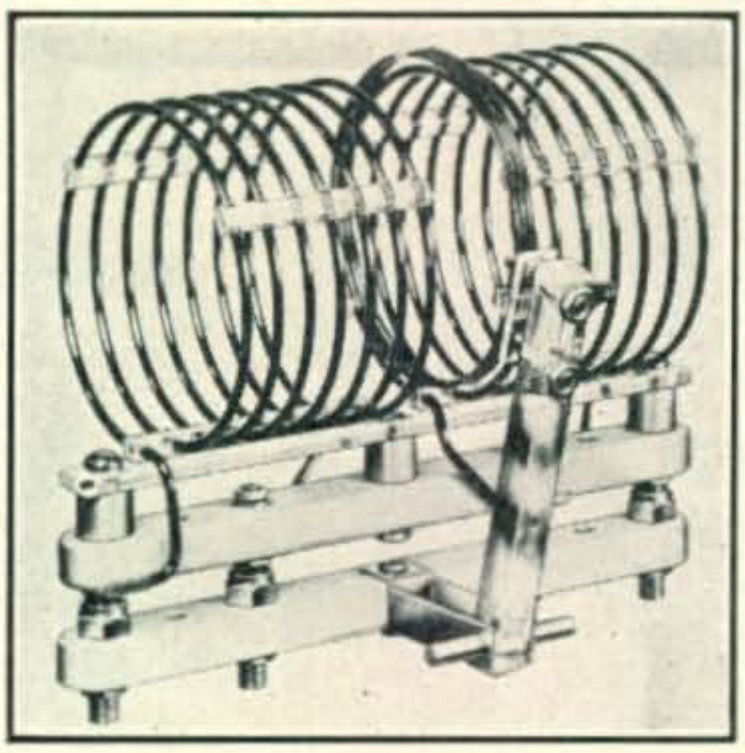
PARTS AND PRODUCTS REVIEW

Air-Wound Inductors

E. F. Johnson Co., Waseca, Minn., is manufacturing a new and comprehensive line of inductors and swinging link assemblies. Available in 150, 500, and 1,000 watt ratings, two models are available for each band: for use either with high voltage

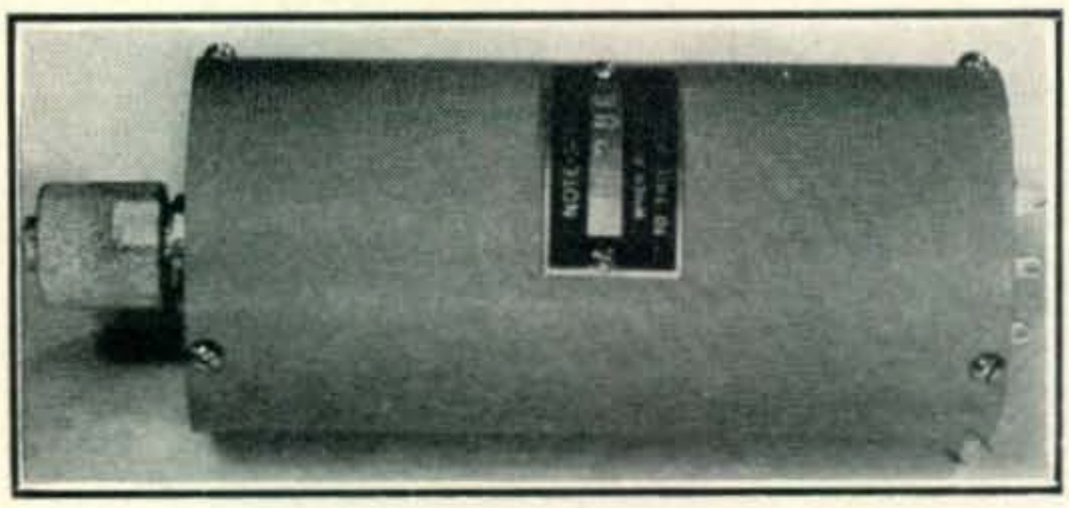


low current or low voltage high current tubes. Instructions will be provided to select the plug-in swinging link that will best match a particular inductor to any feed line from 50 to 600 ohms. The coils, jack bar assembly, swinging link arm, "plug-in" coupling link and necessary hardware are packaged individually.

Broad-Band Matching Transformer

Measurements Corporation, Boonton, New Jersey, manufacturers of Laboratory Standards announce the production of their Model M-286 Transformer. This broad-band transformer was designed for matching 72-ohm coaxial to 300-ohm balanced line in the range from 40 to 220 megacycles.

While the unit was developed primarily for use with Measurements Model 80 Standard Signal Generator, in conjunction with a 72-ohm matching pad,

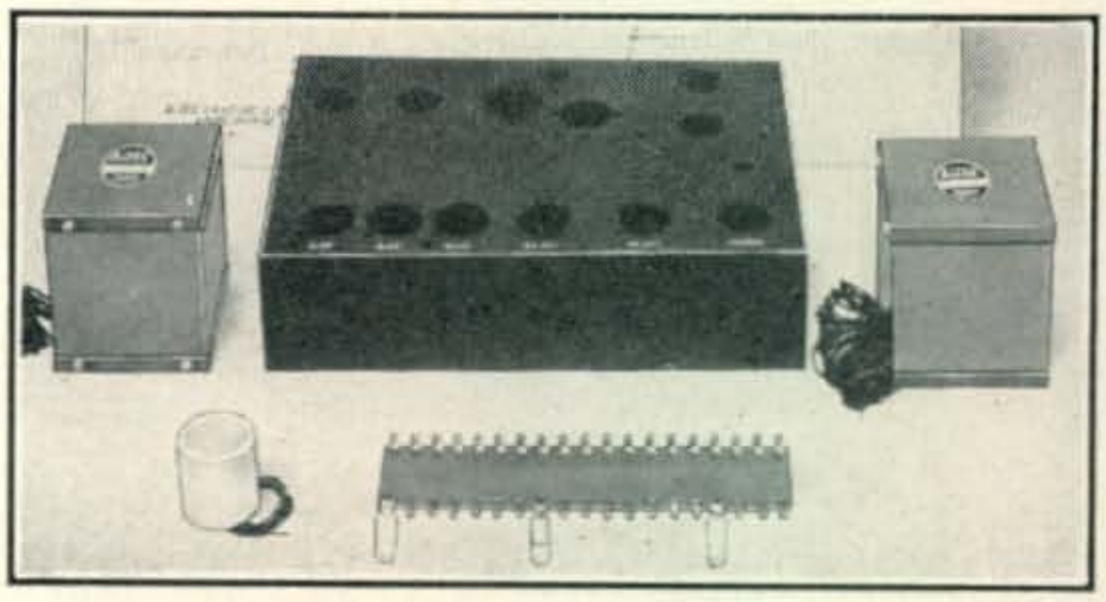


it is adaptable to other signal generators in the frequency range of the transformer. It may also be used for matching coaxial 72-ohm lines to receivers having an input impedance of 300 ohms. The transformer yields a voltage step-up of 1:2.

The 72 ohm termination of the transformer has an AN Type UG-21/U (Navy Type 49268) coaxial fitting; soldering lugs are provided for connections to the 300-ohm termination.

Audio-Amplifier Kit

Altec Lansing Corp. is marketing the 10576 amplifier kit consisting of the power and output transformer, low-pass equalizer choke, the punched chassis and the circuit diagram. All other components, condensers, resistors, controls, etc., are standard parts stocked by most distributors. The assembled kit is a high quality amplifier similar to the Altec Lansing A-323B. Additional details are available from the manufacturer at 253 W. 47th St., N. Y. 19, N. Y.



New Tubes

Developed to meet U. S. Signal Corps application requirements, the Hytron 3B4 is a v-h-f pentode power amplifier. It is a filamentary-type miniature particularly suited to portable mobile operation.

Instant-heating feature of the 3B4s 1.25/2.5-volt filament eliminates filament drain during standby. Full ratings are applicable up to 100 mc. As a Class C amplifier, the 3B4 delivers approximately 1.25 watts of useful power output at that frequency.

The 3B4 has high power sensitivity, particularly for a filamentary type, and the ability to develop good power output with low plate and screen voltages. Its design permits excellent performance, even though the power sources are dry batteries with inherently poor voltage regulation.

Two new miniature electronic tubes, Types 6AV6 and 12AV6, have been made available by the Tube Division of General Electric Company's Electronics Department at Schenectady, N. Y. Providing a mu of 100, they are designed for use as combined diode-detectors, automatic-volume-control tubes, and first audio-frequency amplifiers.

The tubes are intended to supersede the 6AT6 and 12AT6 and may be substituted directly for these latter tubes.

Both types, duplex-diode triodes, have triode sections capable of providing large undistorted output voltages from a small input signal. Heater voltage of the 6AV6 is 6.3 volts while that of the 12AV6 is 12.6 volts.

Additional information on the newly-available tubes may be obtained from the Tube Division G-E Electronics Department, Schenectady, N. Y.

(*Continued on page 88*)

NEW!

STANCOR'S ST-203-A Mobile Transmitter Kit

THE STANCOR ST-203-A is a compact, versatile transmitter designed primarily for mobile operation, but also useful for fixed station service. You can operate the ST-203-A in your car, then quickly transfer it for use in your shack, summer home or other fixed location. Special mounting fasteners make the ST-203-A quickly transferable from car to fixed station.

Power is obtained from a dynamotor or vibrator supply for mobile work or from an AC supply at a fixed location. Performs efficiently with the surplus PE-103-A dynamotor and a T-17B carbon microphone.

Briefly, the circuit lineup consists of a 6V6 harmonic oscillator working from 7 mc. crystals, a 2E26 Class C amplifier, a 6J5 grounded-grid speech amplifier, and a push-pull 6V6 Class A-1 modulator.

Attractively styled in silver-gray hammertone finish with gray plastic control knobs and brushed metal carrying handle. Size only 8 5/8" x 7 3/8" x 6 3/4". Weight with tubes and crystals, 9 1/4 pounds.

Kit includes prefabricated chassis, mounting plate, dust cover, prepared lead wires, all constructional components, and detailed, illustrated instruction manual. **AMATEUR NET PRICE,** less accessories . . . **$44.70**

Also available, wired and tested. Amateur net price less accessories **$58.90**

IN YOUR CAR

IN YOUR SHACK

AT YOUR SUMMER HOME

NOTE THESE FEATURES:

- 27.5 Watt Amplifier Plate Power Input
- Radiotelephony-Amplitude Modulation
- Two Crystal-Controlled Frequencies
- Covers Popular 10 and 11 Meter Bands
- Press-to-Talk Operation
- Both Mobile and Fixed Station Use
- Accessories Available at Low Cost
- Compact—Lightweight
- Moderately Priced

SEE THE ST-203-A KIT AT YOUR STANCOR DEALER TODAY OR WRITE DIRECT FOR DESCRIPTIVE BULLETIN

STANDARD TRANSFORMER CORPORATION

3572 ELSTON AVENUE • CHICAGO 18, ILLINOIS

THE YL's FREQUENCY

(from page 56)

is another National Bureau of Standards worker, in the quartz crystals lab. She takes her hamming on 10 phone and 40 c.w. Another 40 c-w gal, Helen is the XYL of W3MKS. Fran, the XYL of W3BWT, we introduced in this column back in January.

Personal Mention

Diana, ZS6GH, is back in South Africa again. Writing from Capetown, Diana said she had contacted ZS1T, and ZS1CZ, secretary of the SARL. The latter asked her to address their meeting on June 3rd, and she says: "I told about 60 hams of my experiences overseas. I cannot ever say too much about American hospitality, and also the English welcome. ZS1T arranged a sked for me with Jackie W9AYX, with whom I stayed. I was thrilled to hear her voice. Then ZS1CZ fixed a sked with W6BZF and his XYL, W6KAB, in Pasadena, with whom I had spent two days. I spoke to ZS1CZ from there originally. Yesterday I worked Annette, W4CWV. It's the strangest feeling to talk to friends 12,000 miles away—I'll never get over the wonder of it."

From Honolulu we hear that Ellen, KH6QI, is still holding down her post as transmitter engineer at KPOA—in fact, with the chief engineer recently laid up with mumps she put in more than the usual amount of time! But she adds: "Am enjoying my work very much, doing a great deal of recording, handling of remotes such as for the '49th State Fair,' etc. The transmitter goes off once in a while;

At the Atlantic Division Convention, W3CDQ rounded up as many YLs as she could find and treated us to lunch. On the way we paused against the gay background of the Statler's South American Room for this pic of Fran, W3AKB; Nancy, W3KOG; Kay, W3LSX; Pat, W6WTR; W2OOH; and Emzie, W3CDQ.

it's extremely critical—Doherty amplifier—and the slightest irregularity starts a whang of relays kicking open. Hi!"

Ruth, W5IZL, has now made WAS and WAC. She has a new mobile rig, and planned a trip to see her son, W5FYZ, in Lafayette, La.

Velma, W5NWR, keeps daily skeds with her son, W5NET, and her daughter-in-law, W5NES.

Inez, W7JKX, is now living near Washington, D. C., where OM W7BHE has been transferred.

Bea, W7HHH, is teaching code to several would-be hams. *(QSY to page 62)*

HARRISON HAS IT!

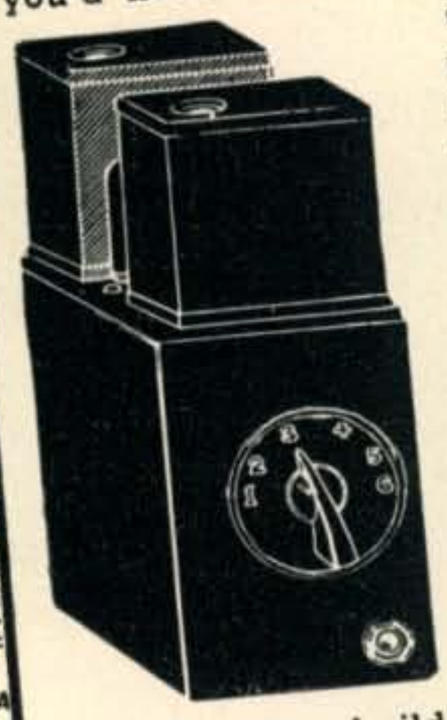
better reception

FOR THE CW MAN

PEAKED AUDIO FILTER

(CQ June '48)

You'll experience sensational CW reception you'd never thought possible!



"...this filter was the extra something needed to let us copy the FA8 through some long winded W who kept calling him on his own frequency through the first 75% of his transmission...."

Gene Black, W2ESO

Complete kit to build compact version (saves desk space) of the deluxe model. Includes punched chassis, two RBL tunable filters (genuine, as specified), all parts, tubes, and reprint of magazine article.

Complete $12.93

FOR THE PHONE MAN

"FLIP-FLOP"

Commercials use diversity reception! Now so can you — at low cost — with this new diversity adapter unit that automatically selects the antenna providing the greater signal strength at all times, thus minimizing deep fading.

A MUST FOR ALL SERIOUS HAMS!

- No relays —electronic selecting action.
- No tuning required.
- More uninterrupted QSO's.
- FB on AM and FM!

See feature article in July CQ.

Decimeter Model DM-430 Diverse Adapter, less tubes **$29.50**

Kit of all parts, punched chassis and instructions to build this remarkable unit yourself. Less tubes. **$11.45**

Kit of tubes $4.98

Meissner SIGNAL SHIFTER

Build the latest new model yourself and save 50%!

Complete kit of parts by Meissner with coils for 10-11, 15, 20, 40, 80 meters, tubes, power supply, and your choice of gray or black cabinet.

$49.75

See Meissner ad in this issue — then send your order to Harrison!

HARRISON HAM-A-LOG

Ham News — HSS Bargains — New Items

All this and more, too! To get your copy, send us your name today. Please be sure to include your call letters.

FL-8 QRM SLICER

SICK AND TIRED OF QRM?

Enjoy QRM-less QSO's by using the FL-8 audio filter adapter as described on page 15, June CQ. Can be attached to any receiver in less than 2 minutes. Amazing results! FL-8 Range Filter **Each $1.95**

DYNAMOTOR BARGAIN!

For that Mobile Transmitter, PA Amplifier, or Emergency Rig. Compact — only 3¾" dia., 6½" L. (Won't take up your entire luggage compartment). **Lightweight** — only 6¾ lbs complete. **Powerful** — 12 volt input gives 680 volts at 210 ma; 6 volt input gives 300 volts at 300 ma. **High efficiency** — ball bearings minimize friction loss. **Dependable**—Constructed for U. S. Navy, inspected, tested, original packing. With built in RF hash suppressors and mounting plate.

Item CRO-5 Complete **$8.95**

Send for data sheet giving full performance curves.

There is no guesswork about HSS

HARRISON RADIO CORPORATION
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From Jira, OK1MI, we hear that she has been able to get a BC-312, and is happy to have a set now that will not break down during QSOs. She adds: "There is a new YL licensed here—OK3IL, Ann Vigasova, a young Slovakian maid who has the gift of gab—hi! Some more YLs will be licensed soon. There are 591 licensed amateurs in Czechoslovakia today, only 5 of them YLs, so we will have to hustle to beat the OMs on the air!"

Between caring for her new daughter, looking out for her two "young Indians," and assisting the OM, W1BFT, in moving their business into larger quarters, Dot, W1FTJ, managed to find time to tell us that she has received the Puerto Rican award WPR-25. According to Alicia ,KP4CL, Dot is the first YL abroad to get this award.

Apparently many of the YLs assisted in Field Day operations. One of them was Hope, W2RTZ, who operated with the Long Island Traffic Net at their location in Amityville, L. I. Eleanor, W6AWW; Neva, W6YXI; Mabel, W6YZV, and Leone, W6BGC, operated with the Palomar Radio Club during Field Day, while Peggy, W6AQL; Peg, W6BCU; Blanche, W6BLF, and Jean, W6ZYD, assisted in Field Day operations of the San Diego Radio Club. Eleanor, W6AWW, writes: "Still very sunburned and rather weary from Field Day weekend, but we had a wonderful time, and will be out there again next year!"

YL of the Month

Some time ago we asked for "nominations" from the OMs as to whom they'd like to have introduced in this department of the column. One nominee we're happy to tell you about this month is a Canadian YL—Muriel Ramsay, VE3BIG, of Toronto, Ontario, the only YL ham to be in the Canadian Navy, and according to reports, the only one in all three branches of the service.

Muriel Ramsay, VE3BIG, YL of the Month. Reportedly the only YL ham in the Canadian services, this pic of "Mu" was taken at Coverdale Naval W/T Station, Moncton, N. B.

Mu's brother, VE7ACW, had operated a radio station as long as she could remember, so the idea of getting her own license was nothing new. Just before the war she took a night school course in radio, but it was through the efforts of a ham in her home town of Vancouver that she got her ticket in July, 1940.

Mu writes: "The inspector wanted to know what the idea was as I couldn't operate then, so I told him one never knows . . . In 1942 I proved it was useful by joining the Navy in the wireless branch. As I had also taken a few flying lessons and a six-months' ground course, it was a toss up between the Air Force and Navy, but the Navy and wireless won out. I was stationed at Ottawa and later Moncton, N. B., at a WREN wireless station. Of the work I cannot speak, as it was highly Huff-Duff and

MORE FOR YOUR MONEY - EVERYTHING FOR THE HAM

BARGAINS GALORE . . . . Distributors of amateur radio equipment and parts.

Look at these EXCLUSIVE *WAR SURPLUS* BUYS!

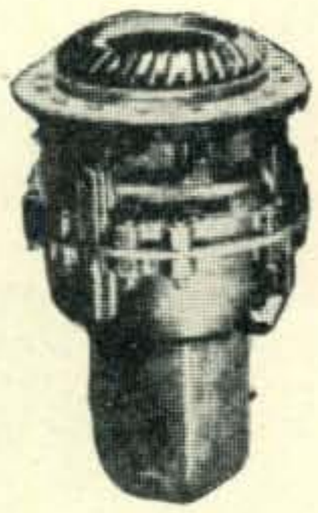
FOR your BEAM!

- Runs on 24 to 33 volts AC or DC (4 amp. transformer will do)
- Reversible—only three wires required.
- 7000 to 1 Gear Reduction stops free swing.
- Approx. 3/4 RPm
- Powerful 1/4 H.P. motor, rugged precision gear train, and sturdy thrust bearing—will support and turn even a heavy dual beam.

Used on aircraft to control pitch of propeller blades, these dependable power units are excellent beam rotators (see pages 22, 23, 29, Nov. QST). Used, but in perfect tested working conditions, with instruction sheet. $8.95

Your Net Converted. $10.95

(Mail orders add **$1.25** for packing)



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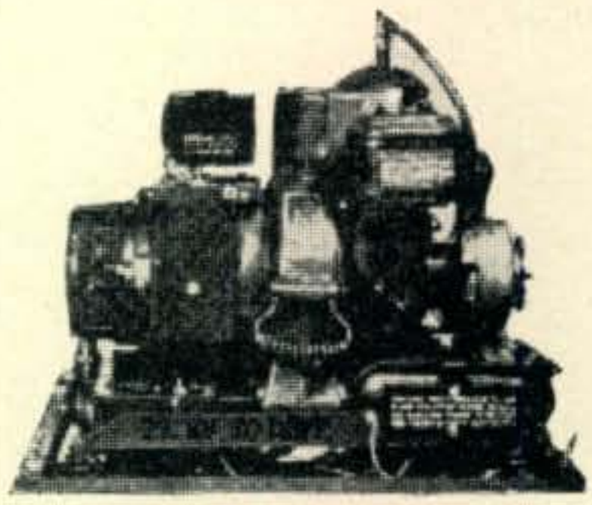
(HRU)

24-28 V. at 70 Amp. 2000 watts gasoline engine generator with electric starter. Power supply which can be used to operate 24-28 V. equipment, start airplane engines, charge batteries.



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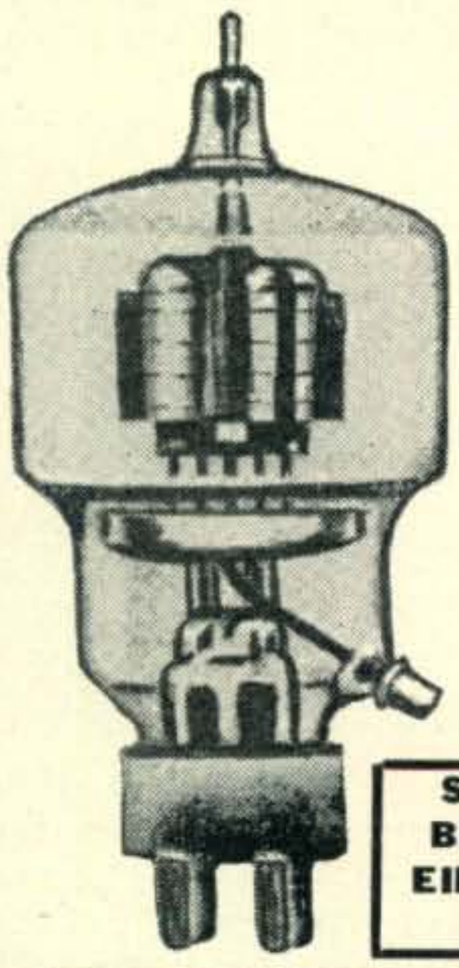
Your Cost **79c ea.**

POWER!! POWER!!



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FOR FM, TELEVISION AND ROTARY BEAM
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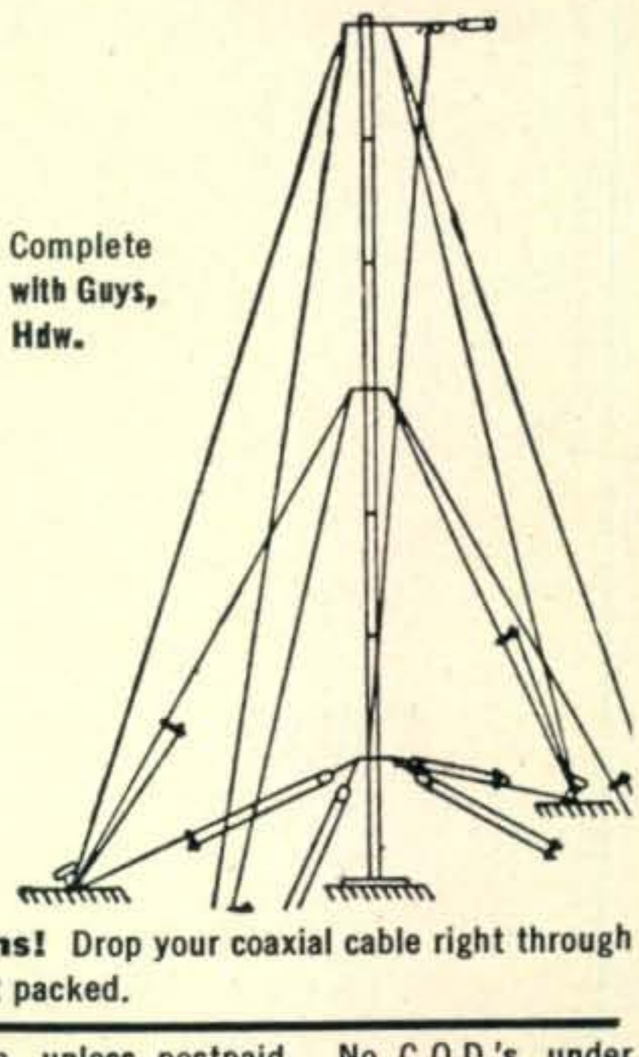
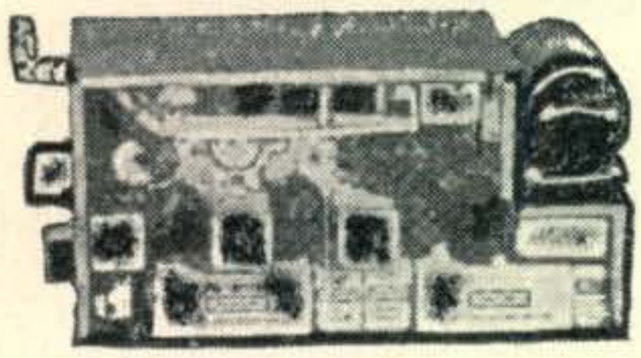


Complete with Guys, Hdw.



SCOOP
110 A.C. REC. BARGAIN
BC-733 D Localizer Receiver

Freq. 108-110 Mc. Tube complement 10 tubes—1—12SQ7, 2—12SR7, 1—12A6, 1—12AH7GT, 2—12SG7, 3—717A. NEAR NEW CONDITION. Companion to the glide path receiver. Also contains 90 and 150 cycle band-pass filters. Has the best AVC system yet developed can use parts or use as a model for construction. 10 tubes, crystals, relays, etc. Schematic included. Don't pass this up. With dynvamotor. At only. **$3.95**

2 for $7.50

Be Sure To Ask For Our Big Special Bulletin

Doublet Antenna Kit used with the famous Hallicrafters BC-610, consisting of 7 steel-alloy mast sections in a handy canvas bag. Each section is 5′ 6″ long, 1½″ OD with the last 6″ rolled to a smaller OD to telescope into the end of the preceding section. No taper. Assemble into mast up to 35 high or shorter by any multiple of 5′. Finished in weatherproof olive drab. **Ideal for erection of FM and Television Beams!** Drop your coaxial cable right through the center! Brand new, export packed.

TERMS: F. O. B. Pasadena unless postpaid. No C.O.D.'s under $2.00. 25% deposit on ALL Orders. All C.O.D.'s shipped by Rail Express. Save freight and C.O.D. fees by sending full price with order and we will ship by fast truck, transportation collect. Minimum order $2.00. Californians include 2½% sales tax.

DOW RADIO

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PASADENA 4, CALIFORNIA
Tel. Sycamore 3-1196
L. A. Ryan 16683

still is, but I will say that it was the most interesting work one could have wished to be doing. Was discharged in February, 1946, and came to Toronto. I am now a long-distance operator for the Bell Telephone Co., so guess I'll stick to c.w. on my station!

"The rig is a 6V6GT into an 807 final with 60 watts input. Antenna is an 80-meter half-wave, end-fed. Receiver is a Howard 430, which the boys kid me about as being a 'nutcracker box.' Still, I hear them—hi! Am on the air at midnight on, often till 4 or 5 a.m., on 3535 kc. C.w. to me is more thrilling—anyone can talk, but everyone can't understand c.w., especially if one stutters on the key like I do at times when my mind tries to be several 'ether waves' ahead of my fist—hi! My DX hasn't been very distant as yet, but my first Yankee contact gave me the biggest thrill—my rig had got me across the border—and from then on my sigs have been pouring into the U.S.A.!"

DX

(*from page 52*)

W9WCE starts out to say he is very sorry that he has nothing to report. He then proceeds to write a full page letter. I wonder what he writes when he has *something* to report? Anyway, he comes up with this little deal. It seems that one morning he heard *VP1AA* calling CQ on 14,045. Since he hadn't worked a VP1 he gave him a call, but, as usual, he came back to someone else. At the same time, he said he never heard such a collection of QRM on one spot in his life. Anyway, the racket quieted down for a moment, and there is VP1AA back on with another CQ. W9WCE adds one more watt and a heavier fist, plus a longer call, and what happens? . . . the same thing again, only this time, more QRM. He finally decides that all those guys couldn't be calling VP1AA, so he takes another listen. . . . They were all calling *C8YR*. Tsk! He finally found C8YR, and says one of these days he is going to work him . . . maybe.

KH6PY, who used to be W6YYW, San Diego, was working a friend of his there the other day, W6EPZ. During the QSO, *EL5B* gives EPZ a call, and they make it a three way. Result? One new country and zone for KH6PY. He then adds, "You can't tell me a KH6 shouldn't work a W6."

PY1DH is a happy guy these days. As he says, "It's happened. Yes, my DX day comes true when I went and worked *VQ8AD* for my 40th zone." Ed explains that VQ8AD "appeared like a bubble emerging from deep water, and I jumped like a cat on a hot brick." PY1DH has heard a guy signing *XR2A* on 28,040, and wants to know who he is. *VS9GT* 14,075, and *FK8+B* 14,015 are new.

W1MRQ had just about given up hope of receiving certain cards when up they pop from *OH2SR*, *OH6NR*, *UA1AF*, *UA1BE*, and *UQ2AB*. He thought maybe this info would be of interest to some of you fellows. W2NFR sends in a swell page of QTHs. Helen (that's W2NFR) says that these QTHs are all 20-meter c.w. *men* whom she has worked on that band.

According to VE3QD's DX column in "Xtal," VE7HC worked 15 countries on 80 meters during the last DX contest. VE4RO sneaks in a little phone operation when no one is looking, and VE5AQ seems to have an understanding XYL who writes in to report the OM's DX activities during the past month. VE3AVA thought he worked *HS1SS*, but in a letter received from the latter, he says in part, "Very sorry to inform you OM, but you worked a

(*QSY to page 71*)

HENRY

HAS

Henry Radio stores in Butler, Missouri and 11240 West Olympic Blvd., Los Angeles, California have complete stocks of all Collins amateur equipment for immediate delivery. Also complete stocks of all other amateur receivers, transmitters, and parts. I promise you that you can find nowhere else lower prices, more complete stocks, quicker delivery, easier terms or more generous trade-ins. I give you 10-day free trial and 90-day free service. I promise that you will be satisfied on every detail. Write, wire, phone or visit either store today.

Bob Henry
WØARA

A FEW OF THE ITEMS WE STOCK ARE LISTED BELOW

Hallicrafters S38	*$ 47.50*
Hallicrafters S53	*79.50*
Hallicrafters SX43	*169.50*
Hallicrafters SX42	*275.00*
Hallicrafters S47	*200.00*
Hallicrafters S55	*119.50*
Hallicrafters S56	*99.50*
Hallicrafters T-54	*169.50*
Hallicrafters S40A	*89.50*
Hallicrafters S51	*129.50*
Hallicrafters SP44	*49.50*
Hallicrafters HT18	*110.00*
Hallicrafters HT9	*350.00*
Hammarlund HQ129X	*189.15*
Hammarlund SP400X Super Pro	*450.00*
National NC-33	*65.95*
National NC-57	*89.50*
National NC-173	*179.50*
National NC-183	*269.00*
National HRO-7	*279.00*
National NC240D	*225.00*
National HFS	*125.00*
RME HF-10-20	*77.00*
RME VHF-152A	*86.60*
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RME-84	*98.70*
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Some prices slightly higher on the west coast.

FOR EXAMPLE:

Collins 75A-1 receiver	**$ 375.00**
Collins 32V-1	**475.00**
Collins 30K-1	**1450.00**
Collins 70E-8	**40.00**
Collins 310C-1	**85.00**
Collins 310C-2	**100.00**
Collins 210B-1	**190.00**
Collins 310B-3	**215.00**

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Henry has *everything* in the ham field.

QUICK DELIVERY

Shipments *4 hours* after receipt of order. Send $5.00 with order and shipment will be made at once C.O.D.

TRADE-INS

You can't beat Bob Henry for trade-ins. Write, wire or phone today about your equipment and Bob Henry will make you a better offer than you can get anywhere else.

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Because Bob Henry finances the terms himself you get a better break. Save time and money, deal with Bob Henry on his personal, profitable time payment plan.

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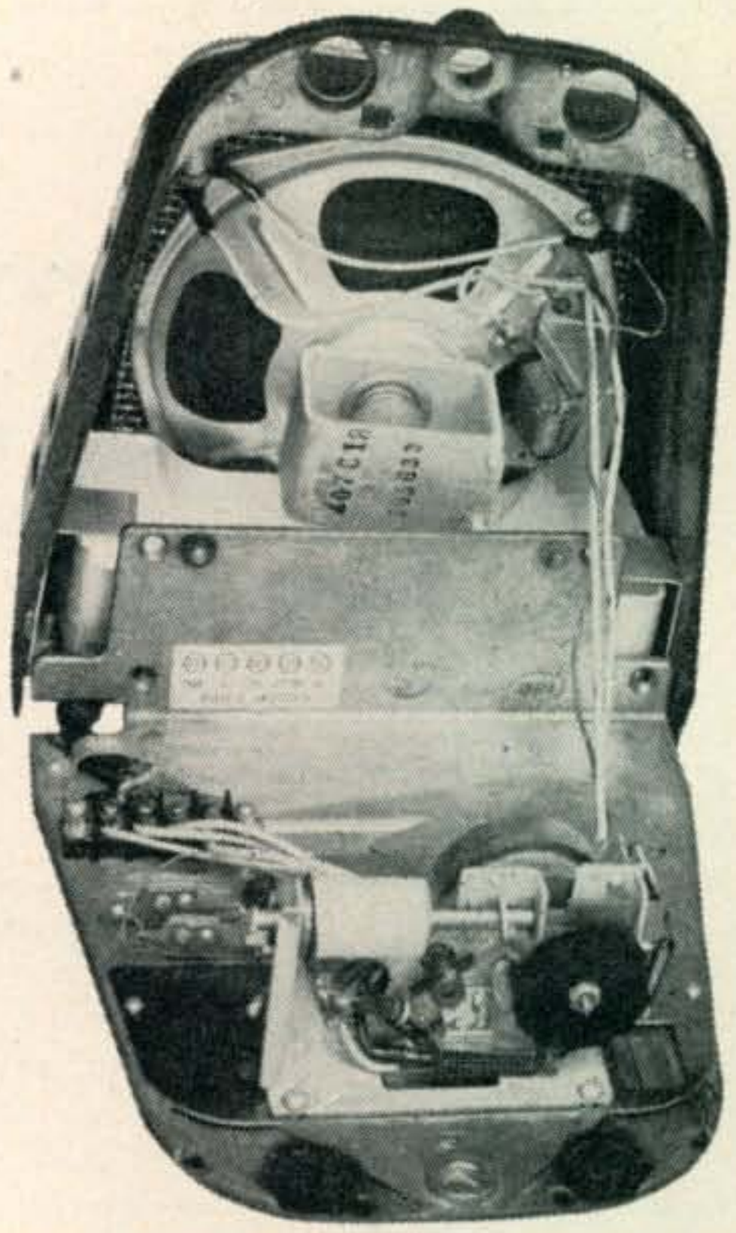
"WORLD'S LARGEST DISTRIBUTORS OF SHORT WAVE RECEIVERS"

Closed View

Open View

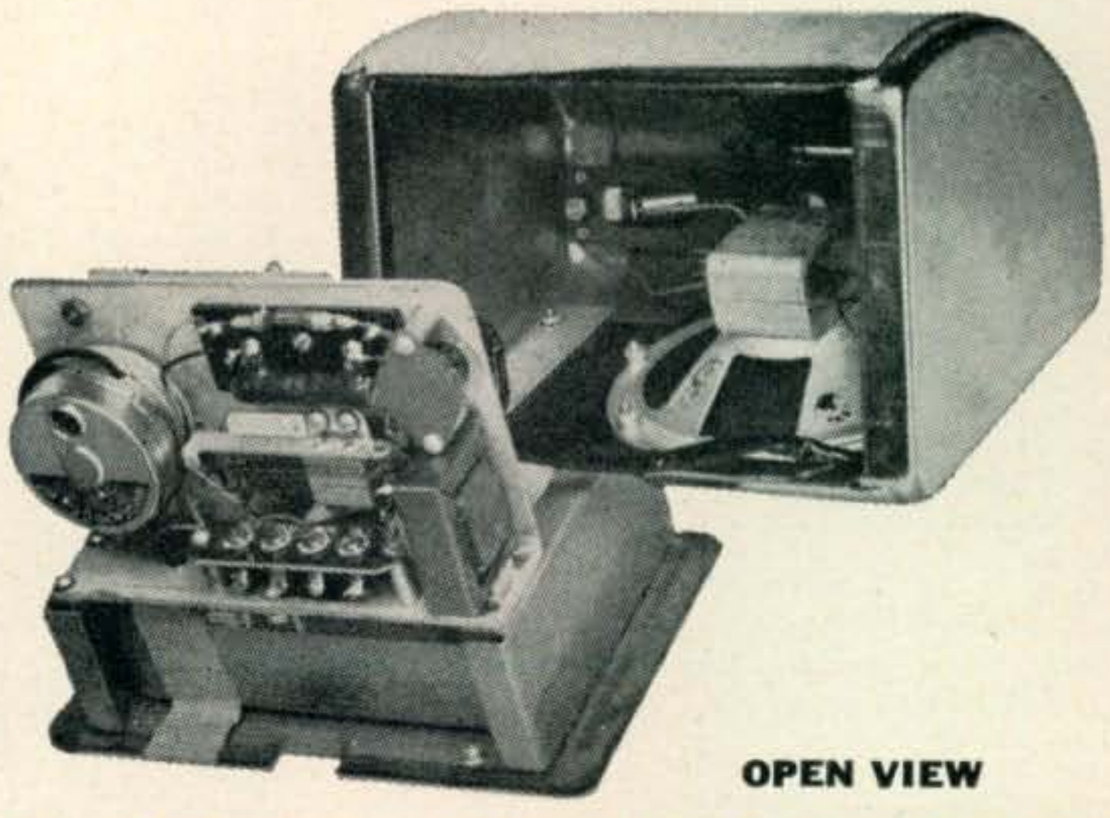


REMOTE CONTROLLED COIN INSERT AND SPEAKER BOX

- Made by Solotone Corp., Los Angeles
- 24 Volt operated, fused
- Size of base 5½″ x 8″ x 10″ high
- Weight 11 lbs.
- Front grill is sloping, illuminated by two pilot lights
- PM speaker 6″ size with matching transformer, screen and felt protective grills
- Will accept 5c or 10c coins
- Each 5c coin gives equivalent of two phonograph records
- Has Haydon Mfg Co timer
- Has provision for lock (lock furnished)
- Coin box readil removable, size 3½″ x 7-¼″ x 1-¾″ deep
- Finished in attractive blue crackle metal, red plastic with chrome plated grill
- Easily mounted on a wall or a flat base
- This unit could be used to house coin operated radio
- Original cost and selling price of this unit was several times our price.

Brand New $4.75

CLOSED VIEW



OPEN VIEW

REMOTE CONTROLLED COIN INSERT AND SPEAKER BOX

- Made by Personal Music Corp. Newark, N. J.
- Model F
- 24 Volt operated, fused
- Weight 6½ lbs.
- Size 4-¾ x 7½ x 5½″ high
- Sloping front
- P M Speaker 5″ size
- Has 2 Pilot Lights for illumination
- Finished in chrome metal and grill with red plastic
- Accepts 1 to 6 nickels
- Each 5c coin gives about two phono records of music
- Should be mounted on a flat base
- Has Haydon Mfg. Co. timer
- Has provision for locks (lock furnished)
- Easily removable coin box, size 6″ x 3½″ x 1½″
- Requires 4 wires from power unit
- A beautiful piece of equipment that could be build to house coin operated radio.
- Worth several times our asking price.
- Price brand new **$4.95**

TERMS: CASH WITH ORDER

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ADAPTER AMPLIFIER

$24.75

- Made by Solotone Corp., Los Angeles
- Model 2
- 115 Volts, 60 Cycles, fused
- 125 Watts input
- 15 Watts output
- Tube line up 6J5, 6SL7, 2-6L6G's, 5 U4G
- Crystal, Magnetic or 600 ohm line inputs
- Individual volume, treble and bass controls
- 15 ohm output
- Size 10½" x 15½" x 8½" high
- Weight 30 lbs.
- Chassis size 10½" x 15½" x 3"¼ high
- Has meter to determine number of plays
- Has 24 V. AC output for the remote speaker boxes, fused
- Toggle switch turns remote speaker boxes off and on
- Black Crackle finish
- Well ventilated
- Built for continuous night and day service
- Originally sold for several times our asking price
- Price Brand New—$24.75

MASTER POWER SUPPLY UNIT FOR MEASURED MUSIC SYSTEM

$24.75

- Made by Personal Music Corp., Newark, N. J.
- Model F
- 110 V 60 cycle, input 300 Watts, fused
- 15 Watt output
- Has high-low AC input line switch
- Tube lineup; 2D21, 6AL5, 6SJ7, 6SN7, 2-6L6G's, 5U4G
- Size 11½" x 17½" x 10"
- Chassis size 11½" x 17½" x 2½"
- Has Vernier volume, master volume, treble and bass controls
- Gray crackle finish
- Well ventilated
- External handles for carrying it
- Provisions to install locks (lock included)
- Built for continuous night and day service
- Originally sold for several times our asking price.
- Price brand new, $24.75

TERMS: CASH WITH ORDER

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MINE-DETECTOR SCR-625 *Brand New*

ATTENTION: LUMBERMEN PROSPECTORS MINERS, PLUMBERS, OIL COMPANIES, ETC.

Below is a description of one of the finest metal detecting Mine Detectors ever built.

Operates in the manner of aural and visual method.

If you are looking for metal buried in logs, pipes in the ground, ore bearing rocks, underground cables, metallic fragments in scrap materials, metallic money buried or hidden in undetermined places this Mine Detector will probably surpass anything that was ever built. The United States Forestry Service has recommended procedure for using this detector to find concealed metal in tree logs and other timber products. Our government is reported to have paid several times the amount of our prices. They originally were sold by War Assets to jobbers for $166.00.

Unit consists of a balance-inductance bridge, a two tube amplifier and a 1000 cycle oscillator. The presence of metal disturbs the bridge balance resulting in a volume change of the 1000 cycle tone. Tubes used are low battery drain types such as 1H6 and 1M5. The circuit may be modified for control of warning signals, stopping of machinery etc., when metal is detected.

Operates from two flashlight batteries and 103 v (B). However a power supply operating for 100 v may be used.

This unit is brand new and comes complete with spare tubes, spare resonator and instruction manual —in wooden chest 8¼ inches x 28¼ inches x 16 inches. Weight in operation is 15 pounds. Packed in original overseas container.

We do not know exactly what the deepest possible penetration would amount to when this detector is used but we have had customers who have bought the detectors with the expectations that the detector would locate metallic objects buried several feet under the ground or under water and we have had absolutely no complaints whatsoever regarding the detector not living up to the customer's expectations.

We can not over emphasize our belief that if an Army surplus mine detector could solve your problems in detecting metal that this detector should fill the bill.

Our price is $79.50. Shipping weight 125 lbs.

NOTE: Batteries are not furnished, we can supply for $4.50 extra.

TERMS: CASH WITH ORDER

AMERICAN SURPLUS PRODUCTS CO.

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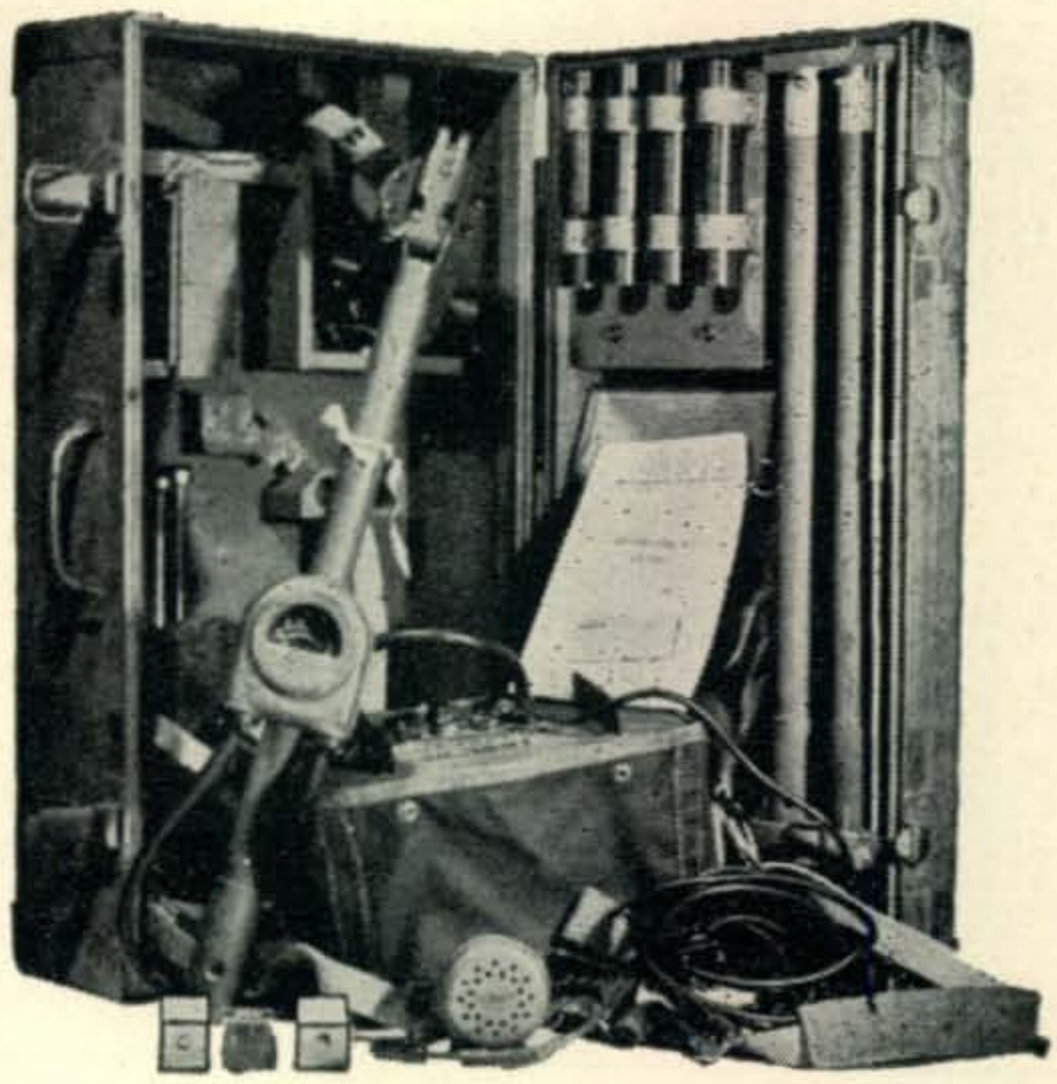
INDIANAPOLIS, IND.

MINE-DETECTOR AN/PRS-1

The detector is designed to detect metals, non-uniformities (rocks, tree-roots) and may be used to detect metal buried in logs, to locate cables, pipes, sewer tile and etc. It is widely used by lumber camps, miners, prospectors plumbers, treasure hunters and explorers.



A portable device used in the detection of both metallic and non-metallic by oral (ear) and visual (eye) means. These are brand new outfits, complete with instruction book and spare tubes. Shipped in original overseas moisture-proof container.

The set consists of the detector head with antenna and reflector meter, a meter housing and lower section of exploring rod, amplifier assembly, exploring rod extension, bag designated to carry equipment while operating, and wooden case for storing or transporting the complete unit when not in use.

This detector is not nearly as sensitive as the SCR-625 Mine detector. However, because of its price and its simplicity, you cannot go wrong on buying one for **$29.75.** Shipping weight, 125 lbs. Weight in operation only 22 lbs.

Batteries are not included but we can supply them for **$8.25** per set.

TERMS: CASH WITH ORDER

AMERICAN SURPLUS PRODUCTS CO.

537 N. CAPITOL AVE.
INDIANAPOLIS, IND.

Our Price $29.75

Shipping Weight 125 lbs.

Weight in Operation Only 22 lbs.

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WAR SURPLUS BARGAINS SOLD AS USED UNLESS OTHERWISE SPECIFIED
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24V—L-3 50 AMP LEECE NEVILLE AIRCRAFT GENERATOR FOR HEAVY DUTY WORK

24 V L-3—50 Amp—Leece Neville aircraft generator for heavy duty work. Can be used on automobiles, etc. for that 24V rig. Weight 24 lbs—5″ diameter—11″ long—(¾″ diameter; 1″ length shaft) Brand new **$17.50**

BC-348 COMMUNICATIONS RECEIVERS—Q's and R's

6 bands, 200-500 Kc. and 1.5-18 Mc. 2 stages RF, 3 stages IF, BFO, crystal filter, manual or AVC. Complete with tubes and 24 V. dynamotor. These receivers have been thoroughly checked in our work-shop and found in excellent condition.

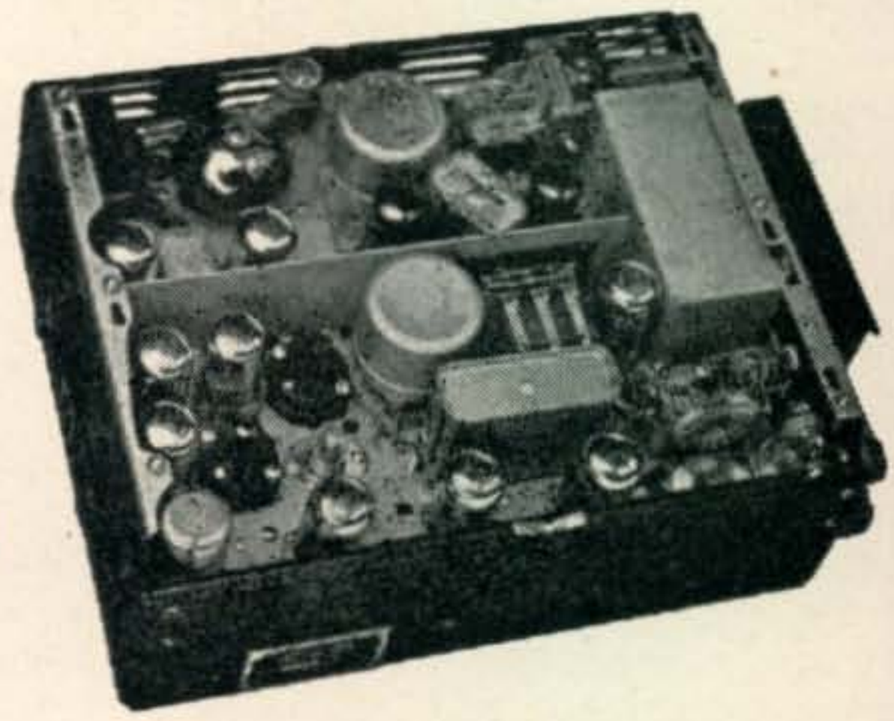
PRICE **$149.50**

BC-348, 110 V. AC power supply, including simple conversion instructions. Complete with tube..... $7.95

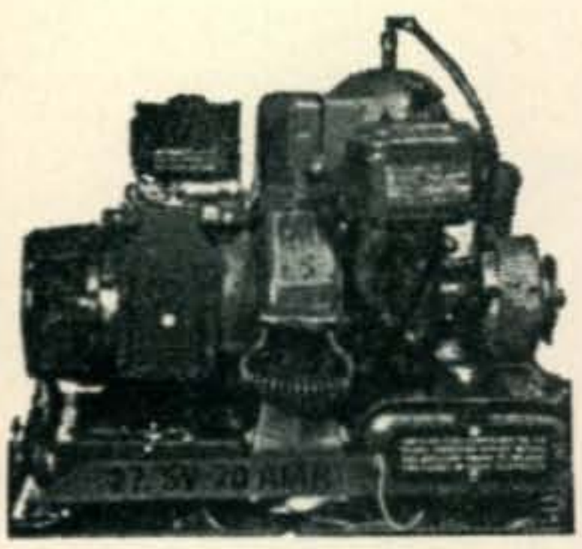
BC-645 ULTRA HI-FREQUENCY TRANSMITTER-RECEIVER

You read about it recently in QST! Originally operated in the frequency band from 450 to 500 Mc. Can be converted to 420 Mc. amateur band. Consists of complete transmitter and modulator system, and receiver.
Complete, Brand New with 15 tubes.

$9.50



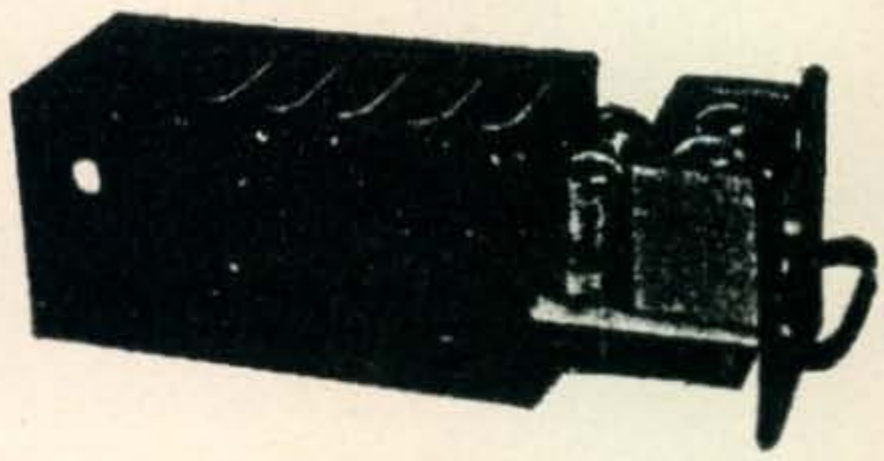
HRU (DC) POWER SUPPLY



24-28 V. at 70 amp. 2000 watts gasoline engine generator with electric starter. Power supply which can be used to operate 24-28 V. equipment, to start airplane engines, to charge batteries, as a welding machine, lighting system, or for an amateur radio station. Height 21½″; Width, 17½″; Length, 24⅝″, and weight, 115 lbs

PRICE **$89.50**

TURBO AMPLIFIERS



Used for parts—shipped complete with the following tubes;

2	7 C5's
1	7 Y4
1	7 F7

PRICE ..... **$1.25 ea**

Pirate. Your card makes the 26th I have had to return for that date."

There is a new one on in Zone 23, according to W6SA. He is signing *C8YC* and operates about the same spot used by C8YR. Speaking of C8YR, he sent word to me through W6AY that he is leaving for Nanking for a stay of six to twelve months. He said others in Zone 23 are *C8KY* and *C8LS*. C8YR said he might be signing C8YR/1 from Nanking, so, fellows, if this happens, don't get too excited when you hear the first part of the call, thinking he is in Zone 23.

In a letter from *C8YR*, he would like to make it plain that his name is Yu Ruey Chi. It seems that he has received a number of cards addressed as A. Hu Kansu. It might be of interest to know that C8YR is really no newcomer, as he operated XU3YR in 1935 and 1937, XU8YR during 1936, C8YR in 1946 and 1947, as well as thus far in 1948, of course.

My old friend *KH6IJ*, ex-K6CGK, passes along a little more info about Zone 23. He says, now that C8YR has gone to Nanking for a while, he has left his equipment to the "Kansu Radio Club." He says this is the first time he knew there was such a radio club, but we know of at least three who could be members of it. Last month, I guess Larry was working the front and back parts of the magazine toward the middle, and we got squeezed out of a little space. Let's see if we can squeeze back in. This is part of the letter which W6ENV wrote to me on DX. Here 'tis:

"From Wayne O. Brewer, ex-*J9AAK* and now W4MVD, we learn that someone must have been bootlegging his J9AAK call, because he has been receiving cards addressed to Denvers, J9AAK, at Taiwan (Formosa)! He points out that the calls *J9AAA* to *J9AZZ* are limited to the Island of Okinawa, and further he wants everyone to know that he will not QSL for these alleged Taiwan contacts. He is at present instructing in the Communications Division of the Air University at Hunter Field, Alabama, and is unable to spend much time at DXing on 10 and 6.

Rupert Lloyd, *EL3A*, expects to return to the States in July, and it may be that we will have lost one of our last Liberian stations. He is not certain where his next assignment will take him and doesn't expect to find another spot as perfect for DX as EL-land. *VQ3HGE*, the Gatti-Hallicrafters Expedition, with Bob, W6PBV, at the key, has had 1114 QSOs in Tanganyika since February 20th, but still needs Montana, Utah and Nevada for W.A.S."

Brownie, *OA4AK*, has entered the DX Marathon, and seems to be doing pretty well considering that he spends a lot of his time dodging the Ws. His Stateside call is W3CJI, and, although he's been a ham for about 16 years, is just getting into the DX game and having a lot of fun out of it. Can you remember when you used to have fun out of chasing DX? I'm thinking hard for myself.

A letter from the A.R.B.D. (Common Radio League of Germany) states that the two-letter D4 calls and the DA calls are pirates (Germans operating in the U.S. Zone of Germany). They are organized and operating with the intent of forcing the occupation authorities to license German nationals through increasing unlicensed activity over there. The A.R.B.D. is emphatically not in accord with this policy. They, of course, hope to be licensed soon, and perhaps before the end of this year.

W6BIL says he is going to put up a beam to get some of the good ones he has heard but can't raise, such as *VQ6NY* and *VP3TW*. (*QSY to page 72*)

OK1AW is still at it, and, apparently, after seeing the picture of *I1MQ*, Miss Ada Garibaldi, in *CQ* he has broken his neck to work her. As he says, "I have received a few nice letters and photos. Now a nice YL, but sorry she is so far from here." Hey! . . . Alois . . . better stick to DX.

OY8LA writes to say that he has had a call since June 1947. Apparently, there is more than one OY ham on the air. As a matter of fact, OY8LA goes on to say that. in the near future, there will be one more. He operates 20-meter phone on 14,290; input usually around 20 watts.

Most of you will remember W5VV, Wilmer Allison, as being a pretty good DX man before the war. Have any of you guys heard him on the DX bands postwar? Of course, you haven't. Anyway, a couple of months ago, I asked W6UXN to relay a message to W5VV the next time he worked him on 6 meters. Say . . . relaying a message by amateur radio . . . I'll bet you that's where "amateur radio relay league" fits into the picture. Well, anyway, the message to W5VV went something like this, "Why don't you try the amateur bands some day and work something?" The other day, W6UXN relayed a message to me *from* W5VV (there's some more of that relaying business). This message said, "To heck with 20. I'm going to W.A.Z. on 6." Now that just goes to show you what can happen. You remember W1SZ? Well, that is what happened to Roddy, too. . . . He's on 6. (Aside to Vince Dawson . . . How did you ever get these guys to mess around with your 6-meter stuff? And, I'll bet I can guess the answer. He'll probably say, "Becker. they used to say that about 10, and look what they're doing with it now." To which I would say, but shouldn't, "Yep, just look!" We're in a rut . . . Let's get out of it.)

KG6AI., who, you recall, is no longer on Guam but is now in the States for a while is getting very antsy about not receiving cards from *HK1CK* and *OX3MG*. These are the only two cards he needs for W.A.Z., and as he says, he hates like heck to have to go back to Guam just to work Zone 9 and 40 again. If you guys can shed any light on these two stations, please get in touch. Incidentally, his pal, KG6AI, is coming back to the States soon, in fact, both of them will probably be at the national convention in Milwaukee.

Just a reminder . . . W4LVV is acting as mail box for all cards going to *HP2X*. Don't send them anywhere else.

W5RX, who used to be 6RX in the old days, is running 60 watts to a BC459A, and, so far, has worked 25 zones and 40 countries. Judging from the

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ON ORIGINAL STEEL REELS

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★ WEATHER RESISTANT ★ LIGHT WEIGHT ★ FLEXIBLE

Immediate Delivery at the following prices:

2,000 ft. steel reels (individually boxed)	Per 1000 ft.	**$ 8.00**
3,000 ft. pay out wooden reels (packed 2 reels per box)	Per 1000 ft.	**$ 7.00**
10,000 ft. steel reels	Per 1000 ft.	**$ 6.50**
20,000 ft. steel reels (same wire but single conductor)	Per 1000 ft.	**$ 2.50**

Other Wire Available from Wells

Field wire, No. 18 stranded, 7 strands (4 steel, 3 copper) 2 conductor, rubber-covered, weather-proof, 500 ft. reels	Per 500 ft.	**$ 5.00**
Aerial wire, No. 12 Phosphor Bronze, 7 strands No. 20	Per 1000 ft.	**$15.00**
Aerial wire, No. 18 copper weld, solid, 3000 ft. reels	Per 1000 ft.	**$ 5.00**
Single conductor, No. 20 shielded, overall braid, 1000 ft. reels	Per 1000 ft.	**$15.00**
Single conductor, ANJC 48 No. 20 stranded, glass braid lacquered, 1000 V. insulation, 2000 ft. reels	Per 1000 ft.	**$10.00**
Single conductor, No. 20 stranded, glass braid lacquered, 3000 V. insulation (for transmitters) 1000 ft. reels	Per 1000 ft.	**$12.00**
Shielded single conductor microphone wire, rubber covered, 500 ft. coil	Per coil	**$15.00**

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RG8U - 52 Ohm co-ax cable. . . . Per 100 ft. coil - $2.95

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tone of his letter, he would be ashamed to work stuff with high power. Well, er . . . ah . . . uh . . . I suppose the guy running high power could possibly feel the same about low power. Oh, nuts! Here we go again.

W3JTC picked up a couple of good ones in *FK8AB* and *WØSQS/Iwo*. W3KDP says he is very sorry to have to confirm our hunch that *PX1E* is NG, as he had his card returned.

W2WMV/C9 repeats that *MX3KP* isn't there any more, and all cards sent to him via W2WMV are sadly placed in file "13." F8PQ says a friend of his, CN8BK, has his 40 cards in for W.A.Z., which is swell news, but, as yet, we haven't seen them. F8PQ has his all time W.A.Z. certificate and is now working on his postwar totals.

VP4TU is off the air and back in the States. He says he has QSLd every card received, and if any of you haven't received yours, you can still get it by sending one to him at the following address: S/Sgt. Larry Welton, Box 38, Litchfield Park, Arizona. According to W4HA, *HP1LS* told him that stations in Panama are now free to operate. He says he has heard a few others on 20-meter phone. HP1LS was on 14,298, while a couple of other phone stations are *ZA1A* 14,203, and *MB9BD* 14,218. J9ABX is still secretary of the Okinawa J9'ers, and J9AAW is Prexy. ABX points out that only J9 calls whose three letters start with an "A" apply to Okinawa, and he will handle these QSLs; the rest go elsewhere, and you would save time by getting the right QTH or bureau. Bill is all worked up over the lousy returns to his QSL cards. He says, in the 17 months on the air, he had 2700 contacts with 1200 stations and sent cards to every station. In return he received only 700 cards. He has compiled quite a detailed breakdown on how many he sent to various districts and countries, and how many he received. It would probably not be of much interest to put the whole table down here, but, for the sake of the record, Canada has the best percentage, as out of 18 cards sent, only three have not been received. J9ABX is leaving for the States, and J9AAR is taking over his QTH.

1948 DX Marathon

CQ is sponsoring a DX Marathon for the year 1948. The purpose of the DX Marathon is to revive some of the interest that has been lost during the terrific last two years of DX. The rules governing the DX Marathon appeared in May CQ on page 74.

W8BKP is anxiously awaiting his card from *C8YR*, which, of course, will make all 40. His Jr. Op., who used to take care of his QSLs, DX list, and a certain amount of operating, has joined the Marines for a three year term and may wind up in ZC6. W8BKP also worked *AC2MA* Bhutan, and is hoping out loud that he proves O.K.

W6AM tells me *MI3ZJ* is going back to "G," although there are plenty of others active, such as *MI3AB*, *BC*, *CD*, *DF*, *FG*, *MD3AB*, and *MD3MB*. Don also says that the station signing SV1VS/MM is trying to get permission from authorities to land. He said, while tied at the dock at FB8, his rig never left the ship. W6AM has applied for his Canal Zone certificate and is now going after the necessary confirmations for "W.A.C.E." Lest you forget, as explained up front, he has his W.A.Z. certificate. I think he purposely bought a larger ham shack in order to take care of this additional wall paper.

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DX MARATHON

C.W.—PHONE

Zone 1

KL7KV	22– 32
KL7KI	15– 23

Zone 2

VO6EP	34– 93
VO6J	15– 38

Zone 3

W6PFD	40–162
W6ITA	40–158
W6ENV	40–146
W6SN	40–142
W6AM	40–123
W6NNV	40–120
W6RM	40–119
W6HZT	40–115
W6KRI	40–114
W6OMC	40–102
W6SRU	40–101
W6FSJ	40– 92
W6ANN	39–109
VE7ZM	39–104
W6PQT	39– 99
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W6LRU	38– 91
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W6UCX	36– 78
W6OEG	35– 80
W6MI	34– 66
W6ZZ	33– 77
W6CTL	33– 75
W6UZX	33– 69
W6MUF	33– 58
W6LER	32– 53
W6WWQ	31– 63
W6BIL	31– 50
W6QD	30– 53
W6KYV	26– 49
W6QWL	25– 43
W6MXM	25– 38
W6AGT	24– 44
W6MGZ	23– 29
W6EYC	20– 33
W6CID	20– 21
W6OKL	19– 40
W7PK	17– 30
W6UXF	17– 18
W6VAT	15– 15

Zone 4

WØXYO	40–128
W9VW	40–124
W5ASG	39–152
WØKGS	39–116
W9GA	39–106
W8SDR	39–101
W9LM	38–120
W9NDA	37–107
W9IU	36–118
W8EWS	36– 96
W9TB	36– 89
W8GLK	34– 88
WØDU	34– 78
W9LNM	33– 97
WØEYR	32– 98
W9CIA	32– 93
W4HA	31– 95
VE3QD	31– 85
WØSBE	31– 84
W9WCE	31– 84
WØCFB	31– 79
WØCMH	30– 48
W5CPI	29– 75
WØAZT	29– 60
W5EWZ	29– 51
W8MQR	28– 57
W9MZP	28– 49
WØUOX	27– 57
W8BF	25– 68
W5ZD	25– 62
W8LFE	23– 38
W8NKU	21– 46
W9EHS	17– 29
W9KMN	15– 13

Zone 5

W1AB	39–114
W1NMP	38–112
W1JYH	37–116
W1BIH	37–107
W3IYE	37–105
W3OCU	36–124
W3DPA	36–113
W1ENE	35–119
W2TJF	35–112
W3EPV	35– 80
W2RGV	34– 98
W3DRD	34– 96
W4JFE	33–102
VE2WW	33– 87
W2MEL	33– 87
W1AWX	33– 78
W2PQJ	32– 89
W1BFT	31– 86
W4LVV	31– 79
W3WU	31– 68
W3NOH	29– 80
W2EMW	29– 70
W8JM	29– 60
W2AW	28– 67
W3AQT	28– 59
W2BF	27– 72
W1MRP	27– 72
W4TO	26– 76
W1CJH	26– 66
W3RJS	25– 52
W4JUJ	24– 46
W2OM	23– 52
W2IOP	23– 47
W2PUD	23– 40
W4LK	21– 46
W1HJ	21– 44
W1QCJ	21– 38
W4ALJ	21– 35
W3NPZ	18– 41
W4BRB	16– 36
W4CY	14– 29
W4HKJ	12– 19

Zone 7

TG9JK	26– 49

Zone 8

W8LZK/KP4	29– 82
KV4AD	23– 56
KP4KD	21– 48

Zone 10

OA4AK	36– 94

Zone 11

PY1DH	39–105

Zone 12

CE3AG	39– 94

Zone 14

F8BS	38–106
G3DO	37–103
ON4MS	35– 76

Zone 20

SV1XR	31– 93

Zone 27

K6GAI	28– 51

Zone 30

VK2DI	40–111

Zone 31

KH6NB	30– 48
KH6PY	30– 42

Zone 37

VQ3HGE	39–116

Zone 38

ZS2X	37– 95

PHONE

Zone 3

W7HTB	37–111
W6DI	36–127
W6CHV	32– 80
W6ITA	31– 87
W6PCK	29– 76
W6PXH	29– 76
W6WUI	28– 54
W6AM	26– 48

Zone 4

W9NDA	35– 83
W9RBI	34– 89
W5ASG	32– 99
W8HUD	31– 83
W8NK	31– 70
W4HA	29– 82
W5LWV	29– 71
WØSBE	26– 60
VE3BBZ	24– 52
W5ERY	22– 43
W9WCE	21– 53
W8LFE	16– 23

Zone 5

W1JCX	34–108
W1ATE	34– 87
W1NWO	33–103
W1FJN	32– 86
W2RGV	31– 74
W4ESP	30– 89
W2IUV	29– 64
W2DYR	27– 66
W2PQJ	25– 51
W1CJH	23– 52
W1EQ	22– 57
W2BF	20– 44

Zone 6

XE1AC	33–113

Zone 8

KV4AD	21– 43

Zone 10

OA4AK	29– 55

Zone 12

CE3AB	26– 51

Zone 14

G3DO	33– 86
F8DC	28– 47

Zone 31

KH6NB	23– 36

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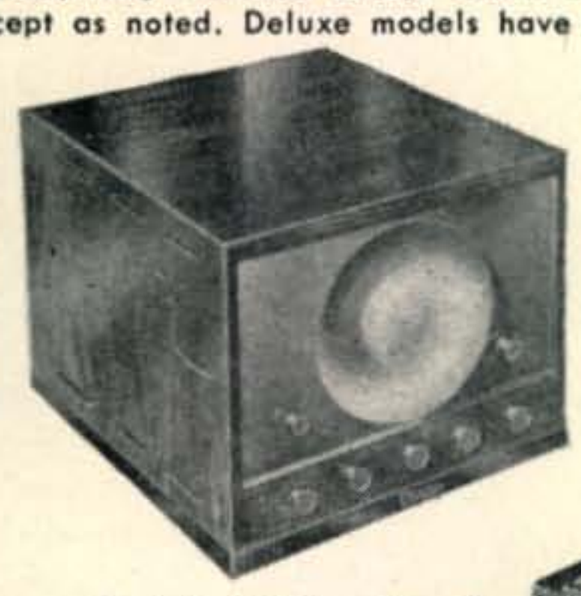

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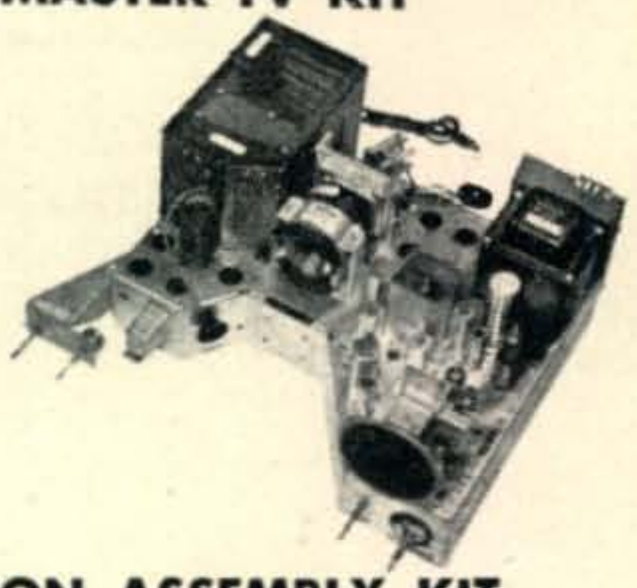
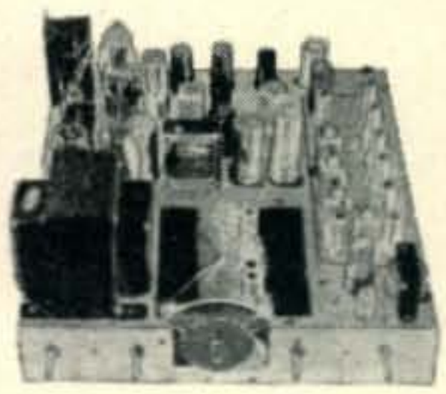


TELEVISION ASSEMBLY KIT



10-12-15 inch kits with the sensational completely wired IF Picture and Sound Strip. Supplied with 13-channel front end, wired for 7 channels, or with continuously tunable *duMont* Inputuner in Champion models.

10" standard model.....**$229.50**; Champion.....**$273.10**
12" standard model..... **259.50**; Champion..... **303.10**
15" standard model..... **349.50**; Champion..... **393.10**
IF strip, alone.....**$77.25**; Inputuner, alone.....**$58.65**

OTHER HARVEY BUYS

GE XFM-1 FM TRANSLATOR

Covers 88-108 mc range, tuning dial 12" long, uses guillotine tuning for highest efficiency, high stability. Designed for export and tropicalized, has power inputs for 110 to 250 volts, 60 cycle. Quantity limited. Shipping weight 30 pounds.

HARVEY SPECIAL PRICE.....$49.50

LS-3 SPEAKER

Signal Corps speaker, 6" PM in rugged, crackle finish steel case, complete with self-contained output transformer to match 4000 ohm load. Speaker voice coil impedance 6-8 ohms. Brand New, in original overseas packing. Shipping weight 15 lbs. **Harvey Special. $4.95**

CRYSTALS

Harvey still has those good crystals for a buck! Specify your frequency, we can supply a crystal right on it, or within 5 or 10 kc. 20-40-80 meter and 6 and 13 mc bands for only.....**$1.00**

All crystals mounted in holder with ½" pin spacing. Lucite adapter for 5-prong socket.....**35¢**
When ordering crystals only include 10¢ postage.

KH6PP is giving up 6 meters for a while, and sa he is going to take a crack at working DX on 20, a enter the Marathon. It is still wide open in Zone 3 W4LZM wants to know the station using the lowe power input to make W.A.Z., and if anyone ha made it on 10 meters only. A quick answer is, ' don't know." Anyway, LZM runs only 67 wat and has 30 zones and 70 countries.

W. A. Z. Honor Roll

To enter the Honor Roll, fill out one of the Zone and Country List forms which we will supply on request. Please send a stamped, self-addressed envelope.

The Honor Roll contains totals of postwar contacts only, that is, contacts made since November 15, 1945.

It is not necessary to submit confirmations until you are eligible for a W.A.Z. certificate. To be awarded a W.A.Z. certificate, send confirmations for the 40 zones direct to the DX Editor, as well as a list of these 40 confirmations giving the call letters of the station, date and time of the QSO. You can again use one of our standard Zone forms for this. It will become our permanent record of your W.A.Z.

Those applying for W.A.Z. awards and not having been previously listed in the Honor Roll, submit your list of zones, as well as the 40 confirmations, and a Country List.

The Honor Roll is in two divisions; the c.w.-phone section, which gives the current total of zones and countries any station has work while using c.w. or phone, or both; the other section contains a list of "phone only" stations. All contacts claimed in this section must be on a "phone to phone" basis.

All-time W.A.Z. certificates will be issued upon presentation of proper confirmations. The certificate will be similar to the postwar certificate, although no listings of all-time W.A.Z. certificate holders is anticipated at this time.

I'm sorry to hear that *SV1RX*, Norman Jolly, is leaving Athens to go to London. Norman had been there since 1935, and, except for the years of the war, has been consistently active. SV1RX has been the most reported station for Zone 20, and, without a doubt, a majority of you fellows have

Build YOUR OWN TEST EQUIPMENT

$39.50
Nothing ELSE TO BUY

NEW 1948 HEATHKIT
5" OSCILLOSCOPE KIT

A necessity for the newer servicing technique in FM and television at a price you can afford. The Heathkit is complete, beautiful two color panel, all metal parts punched, formed and plated and every part supplied. A pleasant evening's work and you have the most interesting piece of laboratory equipment available.

Check the features — large 5" 5BP1 tube, compensated vertical and horizontal amplifiers using 6SJ7's, 15 cycle to 30 M cycle sweep generator using 884 gas triode, 110V 60 cycle power transformer gives 1100 volts negative and 350 volts positive.

Convenient size 8½" x 13" high, 17" deep, weight only 26 pounds.

All controls on front panel with test voltage and ext. syn post. Complete with all tubes and detailed instructions. Shipping weight 35 pounds.

Order today while surplus tubes make the price possible.

$34.50
Shipping Wt., 13 lbs.

HEATHKIT SINE AND SQUARE WAVE
AUDIO GENERATOR KIT

The ideal companion instrument to the Heathkit Oscilloscope. An Audio Generator with less than 1% distortion, high calibration accuracy, covering 20 to 20,000 cycles. Circuit is highly stable resistance capacity tuned circuit. Five tubes are used, a 6SJ7 and 6K6 in the oscillator circuit, a 6SL7 square wave clipper, a 6SN7 as a cathode follower output and 5Y3 as transformer power supply rectifier.

The square wave is of excellent shape between 100 and 5,000 cycles giving adequate range for all audio, FM and television amplifier testing.

Either sine or square waves available instantly at a toggle switch. Approximately 25V of sine AC available at 50,000 ohm output impedance. Output +-1 db. from 20 to 20,000 cycles. Nothing else to buy. All metal parts are punched, formed and cadmium plated. Complete with tubes, all parts, detailed blueprints and instructions.

$19.50
Nothing ELSE TO BUY

HEATHKIT SIGNAL TRACER KIT

Reduces service time and greatly increases profits of any service shop. Uses crystal diode to follow signal from antenna to speaker. Locates faults immediately. Internal amplifier available for speaker testing and internal speaker available for amplifier testing. Connection for VTVM on panel allows visual tracing and gain measurements. Also tests phonograph pickups, microphones, PA systems, etc. Frequency range to 200 Mc. Complete ready to assemble. 110V 60 cycle transformer operated. Supplied with 3 tubes, diode probe, 2 color panel, all other parts. Easy to assemble, detailed blueprints and instructions.

Small portable 9" x 6" x 4¾". Wt. 6 pounds. Ideal for taking on service calls. Complete your service shop with this instrument.

HEATHKIT SIGNAL GENERATOR KIT

Every shop needs a good signal generator. The Heathkit fulfills every servicing need, fundamentals from 150 Kc. to 30 megacycles with strong harmonics over 100 megacycles covering the new television and FM bands. 110V 60 cycle transformer operated power supply.

400 cycle audio available for 30% modulation or audio testing. Uses 6SN7 as RF oscillator and audio amplifier. Complete kit has every part necessary and detailed blueprints and instructions enable the builder to assemble it in a few hours. Large easy to read calibration. Convenient size 9" x 6" x 4¾". Weight 4½ pounds.

$19.50
Nothing ELSE TO BUY

$24.50
Nothing ELSE TO BUY

THE NEW HEATHKIT VACUUM TUBE VOLTMETER KIT

The most essential tool a radio man can have, now within the reach of his pocketbook. The Heathkit VTVM is equal in quality to instruments selling for $75.00 or more. Features 500 microamp meter, transformer power supply, 1% glass enclosed divider resistors, ceramic selector switches, 11 megohms input resistance, linear AC and DC scale, electronic AC reading RMS. Circuit uses 6SN7 in balanced bridge circuit, a 6H6 as AC rectifier and 6 x 5 as transformer power supply rectifier. Included is means of calibrating without standards. Average assembly time less than four pleasant hours and you have the most useful test instrument you will ever own. Ranges 0-3, 30, 100, 300, 1000 volts AC and DC. Ohmmeter has ranges of scale times 1, 100, 1000, 10M and 1 megohm, giving range .1 ohm to 1000 megohms. Weight 8 lbs.

$19.50

HEATHKIT CONDENSER CHECKER KIT

A condenser checker anyone can afford to own. Measures capacity and leakage from .00001 to 100 MFD on calibrated scales with test voltage up to 500 volts. No need for tables or multipliers. Reads resistance 500 ohms to 2 megohms. 110V 60 cycle transformer operated complete with rectifier and magic eye indicator tubes.

Easy quick assembly with clear detailed blueprints and instructions. Small convenient size 9" x 6" x 4¾". Weight 4 pounds. This is one of the handiest instruments in any service shop.

The HEATH COMPANY
DEPT. Q . . . BENTON HARBOR, MICHIGAN

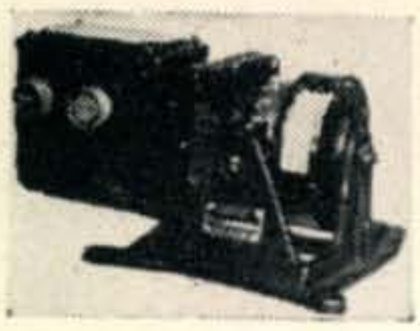
chalked him up on your country list for Greece. He has worked 39 zones and 153 countries postwar, and says, up to the time he closed down on May 30, he had never heard a station in Zone 23. He has worked over 300 W6s, as well as hundreds of others Ws, and has sent QSL cards to everyone worked. If you have worked SV1RX and have not yet received his card, please send yours with a note to this effect via RSGB, and you will get another card "straight away." At present, Norm is in the Marathon with 31 and 93, however, he says since January 1, he has worked 39 and 129, and we're now awaiting his forms to make it official. We're sorry to lose you over there, Norm, but it will be England's gain, I am sure.

W2IOP, picked up a little information from K2UN. *MF2AA* says he is the only MF currently operating, and that it is a British military prefix for Trieste. AG2 is the U.S. military personnel prefix for Trieste. *AG2AA* is assigned but not yet active. Civilians are still using "I" calls. *MD4CG* is on in Italian Somalia but with very low power. According to W7MWQ, a friend of his is on the boat "Ypora" en route to Paraquay, and while aboard will sign ZP1X. So, don't get all excited about it being a land based station. He will be running 500 watts ECO on anything from 10 to 80 meters.

I am glad to see a new W9 in the Honor Roll. This time W9FKC. He says he has been using a 20-meter vertical which probably was equally poor in all directions, but this gave way to a 3-element wide spaced rotary beam. With this layout, he expects to collect the 40 zones, and, of course, I hope he does. I know I shouldn't say this, but he wants to know why Tasmania is not counted as a separate country. As I said in a previous column, there are reasons why it shouldn't be counted, but we would like to have some logical reasons for counting it. If

"Communications"

BEAM ROTATOR



The most powerful, compact assembly offered on surplus for beam rotation. 90:1 gear ratio turned by 24 vdc motor that will run on 12 vac. Bicycle type sprocket for easy coupling to any shaft. 9¼"LX-6½"W x 4"H. with mounting facility. New guaranteed, complete with 110 vac to 12 vac step down transformer **$16.50**

ANTENNA AN/122-A: Dipole, 12' L, ideal for that 6 meter beam. One side of dipole adjustable for fine tuning. Get four of them for only **$20.00** or **$5.65** each.

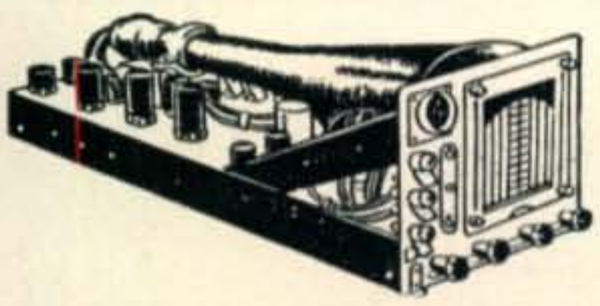
140-600 MC. CONE TYPE ANTENNA, complete with 25' sectional steel mast, guys, cables, carrying case, etc. New.... **$49.50**

ANTENNA AN/128-A. A complete two-meter beam, originally designed to work with IFF set RC 148-A, this unit is extremely compact, rugged, efficient. Consists of two vertical radiators working against a square reflector 3' x 4'. You can't beat this unit for high gain and directivity. New..... **$40.00**

Adcock Direction Finding Beam Arrays, including apx 12 ft. crossbeam and 4 vertical dipoles. New and complete..... **$47.50**

30 Ft. MAST SETS. Heavy duty rugged plywood. Crated in 3 sections with coupling material. Two masts for ideal flat-top antenna. New..... **$40.00** per set

INDICATOR BC 704 A



Indicator Part of Radar Set SCR 521, Makes an excellent foundation unit for a high gain scope. Has following tubes: 4-6AC7, 3-6H6, and 1-5BP1 CR tube. Comes enclosed in metal shield. New, with all tubes, less power supply. With wooden carrying case **$17.50**

EE-89A REPEATER

Extends range of field telephone apparatus, such as EE-8 up to 25 miles, when inserted in a line. New, with spare tube and instruction manual, less standard type batteries..... **$21.50**

BC 686 LINE AMPLIFIER

With magneto ringer, 3-tube 25L6 amplifier. For local point-to-point telephone operation, remote operation of Phone Xmtr, remote reception of receiver output, monitoring facility. Requires only 24 vdc for tube (B) Supply for full operation. New, less tubes, in wooden chest **$18.50**

Per pair for 2-way pt-to-pt operation..... **35.00**

ARC-5 ACCESSORIES

CONVERSION COILS FOR ARC-5 TRANSMITTERS

M.O. Coils	P.A. Coils	Antenna Loading Coils	Freq. Range
$1.00 each	$1.00 each	$.85 each	
#6029	#7247	#6033	3-4 Mc.
#6030	#9293	#6034	4-5.3 Mc.
#6032		#6035	7-9.1 Mc.

CONVERSION KIT, consisting of 1-M-0 coil, 1-P.A. coil, 1-ANTENNA COIL, in any one particular frequency range **$2.00**

ARC No. 6558 variable receiving capacitor, 62 mmf/section, 3 sections, .03" spacing, 8 rotors. Worm drive ratio 33:1..... **$1.75**

ARC No. 4990, variable xmtg capacitor, 22.4—145 mmf. .05" spacing, 11 rotors. Each..... **1.00**

ARC 5632 Var. Xmtg. capacitor, 29.2—117 mmf. .06" spacing, 16 rotors, worm drive: 96:1..... **$1.00**

Single rcvr. mtg. racks, **$1.00;** dual..... **$1.50**

Single-shock mounts for rack **$.50,** dual..... **$1.00**

DUAL CONTROL BOXES FOR RCVRS..... **$1.00**

BAND PASS FILTER

#70473. Sharp band pass peaked at 700 cps. High-to-high impedance. Can be plugged into 'phone output of receiver for good results. Cuts out QRM and QSB. New, with circuit diagram..... **$2.25**

CATHODE RAY TBUES

3BP1	**$1.25**	3GP1	**$3.35**
3FP7	**$1.20**	5FP7	**$1.75**
5BP1	**$1.20**	3DP1	**$2.25**
3EP1	**$2.95**	5JP2	**$4.00**
12GP7	**$10.95**		

XMTR TUNING UNITS

From **BC 375;** TU-9 (7.7-10mc); TU-10 (10-12.5 mc); TU-22 (350-650 kc); TU 26 (200-500 kc). Each..**$2.25**

For **BC 610;** TU 48 (2.5-3 mc); TU 52 (6.35-8 mc) TU 53 (8-12 mc)..... Each **$1.75**

For **BC 223AX:** TU 17 (2-3 mc); TU 18 (3-4.5 mc) Each..... **$1.95**

MINE DETECTOR

AN/PRS-1. Can be used to detect buried objects, such as rocks, tree stumps, water pockets, etc. Every homeowner, camper, prospecter needs one. Complete unit, consisting of detector unit, amplifier, headphones, meter, resonator, with all necessary cables and tubes, new **$12.75**

With Batteries..... **$21.65**

BC 1267 XMTR-RCVR.

XMTR consists of tuned line pulse oscillator on 154-186 mc. Can be modified to operate on voice or CW, and put to work on the amateur 2-meter band. RCVR. is a superhet with 2 stages of RF and 5 stagger-tuned I.F. stages (11 mc). Plenty of room on chassis for additional components and changes. Used, but in excellent condition..... **$27.50**

Complete with power supply for operation from 117 v. 60 cycles..... **$42.50**

DYNAMOTORS

Type	Input Volts	Input Amps	Output Volts	Output Amps	Radio Set	Price*
BD 77KM	14	40	1000	.350	BC 191	**$9.95** N **$5.95** LN
PE 73	28	19	1000	.350	BC 375	**$4.95** N
DM 21	14	3.3	235	.090	BC 312	**$2.79** LN
DM 21CX	28	1.6	235	.090	BC 312	**$2.49** N
DM 25	12	2.3	250	.050	BC 367	**$2.49** LN
DM 28R	28	1.25	275	.070	BC 348	**$5.00** N
DM 33	28	7	540	.250	BC 456	**$3.95** N
DM 42	1.4	46	515	.110	SCR 506	**$3.95** LN
			1030	.050		
			2/8			
PE 55	12	25	500	.400	SCR 245	**$4.95** LN
PE 86 N	28	1.25	250	.600	RC 36	**$1.95** N
PE 101C	13/26	12.6/6.3	400	.135	SCR 515	**$3.49** N
			800	.020		
			9 AC	1.12		
BD AR 93	28	3.25	375	.150		**$4.95** N
23350	27	1.75	285	.075	APN-1	**$3.50** N
35X045B	28	1.2	250	.060		**$2.25** N
ZA .0515	12/24	4/2	500	.050		**$3.95** N
ZA .0516	12/24	8/4	275	.110		**$4.25** N
B-19 pack	12	9.4	275	.110	Mark II	**$6.95** N
			500	.050		

*N—New; LN—Like New

TEST SET 159TPX

Measures frequency between 150 & 200 mc. by heterodyne method. Power of Xmtr can be directly measured. Measures DC voltages up to 500 Volts. Original operation on 110 V. 400 cy. but conversion kit makes it operable on 110 V. 60 cy. new, complete with tubes, crystal, cal. chart, antenna, meter & conversion kit and data for 110 V., 60 cy. operation..... **$29.95**

INSTRUCTION BOOKS

BC 312, VC 342..... **$1.25**

SCR 281... **$1.25** Mark II... **$.75**

ZA Eqpt... **$.75** SCR 508.. **$1.00**

BC 642... **$1.00** SX-32... **$.75**

VIBRATORS

TR 1210, 12 vdc, 5 pin..... **$1.20**

OAK V-6675, 24-32 vdc, 7 pin **$1.10**

Mal. Type G534C, 12 vdc, 5 pin **$1.25**

Mal Type G629-C, 12 vdc, 4 pin **$1.15**

HEADSETS

Dynamic mike and headset combination. A high quality, efficient unit, used in B-19 tank Xmtrs. Mike and phones complete, new **$2.75**

R-15 headsets: 8000 ohms impedance, rubber cushions. Comes with 8" cord and plug PL 55. New..... **$1.95**

HS 30 headset. Insert type headset cuts out background noise, and low impedance (500 ohms) assures efficiency and fidelity. A MUST for every ham at this price.... **$.85**

Xfmr to match 8000 ohms output ..... **$.35**

HEADBANDS: HB-1, HB-4, HB-30, New..... **$.25 ea.**

CARBON PILE REGULATOR. INPUT 22:30 vdc. OUTPUT: 19 v. 5.7 amp..... **$1.00**

REACTOR: Dual 120 hy. 17 ma. per sec..... **$2.45**

PHOTOCELL, RCA #932... **$1.50**

SONAR SOUND DETECTOR: Under water detector with 7 microphone units encased in rubber sheath. Model JR..... **$12.50**

MN 52H Azimuth control box for aircraft radio compas..... **$1.25**

ARC-3 Airborne radio series replacement relays. Types 55526, 55251, 55342, 55528, 55531, 55585, 55458..... **$.60 ea.**

Fuse holder, GE type EL-1 **$1.00**

Amertype Recording Film. 50 ft. lengths individually boxed **$.35 ea.**

Modulation Trans. ARC #9466, push pull 807's to Plates and screens of 2 807's in parallel..... **$1.65**

POWER CHOKES

6 Hy @ 150 ma..... **$1.50**

Dual: 2-2 Hy @ 100 ma..... **$.75**

Dual: 7 Hy @ 75 Ma. 11 Hy. @ 60 Ma..... **$1.50**

8.5 h @ 125 ma..... **$1.50**

25 h @ 65 ma..... **$1.10**

5 hy, 40 ma, 312 ohms, 2,000 v test 2" x 2" x 1½"..... **$.65**

2 hy. 200 ma. 102 ohms 2,500 v. test..... **$.85**

Dual 2.5 hy, 130 ma..... **$1.15**

A COMPLETE LINE OF MICRO-WAVE EQP'T. IN STOCK. 10 CM, 3 CM, 1.25 CM. SEND FOR MICRO FLYER.

ALL MERCHANDISE GUARANTEED. Mail orders promptly filled.

Manufacturers' Quantites In Stock

All prices F. O. B. New York City. Send Money Order or Check. Shipping charges sent C. O. D.

COMMUNICATIONS EQUIPMENT CO.

131 - Q Liberty St., New York Citv 7. N. Y.. DI 9-4124

CROSS POINTER INDICATOR

Two 0-200 microampere movements, 3" case, many applications..... **$2.50**

you think of any good reasons, send them to W1DX. . . . Hey, I wonder what that guy is doing nowadays . . . W2GWE says that *W3LYK/Antarctica* is now home and is QSLing all contacts. See the QTH section.

After you take a look at Zone 3 standings in the phone section of the Marathon, you'll understand why W6DI has been having sleepless nights lately.

We would appreciate you fellows starting to spread the word around about *CQ*'s first World-Wide DX Contest. Although the announcement may seem a bit early, this being the first one, we want the news to get around everywhere. We're having reprints of the contest rules made, and we want to send them to all the foreign stations we can. Along with the rules, we'll send them copies of the blank contest log forms, so they will be all set when October 29th rolls around. I have already been accused of cooking up this contest just so I can work another W9 for my Zone 4 multiplier. Could be . . . 73.

DX Qths

AP2F, Sgt. Wade, Peshawar, Pakistan
AP2H, 26 Church St., Langold, Worksop, Notts., England
AP4A, S/L. G. Howard, Signals, Air H. Q. Pakistan, Peshawar, Armed Forces, Pakistan, or via R.S.G.B.
C6HH, Hanson Lewis, P. O. Box 2, Hanchung Nancheng, Shensi Province, China
C6YZ, c/o Postal Bank, Sian, China
C7TN, Box 52, Peiping, China
D5AA, Gabriel Migeon, SP76422, Bpm 451, French Zone, Germany
EA9AA, Via EA9AI
EQ2L, c/o American Embassy, Tehran, Iran
FE8AB, Ivan Pastre, Base Aviation, Douala, French Cameroons
HA8PE, Pestszentersebet, Budapest, Akacfa Utca 46, Hungary
HC2OL, Box 1293, Guayaquil, Ecuador
HH1LD, P. O. Box 74, Port au Prince, Haiti
HL1AE, APO Box 712, c/o P. M. San Francisco, California
HL1BA, APO box 712, c/o P. M. San Francisco, California
HP2X, c/o W4LVV, 2210 S. W. 27th Lane, Miami, Florida
HS2CK, Via ARRL
HZ1JC, c/o Hewitt Sark, Guernsey, Channel Islands
I1NZ/Trieste, ARAT, Box 301, Trieste
KG6CE, Via his brother W6UXB
KG6DG, NCS Box 16, Navy 926, c/o FPO San Francisco
KM6AH, c/o C.A.A. or via A.R.R.L.
MB9BA, C 12, Army BC Station Bta., Klagenfurt, Austria
MD7RJ, REME, c/o APO Cyprus
OE1AW, Vienna, Austria, wait for his card
OE7KL, Via G2DMM
OY8LA, Post Box 35, Thorshavn, Faroes Isles
OX3RD, Via E. D. R. Copenhagen, Denmark
PA1RCD, Bureau de Control Des Emmissions, Radio Electriques, La Haye, Holland, or via V.E.R.O.N.
PY1SH, Manoel Alves-R. General Ozorio, Itaperuna —E. do Rio, Brazil
PK6TO, Box 76, Malassar, Celebes
PY7WS, Antonio Batista Vieira, Rua Rufino Alencar 89, Fortaleza, Brazil
PZ1OY, Box 547, Paramaribo, Suriname
ST2KR, Box 253, Khartoum, Anglo Egyptian Sudan
TI2EXO, c/o American Embassy, San Jose
VE8CA, Ron McFaul, Aishihik, Yukon Territory c/o Dept. of TSPT. Radio Range
VU2BX, c/o Anchor Cottage Groomsport near Bangor', Leo Down, North Ireland

VU7AF, Surjit Singh Majithia, Indian Ambassador, Katmandu Nepal, India
VQ4DFF, Box 3015, Mombasa, Kenya, British East Africa
VP6PX, Bromley Welches, Christ Church, Barbados, B. W. I.
VK9YY, Wewak, New Guinea
W5KGI/C7, Lt. Glen W. Simpson, APO 912, c/o P.M. San Francisco, Calif.
W6ANX/C6, Box 895, Auburn, California
W3LYK/Antarctica, Lawrence D. Kelsey, 28 Greenwood Place, Valley Stream, N. Y.
YR5W & YR5I, Box 326, Bucharest, Roumania
ZP7FA, Box 654, Asuncion, Paraguay
ZS6BV, Box 3037, Capetown
ZD4AL, S/QMS Field, West Africa Signal Regt., Accra, Gold Coast
ZM6AH, Box 57, Apia, Samoa
ZC6JK, c/o Gross View Galdicot, Chepstow, Mon., U. K.

Key Clicks

Re the article "Let's Go Portable," in *CQ* for June, 1948, the last paragraph relative to positive grounds in automobiles: When using the PE-103 it is very easy to reverse polarity since the high-voltage winding is grounded to the input winding at the brush. All that has to be done is to make a simple wiring change in the PE-103 and it is ready to go with a negative grounded ignition system.

—*W3NL*

• • •

In the May, 1948, issue of *CQ*, page 32, in the article on receiver stabilization, two Centralab No. 13303A capacitors are specified. It has since been determined that this capacitor is not a standard item, but is manufactured only for the industry and is not available from distributors. It is therefore suggested that one Centralab No. CC20N, 5-$\mu\mu$f N750 capacitor be substituted for the two No. 13303A 10-$\mu\mu$f capacitors in series, as specified in the article

Some difficulty has also been experienced in obtaining the 95-$\mu\mu$f "Ceramicon" specified in this same article as a replacement for the injector capacitor. Any good ceramic capacitor of approximately 100 $\mu\mu$f capacity will be suitable in this position. The temperature coefficient of the capacitor in this position is of no consequence.

V. H. F. - U. H. F.

(from page 50)

WØ; and W7 to W6 and XE1 and XE2. Double-hop from W6 to W2 and W4 with fair signals.

June 1—Moderate ionosphere storm during morning hours. Numerous west coast paths open between 2100 and 2330 EST, including W6—WØ, upper W7 to lower W7, and W7 to WØ, some W4 to W5 paths between 2200 and 2245 EST. W5ELL, WØVIK and WØYSJ especially prominent in reports.

June 2—West Coast activity from W7 to W6 1300 to 1400 EST, also around 2200 PST over same paths.

June 3—Only report received mentions W5VV and W4EID at 0900 EST.

June 4—General widespread opening with W5 working into W1, W2, W3 and W8 from 1800 to 2200 EST. W4 to W5 and W9 from 2100 to 2215 EST. W4 to WØ also around 1830 EST. W5 to

W9 and WØ after 2200 EST, finally W6 scattered to upper W7 after 2300.

June 5 Fair opening WØ to VE3 from 0950 to 1100 EST. W4 to VE3 around 1500 also reported. W7QLZ worked several 350-mile paths across the mountains into W6VES and W6AOR after 1800 EST. Good W5 to W1, W2, and W3 between 1640 and 2030 EST.

June 6—More all West Coast activity. W7HEA reports W6 1200 to 1230 EST. W5ELL to W6, W7, and VE7 from 1830 to 2000 EST. W7 to lower W7, XE1KE, W5 and some WØ from 1630 to 1930 EST. More W6 to upper W7 from 1930 to 2300 EST.

June 7 Scattered fair to good morning openings, particularly W5 to W3, W8, and W9 from 1030 to 1330 EST. W4EID reports W9 from 1050 to 1210 EST. W5HLD works into W6 and lower W7 from 1200 to 1400 EST.

June 8—W5 to W6 between 1150 and 1430 EST. W6 to lower W7 from 1430 to 1530 EST. Upper to lower W7 after 2100 and W5ELL to W6 after 2330 EST. W6 to upper W7 from 2030 to midnight EST.

June 9—Good W4 to W5 from 1050 to 1330 EST. W5 also work into W4 and W3 from 1900 until 2200 EST. W6 double-hop signals into W4 and W8 from 2130 until 2300 EST. W5ELL into W9 and WØ from 2200 until 2300 EST.

June 10—Upper W7 to W6 and lower W7 from 1945 until 2330 EST. W4EID works W5NPW at 2210 for only report east of Mississippi River.

June 11—Widely scattered openings throughout entire day. W4 to WØ after 1000 EST. W5 to W9 from 1230 to 1400 EST. W4 to W5 1530 to 1630 EST and again after 2200 EST. W1 to W9 scattered from 1850 to 1930 EST and W9 to XE2 around 1830 EST. W3 into VE1 during early evening and W9 into W4 from 1800 to 1845 EST. Upper W7 to W6 shortly after midnight EST.

June 12—Upper to lower W7 after 2200 EST. W5ELL/5 atop Sandina Crest about 10700 feet up works into lower W6 from 2230 until 2300 EST.

June 13—General overall opening in late afternoon and early evening. W5 into W1, W2, W3, W8, W9 and WØ from 1630 until 2000 EST. VE1 into W8, W9 and W5. W4 work into W9 and WØ. W7 into WØ and W9. No double-hop reported, although conditions were ideal.

June 14—XE1KE works W9NJT at 2005 EST. W9 also work into W5, VE1, VE2 and W1 from 2000 until 2230 EST. W5 work into W8 and western W2 and W3.

June 15—East-West paths very active between W9 and WØ to VE1, VE2, W1, W2, and W3 from 1940 to 2130 EST. W6IWS hears W7HEA at 2140 EST for only West Coast report. W8NQD works VE4CV at 2140 EST.

June 16—Band opened about 0900 EST with no activity over W4—W1, W2 and W3 paths. Only W4FNR reported by Ferrell between 1116 and 1130 EST as he works W8EP, W2BYM and W2RGV. W5ELL works into W9 2030 to 2330 EST and into W7 after 2145 EST. W5 work into W2, W3 and VE3 from 2000 to 2115 EST. W4 also heard in W3 after 2100.

June 17—Reports not completely tabulated—but appears to have been a dead day.

June 18—Reports incompleted, only W7QLZ hearing W7HEA at 2300 EST reported.

June 19—Lower W7 work into W5 from 1700 to 2200 EST. XE1 work into lower W6 from 1750 to 2000 EST. Signals fair to good though day was ionospherically unsettled.

June 20—Some early evening work from lower W7

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and western W5 into upper W7. Conditions still unsettled.

June 21—XE1 work into W5 (particularly W5JTI). Lower W7 work the upper W7 group and some W5s from 2140 until 2230 EST. Upper W7 work WØ after 2100 with scattered signals.

June 22—Short haul paths, or scattered rebound from W5ML into Texas from 1015 to 1245. XE2C, XE1QE, XE1KE, XE1FU, and W4HVV/XE1 work into W5 from 1315 to 1650 EST. XE1KE hears XE2C. W6 work into W5 from 2130 until 2300 EST.

June 23—W5 work good signals into W9 and WØ. Excellent signals from XE1 into W5, W7, W8, W9 and WØ from 1945 until 2200 EST.

June 24—Incomplete reports, but likely to be another dead day.

144-mc Notes

Up to the time of this writing there have been no really sensational 2-meter band openings. Conditions for the leaky duct type of propagation have been slightly above average for the season, although the weather has been unseasonable in many localities. The best East Coast opening was June 14 with stations working 450 to 500 miles. The opening lasted into the wee small hours. Of course, as might be expected, the limitation in the DX range was not the weather but antenna polarization. Verticals from W2 and W3 just couldn't reach the horizontals down in deep W4. Some W2 and W3 groups have become so disgusted that they are organizing expeditions into the W4 territory just for the purpose of working back into home territory.

XE1QE is looking for 2-meter DX using a Workshop antenna, VHF152A and an SX-28A. The frequency is 144.972 and the transmitter ends up with an 829B at 90 watts. XE1QE is one of those old-timers greatly interested in v-h-f work. He has held the calls MIJ and XIJ at various times

New at W9AB is a square corner reflector beam fashioned after the W8JLQ design modified from another W8, etc. It does work, though the reflectors are non-resonant in the usual sense of the word. They are 0.6 wave long and are made of aluminum #9 wire. The radiator is a folded dipole fed with straight 300-ohm lead. The horizontal pattern is rather broad with little back radiation. An outboard tripler is being built for 420 mc using 2C44 tubes.

W5NS is calling CQ 2 DX in four directions each evening with a 24-element beam, but to date has not been having too much luck. Additional reports from the 2-meter gang would be greatly appreciated. We're setting aside regularly space for 2 and higher, but the comparatively few reports make it difficult to give adequate coverage. And don't forget the 144-mc Honor Roll. How about working all districts on 2 as a starter?

CQ's DX CONTEST

(*from page 33*)

only. Sufficient logs will be sent in every case to enable the operator to keep duplicate sheets and save the necessity of recopying. If homemade logs are employed, they should be submitted in the form shown. All logs must be postmarked before midnight November 30, 1948. If specifically requested, an acknowledging postcard will be sent upon receipt of the log. Any logs received which are postmarked later than November 30, 1948, positively will not be considered.

Hamfests

W.A.R.C. Hamfest

Members of the Winnipeg Amateur Radio Club are going all out to make their hamfest the best ever. September 12 is the big day, the gathering place to be the St. Vital Fair grounds. Program will commence at 11 a.m. and will include sports, commercial exhibits, equipment contests, and special prizes for out-of-town visitors.

Eastern Canada Convention

The Eastern Canada A.R.R.L. Convention will be held at the Mount Royal Hotel, Montreal, on October 8 and 9, 1948. Advance registration, $5.00 for the OM, $3.50 for the XYL. Send registrations to Convention Committee, Montreal Amateur Radio Club, Box 1, Station "D," Montreal, Que., Canada.

Central Canada Exhibition—VE3CCE

The Ottawa Amateur Radio Transmitting Assn. will operate a station at the Central Canada Exhibition this year under the call VE3CCE. The station will be operated for six days, 23 to 28 August inclusive. A souvenir QSL will be mailed on request.

Southwestern Division Convention

The Southwestern Division Council of Radio Clubs is sponsoring the Annual Convention at Los Angeles on October 2 and 3, 1948. Hq. will be the Alexandria Hotel on Saturday, Oct. 2. On Sunday the Banquet will be held at Farber's Park View Manor. Tickets will be $5.50. Pre-registration prize for the XYL will be a frozen food locker; for the OM, the latest in a receiver. For hotel reservations, contact Larry Lake, W6RMV, 828 7th St., Santa Monica, Calif.

West Gulf Division Convention

The 18th Annual West Gulf Division Convention will be held in Houston, Texas, on August 20–21–22, at the Rice Hotel. Price $7.50, including banquet; $5 without the banquet for the main convention days Aug. 21–22. The extra day, Aug. 20, has a specially planned program and the day carries a tariff of $2. A first-line communications receiver will be given as a pre-registration prize. Convention chairman is W. Leo Havard, Houston Amateur Radio Club, Box 907, Houston, Texas.

Midwest Division Convention

The Midwest Division A.R.R.L. Convention will be held on October 16–17 at the Hotel Broadview in Wichita, Kans. For registration write Wichita Amateur Radio Club, Box 3, Wichita.

Oakland Radio Club Hamfest

The Oakland Radio Club, W6OT, is holding its annual hamfest on August 7. It will consist of a Feild Day at Camp Padre, Charles Lee Tilden Park, in the Oakland-Berkeley Hills, and a banquet in the evening at the Scottish Rite Temple on Lake Merritt, Oakland. Pre-registration prize will be a $200 receiver. Price of Field Day and banquet is $3.65 for adults, $1.75 for children. Tickets are available from club members, wholesale radio supply houses in Oakland and San Francisco, or from W6OLL E. W. Leach, 15808 Via Alamitos, San Lorenzo, Calif., or W6YMO, D. A. Wright, 63 Chelton Lane, Oakland 11.

PARTS AND PRODUCTS

(from page 58)

Variable Frequency Oscillator

Meissner Manufacturing Co. has announced a new and improved Signal Shifter available as a completely assembled unit or in kit form. The Signal Shifter is bandswitching for 80, 40, 20, 15, 11, and 10, and includes an additional blank strip should operation on any other band be contemplated. The blank strip is particularly recommended for bandspreading any portion of any of the other bands or for 6-mc coverage. High stability is achieved by using zero-temperature coefficient capacitors, turret-mounted inductors, VR power supply.

Only two controls are used, one to select band of operation and the other for frequency. Keying may be done in either the oscillator or amplifier. Tube lineup consists of a 6V6GT oscillator/doubler, 807 amplifier/doubler, OD3, OA3 and two 5Y3 rectifiers. Provision is included to use the signal shifter as a crystal controlled exciter at the flip of a switch. Also available is the Meissner phase modulator FMX. This permits the use of the Signal Shifter on NBFM. Using a 6SJ7, 6SG7, and OD3, input for high impedance crystal or dynamic mike is provided. Deviation control permits a swing of 5 to 10 kc on 28 mc. Full details on both instruments may be obtained from the Meissner Manufacturing Co., Mt. Carmel, Ill.

THE RADIO AMATEUR NEWCOMER

(from page 42)

signal remains constant, but the frequency varies according to the audio frequency, swinging higher and lower about a mean carrier frequency. The r-f output makes one excursion above and one below this mean frequency for each cycle of the audio-frequency modulation. The extent to which the frequency swings higher and lower from the mean frequency may be measured in kilocycles and is known as the deviation of the signal.

Frequency modulation was originally introduced for broadcast purposes with a deviation of about ±75 kc. Obviously such a wide deviation would be much too great for the crowded amateur bands, except, possibly, in the very-high-frequency region. In the 11-, 10-, and 6-meter bands, where FM is currently permitted to amateurs, such great deviation would be out of the question. For hams there has been introduced a system of narrow-band FM, which appears to have certain advantages of FM, yet requires no more of the spectrum than does an amplitude-modulated signal with its sidebands.

One great advantage of FM is seen from the receiving standpoint. Most noise picked up and amplified by a radio receiver is of an amplitude nature. FM receivers commonly incorporate detection means responsive to frequency change but insensitive to amplitude changes, and hence are immune to amplitude noise. An advantage from the transmitting standpoint lies in the economy of operation. No modulator power is required. A single receiving tube, supplying no more than a variation in its normal plate voltage and current, may modulate or deviate a transmitter of any power. Moreover, the final r-f stage may be operated with less excitation and at greater power input, since operation is essentially under c-w conditions. That is, the final r-f amplifier is not called upon to accept large amounts of power from a high-powered modulator tube or tubes, and hence need not have the reserve of excita-

tion and plate power dissipation necessary to accommodate this added power. For this reason, both average plate voltage and plate current to the final amplifier may be greater with FM than with AM, for a given tube or tubes.

One important feature remains the same as for AM. The mean operating frequency must remain constant and stable under modulation. For this reason a crystal oscillator is often employed, either modulated directly or locked to a variable-frequency oscillator which receives the modulation. An extremely stable variable-frequency oscillator may be frequency-modulated, however, and it is possible to build a simple one- or two-tube unit designed to frequency-modulate a commercially built variable-frequency oscillator.

From the standpoint of power output, FM is in much the same class as grid-bias modulation in that the peak power output cannot exceed that obtained with maximum plate input at maximum efficiency. With FM, however, the output remains constant. That is, the final amplifier always operates at maximum efficiency and maximum power input. In contrast, the plate-modulated r-f amplifier will swing to a peak power output of four times its average carrier output, and the average output under conditions of 100 per cent modulation will be equal to 150 per cent of the carrier output.

K2UN

(*from page 43*)

operating console is the HRO-7 receiver, a Panadaptor, transmitter remote controls, beam and antenna selector, and BC-221 frequency standard.

As an integral part of the transmitter, controls switches are provided to permit operation at quarter power to avoid unnecessary QRM when in QSO where a kilowatt is not required.

By its magnificent appearance and location at the U.N., the amateur radio station is commanding a tremendous amount of interest. By its performance it is daily making new and important friends for amateur radio. By proving to the United Nations and its 55 member nation representatives that amateur radio can be a vital force in world peace, ham radio is getting a boost of inestimable value. Every ham has his share in this station just as much as every citizen has his share in the United Nations. In its own way K2UN can mean as much to the future of amateur radio as the United Nations can to all mankind.

TVI CORRECTIVE MEASURES

(*from page 37*)

the practice of shorting turns to obtain less inductance. Inductances should be made of large wire (#8 to #14, depending on the power to be handled) and the length of the coil should approximately equal its diameter. It is better to have the coil shorter rather than longer as compared to diameter. Shields should be at least one coil diameter from the end or side of the coil. Supports should be of isolantite or similar low-loss insulation, and plug-in coils should have low contact resistance and, in no case, should the coils nor its terminals heat excessively.

Don't expect the first corrective measure to entirely eliminate your TVI troubles even though the field meter may show excellent attenuation. Some improvement may be noted at the TV set, but the meter should be used for obtaining the best adjust-

ment of *each* applied remedy and will indicate whether or not the measure is doing anything at all.

Remember, patience, time and persistence are required to produce the most favorable results. And remember too, it is the cumulative results that are important—the last few db attenuation may drop the TVI out of the picture.

BOOK REVIEWS

(*from page 42*)

a soldering iron and screwdriver. As the oscillator is being built the operation of condensers and transformers are studied in a plausible cause and effect manner. Subsequently, a "beat-note" receiver, an audio amplifier and a receiver for detecting modulated radio signals are built and studied.

In this fashion many of the intricacies of radio unfold and in a remarkably short space of time the beginner is running off an *EgIp* curve and apparently fully realizing the purpose it serves. Although no photographs appear in this book it is nevertheless profusely illustrated with scores of excellent drawings by Francis Mair. "An Approach to Radio" may be highly and safely recommended to those who are apt to tend towards the mechanical side of the art as well as those who want to find a logical and intelligent starting point in radio theory.

World-Radio Handbook for Listeners, published and edited by O. Lund Johansen, Lindorfsalle 1, Hellerup, Copernhagen, Denmark. 96 pages, 6½ by 8¼ inches. Obtainable from the American representative, Ben E. Wilbur, 80 S. Oraton Parkway, East Orange, N. J. Price $1.25. Two editions published per year.

International Broadcasting is far more complicated than we here in the United States have been led to suspect. This fact was brought to mind by this unusually complete and extensive handbook for broadcast and short-wave listeners.

Compiled by continent and country are the broadcast station call letters, locations, frequency, power, and hours of operation. Normal clock times from GMT, address and names of station personalities, network affiliations, usual program arrangements are listed. The interval signal, call sign announcement language and message to listeners is also given in detail.

With the aid of the common frequency list a foreign language short-wave station may be partially identified. But, with the "World-Radio Handbook" it is also possible to ascertain if the suspected station is on the air, what the program is most likely to be and when the next station announcement will be made. While this removes much of the guesswork and quite a little of the unknown from SWL DX-ing the Handbook should be invaluable to anyone tuning for short-wave foreign language broadcasts. Anyhow, we had often wondered what that interval signal was they played from "Radio Brazzaville." It is a "kisanzi," or just a bunch of iron pipes strung up inside a wooden box—almost exactly what it sounded like.

The Radio Amateur's Beam Pointer Guide, by John F. Rider, W2RID. Published by John F. Rider Publisher, Inc., 404 Fourth Ave., New York 16, N. Y. 30 pages, 8½ x 11. Price $1.00.

This is a 30-page book giving great circle bearings on the principle DX areas of the world centered on twenty-two different geographical centers throughout the world.

LETTERS

(*from page 8*)

Postage, packing and insurance (for up to four assorted tubes) is U.S. dollars 0.50

The present British Exchange Control Regulations require us to insist on cash with order, paid from a U.S. banking account, or by an International Money Order, or in cash transmitted direct from the U.S.A.

E. B. Powell, G2BQR Export Department
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THE U. S. N. R.

(*from page 43*)

Commission has assigned amateur calls of the USN and NR series with prefix "K" to the Electronic Warfare units on the air. Mobile radio stations will provide emergency communications for localities visited by hurricanes, blizzards or floods. In addition, Naval Reservists who are licensed by the Federal Communications Commission to operate their amateur radio stations may be assigned Navy call signs and authorized to operate on Navy assigned frequencies employing Navy procedure. These Amateur Reservists receive special certificates of authorization from the Commandants of their Districts, and a mounted crystal for the Navy frequency authorized.

The Naval Reserve Communication Network will include a comprehensive system of radio stations linking Naval Districts with Radio Washington within the Naval Reserve Network, and linking District reserve radio stations with training Centers, drill quarters and Electronic Warfare stations within the District.

The system has the following functions:

1. To handle Naval Reserve traffic originated by and addressed to Naval Reserve activities, and kept wholly within the Naval Reserve Network (Navy frequencies).
2. To carry Naval Reserve Drill traffic, designed to serve the purposes of operational training in communications.
3. To provide a medium for radio competition and for evaluating the effectiveness of training of the various reserve communication groups.
4. To tie in with amateur radio emergency nets and to assist and facilitate these in the event of disasters.
5. To serve as an alternate to the Naval Communication System in event of extensive casualty to any NCS facility.
6. To provide equipment in operating condition to help meet the needs of Naval Communication System in the event of emergency.

The maintenance of a large Electronic Warfare Component in the Naval Reserve is necessary because of the vast amount of electronic equipment employed in the modern naval vessel. Therefore, the need of well trained operations and technicians is great since reliable Communications and Intelligence are so vital to the Navy.

If you desire to participate or help in the Electronic Warfare Program, it is suggested that you visit the Naval Reserve office in your community.

In the event that none presently exists in your area write to the Commandant of the Naval District in which you live.

The following is a list of Naval Districts, commandants' addresses and the areas which they cover:

1ND—495 Summer Street Boston, Mass.	Maine, New Hampshire, Vermont, Massachusetts, Rhode Island
3ND—90 Church Street New York City	New York, Connecticut, Northern New Jersey
4ND—Navy Yard Philadelphia, Pa.	Southern New Jersey, Delaware, Pennsylvania
5ND—Naval Operating Base Norfolk, Va.	Maryland, Virginia, West Virginia, Washington, D. C.
6ND—Naval Base Charleston, S. C.	North Carolina, South Carolina, Georgia
7ND—Naval Air Station Jacksonville, Fla.	Florida
8ND—New Federal Building New Orleans, La.	Western Florida, Tennessee, Alabama, Mississippi, Louisianna, Arkansas, Oklahoma, Texas
9ND—Naval Training Center Great Lakes, Ill.	Kentucky, Ohio, Indiana, Michigan, Illinois, Missouri, Nebraska, Kansas, Iowa, Minnesota, North Dakota, South Dakota, Wisconsin
11ND—Naval Operating Base San Diego, Calif.	New Mexico, Arizona, Southern California
12ND—Civic Center San Francisco, Calif.	Northern California, Nevada' Utah, Colorado
13ND—Naval Station Seattle, Washington	Washington, Oregon, Montana, Idaho, Wyoming

CONVERTER FOR 75 & 10

(*from page 31*)

Two stages of voltage amplification, comprising the 7B7 and the first half of the 7F7, are used in the preamplifier. The third stage uses the second half of the 7F7 as a cathode follower, to permit coupling the output into a line and into the a-l-c rectifier without distortion. With this output circuit, any load impedance from a few thousand ohms to infinity may be used. Direct coupling is used between the two halves of the 7F7, since it saves a grid resistor and grid coupling capacitor.

The a-l-c circuit is a little unusual, mainly because of the characteristics of the 1N34-1 rectifier used. The resistance of this unit is somewhat less than a megohm in the nonconducting direction, rather than the hundreds of megohms of a tube rectifier. In operation, the full output of the cathode follower is coupled to the 1N34-1 through *C2*. Positive delay bias, to prevent gain-reducing bias for the 7B7 from being produced at low audio levels, when full gain is needed, appears across *R13* and is applied to the 1N34 through *R12*. Adjustment of *R13* permits setting the output voltage level at the desired point. With 7 volts across *R13*, the maximum audio output voltage is 8 to 10 volts.

Since reverse leakage through 1N34-1 tends to apply the full positive delay bias across C5, and through *R1* to the control grid of the 7B7, a second rectifier, 1N34-2, is connected across *C5* and so poled that it prevents positive voltage from appearing at this point. Some negative bias appears on the grid of the 7B7 as a result of initial velocity, even when none is produced by the a-l-c rectifier.

(Note: 1N34-2 was added after photo for *Fig. 4* was taken, and thus is not shown thereon.)

To be effective, an a-l-c circuit should be capable of reducing the gain rapidly when it is too high, and then permit the gain to build up much more slowly. In this circuit, this condition is obtained by charging *C5* through the low forward resistance of the 1N34-1, and discharging it through its much higher back resistance and the back resistance of 1N34-2. No discharging resistor is connected across *C5* as in conventional circuits, since the back resistance of the 1N34s could be considerably higher without producing too long a time constant. In fact, if one of the higher back-resistance crystals, such as the 1N38, is available its use is suggested to increase the time constant.

The interstage coupling capacitor, *C3*, and the a-l-c coupling capacitor, *C2*, are purposely made small in order to permit reasonably fast action of the a.l.c without motorboating. They are still large enough to provide good response down to 100 cycles.

When adjusting this a-l-c preamplifier, as with any a.l.c., the gain should be so set that very little a-l-c action takes place under normal conditions. The chief function of the a.l.c. is to prevent overmodulation in case someone accidentally talks too close to the microphone or too loudly. If the gain were set appreciably higher than required for full modulation under normal conditions, overmodulation still would not occur but background noise would rise excessively during pauses.

Control Circuit

The control circuit included in the unit consists of the push-to-talk relay, *K1*, the function switch, *S1*, and associated circuits.

Heater power is brought to the blade of *S1B*, which, in addition to its off position, has positions for applying voltage to the converter heaters only, for listening, or to them and the transmitter heaters as well.

Plate power is obtained from the associated broadcast receiver. It is disconnected from the broadcast circuits internally, and applied to the blade of the relay, *K1A*. In the unenergized position of this relay, voltage is fed back to the broadcast circuits through its back contact, which also applies it to *S1A* for the converter plates. With *K1* in the energized, or transmit position, plate voltage is removed both from the broadcast circuits and the converter, and instead applied to the preamplifier, and through external connections to the audio and r-f driver circuits of the transmitter.

A fourth position on *S1*, labeled "FREQ. CHECK," is included to permit energizing the converter and the transmitter driver circuits simultaneously. This is done by adjusting the stop on the switch, which must be of the shorting type, until position 4 is actually 3½, in which case contacts 3 and 4 of *S1A* are bridged. Plate voltage is then applied to the receiving circuits through contact 3, and to the transmitter driver circuits through contact 4. This feature permits checking the transmitter tuning

Classified Ads

Advertising in this section must pertain to amateur radio activities. Rates: 25c per word per insertion for commercial advertisements. 5c per word for non-commercial advertisements by bona fide amateurs. Remittance in full must accompany copy. No agency or term or cash discounts allowed. No display or special typographical ad setups allowed. "CQ" does not guarantee any product or service advertised in the Classified Section. Closing date for ads is the 25th of the 2nd month preceding publication date.

BEAM CONTROL CABLE. New material. 2 No. 16; 6 No. 20 rubber insulated, coded, tinned conductors. Weatherproof rubber jacket. Heavy armor shield ½" diameter. Price 10c foot. f.o.b. Chicago. Trans-World Radio-Television Corp., 6639 S. Aberdeen Street, Chicago 21, Illinois.

QSLs QUALITY CARDS priced right. Samples. W9UTL, 1768 Fruitdale, Indianapolis, Ind.

VESTO self-supporting steel towers. No guys. Easily erected. Every ham can afford. Write The Vesto Company, Parkville, Mo.

QSLs. Samples for stamp. Henry L. Carter, Jr., W2RSW, 747 S. Plymouth, Rochester 8, N. Y.

AMATEUR RADIO LICENSES. Complete theory preparation for passing amateur radio examinations. Home study and resident courses. American Radio Institute, 101 West 63rd Street, New York City.

SELL PERFECT TEMCO 500GA commercial kilowatt, complete for all-band operation, phone or c.w.: $1000. No lower offers please. Reason: Marriage. W3ILD, 4912 Quebec N. W., Washington 16, D. C.

RADIO CLUBS—ATTENTION. For the purpose of compiling an up-to-date mailing list of active radio clubs in the U.S., have your club secretary inform theCirculation Department of your local club's address. Send to: CQ-Radio Magazines, Inc., 342 Madison Ave., New York 17.

10-METER 3-ELEMENT BEAMS—$19.50. Send card for free information. Riverside Tool Co., Box 87, Riverside, Illinois.

HAS YOUR CLUB SECRETARY been informed of the Special Ham Club group rate offer? If not, have him write for information to: Circulation Manager, CQ-Radio Magazines, Inc., 342 Madison Ave., New York 17, N. Y.

QSL's, SWL's. Made the way you want them. Samples? W9BHV QSL Factory, 857 Burlington, Frankfort, Indiana.

ARR5 RECEIVER, converted 110 v.a.c. P.P. 6V6 audio stage added. New, excellent condition. 8" Utah P.M. speaker. $95.00. W6VWA, 10306 Otis St., So. Gate, Calif.

FOR SALE: BC-610-E, 10 to 80 meters, purchased brand new. $650.00. W2SOV, 49 Belshaw Ave., Eatontown,N.J.

IN STOCK: New and used Collins, National, Hallicrafters, Hammarlund, RME, Millen, Sonar, Meck, other receivers, transmitters, etc. Lowest prices. Best terms. Reconditioned S22R $49.00, S53 $59.00, S40 $59.00, S40A $69.00, HQ129X $129.00, SPC400X $249.00, NC80X $39.00, NC57 $69.00, HR05T $119.00, NC240D $149.00, DM36 $29.00, DB22A $49.00, HF-10-20 $59.00, VHF152A $69.00, S20R, S39, SX16, S47, SX24, SX25, SX32, SX28, SX28A, NC173, NC183, HR07, RME45, HT6, HT9, BC-610s, Tech-Rad T350TM, other receivers, transmitters, etc. Shipped on trial. Write for free list. Henry Radio, Butler, Mo.

PRECISION, LOW DRIFT, mounted crystals, 80 to 20 meters, ± 5 kilocycles, $1.00. Exact frequency $1.50. Specify mounting. Breon Laboratories, Williamsport, Penna.

SELL: BC-348Q receiver, converted in CQ shop according to article in April '48 issue, including a-c power supply, complete ready to operate. $55 F.O.B. New York. W2OOH, c/o CQ, 342 Madison Ave., New York, 17 N.Y.

FOR SALE: HRO, complete with #697 power supply and National speaker, 7 coil sets (4 bandspread, 2 broadcast, 1 long-wave) $160. W2ESO, Gene Black, 449 W. 56 St., NYC 19, or phone PLaza 7-8343.

CHOICE PARTS and equipment. Send for list. W1CPI, Wakefield, Rhode Island

FOR SALE: Hallicrafters SX-43. Used less than 2 weeks. Complete with matched speaker R-44, $155. C. Kunz, 324-92nd St., Brooklyn 9, N. Y.

THE FOLLOWING CRYSTALS and two D104 mikes, less cords, for sale as a whole, $75.00. Bliley: 3996, 3884.5, 3914, 1928.5, 7124, 3921, 3510, 7105, 3931, 1739.5, 1977.5, 1803, 7091, 1842, 1810, 3960, 3984, 1860, 3976, 1990, 3564, 3903, 3511.5, 3909.5, 3905, 1890, 3746.5, 3821, 7458, 7438, 1711.9. Valpey: 7243, 3868, 7103, 3980, 3980. DX—3998.6. W1ZE, Mattapoisett, Mass.

HT-9 Xmitter—$275. New condition. Complete with xtals and coils for 10 meters. Instructions included. Rudy Comtois, 417 Chestnut St., Lynn, Mass.

500 WATT CW, 300 watt phone transmitter. Separate power supplies each stage, 20 watt speech amplifier, coils all bands. Contained in two 42" cabinet racks. Getting married. Take it away for $375. W2HVR.

QSLs? SWLs? Made-to-order! Samples 10c. Sackers, W8DED, Holland, Mich.

FOR SALE-HT-18 VFO, Used about one hour, perfect condition, $90. Got mobile bug. Will answer all letters. King, W9DFQ, 805 W. Pecan St., Carbondale, Ill.

CQ RADIO MAGAZINES—Oct. 1945 to June 1948 for sale, or trade for anything useful in radio servicing. W9KHF, 912 West 151st, East Chicago, Indiana.

WANTED: TELETYPE 1/40th HP synchronous motor. W6ITH, Moraga, Calif.

BARGAINS—NEW AND USED TRANSMITTERS—receivers—parts. New 150 watt phone $199.00; 60 watt phone $99.00; signal shifter $39.00; Abbott TR-4 $29.50; NC-173, SX-28, HRO Senior, HQ-129X $149.00 ea. RME-45, SX-25 $99.50 ea.; NC-81X, S-40 $65.00 ea.; S-20R, S-15 $49.00 ea.; NC-45 $42.00; S-38 $35.00; many others. Large stocks—trade-ins. Shipped on approval. Terms financed by Leo WØGFQ. Write for bargains and best deal to World Radio Labs, Council Bluffs, Iowa.

STANCOR 60P complete for ten. Needs little work on modulator. Also S-38 like new. First reasonable offer takes either or both. Wm. J. Kiewel, Crookston, Minn.

SALE COLLINS 32V-1 transmitter, slightly used, $400. John Ditmer, Mechanicsburg, RFD 1, Pa.

SELLING OUT: Table rack 350 watt xmitter with NBFM exciter, S40 rcvr with S meter and 2 meter super attached. Abbott TR4 with ac and 6 volt dc supplies—mikes and spare parts. Offer over $325—W1KLN.

COMPLETE STATION FOR SALE, going overseas soon. ART-13 transmitter, 110v supply. BC-348 converted for 100 v, limiter, phasing control, 8" speaker. Mike, bug, bushel parts. Sacrifice $150. Lt. Gould, VMFN114, MCAS, Cherry Point, N. C.

GENUINE ARC-5 EQUIPMENT, 2,000 piece hardware assortment $1.25. IFS 1415 and 2830 kc, 3 for $1.00. 10 assorted micas $1.00. 15 assorted ceramicons $1.00. PE 103 dynamotor starting relays $1.25. Shipped postpaid. Powell, W2PLH, 68 Lyall Road, Clifton, N. J.

FOR SALE: COMPLETE 800 watt transmitter VT-127-A's final; vfo, 6V6, 807, 813 exciter; Class B 838's modulators and 5 meters. Metal rack and panel. 75, 20, 10 meters. 2 element 10 and 20 meter beam, complete with rotating mechanism and Selsyns. RCA Voltohmist. Webster 79 foundation unit and amplifier. Converted SCR-522. TVY-4. Will sell separately or all for $650.00. Morris Winn, W9ACW, 755 Oak St., Huntington, Ind.

COLORTONE QSLs are outstanding! Reasonable! See for yourself! Colortone Press, Tupelo, Miss.

point on the converter, either to check the converter calibration against the transmitter, or if the transmitter is v.f.o. to set it to zero beat with an incoming signal.

Some idea of the construction of the enclosing case may be obtained from the photographs. All parts are constructed from 1/16" aluminum alloy, the two ends being formed around hardwood blocks cut to size and the chassis and wrap-around formed by clamping between heavy steel bars with a vise and C clamps, and pounding with a hardwood block. The rear end is made smaller than the front, so that the three-sided wrap-around and flat cover slip inside the flange of the front but fit outside the rear. Chrome-plated self-tapping screws are used for assembly.

Over-all outside dimensions not including protuberances, are: Height, 3 7/8"; width, 6 7/8"; depth, 8¼".

Installation

No installation details for this unit can be given because of the extreme variation in the construction of various automobiles and in the mounting space and facilities available. One suggestion is to mount a section of aluminum angle across the top of the converter in such a position that it will hook under the bottom edge of the dash. The converter can then be held forward against the dash by means of an adjustable bracket or turn buckle between the rear of the converter and the bulkhead or front edge of the floor board. In order to obtain satisfactory reception on 75 meters it is necessary to use as long an antenna as possible and to connect it to the converter by means of low capacity transmission line. RG-11/U or other 72-ohm cable is suggested because it has appreciably less capacity per unit length than 52-ohm cable. 72-ohm cable will probably result in slightly higher standing waves on 10 meters but the difference is negligible and the lower capacity is a big improvement on 75 as well as on the broadcast band.

SCRATCHI

(*from page 10*)

sample of cactus juice before going up pole. Hacksaw in hand I are managing to saw off most of the ends before a parasitic are developing in my stomach. Not seeming too serious I decide to go ahead, and I have just begun to cut the last can off a director when blooey—it happens. Beer can starts acting like frustrated rattlesnake, big arcs weld hacksaw blade on can and first things I am knowing Scratchi is sailing through space.

I must have passed out before hitting the ground, as everyone telling me I making three hundred point landing in cactus patch. Next thing I know I wake up to find Hon. Doctor sweeping cactus needles off floor where he are dropping them after removing from Hon. Hide. It is then that I are finding out that when trying to turn off filaments on half-kilowhats rig the plate switch is accidentally thrown.

Scratchi are feeling better now especially as neerby ham are dropping in and leaving me nice present because beam is now loading up like million bux. He are bringing me a nice bunch of potted cactuses.

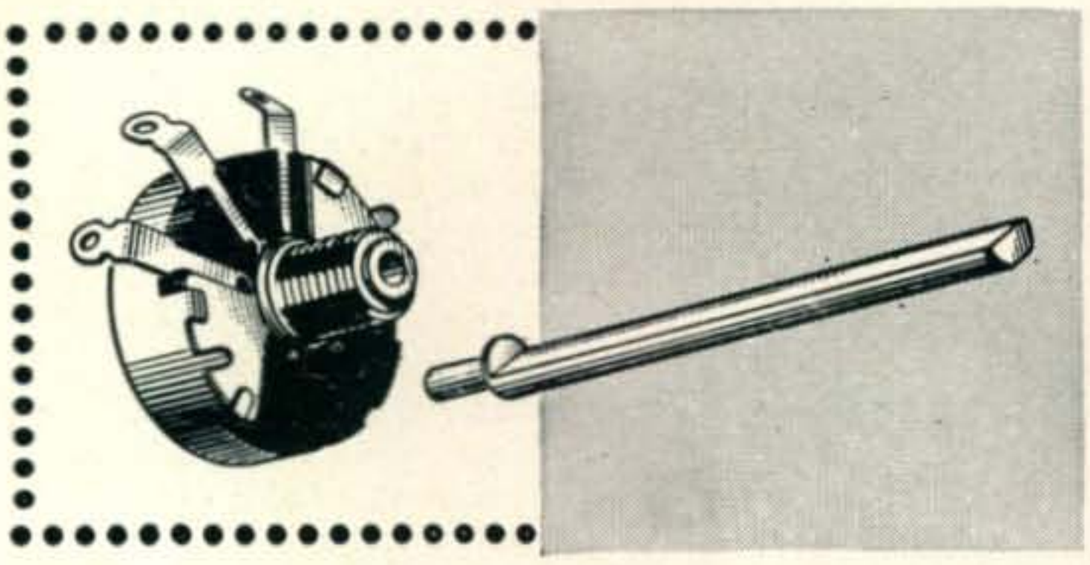
Respectively yours,
Hashafisti Scratchi

For *Instant* Positioning Easy Calibration

IRC CONTROLS with DOUBLE-FLATTED, TAP-IN SHAFTS

Remember the last control you installed in your rig—the tedious filing, tinkering with shaft inserts, tiresome "build-up"? With IRC *double-flatted* tap-in control shafts you avoid all that bother.

With the *double-flatted* shaft you can position for either set screw or push-on type knobs—match knob pointers with dial scale—quickly, easily, accurately the first time. Just insert shaft, calibrate, cut to proper length, and install knob. The whole operation takes just a few moments.



Every standard IRC tap-in control is equipped with the *double-flatted* shaft. And 12 special tap-in shafts provide adaptability for every rig requirement. Specify IRC next time you order controls for your rig. Only IRC offers the *double-flatted* standard shaft for instant positioning and easy calibration. See your distributor—or if more information is desired, write us direct.

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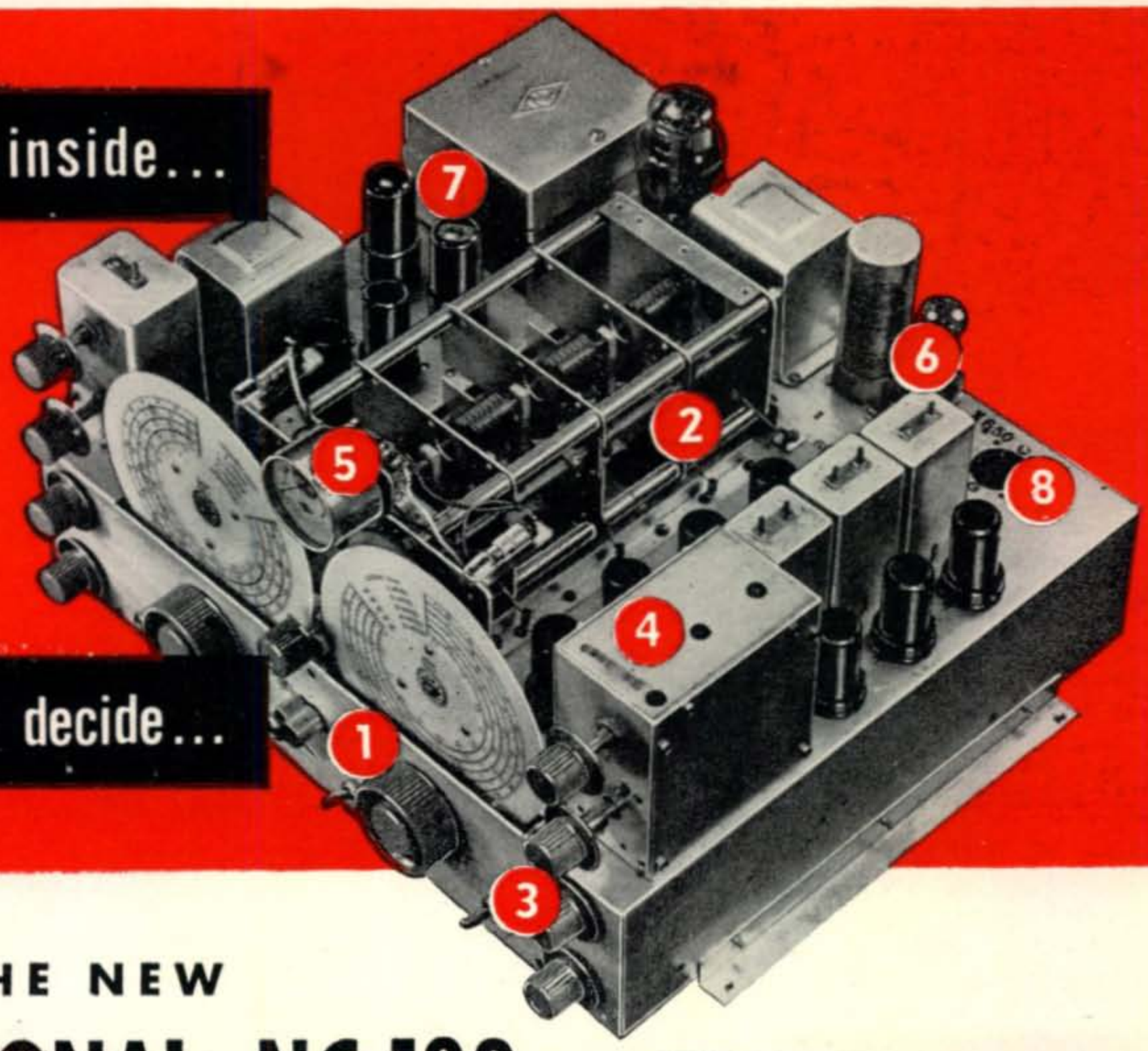

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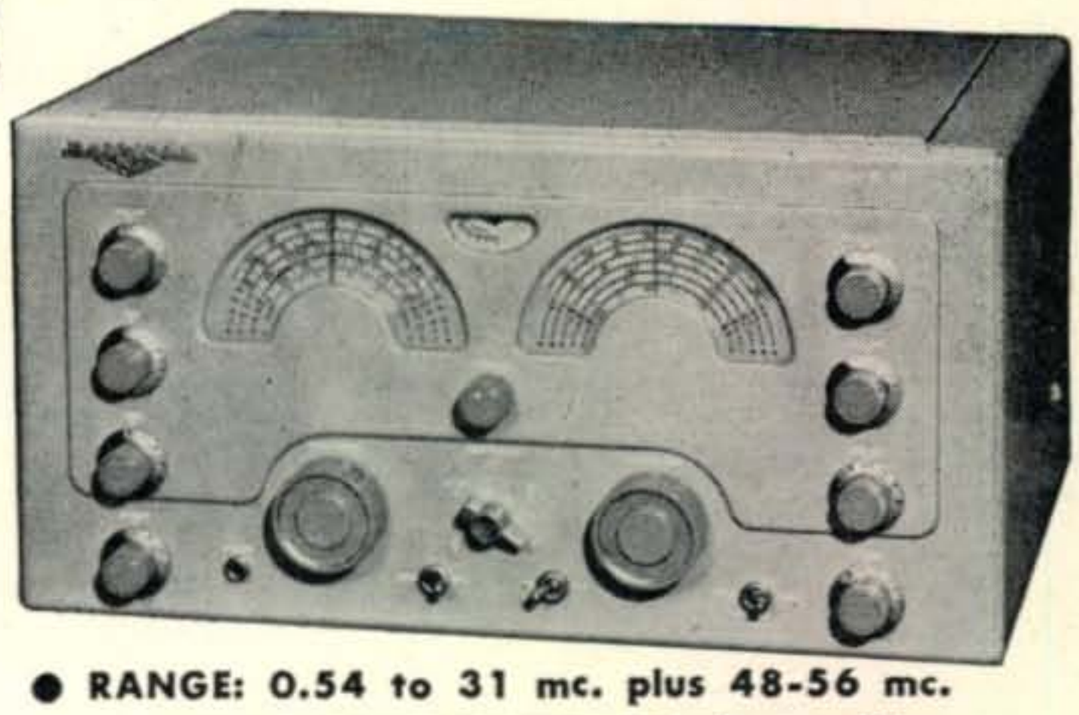

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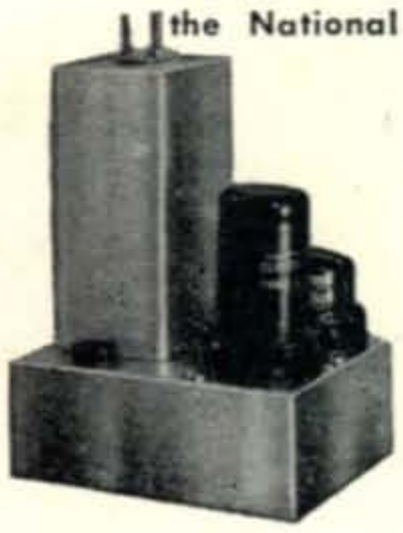

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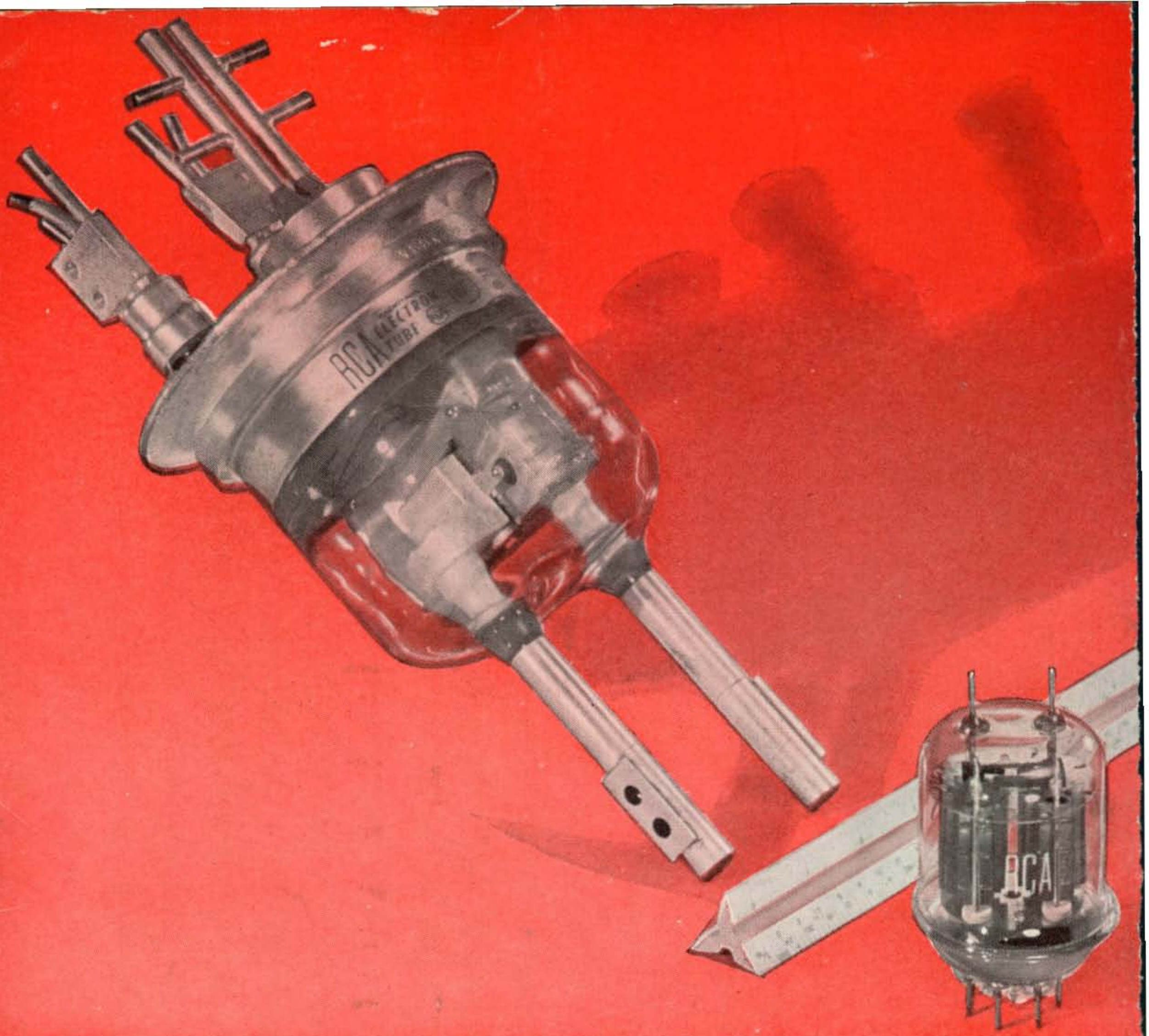

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