CQ

JULY, 1949

The Radio Amateurs' Journal

35¢

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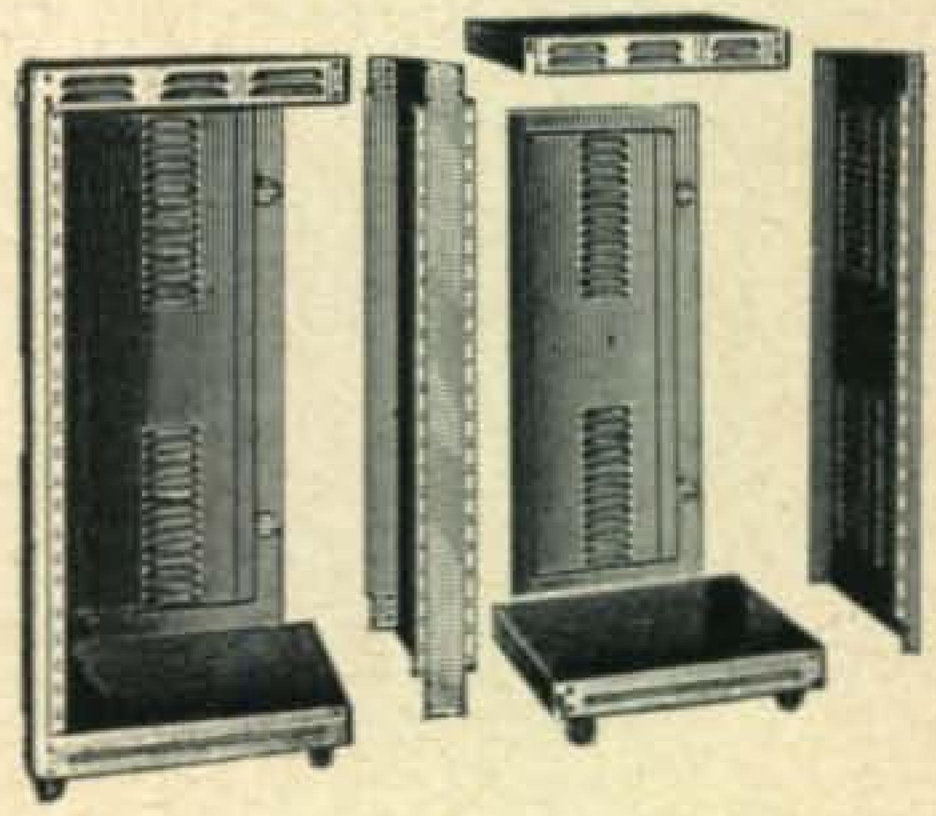

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CR-1779	two coupled relay racks same size as CR-1774	Dealer Cost	$54.75
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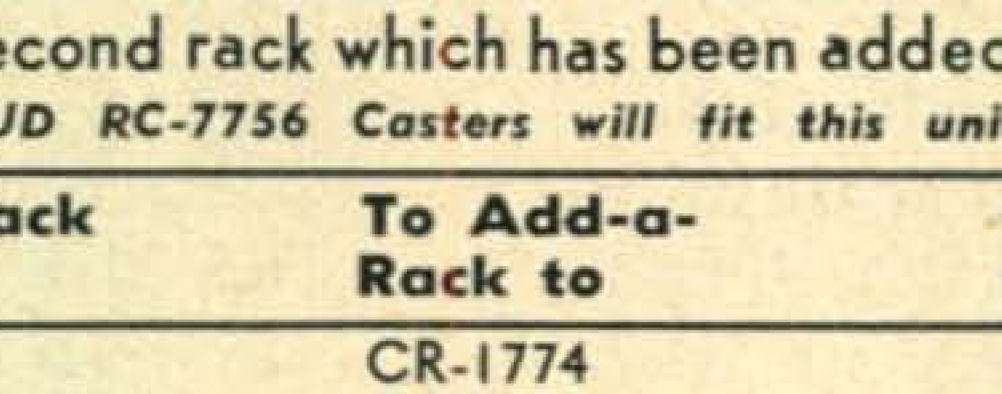

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Vol. 5 JULY, 1949 No. 7

In This Issue

COVER— After this we won't have to run any more tower pictures on the cover, because this one will be hard to top. The daring photographer took this shot looking down when the tower was slightly under 500′ tall. It'll stop at 760′. What's the station's call? WOR-TV . . . and aside from making a lot of hams jealous, it is indicative of the trend toward improved TV coverage which will aid the overall TVI problem. The 760-foot tower is located on a high point of the Palisades, right in the town of North Bergen. Keep this issue around for the next time someone objects to your 35 footer.

★ ★ Letters ★ ★

FCC Proposed Regulations

Gate City Highway, Kingsport, Tenn.

Editor, *CQ*:

I congratulate you for your editorial in the June issue of *CQ*. It very nearly expresses the consensus of our Kingsport Amateur Radio Club. . .

Jim Welch, W4CBU

P. O. Box 82, Warner Robins, Ga.

Editor, *CQ*:

I read "Zero Bias" in your June issue and I agree with you nearly 100%.

Making the class A hams pass a 20 wpm code test is the most unreasonable proposal I have heard of. I do agree with the 5 wpm code test for a class C ticket, provided that such operators are not allowed to use the 7-7.3 mc band at all, and no phone below 50 mc.

George R. Keenes, W4NHS

P. O. Box 188, New Haven, W. Va.

Editor, *CQ*:

A week ago I was mailed a copy of the FCC proposed changes in Amateur Service Regulations. I favored these changes as soon as I read them, and I still do.

. . . I do not think 20 wpm code test is so bad. In fact, it is much too easy . . . Of course, quite a few of the class A hams are good on phone operation but not so much on the code. As long as phone operation is allowed, I think that will be the situation.

William J. Parker, W8OIC

1615 N. Genesee, Hollywood 46, Calif.

Editor, *CQ*:

I have just read your June editorial and I think your ideas are quite good, but I would like to suggest one more "minor" modification. That is for the novice to confine his operation to the little used high portion of the 10-meter band, say from 29.5 to 29.7.

Jerome Waldref, W6DMJ

745 Fifth Ave., New York 22, N. Y.

Editor, *CQ*:

Concerning the proposed FCC regulations relative to relicensing, let me say that I believe them to be poorly conceived and unjustifiiably harsh.

. . . Many of us have given a great deal to amateur radio throughout the years in research, disaster emergencies and wartime nets . . . All of us have established a large circle of friends in these Class A bands. Should we now be deprived of a part of the hobby we most enjoy? I consider such a proposal definitely out of line with true American principles. In fact, I consider it confiscatory in that it will make useless to us much of the equipment which we have invested in.

I have been practicing dentistry for twenty years and I was licensed to practice when I left college. I had to take a stiff theoretical examination to get the license, but I can truthfully sav that I know more about dentistry todav than I did when I left school. However, I would hate to have to pass a full State Board examination todav. I personally have had so much code experience that passing another code test would be no great problem to me.

(Continued on page 58)

How to Make Friends

and keep them!

Many a beautiful friendship has been lost to a handful of kilocycles! More and more . . . under crowded present day band conditions . . . amateurs are learning IT PAYS TO STAY PUT . . . with PR Precision CRYSTAL CONTROLS. Yes, PRs pay off . . . with stable, trouble-free operation on spot frequencies . . . where you can make friends and keep them. Whether you operate phone or CW, or both, you will appreciate the fine dependability, high output, economical operation and hair-line accuracy of PR Crystals. They're UNCONDITIONALLY GUARANTEED, and your Jobber can supply you with the EXACT FREQUENCY YOU WANT (Integral kilocycle) WITHIN THE AMATEUR BANDS AT NO EXTRA COST, NO PREMIUM. Insist on genuine PRs!—Petersen Radio Company, Inc., 2800 W. Broadway, Council Bluffs, Iowa. (Telephone 2760)

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10 METERS PR Type Z-5.	Harmonic oscillator. Ideal for "straight through" mobile operation. High activity. Heavy drive without damage in our special circuit $5.00
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Feenix, Ariz

Deer Hon. Ed:

Sumtimes I think I are being born under illfate star. If it isn't one thing it's two things that ar happening to poor Scratchi. Take like times las week that I are visiting amateur friend in Lo Angeles. He are having super-dooper layout o penthouse of big apartments building. One room ar all one big ham shack, with cupple couches an many easy chairs.

When I are arriving he are putting finishin touches on new rig he are having built. Wow! bu it are some classy. It are having more meters tha antenna for 160. From looks of front panel perso are needing engineering degree to tuning it.

That evening we are deciding to put it on th air and see what it can doing. By pushing button here and other buttons there and watching colore lights popping off and on finally all meters are in dicating we are on the air. One snappy CQ ar reely producing results, and in no time we are hav ing cupple nice QSO's. We are about to go afte some hots DX when building sooperintendent ar coming in and breaking bad news. Yes, Hon. Ed. you are guessing it—TVI.

Scratchi's friend are taking this kinda hard, bu I are telling him not to worrying, he are talking t expert on all kinds TVI. So, next cupple days w are working like furies. We are making straigh wiring crooked and crooked wiring straight. We ar putting in more shielding. Next are bypassing al leads where they coming out of each chassis. Eve bypassing power leads. I are all for bypassin antenna leads to ground, but are getting talked ou of it. We are checking each stage and installin traps. We are readig up on TVI cures in Hon Ed's TVI Handbook and putting everything in tha anyone are ever mentioning. In fact, are doin everything except going on signle-sideband.

That night are calling up sooperintendent as h are having TV receiver and are going to chec signals. Amateur friend are going down to sooper apartment, and I are running rig. First channel— no interference. Next channel—no interference. Ho diggedity!! Third channel—still nothing. Nex channel—oh, oh, nothing but interference. In fac nothing but Scratchi, all over place. Further check show everything swell except that one channel Friend are coming up and saying he are not under standing it. So, I are going down to see how ba interference is. Hokendoke. I are not finding an trubbles at all. Same channel as before, but progran coming in like peachy.

I are rushing up to rig and friend rushing dow to check good news. Sacremento Boulevard, wha are happening—interference are there with ven geance. Amateur friend are coming back up an we are getting into conference. This are impossible Even 1/c expert like Scratchi are mistified. Her

(Continued on page 68

ZERO BIAS

EDITORIAL

Clinton B. DeSoto

1912-1949

WHEN the future historians of amateur radio prepare to define and trace its meteoric rise, its gigantic strides from the raucous spark of yesterday to today's operation under "impossible conditions," they will find their work up to 1936 already completed. Amateur radio's history was compiled by a lifelong amateur, licensed for 23 of his 37 years, who had, also, the vision to forecast with extraordinary accuracy the course his beloved hobby would surely take. And at a time in our history when such vision is needed more than ever before, death has claimed this great amateur, Clinton B. DeSoto, W2IU, ex-W1CBD, ex-W9KL.

Everyone knew Clint, although not a great many amateurs had worked him on the air. He was the scholar, the counselor, the experimenter—above all his pen spoke eloquently about hams and for hams. When still a schoolboy he started his monumental work "200 Meters and Down." And while in his teens, in 1930, he joined the staff at ARRL Headquarters, having won recognition already for his then uncompleted work. As an assistant secretary first, and then as assistant editor of *QST*, by 1942 he was already well known to hams everywhere through his League activities, his field trips to hamfests and clubs in every state in the country, and especially through his limitless writing on every facet of ham radio, including a second book, "Calling CQ." He became executive editor of *QST* in 1943 and editor in 1944.

In 1946 Clinton assumed the duties of technical editor of The Institute of Radio Engineers, following an enforced rest due to overwork, and continued in the professional field the high standards he had upheld in amateur radio.

Born in Ogilvie, Minn., in 1912, Clint attended the University of Wisconsin School of Journalism. Licensed first in 1926, he was thereafter continuously active on behalf of amateur radio.

As titular and working head of the only publication devoted solely to amateur radio during the war, Clinton DeSoto for several years accomplished the work of practically an entire editorial staff, most of *QST*'s staff having gone off to war and to industry. With only a handful of assistants, most of them totally unfamiliar with editorial problems, the supreme effort of this one amateur did much to keep the hobby alive during the war years, and to increase the contribution of ham radio to the war effort.

We fellow amateurs, especially those in the editorial field, cannot help feel that most amateurs do not have full appreciation for his work. At the sacrifice of his own health, Clinton DeSoto made possible, to a very great extent, the continuous publication of *QST*, the "Handbook" and other publications which not only kept amateur radio alive, but which gave ARRL revenue to stay in existence, to plan for the future. ARRL might easily have foundered during the war years with inadequate staff or income; it might have survived only to have faced the postwar period completely unprepared for the tasks that lay before it. That ARRL emerged from the war period a vigorous organization will always be a tribute to Clinton B. DeSoto, W2IU.

Fig. 1. W6UYH inspects a vertically polarized temporary test installation of the 40 to 500-mc discone.

JOSEPH M. BOYER, W6UYH, ex-W8PVL*

A single efficient antenna for operation on any frequency from 40 to 500 mc that requires no tuning stubs or matching transformers, has an s.w.r. under 2:1 and provides gain over a dipole throughout its spectrum.

Discone—40 to 500 Mc Skywire!

ONE ANTENNA CAPABLE of highly efficient performance from six to three-quarter meters—period! No tuning stubs or matching transformers needed. Voltage standing wave ratio in the transmission line under 2:1 over the entire stretch of r.f. territory quoted. Once up you can forget it, come gale or high water. That, ham brethren, is the discone.

The writer decided upon the discone for v.h.f. work when the XYL made it clear she didn't want the brand new QTH looking like a radar development laboratory. Now visiting hams say, "Yeah, that's a nice ultra-modernistic weathervane up there but where's the skywire?" A few minutes of listening on 2 meters, however, with the OM using a coaxial switch to cut from a well matched ground plane antenna to the "weather vane" and they climb up on the roof for a closer look.

While not too familiar to the ham fraternity,[1] the discone was developed and used during World War II. Some designs now in the patent files of this and other countries show some similarity in theory of operation and appearance to the discone, but the exact configuration of top disk and cone is the brain child of Armig G. Kandonian.[2]

The discone consists of a metal cone which is a continuation of the shield of a coaxial cable, and a top disk which is connected to the inner conductor of the same coaxial line. The slant height of the cone (shown in *Fig. 2* as dimension *d*) is equal to an electrical quarter wavelength at the lowest frequency for which operation is desired. The flare angle at the apex of the cone has a first order effect upon the input impedance of the discone antenna. The exact diameter of the top disk is only critical if the discone is to be operated over the first few megacycles of its low frequency design point; otherwise its effect upon input impedance is secondary.

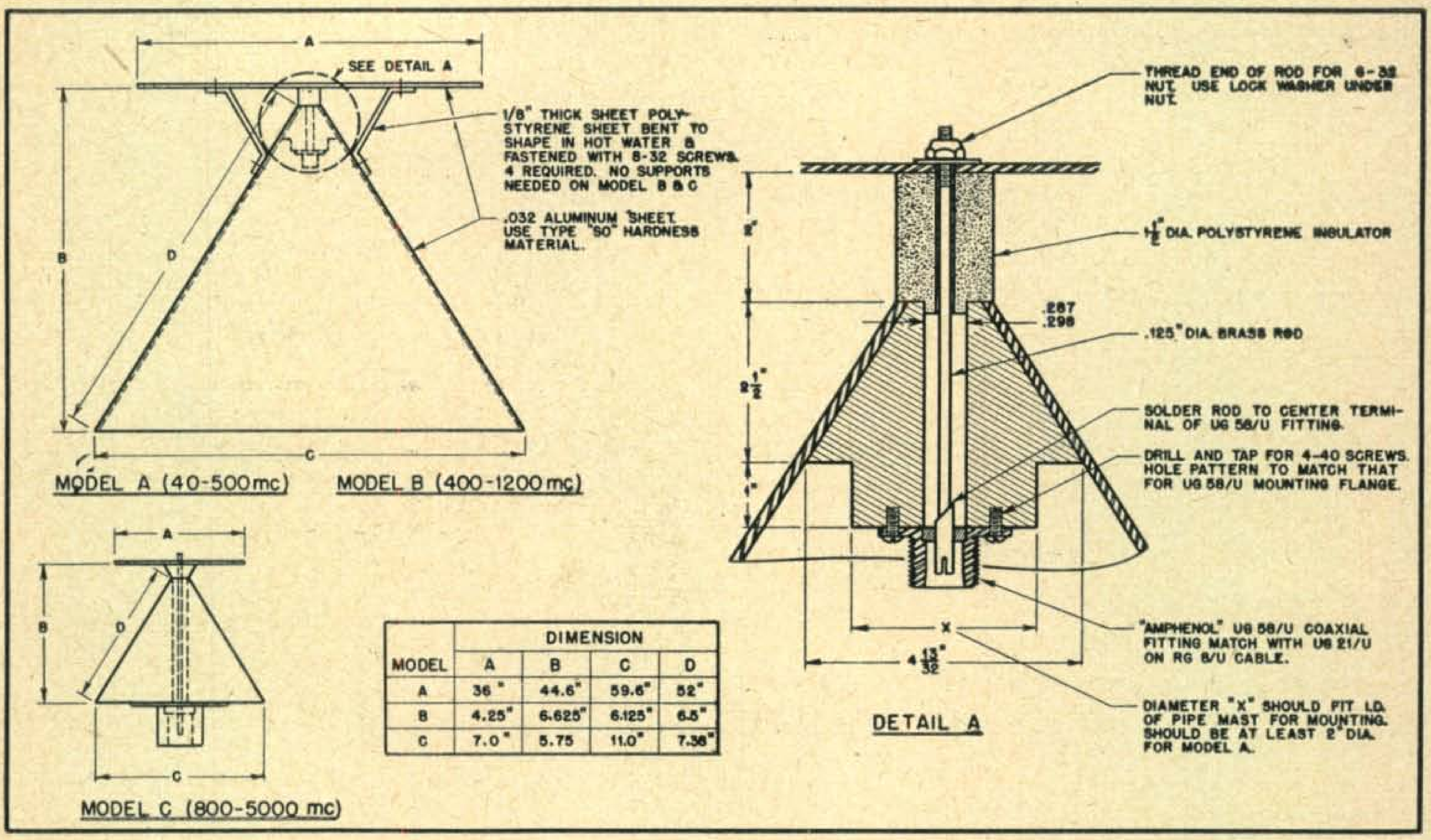
Physical dimensions are given in *Fig. 2* for the three models of the discone to be described. Model A is designed to cover the frequency range 40—500 mc; model B, 400-1,200 mc; and model C (800—5,000 mc) is a scale replica of the 40—500 mc version whose purpose was to provide a means of measuring the radiation pattern of the discone using the model antenna range technique. This technique will be described later in the article.

Theory of Operation

While a rigorous analysis of the discone would result in an unwieldy mass of boundary equations, a brief non-mathematical description should be of value particularly to those desiring to modify the basic design for their own special needs.

There are several non-mathematical analogies which permit a visualization of the operation of the discone, but two are particularly valuable. First, the discone antenna may be looked upon as a "hi-pass" filter network. Imagine such a network hooked between two transmission lines, one labeled "Communications Network" and the other "Space Network." If we add an energy source in the form

*Design Engineer, Douglas Aircraft Co., 208 Calle de Madrid, Hollywood Riviera, Redondo Beach, Calif.
1 Lester, "Looking Over V-H-F Antennas," *CQ*, November, 1948.
2 Federal Radio and Telegraph Company.



MODEL	DIMENSION			
	A	B	C	D
A	36"	44.6"	59.6"	52"
B	4.25"	6.625"	6.125"	6.5"
C	7.0"	5.75	11.0"	7.38"

Fig. 2. Constructional details and dimensions of discone models A, B, and C. Each of the three antennas shown, spanning the frequency band 40 to 7,500 mc, will offer almost constant input impedance to a coax feed line.

of a very high frequency signal generator to the "Communications Network" it will be found that for all frequencies below some critical value the filter will pass little energy from the generator to the "Space Network." High magnitude voltage standing waves will exist on the line connecting the generator to the filter.

However, once the critical frequency is exceeded the voltage standing wave magnitude will quickly drop to a very low value and energy will pass smoothly from the "Communications Network" to the "Space Network." We might call such a "hi-pass" filter a "broad band" network. From theory such a network, after the critical low frequency limit is passed, will offer little attenuation to all frequencies on up to light waves. Practical networks fail to achieve this performance either because lumped elements such as coils begin acting like condensers after a certain frequency range is covered; or if distributed elements such as transmission line sections are used in its construction a frequency region is reached where minute defects in fabrication and surface pits and "bumps" present discontinuities—that is, begin to act like lumped elements and the network design fails.

The discone, then, may be visualized as a "hi-pass" network with the above limitations. The familiar dipole, on the other hand, acts like a "band-pass" network. Over only a very narrow band of frequencies does it pass energy from the "Communications Network" to the "Space Network." The objection may be raised that a dipole will radiate first as a half-wave antenna, then as a full wave, and so on. Its input impedance, however, at each of these resonance points changes radically and consequently, unless the generator's impedance is matched to the antenna impedance at each of these points, high standing waves will still exist with poor energy transfer. This change of input impedance with frequency, relatively speaking, does not occur with such an antenna as the discone.

Intrinsic Impedance

The question then arises: what sort of radiation characteristics does an antenna have to possess in order to function like a "hi-pass filter network"? The first step in this direction is to define the term *intrinsic* or *wave impedance*. There is nothing formidable about this term, and as ham radio moves into the region beyond 2,000 megacycles on a large scale its use in the hobby's jargon will become common. Today most amateurs are familiar with the picture of radio energy being merely *guided between* the conductors or boundaries of a transmission line. (The earth, for example, serves as a rather leaky waveguide wall or boundary for vertically polarized "ground" waves on most ham frequencies.)

The *intrinsic* or *wave impedance* is simply the ratio of the electric to magnetic fields existing between a particular pair or set of such wave boundaries. It is the wave equivalent of the familiar law of Ohm, $R = E/I$. This concept permits assigning a value of impedance to the empty space existing between all the transmitting and receiving skywires in the universe. The assigned value is 377 ohms and space is then looked upon as a mammoth transmission line with this value of intrinsic impedance.

The job of any antenna is to act as an impedance matching transformer between the impedance of the communications networks connected to them and the above mentioned space transmission line. The sharply tuned transformer represented by the dipole is one way of doing this job, but its characteristics are not suited for operation over a wide band of frequencies.

The discone goes about its space matching duties in a slightly different manner. Assume a very high frequency signal generator connected to a long coaxial line of convenient characteristic impedance, say 52 ohms. At a frequency of 300 mc, for example, energy passing down the line and reaching the open end reflects back and sets up high magnitude voltage standing waves. Little power can leak out of the open end and propagate into space. If, however, over a distance of 10 feet or more the spacing between the inner conductor and the shield of the coaxial line is gradually increased so that at the open end the shield is now a tube several feet in diameter—then it will be found that almost *all* energy supplied to the line is being radiated. The standing waves along the line will, for practical purposes, have vanished. Radiation will continue to occur even when the signal generator is tuned to higher and much higher frequencies. What we have done is build a wide band antenna known as a form of anular slot, which in its way is a brother to the discone.

To see the similarity attention is directed not to the open end of the line but to the gradually tapering section between the signal generator and the slot radiator at the open end. This section is known as a *taper transformer*. Such a configuration of

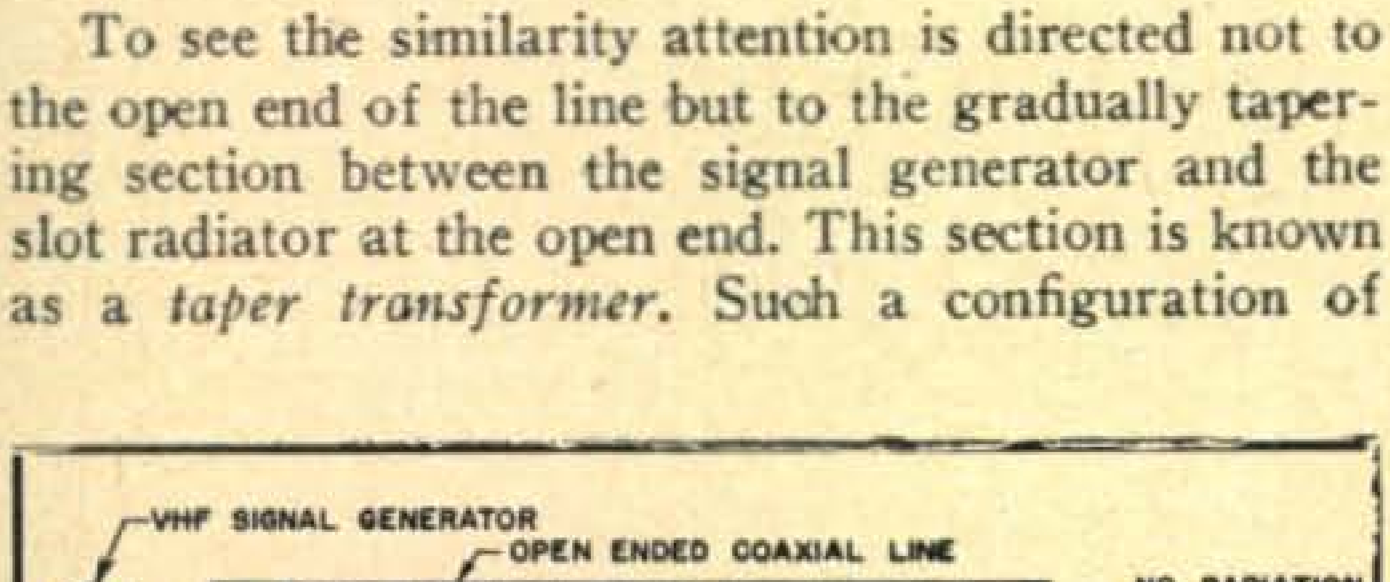


Fig. 3. Evolution of the discone antenna from an open-ended coaxial line. The relationship shown is true only when the discone is operating at least a half octave above its low frequency cutoff point.

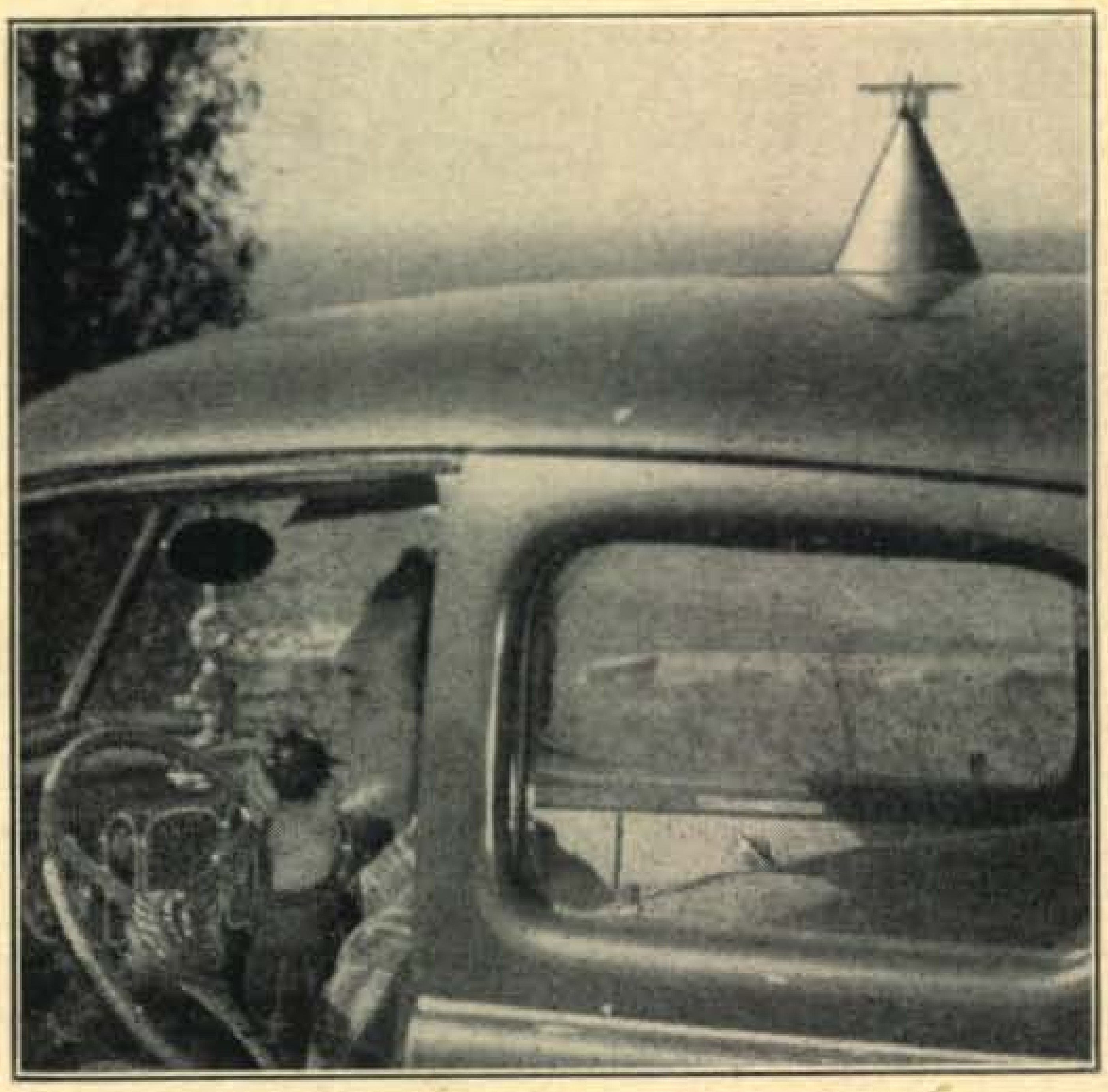


Fig. 5. The model B discone, shown mounted on the metal roof of the test car, proved to be very efficient in tests over a 12-mile path on the amateur 420-mc band. Transmitter used had a power output of 2½ watts.

boundaries starts out with a low value of wave impedance because of the electrical dimensions between the shield and inner conductor. As these spread apart the wave impedance changes gradually until somewhere along its length it "looks" like the value for space. The location of this point will change with a change in frequency, either moving further back down the throat of the taper transformer or out toward the open end. But in either case from this point forward in the taper transformer the radiated waves will find themselves in an environment which has the electrical "feel" of space and from there on out into actual space electromagnetic waves will propagate with little loss.

Tapering boundary transformers are the theory basis for many types of microwave radiators such as the electromagnetic sectorial horn used in radio city-to-city links, and they also explain the operation of the discone.

Coaxial Taper Transformer

All the foregoing ground had to be covered in order that we might finally see that the discone is a *coaxial taper transformer* in which the shield of the transmission line has been folded back on itself at the beginning of the taper and flared out into a cone (*Fig. 3*). The top disk is provided for two good reasons. One, it provides a continuous boundary, symmetrical in all directions from the center of the system, upon which the electric field lines of force extend themselves as they advance out along the cone into space. Two, at the low frequency limit point (where the electrical diameter of the open end of the taper is barely sufficient in size to support radiation) the top disk acts as a capacitive plate to permit the discone to function quite like a top loaded dipole. This low limit point occurs at a frequency for which the slant height of the cone is equal to an electrical quarter wave.

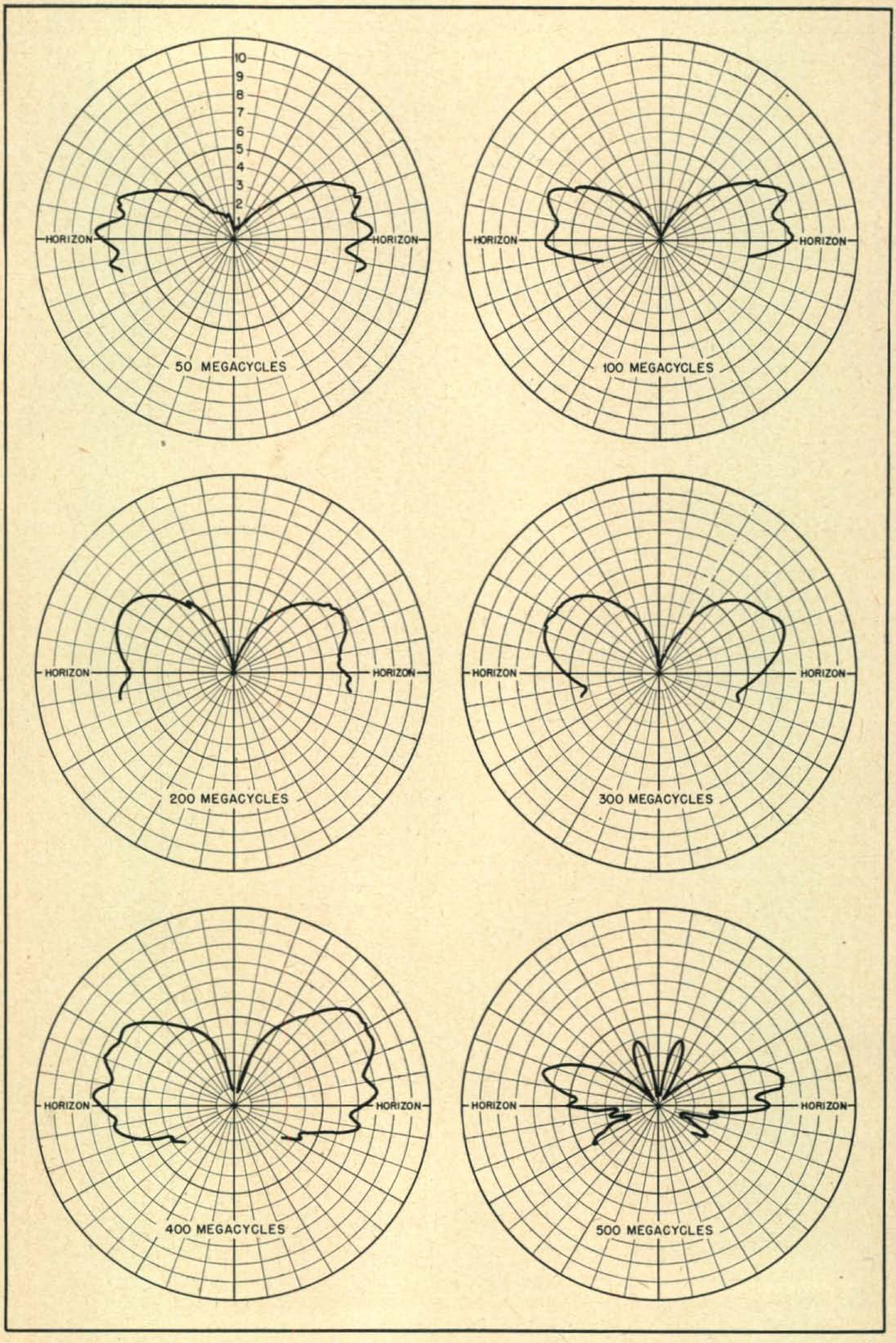


Fig. 4. Asymmetry of scale model C radiation patterns is caused by reaction of objects within the antenna fields.

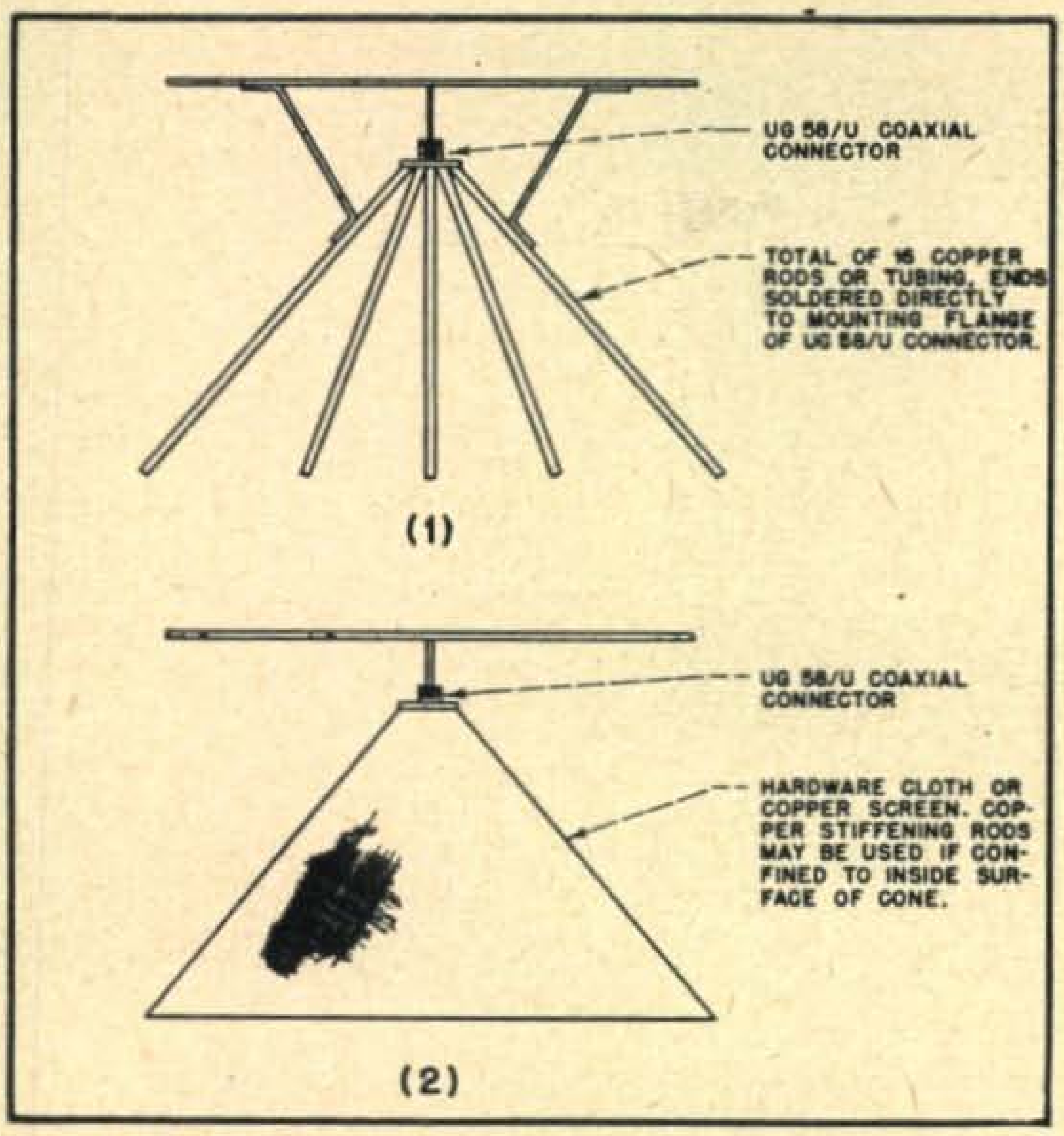


Fig. 6. Two alternate methods of constructing simple discone antennas.

Radiation Patterns

As mentioned previously, the radiation patterns of the discone were secured by the model antenna range technique.[3] A one-twentieth scale model of the discone was constructed to operate over a frequency range of 800 to 5000 mc. An Army surplus APT-5 transmitter unit was used from 800 to 1,500 mc to excite a large pyramidal horn radiator used to "illuminate" the model antenna under test. From 1,500 mc up a Klystron transmitter was available.

The model discone was mounted upon a specially constructed dielectric tower. This tower, in turn, was fixed upon a motor driven circular table which permitted the model antenna to slowly rotate about its central axis either in the vertical or horizontal planes. As the model turned at approximately 1 r.p.m. it was "illuminated" by the uniform wave front beam of the horn radiator mounted upon the laboratory building. All signals to the model were square-wave modulated to avoid danger of frequency modulating the Klystron.

A bolometer detector (10 ma Littelfuse in a special holder) connected to the model discone demodulated the received signal, passing the audio component back to tuned amplifiers in the laboratory. To record this signal graphically in the form of a polar plot of field strength a specially designed cathode ray oscilloscope with servo-driven deflection coils was provided. The oscilloscope screen is photographed during the process of rotating the antenna through 180 or 360 degrees to secure a permanent record. The plots shown in *Fig. 4* were projected and traced from such films.

As can be seen, the vertical pattern changes relatively little over the large span of frequencies covered, which are equivalent to the range 40 to 500 mc for the model A discone. Wasteful high angle lobes are noticed at the frequency equivalent to 500 mc. The model range technique permits measuring patterns with great accuracy under realistic conditions and the results differ in many respects from the idealized patterns usually encountered in textbook literature.

If a more narrow beam is desired near the horizon while retaining the 360 degree horizontal coverage, several discones may be stacked one above the other. While the band, over which the input impedance of such an array remains essentially constant, is narrowed by this procedure it is still enormous when compared with the useful bandwidth of arrays such as the stacked Franklin or the loop type radiators used in FM broadcasting.[4]

Operating Tests

The discone has a theoretical gain of about 1.8 over a dipole in its first half octave of frequency coverage. It was the purpose of the operating tests to determine what superiority, if any, could be noticed on the various ham bands within the model A discone's territory. A rig ending in a 4E27 with 200 watts input was used on the 6-meter band. An SCR 522 was put on 144 and 220 mc, with an APT 5 employed on 420. A 3-watt mobile unit for 420 was used for the mobile tests.

With regard to actual air contacts it is only fair to comment that ham radio in general is not set up as a research project. Hence the results to follow, because they are based on many "R" meter readings—each with its own peculiar characteristics of calibration and law characteristic—are necessarily qualitative instead of quantitative.

Comparison between the performance of the discone and four individual ground plane antennas cut for the middle of each band and carefully matched

(*Continued on page 69*)

3 Sinclair, Jordon, Vaughan, "Measurement of Aircraft Radiation Patterns Using Models," Proc. I.R.E., Dec., 1947.

4 Longitudinal and transverse arrays of discones as well as an "array" consisting of a discone feeding a hollow paper tube with a half power beam width of only 5 degrees cannot be described here but may be the subject of a later article.

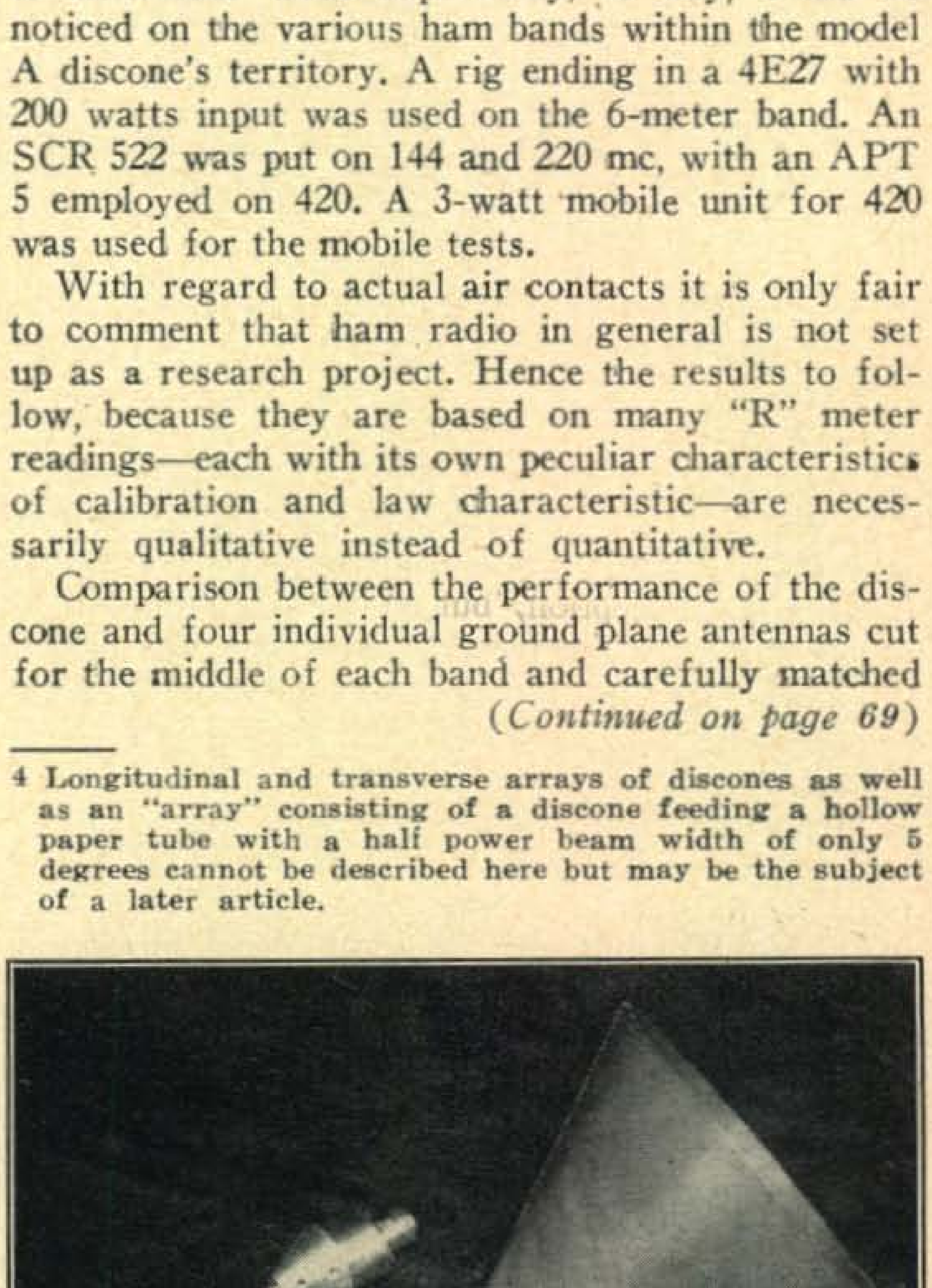
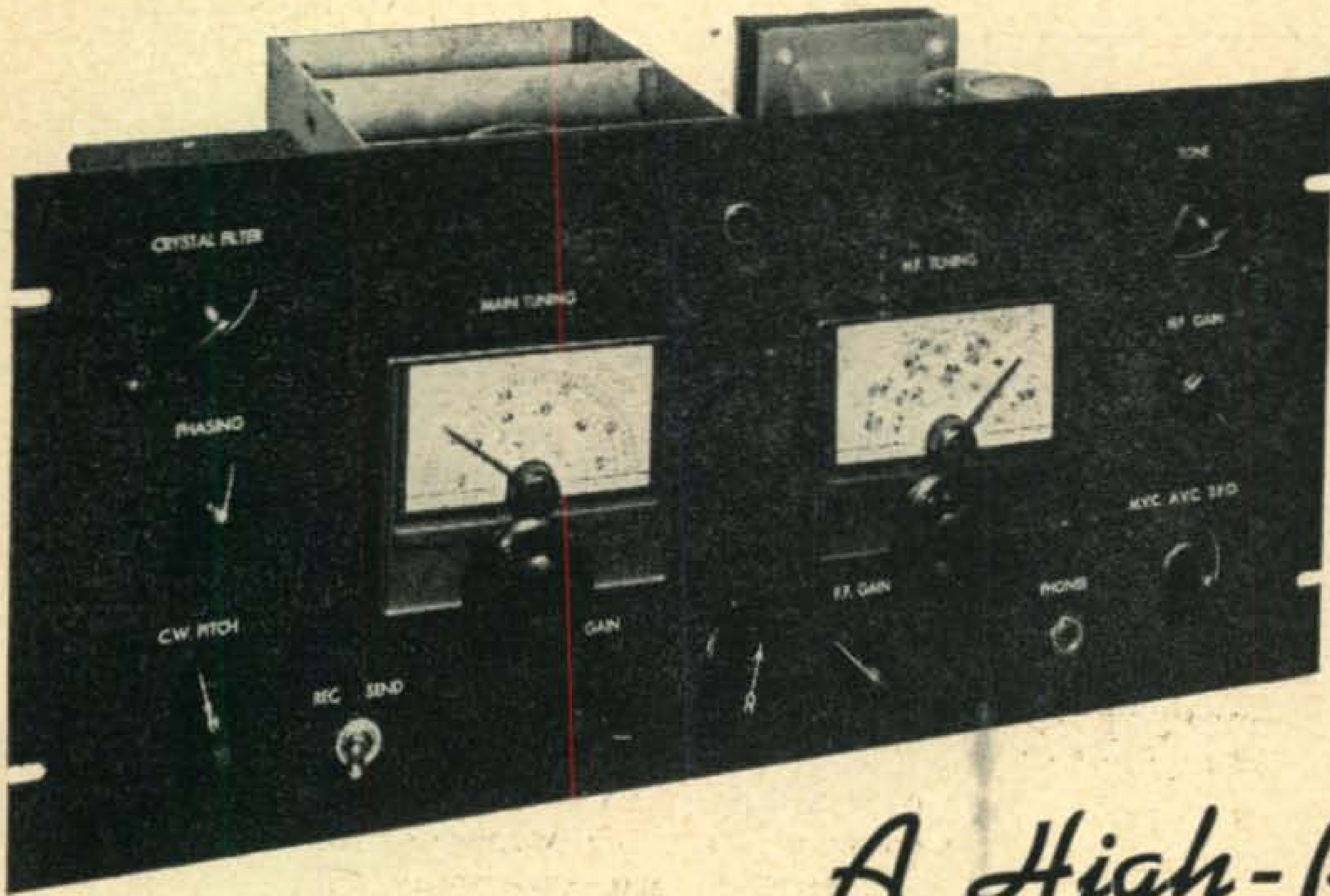


Fig. 8. An "exploded' view of the model B discone illustrating the simplicity of construction. A special flange, not shown, was welded to the base of the antenna for ease in mounting to an automobile roof.



Front view, showing layout of controls on the 8¾ x 19 inch panel. The receiver is intended for mounting in a standard desk-type cabinet rack. Starting at the upper left, the controls are crystal selectivity, crystal phasing, c-w pitch, receive-send, a-f gain, antenna switch, r-f gain, m.v.c.-a.v.c.-b.f.o., h-f gain, and on-off-tone, in addition to the main and h-f tuning. The large bar knob in the center is the antenna transfer control. Decal transfers were used to label the controls.

A High-Performance Dual-Conversion Superhet

ROBERT C. CHEEK, W3LOE*

RECEIVER CONSTRUCTION appears to have become almost a lost art among amateurs. The amateur station which uses a manufactured transmitter is still the exception, but nowadays a station in which the main receiver is home built is unusual. To some extent this is understandable in the light of the present-day availability of a wide variety of manufactured receivers of excellent mechanical and electrical characteristics, one look at any of which is enough to discourage most amateurs who entertain any thought of attempting to design and build a comparable unit.

Several recent circuit developments, however, have suggested the design of a general-purpose receiver which can be duplicated relatively easily by the average amateur who has limited workshop facilities, and which can be aligned and put into operation with no other test instruments than those usually found in the average ham shack. It is a design, furthermore, which provides sensitivity, selectivity, signal-to-noise ratio, image rejection, and stability comparable to the best receivers available. This is no beginner's receiver, but one which was designed for the average and the advanced amateur for DX work, rag-chewing, traffic handling, or what-have-you under the toughest operating conditions.

*RFD #4, Irwin, Pa.

Actually, as the block diagram of *Fig. 1* shows, the unit consists of a separate low-frequency receiver which operates directly from the antenna on 3.5 and 7 mc, but which is preceded by a high-frequency converter on 14, 21, 27, and 28 mc, making the combination a dual-conversion job on the latter bands. The output of the high-frequency converter is 7.3 mc, and the 7-mc coils of the low frequency unit are left in place for high-frequency operation. A selector switch, operated from the front of the panel, permits the receiver to be switched instantly from 7-mc operation to operation on a higher-frequency band.

The low-frequency receiver portion is straightforward in design, and by itself is similar in tube lineup to most manufactured receivers in the medium-priced class. It consists of a 6SK7 r-f amplifier, 6SA7 mixer, 6J5 oscillator, 6SK7 1st i.f., crystal filter, 6SK7 2nd i.f., 6SQ7 detector-a.v.c.-1st audio, 6V6 audio output amplifier, and 6SJ7 b.f.o. Al-

This is in reality three articles—one about a good conventional receiver, and another on an up-to-date high-frequency converter which includes such recent developments as the Cascode low-noise preamplifier, the Clapp oscillator circuit, and the new 6BA7 high-gain mixer. The third article describes the combination of the two circuits into a hot dual-conversion superhet which features extreme sensitivity, low noise, high stability, crystal filter, separate bandspread and calibration on 11 meters and on 10-meter c.w., and low-cost permeability-tuned coils.

though it is used by itself only on 3.5 and 7 mc in this assembly, it is identical in most respects with a design which has been used with highly satisfactory results on all bands from 28 mc down.

It is the high-frequency converter section, however, which is responsible for most of the performance of this receiver on the higher-frequency bands. Since there may be some who will wish to construct a similar high-frequency converter separately, to use in conjunction with an existing receiver which tunes to 7.3 mc, the accompanying diagrams have been drawn with this portion of the receiver more or less separated from the rest.

The High-Frequency Converter Section

As shown in the block diagram of *Fig. 1,* the high-frequency converter section consists of a 6AK5-6J6 cascode input amplifier,[1] a 6AK5 conventional r-f amplifier, a 6BA7 mixer, and a 6C4 oscillator using the much discussed Clapp oscillator circuit. The antenna, r-f, and mixer-input coils are permeability-tuned to resonate with circuit and tube capacitances and are resistor-loaded and stagger-tuned to provide uniform overall response over each band. It is thus necessary to tune only the oscillator of the converter. The oscillator coils are also permeability trimmed; a separate oscillator coil is used for 28-mc general coverage, 28-mc c-w bandspread, and 27-mc bandspread, all with the same antenna, r-f, and mixer coils. A jumper in the 28-mc general coverage oscillator coil brings the second section of the split-stator tuning condenser into play for 28-mc general coverage. For 14 mc, 21 mc, 27 mc, and for 28-mc c-w bandspread, only one section of this condenser is used. The desire for separate bandspread and calibration for the 28-mc c-w band needs no explanation to the c-w DX man who has tried to pick a weak signal out of several strong ones with the crystal filter at maximum on this band.

1 H. Wallman, A. B. MacNee, and C. P. Gadsden, "A Low-Noise Amplifier," Proceedings of the I.R.E., Vol. 36, No. 6, June, 1948.

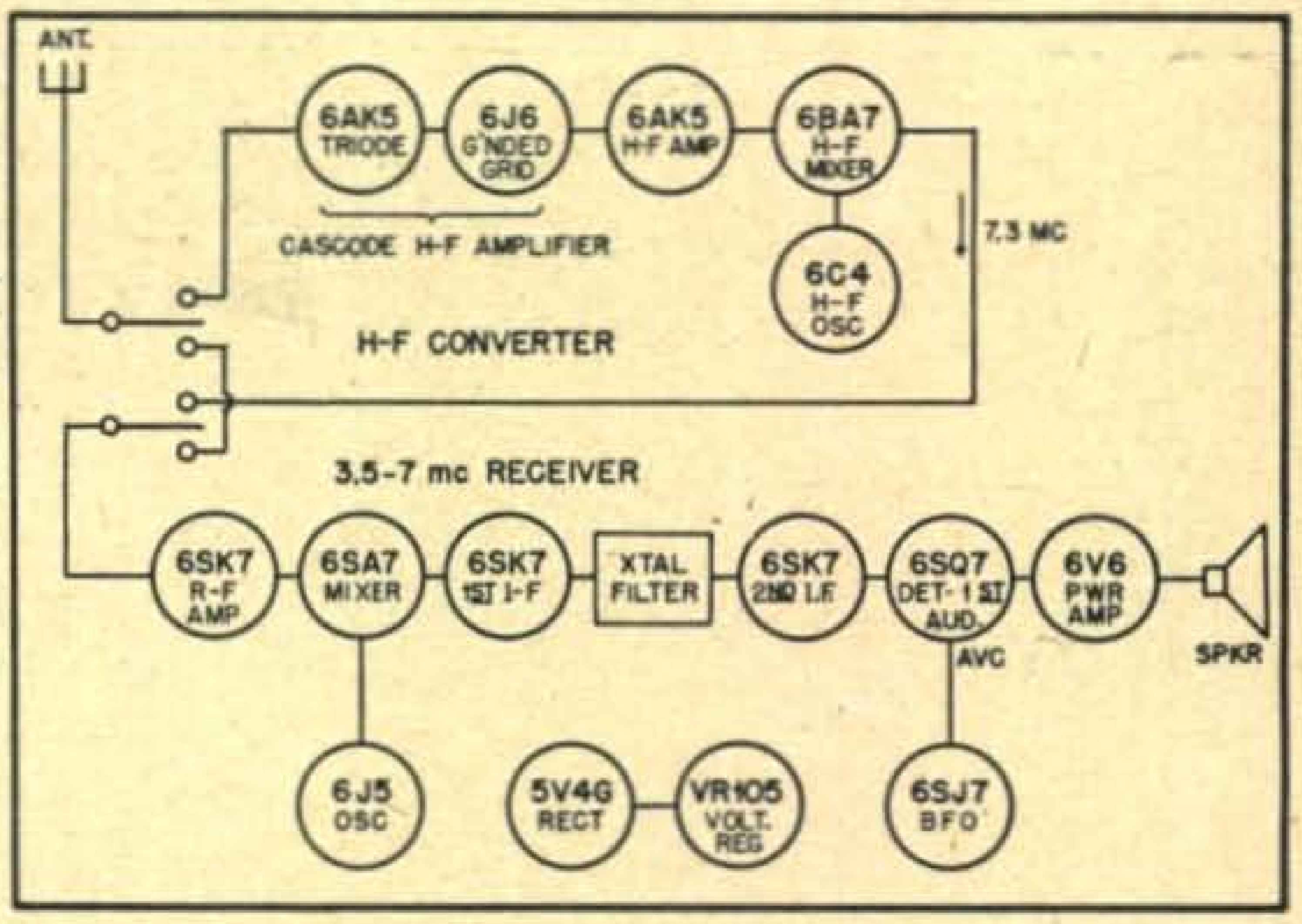
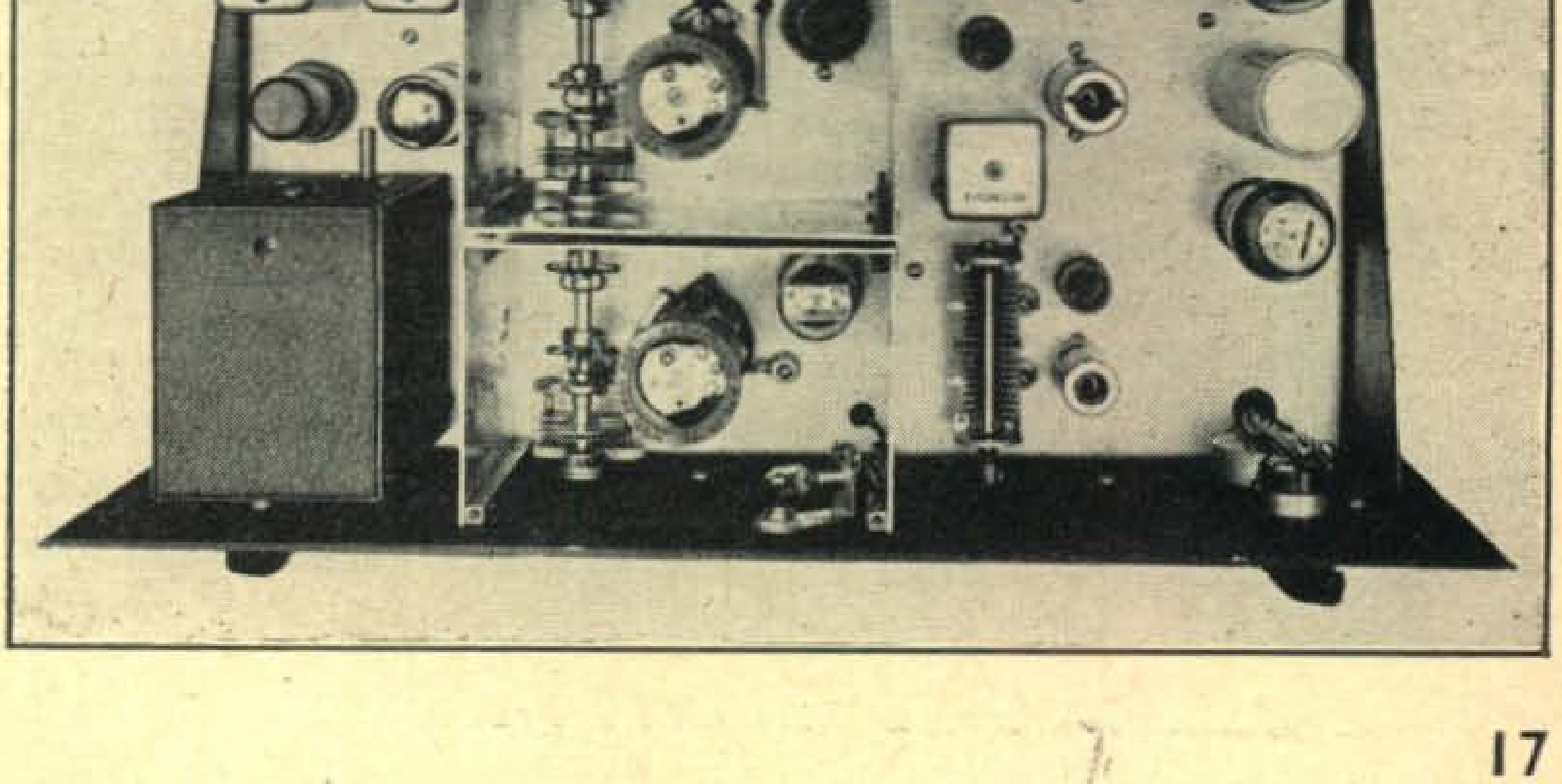


Fig. 1. Block diagram of the dial conversion superhet.

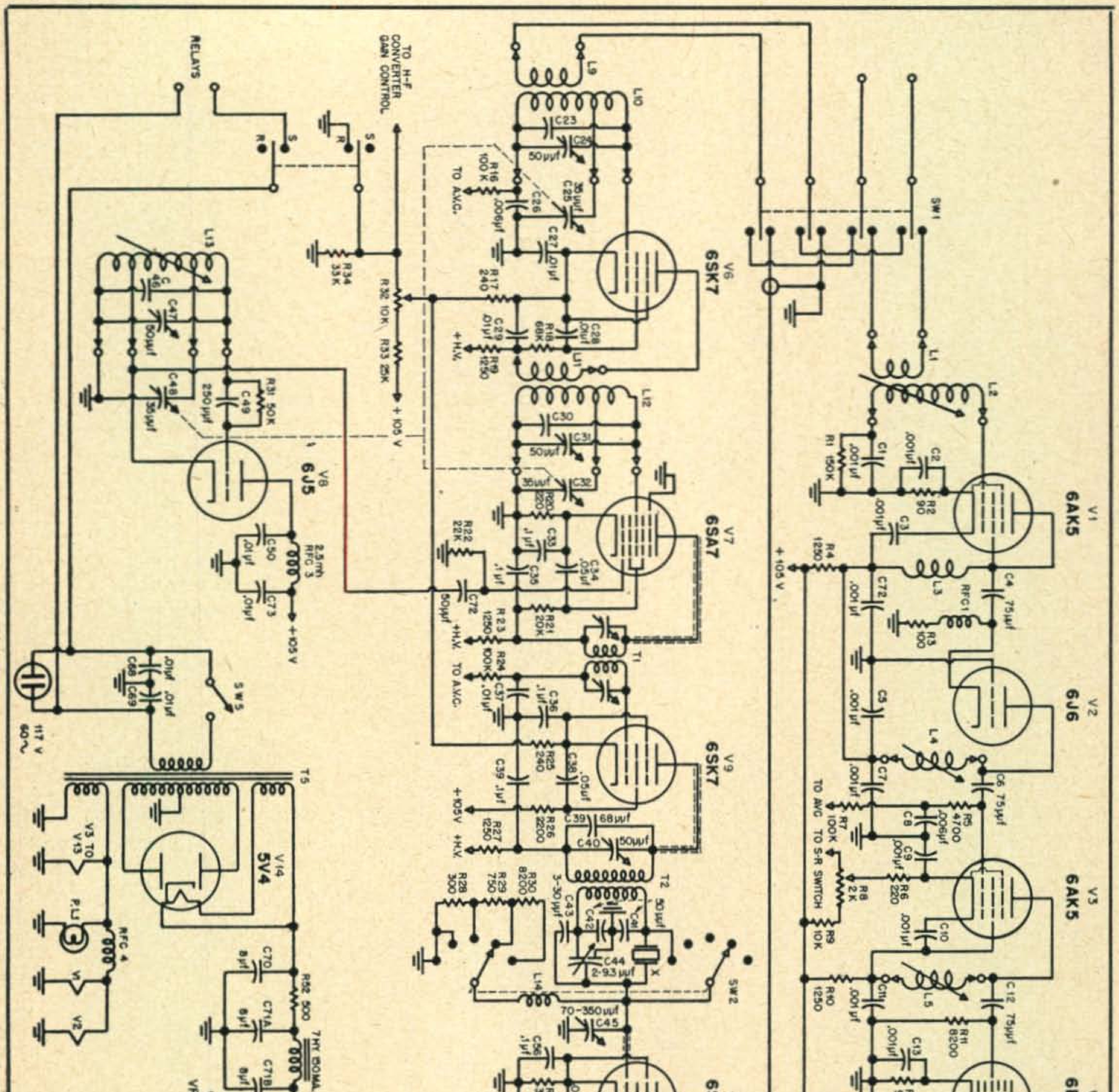
The high-frequency converter owes most of its low-noise properties to the use of the cascode input amplifier.[1] This circuit has not been used extensively in amateur work,[2] but it is safe to predict that it will appear in many receivers and converters in the near future. For this reason, a brief discussion of its properties are in order. The cascode amplifier consists of a grounded-cathode 6AK5, triode-connected, feeding into a grounded-grid triode stage consisting of one triode section of a 6J6. The triode connection of the 6AK5 is used in order to obtain the lowest possible noise factor. If the 6AK5 were used alone in a conventional triode arrangement, however, the use of a plate load impedance sufficiently high to provide a gain which would make the noise contribution of succeeding stages negligible would make the triode stage extremely unstable, mandating careful neutralization. This would be a tricky process at best, leading to considerable circuit complication and difficulty in maintaining neutralization when bands are changed.

In the cascode amplifier, these difficulties are

2 J. E. Stacy, "A Low Noise V-H-F Converter," *CQ*, March, 1949



This view of the top of the 17 x 13 x 3 inch chassis shows the general layout of the receiver. From top to bottom at the right are the power-supply components and the h-f converter section. At the center, top to bottom, are the large shield boxes containing the medium-frequency r-f amplifier, mixer, and oscillator, respectively. The input i-f transformer is at the upper left edge of the mixer shield box. The crystal filter is contained in the shield box at the lower left, and the b-f-o coil is located at the upper left-hand corner of the chassis.


RELAYS
TO H-F CONVERTER GAIN CONTROL
V1 6AK5
V2 6J6
V3 6AK5
V4 6BA7
V5 6C4
V6 6SK7
V7 6SA7
V8 6J5
V9 6SK7
V10 6SK7
V11 6SQ7
V12 6SJ7
V13 6V6
V14 5V4
V15 VR 105
6J6 SOCKET CONNECTION
117 V 60~
SPKR

avoided by using the input circuit of a grounded-grid triode as the load impedance for the grounded-cathode triode stage. Since the input impedance of a grounded-grid amplifier with a high-transconductance tube is very low (on the order of 200 ohms with the 6J6 used here), the voltage gain from grid to plate of the 6AK5 is very nearly unity, and there is no tendency for this stage to self-oscillate. The signal-frequency output current of the 6AK5 flows directly through the grounded-grid stage, however, and appears practically unchanged in the relatively high plate load impedance of this stage. Thus, the grounded-grid stage isolates the high-impedance output circuit from the 6AK5 input circuit and permits a high gain to be realized without the necessity for neutralization.[3] At the same time, full advantage is taken of the low-noise properties of the triode-connected 6AK5. The noise contribution of the grounded-grid stage is negligible. Actually, the gain of the 6AK5-6J6 cascode circuit for a given load impedance is higher than that of a 6AK5 pentode alone, because the transconductance of the 6AK5 triode connected is greater than that obtained with the usual pentode connection.

For best noise performance, the proper source resistance must be presented to the 6AK5 grid. This optimum source resistance changes with frequency. The antenna coils described in the coil tables were designed to present the optimum source resistance with approximately 300-ohm input.

Since the low input impedance of the grounded-grid stage loads the 6AK5 plate circuit very heavily, the 6AK5 plate coil tunes so broadly that it is unnecessary to change it for operation between 14 and 30 mc.

As a result of the high gain of the cascode amplifier, the noise contribution of succeeding stages is practically negligible. Therefore, a 6AK5 with conventional pentode connection follows the cascode. This stage is provided with manual gain control; for phone reception a-v-c voltage from the a-v-c line of the low-frequency receiver is applied to this second 6AK5.

The new 6BA7 high-gain pentagrid converter is used in the mixer stage. This recently announced tube is probably the best pentagrid converter available for high-frequency use. The 9-pin construction permits the use of an additional shield elec-

[3] Neutralization is beneficial in a cascode v-h-f amplifier (above 30 mc) in providing lowest noise factor.

Fig. 2 (opposite). Schematic diagram of the receiver. The upper row of tubes constitutes the h-f converter section.

C1, C2, C3, C5, C7, C9, C10, C11, C13, C17, C72—.001 μf, postage-stamp mica.
C4, C6, C12, C26—75 μμf, postage-stamp mica.
C8, C14, C65—.006 μμf, mica.
C15—25 μμf, silvered mica.
C16—10 μμf, silvered mica.
C18, C59, C60, C61—100 μμf, postage-stamp mica.
C19—75 μμf, silvered mica.
C20, C21—47 μμf, silvered mica.
C22—28.5 μμf, per section split-stator variable (Hammarlund HFD-30X).
C23, C30, C46—See coil table (mounted in coil form).
C24, C31, C47—50 μμf, air trimmer (mounted in coil form).
C25, C32, C48—35 μμf, variable (Hammarlund MC-35S).
C27, C28, C29, C37, C50, C62, C68, C69, C73—.01 μf, 400 v., paper.
C33, C35, C36, C39, C54, C56, C58, C64—0.1 μf, 400 v., paper.
C34, C38, C57, C74, C75—.05 μf, 400 v., paper
C40—50 μμf, variable.
C41, C42—47 μμf, mica.
C43—3-30 μμf, mica trimmer (see text).
C44—2-9.3 μμf per section differential variable (Johnson 160-305).
C45—70-350 μμf, mica trimmer.
C51—470 μμf, silvered mica.
C52—35 μμf, variable (see text).
C49, C53, C66—250 μμf, mica.
C55—3 μμf, mica or ceramic.
C63, C67—25 μf, 50 v., electrolytic.
C70—8 μf, 525 d.c.w.v.
C71—8-8 μf, 450 d.c.w.v.
R1, R47—150,000 ohms, 1/2 w.
R2—90 ohms, 1/2 w.
R3—100 ohms, 1 w.
R4, R10, R14, R19, R23, R27, R40—1250 ohms, 1/2 w.
R5—4700 ohms, 1/2 w.
R11, R30—8200 ohms, 1/2 w.
R6, R20—220 ohms, 1/2 w.
R7, R15, R16, R24, R36, R37—100,000 ohms, 1/2 w.
R8—2000-ohm w.w. potentiometer.
R9—10,000 ohms, 2 w.
R12—95 ohms, 1/2 w.
R13, R22—22,000 ohms, 1/2 w.
R17, R25—240 ohms, 1/2 w.
R18, R54—68,000 ohms, 1 w.
R21—20,000 ohms, 2 w.
R26, R45—2200 ohms, 1/2 w.
R28, R39—300 ohms, 1/2 w.
R29—750 ohms, 1/2 w.
R31, R35—50,000 ohms, 1/2 w.
R32—10,000-ohm w.w. potentiometer.
R33—25,000 ohms, 2 w.
R34—33,000 ohms, 1 w. (see text).
R38—10,000 ohms, 1 w.
R41—2.2 megohms, 1/2 w.
R42—1 megohm, 1/2 w.
R43—47,000 ohms, 1/2 w.
R44—250,000 ohms, 1/2 w.
R46—2-megohm potentiometer.
R48—500,000-ohm potentiometer.
R49—470,000 ohms, 1/2 w.
R50—400 ohms, 2 w.
R51—15 ohms, 1 w.
R52—500 ohms, 20 w.
R53—3000 ohms, 20 w.
T1—456-kc input i-f transformer (Meissner 16-5712).
T2—456-kc crystal filter input transformer (see text).
T3—456-kc output i-f transformer (Meissner 16-5714).
T4—Universal audio output transformer.
T5—Power transformer, 375-0-375 v., 160 ma., 5 v. 3 a., 6.3 v. 5 a. (Thordarson T-22R33).
X—456-kc filter crystal (James Knights Co., or Bliley Electric Co.).
L1, L2, L4, L5, L6, L7, L8, L9, L10, L11, L12, L13—See coil tables.
L3, L14, L15—See text.
L16—7 h, 150 ma, filter choke (Stancor C-1710).
RFC1—See text.
RFC2—1 mh (National R300).
RFC3—2.5 mh.
RFC4—Filament choke (see text).
SW1—4-pole 2-position selector switch (see text).
SW2—2-pole 5-position selector switch.
SW3—2-pole 3-position selector switch.
SW4—Double-pole double-throw toggle switch.
SW5—On-off switch (part of R48).

trode which may be directly grounded along with the suppressor grid. In addition, low noise properties are claimed for it, in spite of the fact that it is a pentagrid type. The plate coil of the converter stage is shunted by a 25-$\mu\mu$f fixed capacitor and permeability tuned to 7.3 mc. A low-impedance output link is provided for the RG 58/U coaxial line between the high-frequency converter and the low-frequency receiver.

Although the oscillator circuit is based upon the now well-known Clapp oscillator circuit,[4] examination of the schematic diagram of *Fig. 2* reveals that the frequency variation control is not a series tuning condenser. The frequency stability of the Clapp oscillator does not depend upon the use of variable series tuning as such, but upon the use of a series *L-C* circuit in place of the usual *L* alone, regardless of whether the series *C* is fixed or variable. The series capacitance (C_{21} in the schematic diagram) in effect reduces the coupling between the oscillator tube and the tank circuit, reducing the effect of changes in capacitance across the tube elements upon the oscillating frequency.

There is no reason why the series capacitance cannot be fixed and the shunt capacitances varied, at least for operation over such a narrow frequency range as an amateur band. The very fact that capacitance changes across the tube elements have relatively less effect upon the frequency can be taken additional advantage of to provide bandspread as is done in the oscillator circuit shown here. The arrangement has the further advantages that both the tuning condenser rotor and the cathode of the tube can be grounded, the first providing for simpler mechanical construction and the second providing freedom from the hum modulation which often plagues high-frequency oscillators in which the cathode operates at other than ground potential.

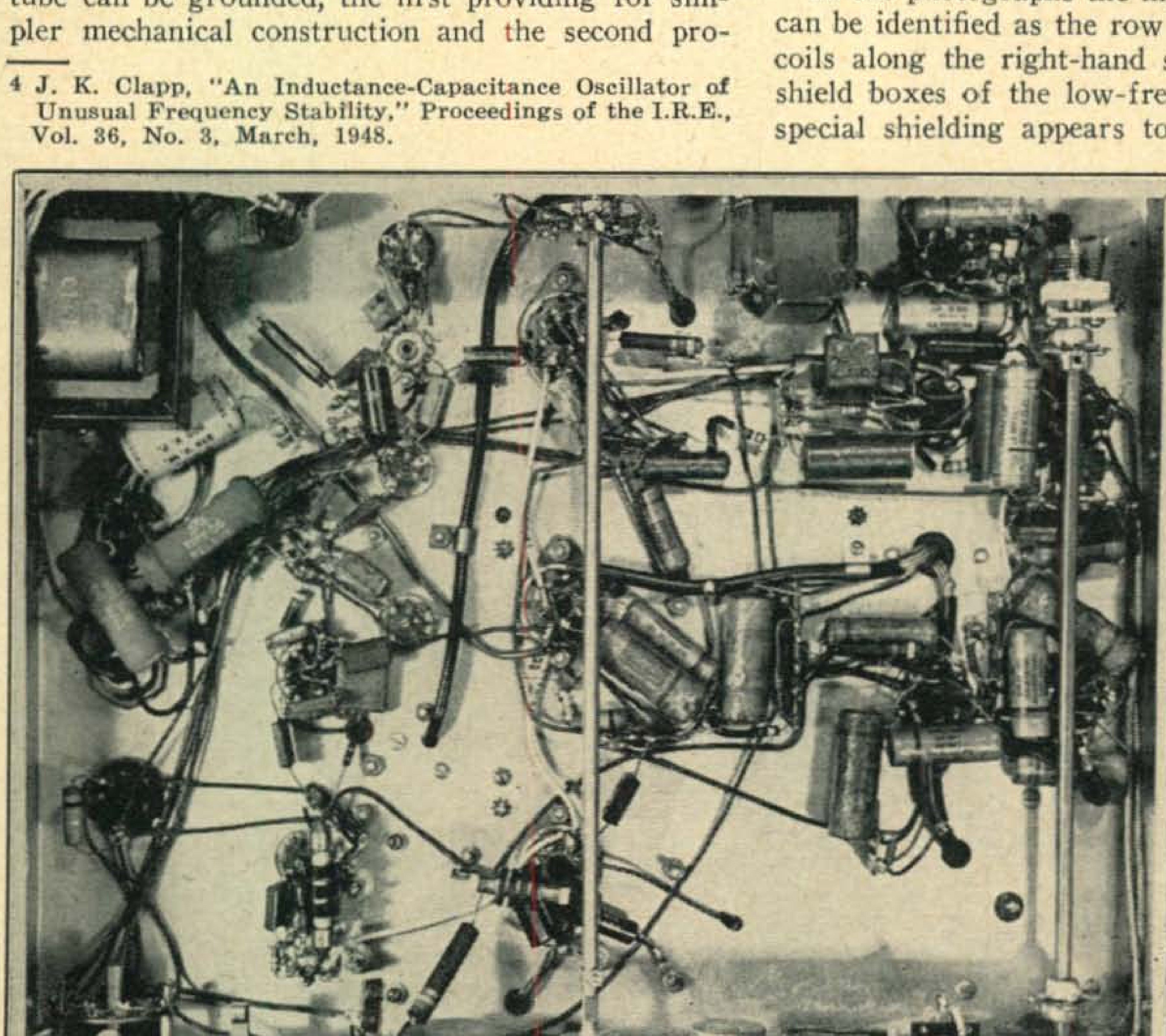
In the oscillator circuit shown, the fixed shunting capacitors, the tuning capacitor, and the series capacitor have been chosen so as to provide full bandspread on 14 mc, covering nearly the entire dial, with a single section of the tuning condenser connected across the grid-cathode shunting capacitor, C_{19}. The 21-mc band, which is to be 450 kc wide, then covers almost the same number of degrees on the dial, as do the first 600 kc of the 28-mc band. On these ranges, the plate-to-grid feedback is increased automatically by increasing tuning capacitance, thereby maintaining practically constant grid No. 1 current on the mixer and hence constant conversion gain. A jumper in the separate oscillator coil used for general coverage of the 28-mc band connects the other section of the tuning condenser across the plate-to-cathode shunt capacitor, C_{20}, which is made slightly smaller than C_{19} so that the full 1700 kc can be covered with only twice the total change in tuning capacitance.

The value of the series capacitor, C_{21}, is not as small as would have been used if stability and stability alone had been the problem. Its value was arrived at after necessary consideration had been given to tuning ranges and required output, in addition to stability. However, the stability of the final circuit is considerably superior to that of conventional oscillator circuits that were tried.

Construction of the H-F Converter Section

In the photographs the high-frequency converter can be identified as the row of miniature tubes and coils along the right-hand side of the three large shield boxes of the low-frequency r-f section. No special shielding appears to be necessary between

[4] J. K. Clapp, "An Inductance-Capacitance Oscillator of Unusual Frequency Stability," Proceedings of the I.R.E., Vol. 36, No. 3, March, 1948.



Bottom view of chassis. The triode 6AK5 output coil and the 6J6 cathode choke are visible just to the right of the filter choke. The long shaft at the center is the antenna switch shaft. That at the right is the c-w pitch control shaft.

the coils, except for the 2" x 2½" aluminum plate midway between the input and output coils of the second 6AK5. The tube shields of the cascode-stage tubes apparently furnish sufficient shielding between the input and output coils of this stage. Also it is probable that the presence of the large shield boxes along the side of the converter help to some extent. At any rate, with the antenna connected to load the input circuit properly, there is no evidence of regeneration with the gain wide open. With the entire unit mounted in the metal cabinet, there is very little signal pick-up with the antenna disconnected and replaced with an equivalent resistor. This indicates that there is little justification for further shielding to reduce such pick-up.

Oscillator Tuning Condenser Mounting

The oscillator tuning condenser, which is a surplus job equivalent in capacity and general construction to the Hammarlund HFD-30-X, is mounted solidly on the chassis upon a bakelite block at each end of the frame, to eliminate any possible trouble from vibration or twisting which might be encountered with single-hole mounting from the panel. To eliminate misalignment between the dial and the condenser, the panel holes for the mounting screws for the Millen Type 10039 dial were made slightly oversize, and the dial set screw run in until it touched the condenser shaft before the dial mounting screws were tightened. Small ceramic feed-through insulators are used to bring the stator connections through the chassis. Leads on the silvered-mica series and shunt capacitors in the oscillator circuit are clipped as short as possible and the capacitors are soldered in place with their edges resting against the chassis. Leads on the plate r-f choke are also clipped short, and the B+ end of the choke is supported by a firmly mounted lug terminal. With these and other obvious precautions to prevent any possibility of vibration, there is no appreciable modulation of the pitch of a c-w signal even when the panel or the cabinet is rapped quite heavily.

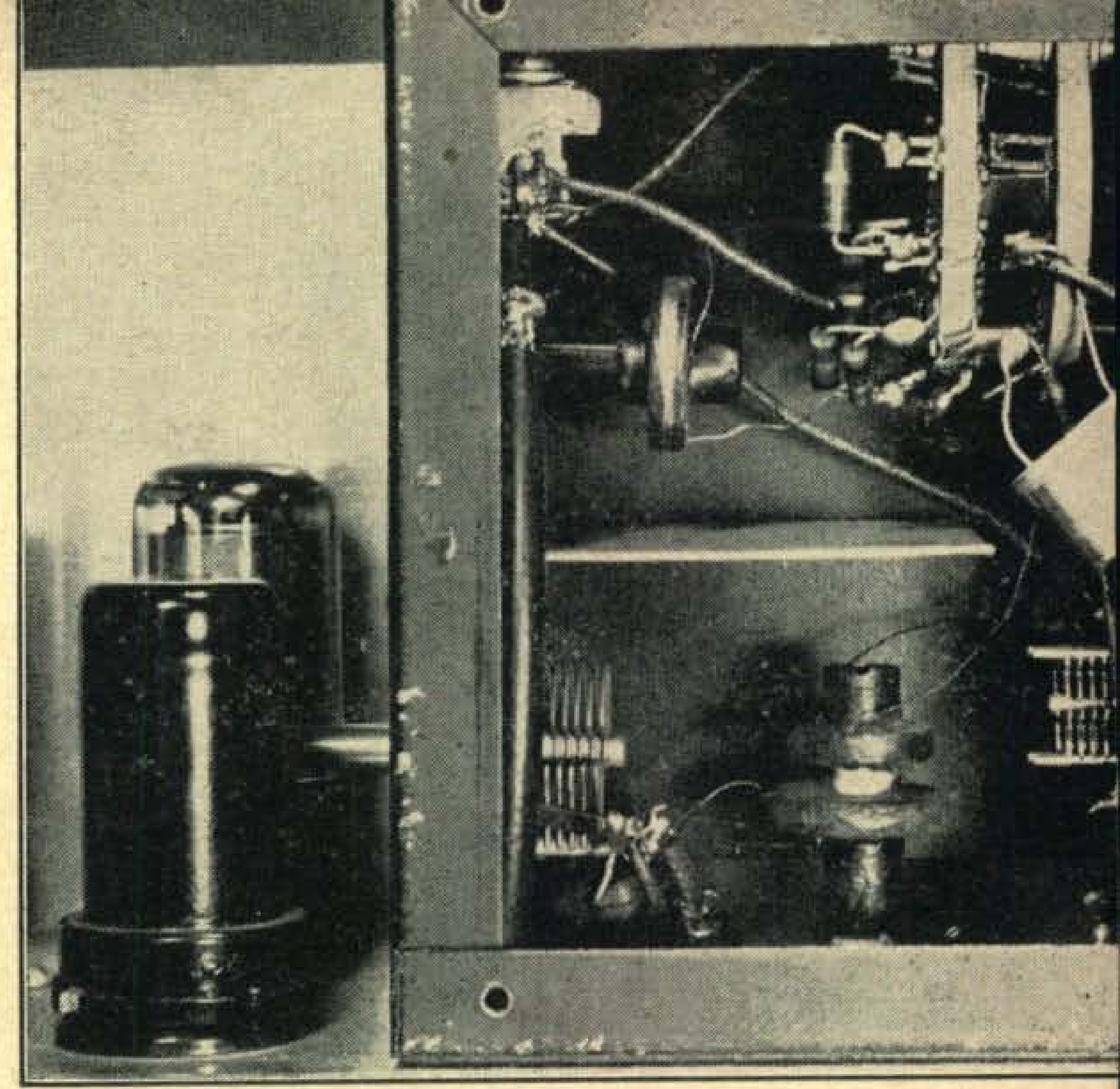
Throughout the converter, all leads are made as short as possible, and no greater length of lead is left on the mica bypass capacitors than that required to reach between the necessary points.

L_3, the plate coil of the 6AK5 triode, consists of 32 turns of No. 22 enameled wire. This coil is close-wound on a ⅜" diameter rod and wrapped with a single layer of cellulose Scotch Tape to make the coil rigid, after which the dowel is removed.

The cathode choke of the grounded-grid stage, RFC_1, is a single layer of No. 26 enameled wire 1⅛ inches long, close-wound on the 100-ohm 1-watt cathode resistor of this stage.

The filament choke RFC_4, through which the cascode stage heaters are fed, is a self-supporting coil of 24 turns of No. 22 close wound, ¼ inch inside diameter.

All plug-in coils are wound on Amphenol ¾" diameter miniature polystyrene forms, which are made with six pins to fit a special Amphenol polystyrene socket. One of these pins is a center pin,



Close-up of crystal filter with cover removed. The lower half of the box contains the input circuit, which is tuned by the APC condenser whose shaft protrudes to the rear. The upper half of the box, which is separated from the lower half by a shield plate, contains the output circuit, the selectivity switch, and the crystal. The latter is mounted directly on the switch.

which is carefully drilled out of each form with 7/64" drill. The hole is threaded with a 6-32 tap to accommodate the tuning slug. The center clip is removed from each socket, and the hole remaining is enlarged to 3/16 inch to provide plenty of clearance for the stud on the tuning slug when the coil is inserted in the socket.

The powdered-iron tuning slugs were obtained on the surplus market. They are ¼ inch in diameter and ½ inch long, with a 1⅛ inch 6-32 stud. Their frequency rating for highest coil Q is not known, but their small diameter prevents them from having too great an effect on coil Q in any event. Their primary purpose is to provide a convenient means of compensating for small differences in circuit capacitances, permitting the coils to be resonated exactly to the desired frequencies with a minimum of cut and try. Since they provide an inductance change of about 20 per cent, they serve this purpose quite well. A similar tuning slug is listed as a standard item by Miller, and it is probable that these could be used with equal success.

The current drain of the h-f converter section is approximately 60 ma at 105 volts. If the converter is constructed separately for use with an existing receiver, the a-v-c connection can be ignored and R_5 can be grounded directly to the chassis, as can the end of gain control R_8 which in *Fig. 2* is indicated as being connected to the send-receive switch.

Construction of the Low-Frequency Receiver Section

The antenna switch, SW_1, is a 4-pole double-throw selector switch wafer which was removed

HIGH-FREQUENCY CONVERTER COILS

Band	L1	L2	L4,L5	L8
28 mc General Coverage.	8 t. #22, closewound over bottom third of L2.	12 t. #22, spaced to 1/2" length.	8 t. #22, spaced to 1/4 inch length.	6 t. #22, spaced to 1/2 inch. (Jumper in coil form. See diagram).
28 mc C-W Bandspread.	Use L1, L2, L4, and L5 from above			6 t. #22, spaced to 1/2 inch (no jumper).
27 mc	Use L1, L2, L4, and L5 from above			6 t. #22, spaced to 1/2 inch (no jumper).
21 mc	9 t. #22, closewound over closespaced part of L2.	15 t. #22, Bottom 8 turns closewound, remainder spaced to total length of 1/2 inch.	13 t. #22, spaced to 9/16 inch length.	8 t. #22, spaced to 9/16 inch (no jumper).
14 mc	10 t. #22, closewound over bottom third of L2.	19 t. #22, spaced to 9/16 inch length.	21 t. #22, closewound (9/16 inch length).	10 t. #22, spaced to 1/2 inch length (no jumper).

L6, 24 t. #26, close wound (3/8 inch length).
L7, 7 t. #26, close wound 1/16 inch from bottom of L6.

All coils wound on Amphenol 3/4 inch dia. miniature plug-in forms, except L6 and L7 on solidly mounted form.

from the indexing mechanism and mounted at the center of the back edge of the chassis, spaced away from it by a pair of 1/2-inch metal spacers. The indexing mechanism itself is mounted behind the panel in the usual manner, and a 1/4-inch brass rod approximately 11 1/2 inches long, filed to fit snugly in the shaft hole of the switch wafer, is used to couple the two parts of the switch together.

The three shield boxes which contain the r-f, mixer, and oscillator stages are 5 3/4" x 3 7/8" x 4 3/4" high. They are assembled from 1/16" aluminum with 1/4" square brass corner posts. The bottom ends of the corner posts are drilled and threaded for 6-32 mounting screws.

The plug-in coils for the low-frequency bands are wound on 1 1/2 inch Hammarlund SWF forms, which provide a convenient mounting post for the 50-μμf air trimmers inside the form. The 5-prong coil sockets are mounted up from the chassis on 1/2 inch spacers, to provide adequate clearance for leads underneath. The grid lead for each stage is led through the chassis with a small ceramic feedthrough insulator.

Shunt capacitor bandspreading is used on 3.5 mc, and a combination of shunt capacitor and tapped coil bandspreading is used on 7 mc.

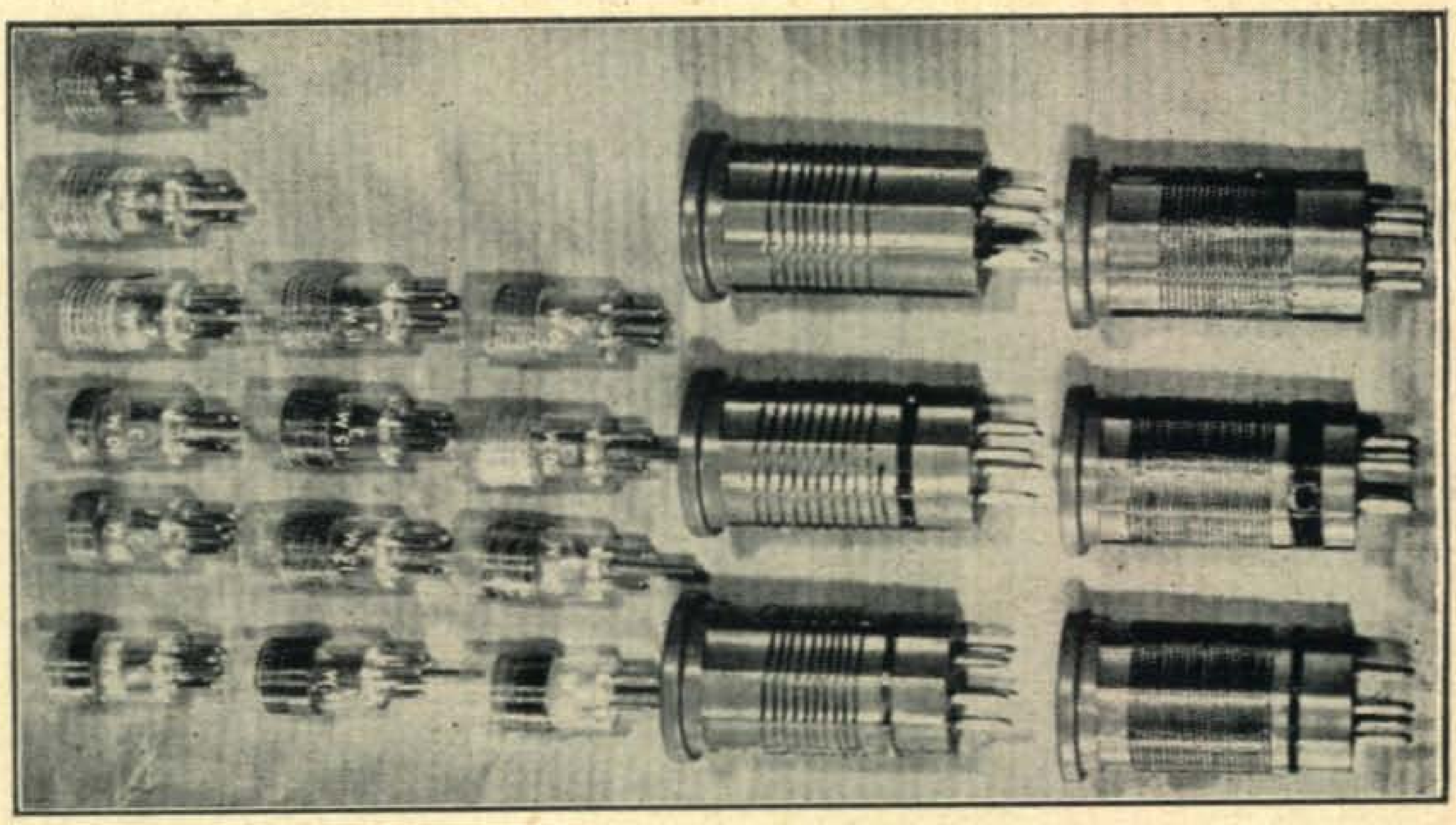
The plate lead from the mixer, the input and output leads of the first i-f stage, and the output lead of the crystal filter are RG 62/U low-capacity coaxial cable, which is used to prevent any possibility of regeneration, which probably would occur with unshielded leads of the length required. The outer conductor of each lead is of course grounded. RG 58/U or RG 59/U could no doubt be used as well, although their capacitance for a given length is somewhat greater.

The crystal filter circuit is that which is used in the Hammarlund receivers. It provides extremely

LOW-FREQUENCY RECEIVER COILS

Band	L9	L10,L12	L11	L13	C23,C30,C46
7 mc	5 t. #26, closewound, 1/4 inch from bottom of L10.	10 t. #22, spaced to 1 inch length, tapped 2-1/2 t. from top.	9 t. #26, closewound, 1/4 inch from bottom of L12.	9 t. #22, spaced to 1-1/8 inch length. Bandspread tap 1.6 t. from top. Cathode tap 5 turns from bottom.	100 μμf
3.5 mc	6 t. #26, closewound, 1/4 inch from bottom of L10.	26 t. #22, spaced to 1-7/16 inch length. No tap. Tap prong connected to grid end.	20 t. #26, closewound, 3/16 inch from bottom of L12.	22 t. #22, spaced to 1-3/8 inch length. Cathode tap 7 t. from bottom. Bandspread tap prong connected to grid end.	47 μμf

All coils wound on 1 1/2 inch diameter plug-in forms.



Complete set of coils for the dual-conversion super. The 10-meter r-f and mixer coils are used in common with the 10-meter general coverage, 10-meter c-w, and 11-meter oscillator coils. The high-frequency coils are marked with the same type of decals used for marking the panel.

sharp maximum selectivity for c.w., but it also can give adequately broad selectivity for reasonably good quality phone. The crystal filter is constructed in a standard 3" x 4" x 5" utility box. The close-up view of this portion of the receiver shows the general arrangement of the components. The filter input transformer, T_2, is made up from the coils of a Meissner Type 16-5712 input i-f transformer. The leads and coil ends are all unsoldered from the trimmer lugs, and the winding form is sawed in half between the coils as closely as possible to the coil nearest the mounting stud. This coil is the primary. The winding form is likewise sawed off close to one side of the other coil, from which approximately 100 turns are removed. This coil, which is the secondary, is mounted 5/32 inch from the primary by means of a short length of wooden dowel inserted in the tubular forms. Paraffin is then melted around the junction to hold the secondary securely in this position.

The output coil of the crystal filter, L_{14}, is taken from another Meissner Type 16-5712 i-f transformer. The other coil from this transformer is retained for the b.f.o., as will be described later. Approximately 50 turns are removed from the coil used in the crystal filter. The mica trimmer for this coil is mounted on a lug strip near the top of the shield box, where it is accessible through the hole in the top of the box. An aluminum shield 2¾ inches long by 2¼ inches wide is used between the input and output circuits of the filter.

The phasing trimmer, C_{43} in *Fig. 2*, was found to be unnecessary in this particular filter, but it is shown in the diagram because experience with other filters using this circuit has shown that it is often necessary, especially with crystals whose holder capacity is relatively large. Its purpose is to compensate for lack of matching between capacitors C_{41} and C_{42} and for the added capacitance between the rotor of the phasing condenser and the grounded stator, resulting from stray circuit capacitance, thus permitting the normal phasing setting to occur at the middle of the phasing range. These effects apparently compensated for each other in the particular filter shown, however, and since the best setting was with the trimmer wide open, it was not left in the circuit.

The resistance values switched in series with L_{14} to control selectivity were chosen to provide what this writer considers to be two useful steps of phone selectivity and two useful steps of c-w selectivity, in addition to the broad "crystal out" selectivity. The individual builder may wish to experiment with these values to obtain selectivity steps to suit his own taste, and he may wish to use a selector switch which will provide a greater or smaller number of selectivity steps.

The rotor of the phasing condenser must be insulated from ground, so the condenser is mounted on a small bakelite strip attached to the inside front edge of the shield box. The hole in the box through which the shaft protrudes is made large enough to give plenty of clearance for the condenser mounting nut. A shaft extender was fashioned from a short piece of ¼" diameter heavy-wall copper tubing, which fits snugly over the $\frac{3}{16}$ inch shaft of the condenser.

The Beat Oscillator

The beat oscillator is a 6SJ7 in an electron-coupled circuit. This circuit was used because it appears to be less subject to pulling effects than the more usual triode Hartley oscillator. The beat oscillator coil, L_{15}, is made from the remaining coil of the i-f transformer which furnished the crystal filter output coil. First, 180 turns are removed from the coil, and then the removed Litz wire is used to form the feedback winding, consisting of 40 turns bunch wound as close to the main coil as possible. A lug strip mounted on the chassis inside the coil shield is used to terminate the ends of the windings and to mount the 470-$\mu\mu$f padder condenser, the grid condenser, and the grid leak. Be sure to connect the feedback winding so that its winding direction is a continuation of that of the main winding.

The b-f-o tuning slug is mounted from the top of the shield can. It is identical with those used in the h-f converter coils, and is used to set the b-f-o frequency to zero beat with the crystal frequency at the center of the pitch control range. A mica or ceramic trimmer of about 50 $\mu\mu$f maximum

(*Continued on page 71*)

The FCC Proposals and the Amateur

CQ's position urging the acceptance of FCC's public document 9295 as modified in accordance with the recommendations suggested in the June editorial.

The American Radio Relay League has just held its annual Board of Directors meeting. By far the most significant piece of business considered and acted upon was the new amateur proposals made by the Federal Communications Commission. The action of the Board in completely rejecting these proposals calls for interpretation, we believe, by an outsider who is more likely to take a completely objective view of this tumultuous situation than any of the participating organizations.

Why did the Board reject *in toto* proposals, though sweeping in scope and controversial in part, which we believe were definitely favored by most amateurs? Was it because the proposals did not stem from ARRL, was it because the Board genuinely felt they were inimical to the best interests of amateur radio, or were there other less obvious reasons?

We know that for many years it was the prerogative of ARRL as virtually the sole organized voice of amateur radio to present to the FCC recommendations dealing with amateur matters. In general these suggestions became, in fact, the law. It was a desirable arrangement for amateur radio unquestionably, because hams virtually had the privilege of deciding for themselves the rules and regulations under which they would operate.

As time progressed certain slow but very definite trends developed. There were growing numbers of politically conscious amateurs who were dissatisfied with the actions of the ARRL Board of Directors. They wanted, quite in keeping with our American Democratic form of government, to be heard as minority groups. They felt, whether justified or not, that the ARRL constitutional organization did not offer them a fair chance to present their views. They formed, as a result of this dissatisfaction, the National Amateur Radio Council and the Society of American Radio Amateurs.

Both SARA and NARC are self-constituted pressure groups, groups whose aims were to influence the ARRL Board in favor of their respective ideas. Such groups in American politics have been traditionally accepted and they have served an honorable and useful purpose. In amateur radio though, we were faced with a peculiar situation. The established procedures of ARRL did not provide for any method by which NARC and SARA could be invited to consult with the Board of Directors (even if it were practicable in the limited time available at a Board meeting). Even more serious, the Board is not governed by an administrative procedures act, which would make it mandatory to hear these minority groups.

It is here that the ARRL committed what we consider a major strategic error; they all but ignored NARC and SARA. While it is undeniably true that ARRL represents a far greater number of amateurs than any other group, it is equally true that they are bound by the fundamental traditions of our land. In a democracy all sides must be given an opportunity to be heard. Where was the debate, what chance were amateurs given to examine the merits of all the proposals to the FCC? Because no chance existed, and none was offered, NARC and SARA turned to the one agency that was bound by law to hear everyone—the FCC itself.

But what has happened? In going to the FCC the minority groups may have jeopardized one of hamdoms most precious privileges, that of self-determination, and by their actions have implied to a government agency, "We are not capable of handling our own problems, will you resolve them for us." The fundamental questions now at stake are simply, did they do wrong and are the FCC proposals in the best interests of amateur radio?

Well, first of all, what is this FCC Amateur Division we talk about? Three years ago the government radio regulatory body, the FCC, established a separate Amateur Division to deal with the overall ham picture. In setting up this division, amateurs, and good ones too, were appointed to the top administrative positions. They are honest sincere government employees and the implication which appears repeatedly that they are "empire builders" or that their proposals are to serve ulterior motives has only served to obscure the issue. No group of men have the interest of hams more at heart than the Amateur Division of the FCC, who today exemplify the best type of civil servant. But we will concur with the *possibility* that this might not always be the case. If we were to imagine a hostile Amateur Division, its regulatory life and death power over amateur radio would indeed be far more serious than it is today. It is this analysis, and only this one, that makes the action of the ARRL Board comprehensible. They, the ARRL Board of Directors, want to protect amateur radio against some future possibility that a hostile or incom-

(Continued on page 54)

Change in 27-mc Frequency Allocations

At a session of the FCC on April 27th, the Commission ordered, effective July 1, 1949, that Part 12, Rules Governing Amateur Radio Service be amended as follows:

Substitute the following text for the present text of Section 12.111. Frequencies and types of emission for use of amateur stations, paragraph (a) subparagraph (5):

(5) 26.960 to 27.230 mc., using unmodulated carrier, radiotelegraphy, radiotelephony, radio printer, or facsimile, with any type of emission except damped waves and pulse, subject to such interference as may result from the emission of industrial, scientific and medical devices within 100 kc of the frequency 27.120 Mc.

Substitute the following text for the present text of Section 12.134. Modulation of carrier wave.

12.134 Modulation of carrier wave.—Except for brief tests or adjustments and except for operation in the band 26.960 to 27.230 megacycles, an amateur radiotelephone station shall not emit a carrier wave on frequencies below 144 megacycles unless modulated for the purpose of communication.

Improved BC-624 Noise Limiter

DONALD H. ROGERS, W2MLF*

Greatly improving the receiver portion of the SCR-522 with simple modifications.

THE NOISE LIMITER and second detector described here is an improvement on the original circuit in the BC-624AM. The arrangement to permit the audio section to double as an intercom amplifier is of little use to the average ham. Also, in the original intercom arrangement considerable gain and some i-f selectivity were sacrificed. The revised and simplified circuit shown in *Fig. 1* is applicable to other models of the BC-624, providing better noise limiting characteristics, noticeable increase in gain, and improved selectivity.

The original circuit possesses the undesirable feature of loading down the last i-f stage through low resistance values in the detector and audio transformer primary section. The resistances in series with the windings further materially reduce the gain. In the revised circuit the detector diode load resistors and the noise limiter load are increased in order to increase the selectivity of the last i-f transformer. The audio gain control is returned directly to the proper point on the cathode resistor to provide correct bias for the 6B8 (or 12C8) tube. The a.v.c. take-off is moved to the secondary of the last i-f transformer so that adjacent channel signals will be less likely to depress the desired one. Finally, the second half of the 6H6 (or 12H6) is reconnected as a shunt diode limiter to further supplement the series limiter already in the circuit. The combination of series and shunt diodes is superior to either one individually.

Limiter Operation Theory

The new noise limiter is of the self-biasing type which automatically adjusts its threshold to the value of the carrier being received. In *Fig. 1* the audio voltage developed across *R1* is passed through the series (right) diode and taken off the limiter load resistor, *R3*. The rectified carrier voltage developed across *R2* is filtered by *R4* and *C1* to remove audio variations and is applied to the low end of *R3* to cause the series diode to conduct. This same voltage blocks the shunt (left) diode, which is reversed. It is apparent that this bias voltage will be some fraction of that developed across *R2*, a fraction depending on the proportions of *R3* and *R4*.

The operation of the noise limiter depends on the fact that noise appears at any point on the load resistor of a diode as a negative pulse with respect to the cathode and a-c ground. A negative pulse developed across *R1* which exceeds the biasing rectified carrier drop across *R3* will cause a reversal of potential across the limiter diodes. The series diode then will not conduct, hence cutting off the detector output during the pulse, and the shunt diode will conduct, shorting the pulse to ground through *C1*.

The audio peaks of a properly modulated signal can equal but not exceed the carrier. Hence, if the carrier voltage across *R3* is exactly equal to that across *R1*, the limiter will not operate on speech, but will operate on any noise pulse greater than the received carrier. This condition can be obtained by making

$$R1 = \frac{R3}{R3 + R4} \cdot \frac{R2(R3 + R4)}{R2 + R3 + R4}$$

or,

$$R1 = \frac{R2R3}{R2 + R3 + R4} \qquad (1)$$

(provided the internal resistance of the conducting diode is very low compared to the values of *R2*, *R3* and *R4* and the internal resistance of the non-conducting diode is very large compared to *R4*, *R3* and *R2*.)

If, however, *R2* is made smaller or *R1* larger than the value calculated from (*1*) the limiter will clip noise more effectively, but clip speech peaks (at high modulation percentages) as well as

(*Continued on page 69*)

*41 Fourth St., Fanwood, N. J.

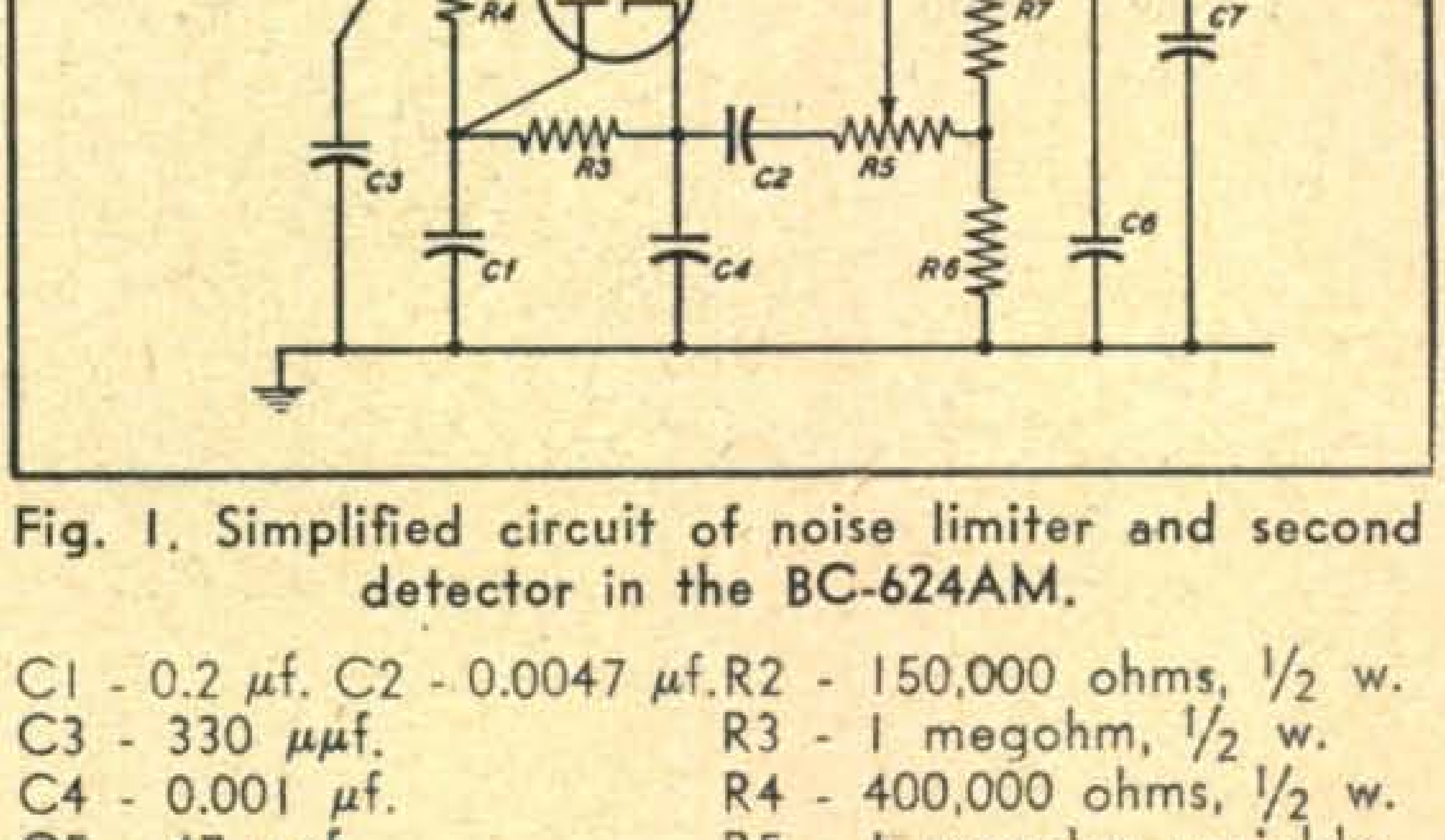
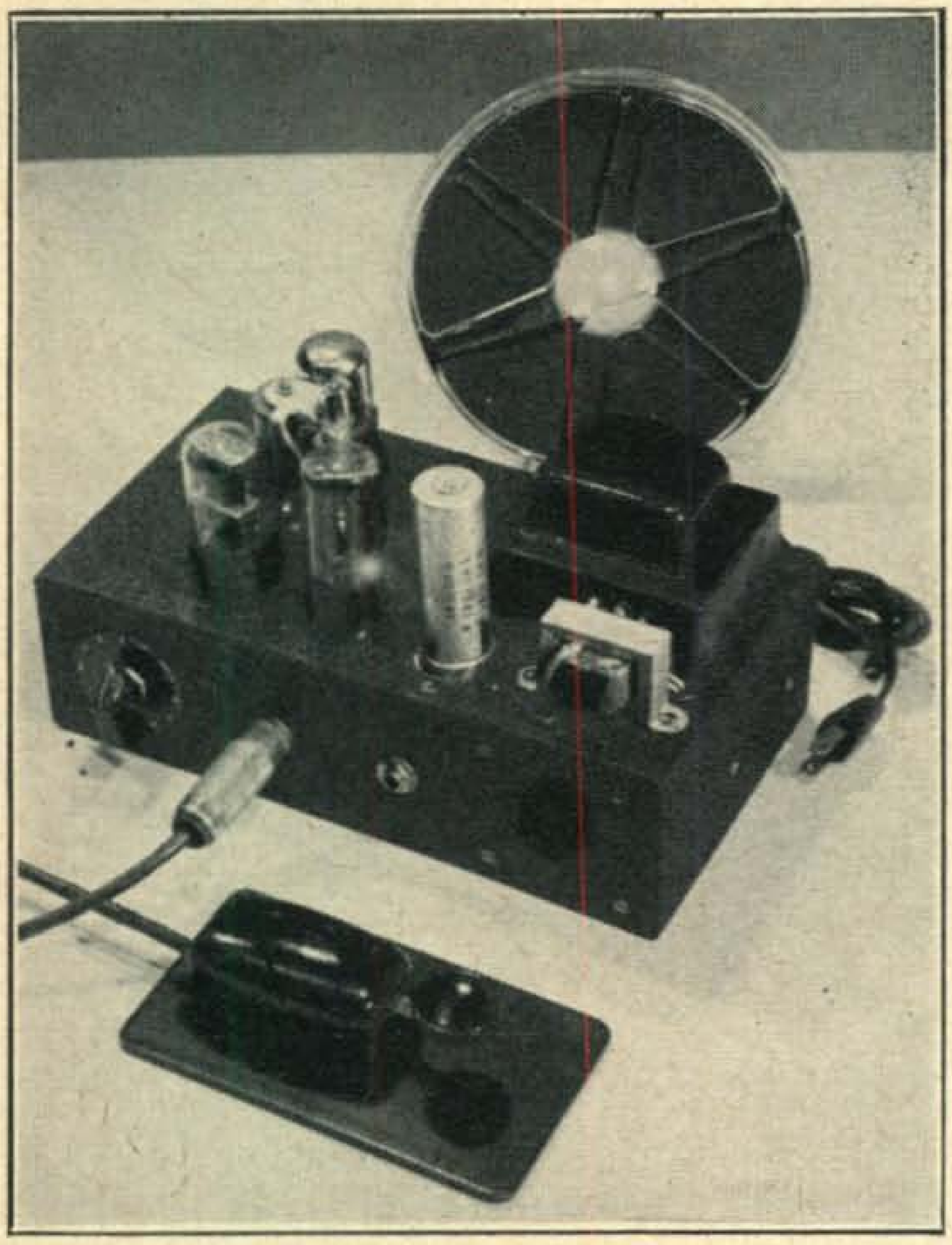


Fig. 1. Simplified circuit of noise limiter and second detector in the BC-624AM.

C1 - 0.2 μf.
C2 - 0.0047 μf.
C3 - 330 μμf.
C4 - 0.001 μf.
C5 - 47 μμf.
C6 - Parallel 1.0 electrolytic 0.1 μf paper.
C7 - 0.1 μf.
R1 - 100,000 ohms, 1/2 w.
R2 - 150,000 ohms, 1/2 w.
R3 - 1 megohm, 1/2 w.
R4 - 400,000 ohms, 1/2 w.
R5 - 1 megohm variable
R6 - 18,000 ohms, 1/2 w.
R7 - 1800 ohms, 1/2 w.
R8 - 470,000 ohms, 1/2 w.
R9 - 560,000 ohms, 1/2 w.



The complete keying unit. In the background is a roll of tape from a Brush Soundmirror.

An Automatic Tape Transmitter

ADELBERT KELLEY, W2VSX*

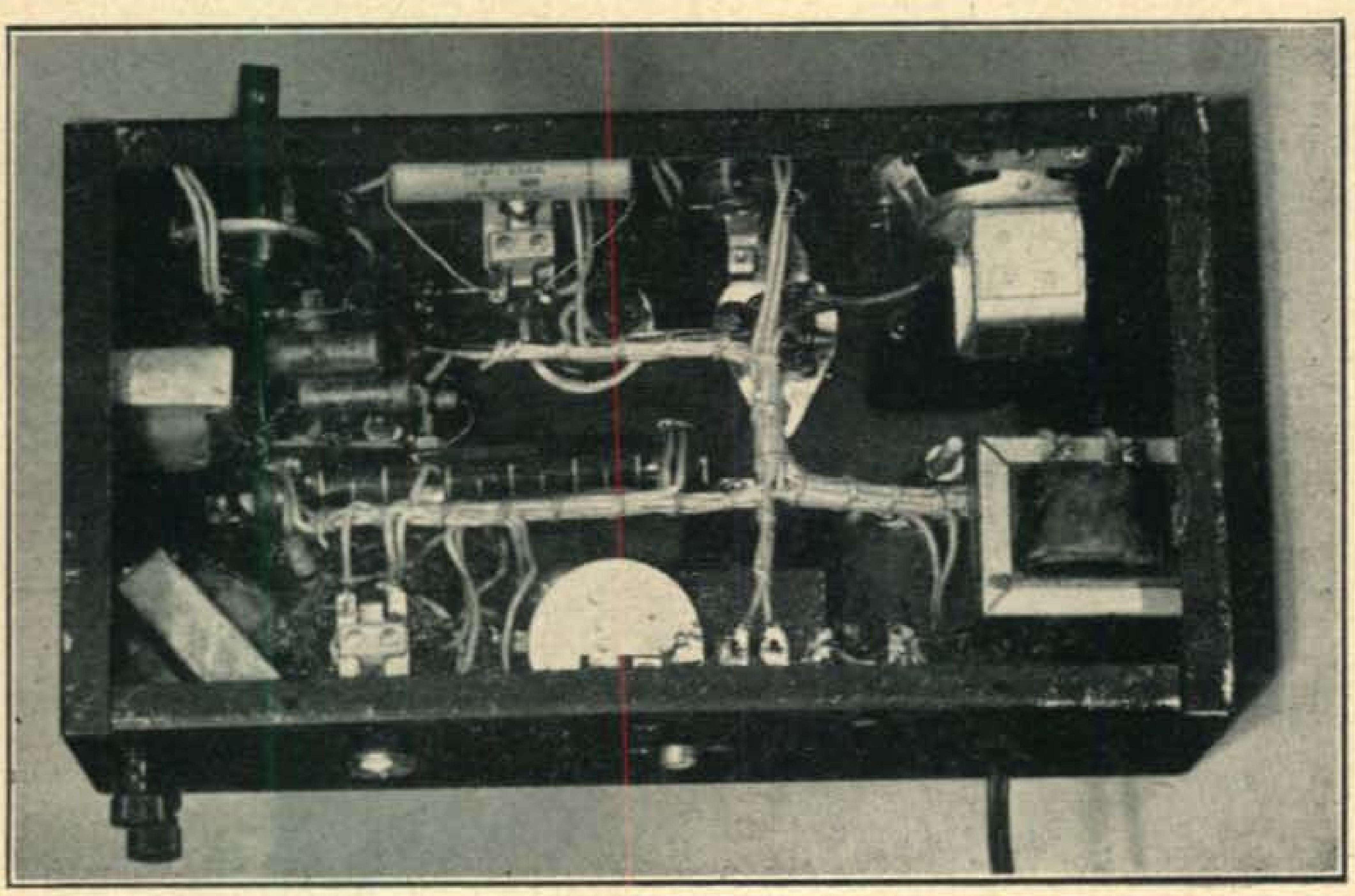
Any recorder may be used as an excellent tape transmitter by using this keying unit.

Would you like to surprise a friend by recording his c-w transmission and sending it back to him? Are you one of those public-spirited hams regularly conducting code practice transmissions over your station for beginners? An automatic tape transmitter, a machine that will exactly reproduce without attention a previously recorded code message is practical and inexpensive with this simple auxiliary unit.

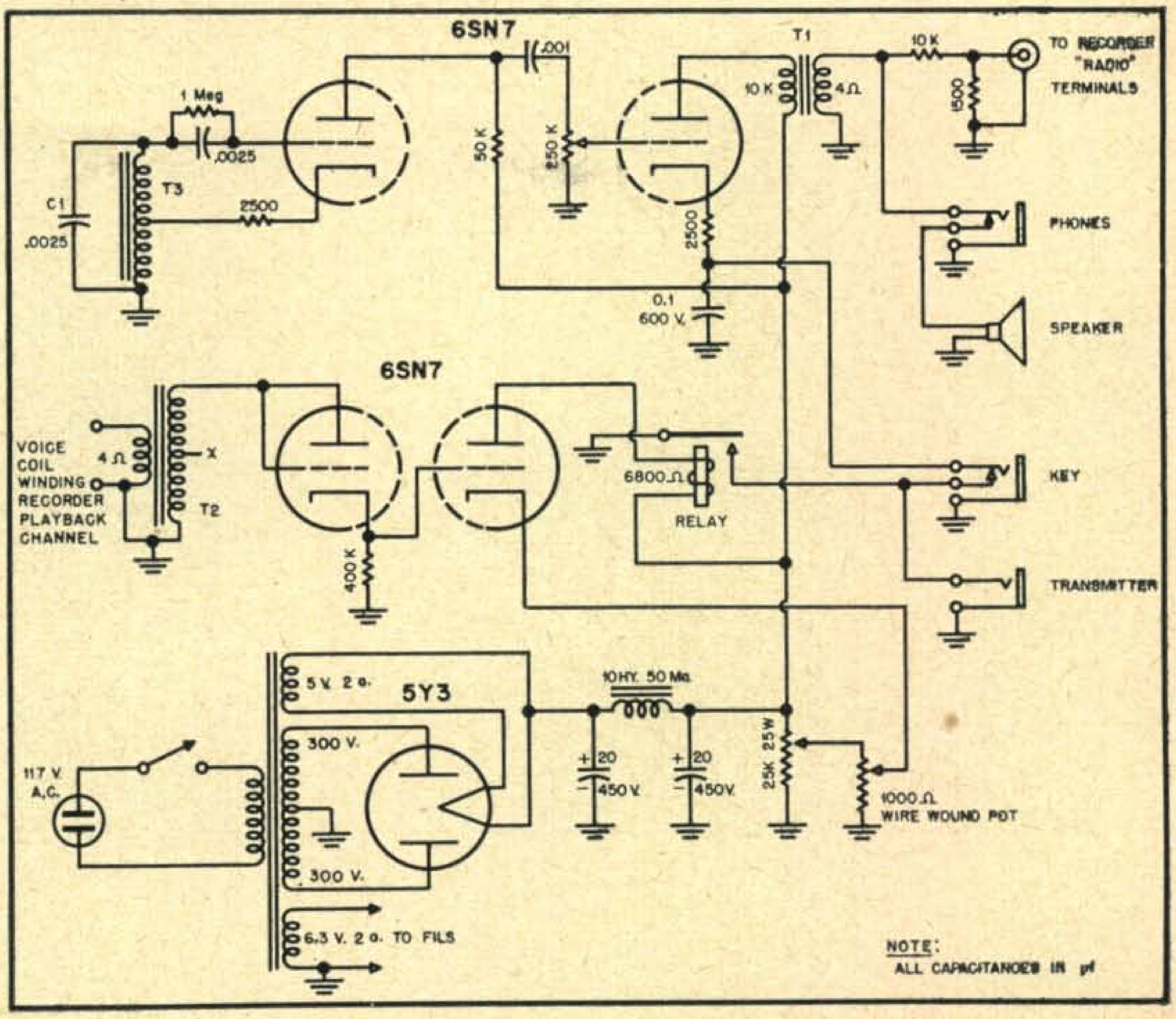
Conventional automatic keying units are expensive and require a puller, an inker-recorder, and a keying head. It is no wonder the occasional user questions the advisability of investing the money required to obtain a satisfactory automatic keying device.

If you have a recorder in your shack, why confine its use to transcribing phone QSOs or music from the local broadcast station? A simple attachment can be added to make an excellent automatic tape transmitter, without modifying your recorder in any way. It is simple and easy to build, and, because it is primarily electronic in operation, there is little to get out of order. All it needs for accessories are a key, tape, and your present recorder, in our case a Brush Soundmirror. The unit will operate equally well with wire, tape, or disc recorders, though naturally the wire or tape

*58 Exchange St., Binghamton, N.Y.



Bottom view of the self-contained keyer unit.



Circuit diagram of the complete keyer. Parts values are indicated on the schematic.

T1—10,000-ohm plate-to-voice coil "universal" midget output transformer.

T2—Push-pull output-to-voice coil "universal" type.

T3 — Same as T2 with transformer center tap (B— lead) connected to oscillator cathode.

Relay — Sensitive relay that will close on 8 to 12 ma (winding of 6,000-10,000 ohms resistance). SPST or DPST. An alternative keying circuit providing isolation between the keyed circuit and the keying circuit should use a DPST relay with the transmitter jack returning to ground through the extra relay arm.

recorder is less expensive to operate over a period of time since the same recording surface can be reused.

This unit will key any c-w transmitter at any rate of speed normally encountered on the amateur bands. As long as a clean signal is transcribed on the tape, keying will be accurate and dependable. Signals can be recorded off the air and used to key your transmitter, but remember that static will operate the keying relay the same as a dot, a heterodyne will hold the relay shut the same as a dash. Since the keyer is responsive to all frequencies above about 150 c.p.s., it will not discriminate between signals of a different pitch. Naturally, if the self-contained tone generator is used to "cut the tape," no trouble will be experienced with interfering signals or noises.

Construction Details

The entire unit is built on a 5½" x 10" x 3" chassis enabling a compact assembly with enough room for wiring. Parts layout can be determined from the photographs. The oscillator and amplifier tube, rectifier and filter condenser, and the output transformer are mounted along the front of the chassis, while the keyer tube, bias potentiometer, and power transformer are mounted along the rear. Binding posts for connection to the loudspeaker winding of the tape recorder, the jack for transmitter keying, and the low level audio output jack are mounted on back of the chassis. The small monitor speaker, keying and earphone jacks, and volume control are mounted on the front end of the chassis. A small patch of wire screening is placed over the speaker mounting hole for protection.

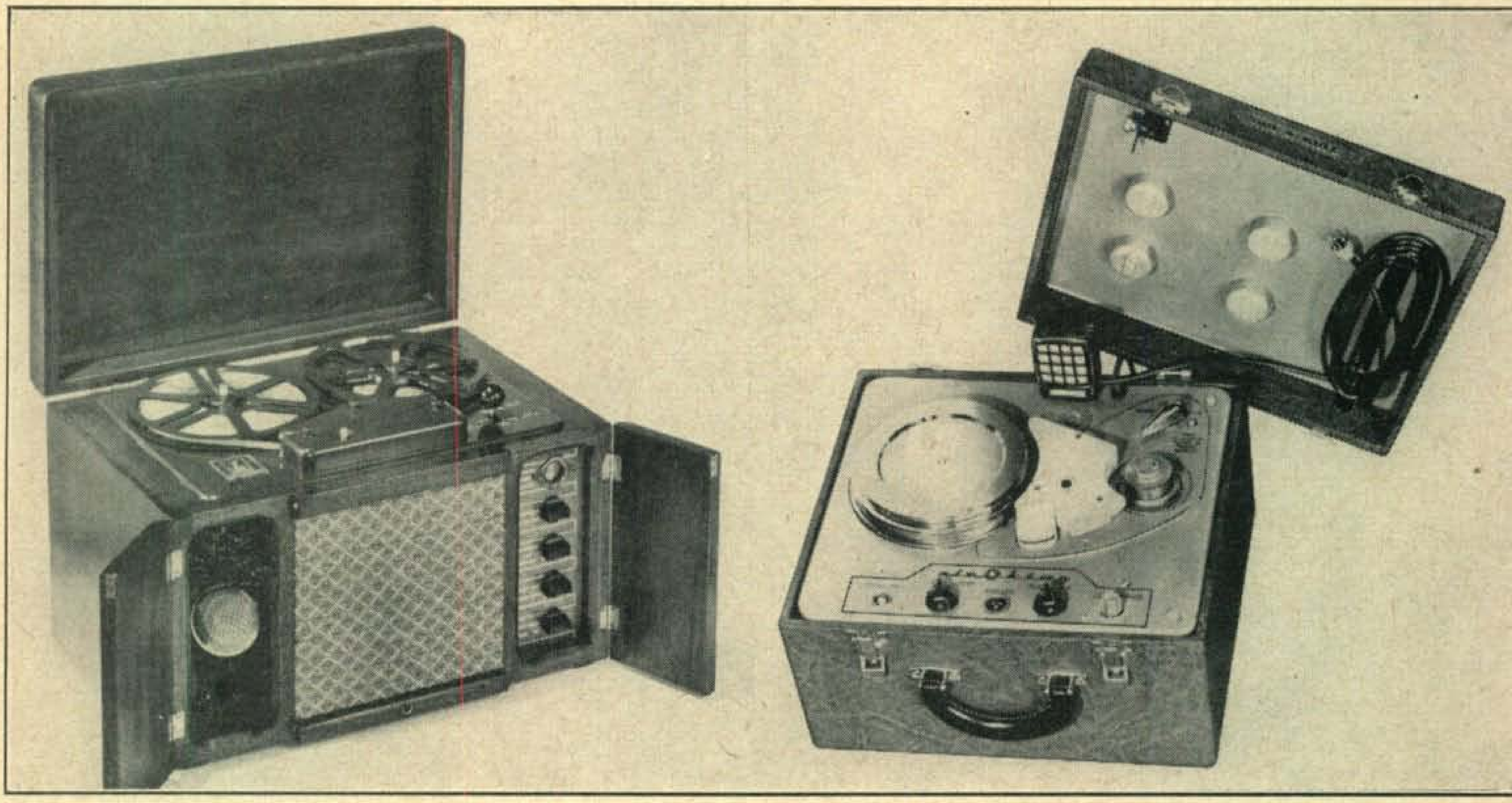
Double triode type 6SN7 tubes are used to conserve space. The oscillator circuit is familiar to everyone; a junk box output transformer was used as a grid coil, and laminations were removed to get a pleasing audio tone. Some experimentation with the value of C_1 might be in order if operation on the laminations is ineffective.

The other section of one 6SN7 is used as a keyed amplifier with output fed to a voltage divider network to drop the volume to a value suitable for the recorder "radio" input. The same tube drives the small speaker for monitoring purposes. If headphones are used, the speaker is automatically disconnected when they are plugged in.

The keying relay is the heart of the unit and should be selected for rapid, positive operation. The particular one used in this model is a Clare 6300-ohm unit available in some surplus houses. This relay, with its bias pot, was mounted on top of the chassis for ease of adjustment. In actual operation, the bias pot is adjusted to the point where the relay closes, backed off to where it opens, then turned farther to the position where the keying action is best, though the adjustment is not at all critical.

The relay is operated by one half a 6SN7, biased to conduct only when a voltage appears across the 400K ohm diode load resistor. The other half is used to rectify the audio from the transformer, a small push-pull triode plate-to-voice coil unit, reversed, with center tap unused. This is, in turn, connected to the voice coil winding of your recorder. Low speaker volume is all that is required to operate the keyer unit. Any small audio amplifier section will drive it.

Since the load on the power supply is light, the smallest transformer available will be adequate.



The Brush Soundmirror tape recorder (left) and the Air King wire recorder (right) are typical units that adapt themselves readily to tape transmission in conjunction with the keyer described.

A voltage divider is provided to improve the voltage regulation as well as keep the power dissipated in the vernier bias pot to a safe value. The tap on the voltage divider is adjusted to the 20-volt position when the unit is first put into operation, and subsequent adjustment is, in general, unnecessary.

It will be noted that when the key is up, the full power supply voltage appears across the heater-to-cathode terminals of the tone amplifier tube. Though this voltage is considerably in excess of the rated value, the tube stands up well under actual use. The appearance of the voltage is mentioned to warn against attaching transmitters employing high plate voltages to the unit without some form of d-c isolation. If a high-power rig is used, it is a good idea to use a keying relay, or, better yet, obtain a plate current relay with an additional set of contacts so the transmitter keyed circuit can be completely isolated from the monitoring circuit in the keyer. If the plate voltage of your transmitter is under 450 volts, it can be keyed with no change in the wiring of the auto-keyer.

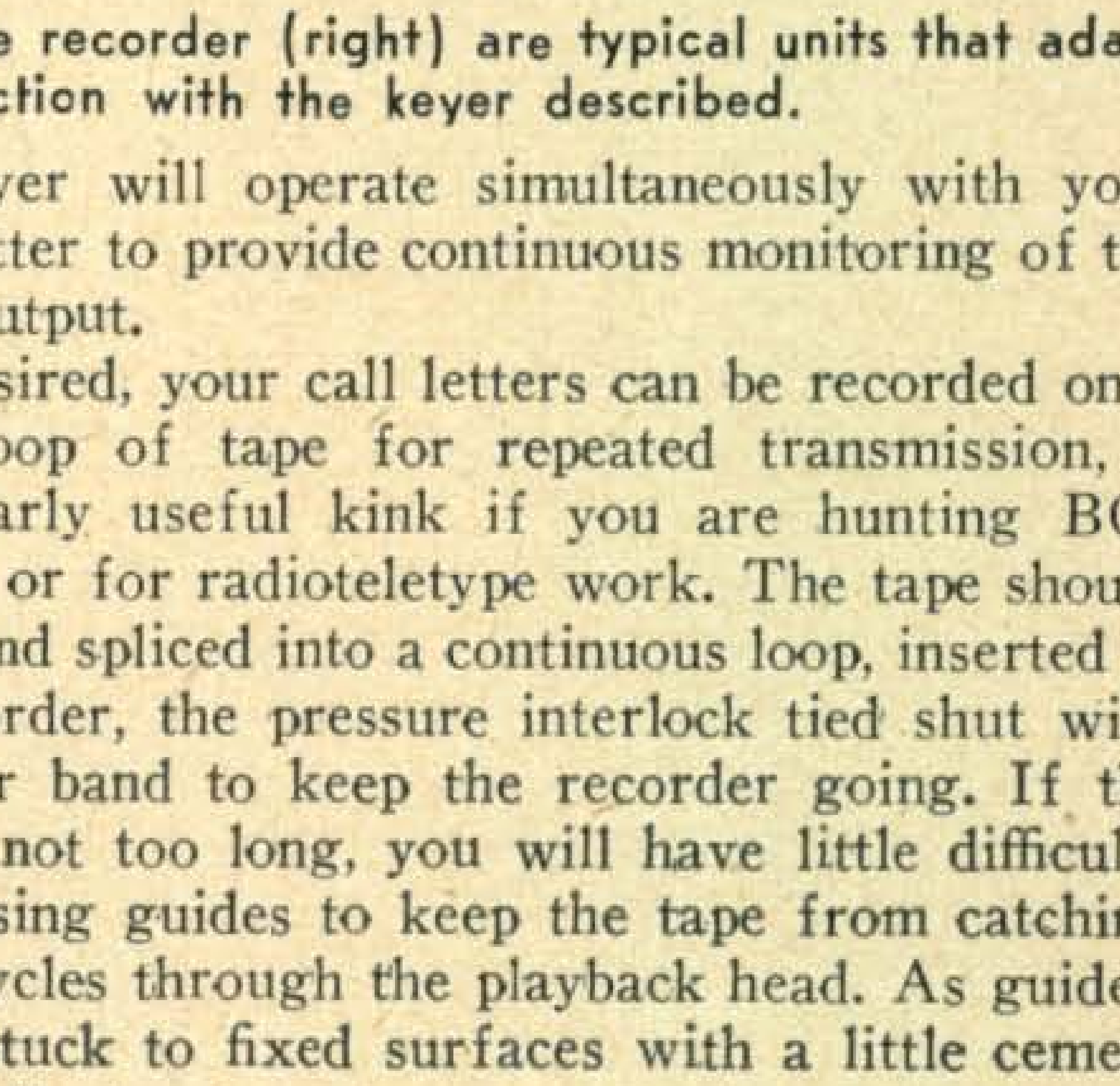
Connecting to the Recorder

To operate the keying unit, the low level output tip jack is connected through a shielded wire to the radio input terminals of your recorder. Plug a key into the key jack and after turning on both the tape recorder and the keyer unit, adjust the volume controls for satisfactory monitoring level as well as recording level. After material is cut on the tape, it can then be played back for checking before you put it through the keyer.

To key the transmitter, connect the binding post terminals to the voice coil winding of the recorder output transformer. Plug the keyed cathode circuit of your transmitter into the jack of the auto-keyer, start the tape playback mechanism, and adjust the volume control on the tape recorder for cleanest keying. The tone generator section of the auto-keyer will operate simultaneously with your transmitter to provide continuous monitoring of the keyer output.

If desired, your call letters can be recorded on a short loop of tape for repeated transmission, a particularly useful kink if you are hunting BCI or TVI or for radioteletype work. The tape should be cut and spliced into a continuous loop, inserted in the recorder, the pressure interlock tied shut with a rubber band to keep the recorder going. If the loop is not too long, you will have little difficulty improvising guides to keep the tape from catching on its cycles through the playback head. As guides, spools stuck to fixed surfaces with a little cement are excellent.

Dollars for Watts



Balanced Feed Systems with Coax

WILFRED M. SCHERER, W2AEF*

Here are the answers to the questions of how to balance a coax feed system and tune the beam for maximum transfer of energy.

THE MOST POPULAR types of transmission lines for feeding antennas, particularly rotating beams, are Twin Lead and coaxial cable. Both types have advantages or disadvantages over one another as has been outlined elsewhere.[1]

Probably the most common fault found with the use of coax line is that the antenna becomes unbalanced to ground and the symmetry of the entire system is upset. The desirability of balance has been pointed out in other antenna articles,[2] and it is of special concern where beams are involved. Several relatively simple methods of obtaining balance using coax are possible and will be described herein. These methods have been previously discussed separately in one form or another; however, a compilation into one article, together with practical constructional and matching data, should prove to be of interest.

The Bazooka

Figure 1A is that of the well-known bazooka. At the antenna end of the transmission line a section of coaxial cable one quarter wavelength long is mounted four to six inches (not critical) from the regular feed line and parallel to it. Connections are made as indicated in the diagram. The quarter-wave line, in conjunction with the outer conductor of the regular transmission line, between points x and y, then forms a shorted quarterwave transformer and places point x at a high impedance to ground or to point y. Point z is also at the same impedance point and the balanced value looking into the antenna is that of the coaxial line. For the most popular cables this will be either 52 or 72 ohms.

When calculating the length of the quarterwave section, it is not necessary to consider the velocity constant (V.P.) of the cable because the dielectric in this case is the air space between the two pieces of coax.

The formula for the quarterwave bazooka section is:

$$\text{Length in feet} = \frac{246}{f_{mc}} \times .95$$

Dual Transmission Line

In *Figure 1B* two lengths of coax are run side by side all the way from the transmitter to the antenna. The outer conductors are connected at the ends of the cables, thus placing the line impedances in series and resulting in an impedance of twice that of each cable, or, in the case of 52 and 72-ohm lines, 104 and 144 ohms respectively. Both inner conductors are at the same impedance above ground and the line is balanced. Each conductor also is shielded. The ground junction of the shields at the antenna end may be connected directly to the center of the antenna.

This method of obtaining balanced feed is the simplest and is particularly good for reception. As the line is balanced for its full length with the inner conductors shielded, is not very susceptible

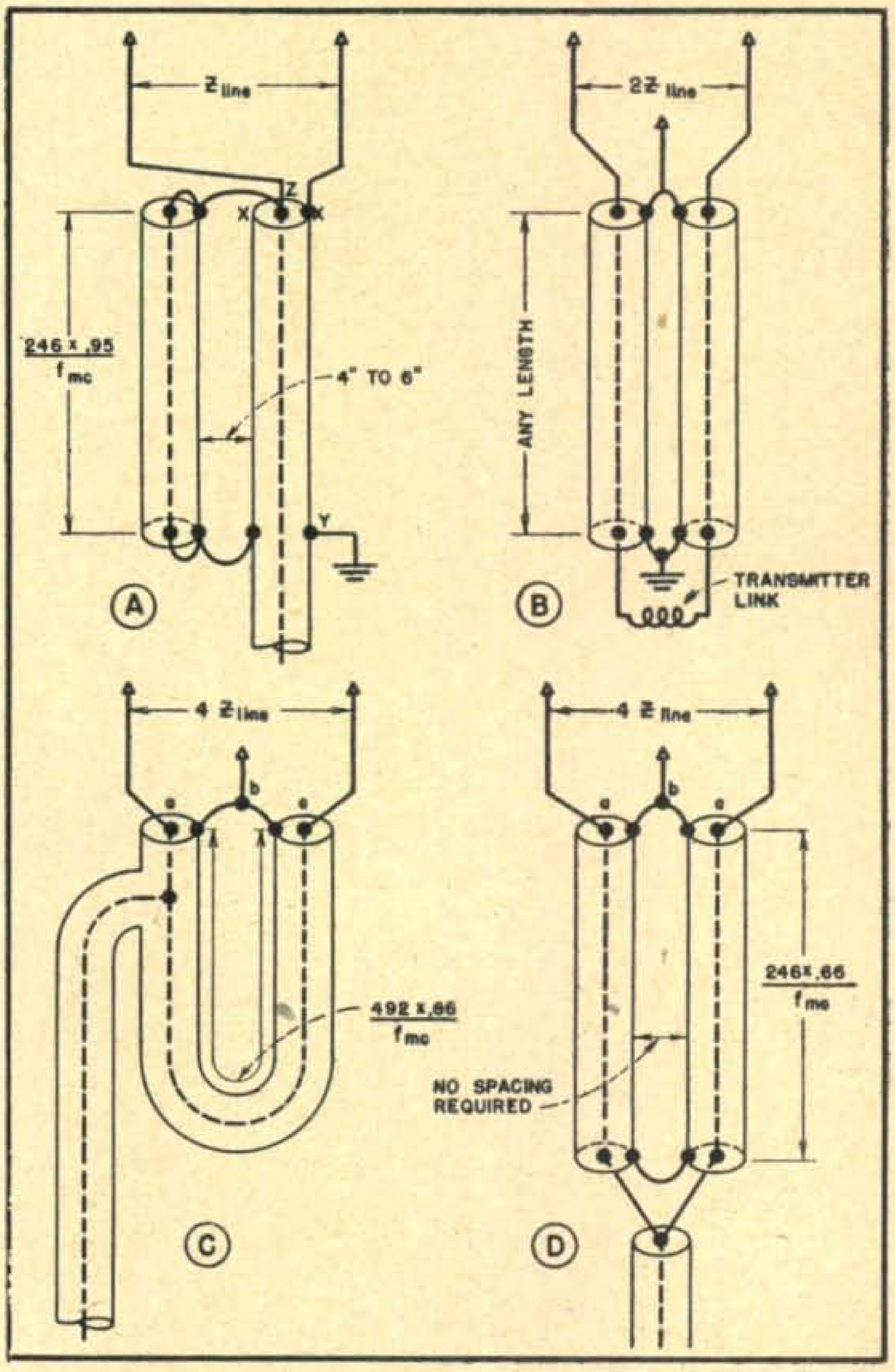


Fig. 1. Four methods using coax for balanced feed. (A) is the bazooka, (B) is dual coax, (C) is the phase inverter of impedance transformer, and (D) is a quarter-wave matching transformer.

**100 E. Palisade Ave., Englewood, N. J.*

1 M. J. Fein, "Coax For Your Antenna", *CQ*, Feb. '47.

to noise pickup. It has the disadvantage of requiring twice as much total cable and is subject to higher losses, especially where the length of the line is considerable.

Phase Inverter or Imepdance Transformer

Figure 1C is often mistaken for the bazooka. Actually it is a half-wave re-entrant line forming a phase inverter or impedance transformer.[2] An electrical half-wave section of line is folded so that the inner conductor at each end, *a* and *c*, may be connected to the antenna. The line from the transmitter is connected to one end of the half-wave section; shown in the drawing. The normal transmission line impedance is expressed between points *a* and *b*, and since a line composed of one or more half-waves repeats whatever appears at one end, this same value of impedance then appears between point *b* and *c*, and is 180 degrees out of phase with that at *a*. The total output impedance between points *a* and *c* will then be four times that of the coaxial line and it will be balanced. In the case of 52 or 72-ohm cables this will be 208 and 288 ohms respectively. Point *b* may be connected directly to the center of the antenna.

When calculating the length of the half-wave section, the velocity constant of the cable must be taken into consideration. For the most widely used coaxial cables (polyethylene insulation) the V.P. is .66.

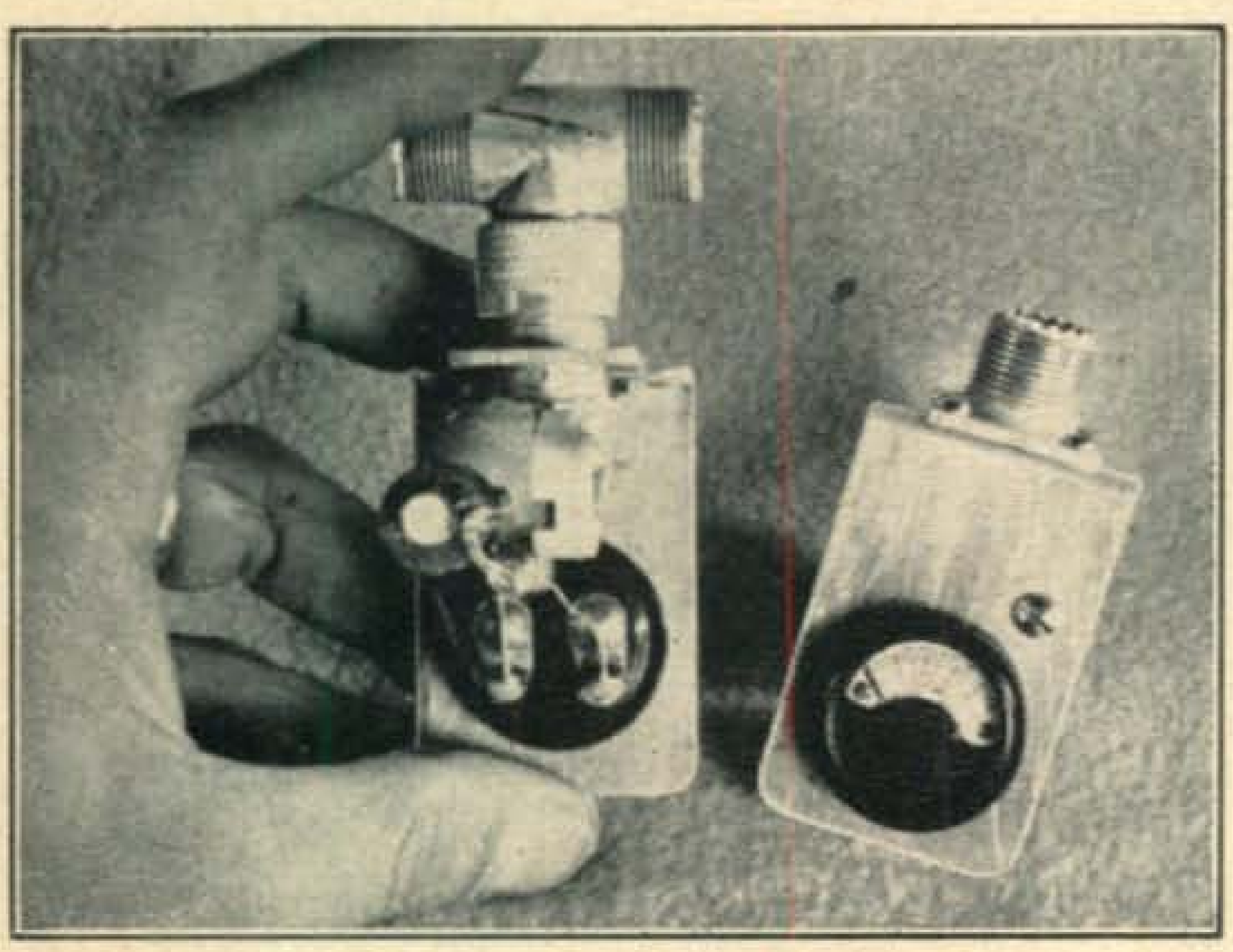
The formula for the half wave section is:

$$\text{Length in feet} = \frac{492}{f_{mc}} \text{x V.P.}$$

It is important that the length be figured with the fittings connected at the ends of the cable. This should also include the receptacles shown in the assemblies of *Fig. 2*. Since the dielectric of the fittings is usually different from that of the cable, inclusion of their length in the calculations will still be very slightly in error. Wherever possible, the correct length should be determined using a Grid-Dipper.[3]

[2] H. Bach, Jr., "The Trombone T", *CQ*, March and April '47.

[3] W. M. Scherer, "Applications of the Grid-Dip Oscillator", *CQ*, Jan. '49.
W. M. Scherer, "The Improved Dipper", *CQ*, Feb. '49.



R-F voltmeters designed to facilitate rapid and accurate s.w.r. measurements.

The line from the transmitter should be connected as near as possible to point *a*. A "T" fitting at this junction serves satisfactorily. This is shown in the photograph.

Quarter-wave Matching Transformer

Figure 1D is similar to *Fig. 1C* in that the final result is the same. It is not as cumbersome but requires an additional means of connecting the transmission line. Two sections of cable cut to an electrical quarter wavelength are placed side by side with their outer conductors connected at each end. Their impedances are in series. This then forms a quarter-wave matching transformer having a surge impedance equal to twice that of the coaxial cable. When a transmission line of the same cable impedance is connected at the lower end of the transformer, the balanced impedance appearing between points *a* and *c* will be four times that of the line.

Calculations for the quarter-wave matching transformer should be made in the same manner as for the half-wave phase inverter of *Fig. 1C*.

The formula for the quarter-wave section is:

$$\text{Length in feet} = \frac{246}{f_{mc}} \text{x V.P.}$$

These balancing methods may be used in a number of ways with different types of antennas. If the antenna is a half-wave dipole of 72 ohms impedance, the bazooka (*Fig. 1A*) may be connected directly to the open center of the antenna when the line used is 72 ohms. Where the antenna is a half-wave folded dipole of approximately 288 ohms impedance, the half-wave phase inverter (*Fig. 1C*) or the quarter-wave transformer (*Fig. 1D*) may be connected directly without the need for any matching system, 72-ohm coax line being employed.

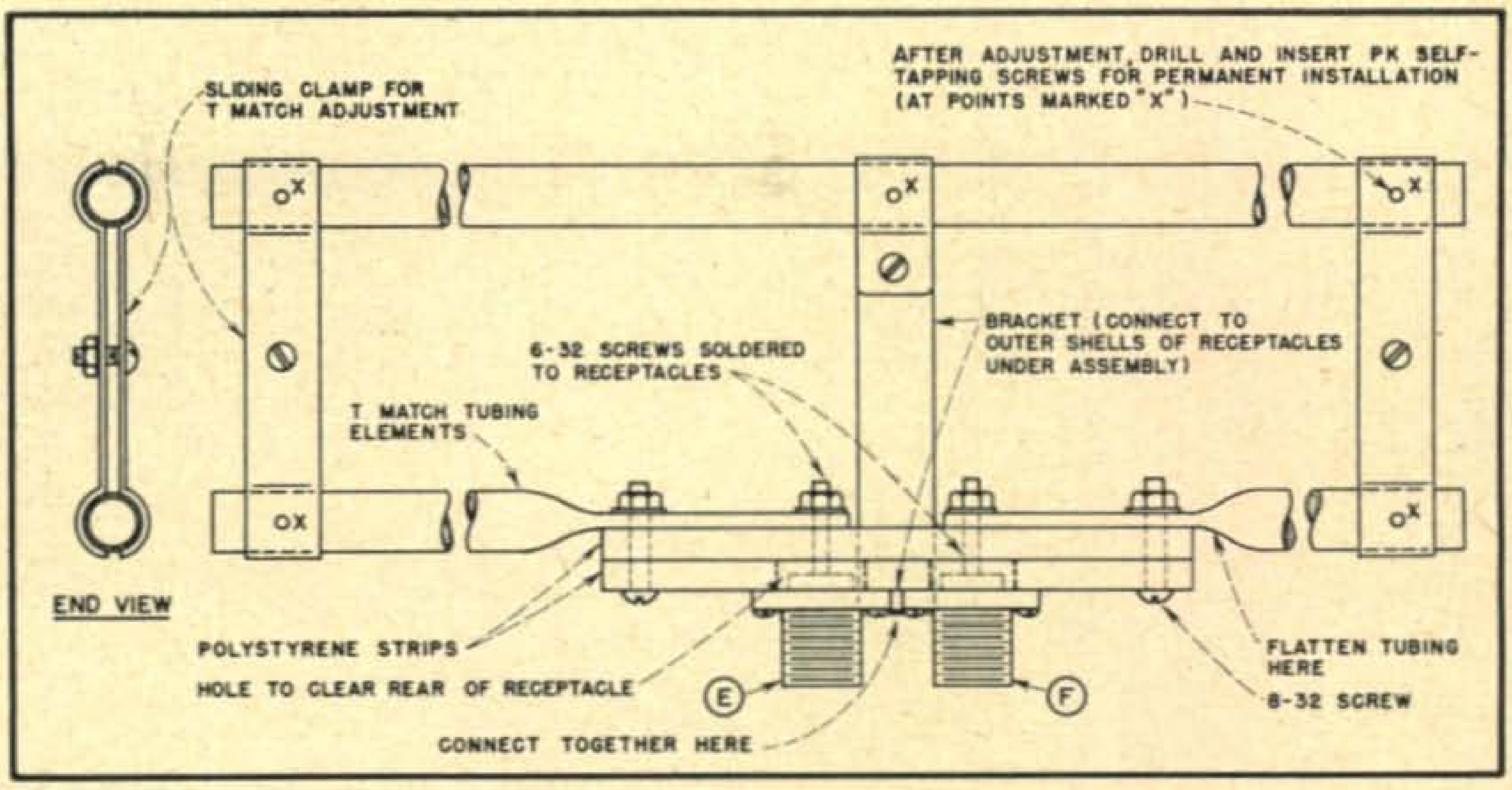
If the beam impedance is near 52 ohms, the bazooka may be used directly with a 52-ohm line; however, most amateur beams (and we are concerned mainly with beams) have an impedance lower than 52 ohms and a method of matching the higher impedance (52-288 ohms) balanced-line sections to the antenna must be utilized.

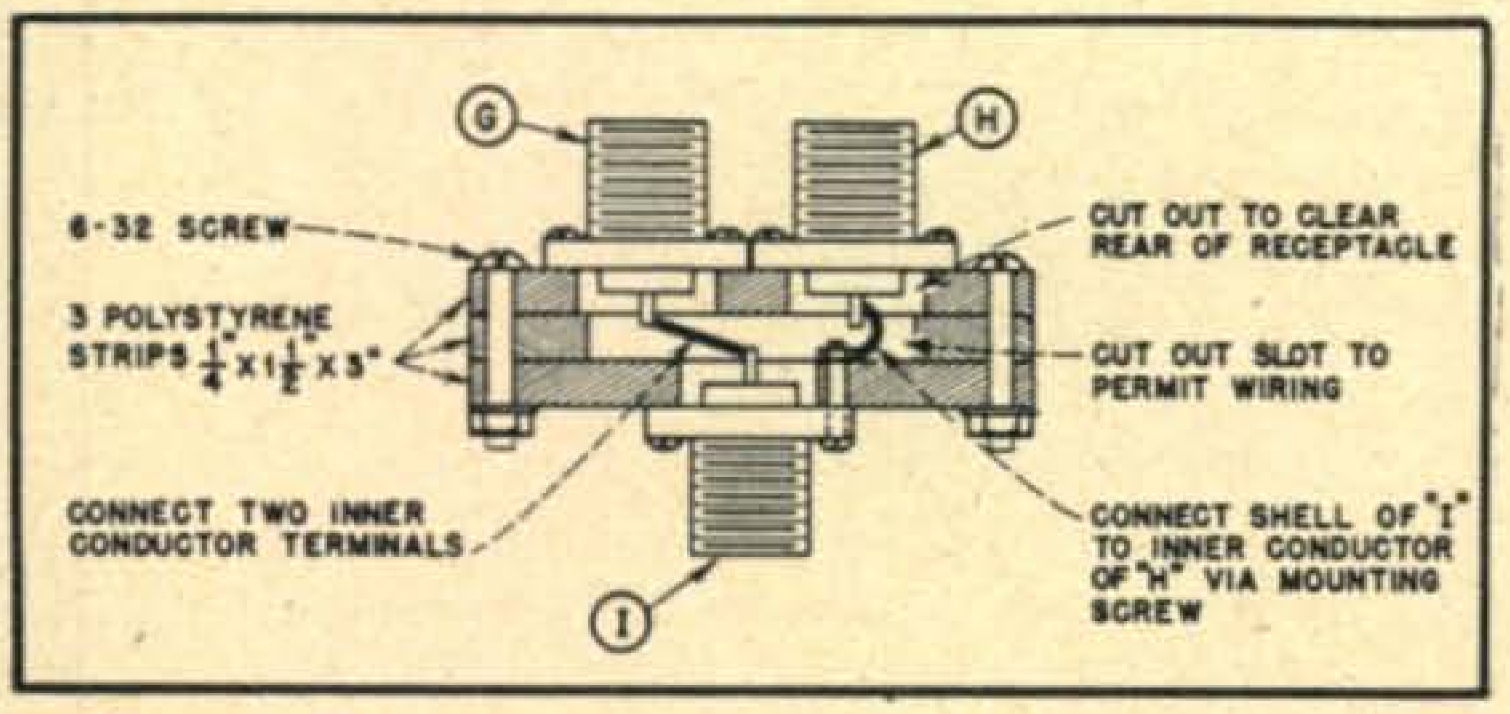
The T-match is recommended for this purpose, not only because it is simple, but also because a correct match may easily be obtained without the need to know the antenna impedance which, more often than not, is different from that of similar duplicate arrays due to differences in spacing, height above ground, nearby objects, element diameters, etc. A number of amateurs have not had satisfactory results with the T-match, claiming it is impossible to obtain a match, or that it is too critical. It is our belief that this has risen out of incorrect tuning procedures for we have found it non-critical and have been able to realize a proper match with any type of feed line or antenna when the tuning methods to be subsequently described were employed.

Simple T-Match

Figure 2A shows the constructional details for the coax fitting assembly used at the center of the T-match. The fitting also serves as the center support for the matching device.

Fig. 2A (right). Mechanical details of T-match connector and support. Fig. 2B (below). Mechanical details of coax transformer-to-transmission line coupling connector.





One inch 6-32 screws, with heads cut off, are soldered to the center conductor rear terminal of each of two female coax receptacles. The receptacles are then mounted, side by side, on the bottom of a piece of polystyrene ¼" x 1½" x 4". The outside shells of the receptacles are joined together. Another polystyrene strip, of the same size, is cemented on top of the one with the receptacles. Holes are drilled in the top strip to pass the 6-32 screws on the fittings. Polystyrene cement (Amphenol 912 coil dope) is applied around the screw holes to seal them against moisture seepage.

The ends of the tubing making up the T-match are flattened and are then bolted to the assembly as shown in the diagram. A bracket from the center of the antenna to the center of the assembly supports the entire unit. The bracket also is connected to the outer ground shells of the receptacles. After completion, the assembly is sealed with several coats of coil dope.

The tubing used for the T-matching section may be of the same diameter, or slightly smaller than that of the antenna, and it should be spaced three to five inches from the antenna. The length of the tubing is ultimately determined during the matching process, but for a start, each half may be about one-sixth the length of the antenna.

When using the dual coaxial line arrangement of *Fig. 1B*, the antenna ends of the lines are plugged into receptacles *E* and *F*. At the transmitter end, the two outer conductors should be fastened together and grounded, while the inner conductors are connected to the ends of the final amplifier coupling link. A dual receptacle device may be made up for use at the transmitter end.

If the phase inverter of *Fig. 1C* is utilized, the center male plug of a coaxial T-fitting is inserted in receptacle *E* so that the length of the T-fitting is at right angles to the length of the polystyrene strip. This may be seen in the photograph. One end of the half-wave line is connected to receptacle *F* and the other end is plugged into one of the free ends on the T-fitting. The half-wave line may be left hanging in the shape of a "U," or it may be rolled upon the boom supporting the beam elements. The transmission line is joined to the remaining free end of the T-fitting.

If the quarter-wave transformer of *Fig. 1D* is to be used, the antenna ends of the two lines making up the transformer are connected to both receptacles *E* and *F*. The transmission line ends are connected to receptacles *G* and *H* shown in *Fig. 2B*. This assembly is made up in the same manner as that of *Fig. 2A*. Correct connections for the receptacles are indicated in the drawing. The transmission line from the transmitter is plugged into receptacle *I*.

A permanent installation of the bazooka of *Fig. 1A* has not been made by the writer, but plug-in assemblies, similar to those already described, could be devised together with some mechanical means of spacing the bazooka lines.

Adjusting the T-Match

One of the most important requirements for perfectly matching any feed system to any antenna, for the attainment of near unity standing wave ratio and a maximum transfer of power to the antenna, is that the antenna be resonant at the desired operating frequency. This can not be stressed too strongly, for it is impossible to obtain a perfect match with the antenna incorrectly tuned. This is one big reason why many amateurs are unable to realize a satisfactorily low s.w.r.

Several methods may be employed to resonate the antenna. It may be accomplished quickly and accurately using a Grid-Dipper. The length of the beam elements should first be set approximately according to formula. The T-matching section should be installed on the antenna element, but all coax cable should be disconnected. If any difficulty is encountered in obtaining a resonant dip on the

Grid-Dipper due to low antenna Q, large diameter elements, etc., connect a crystal diode and a 0-1 ma meter (or smaller) in series between the two halves of the T-section as shown in *Fig. 3.* Couple

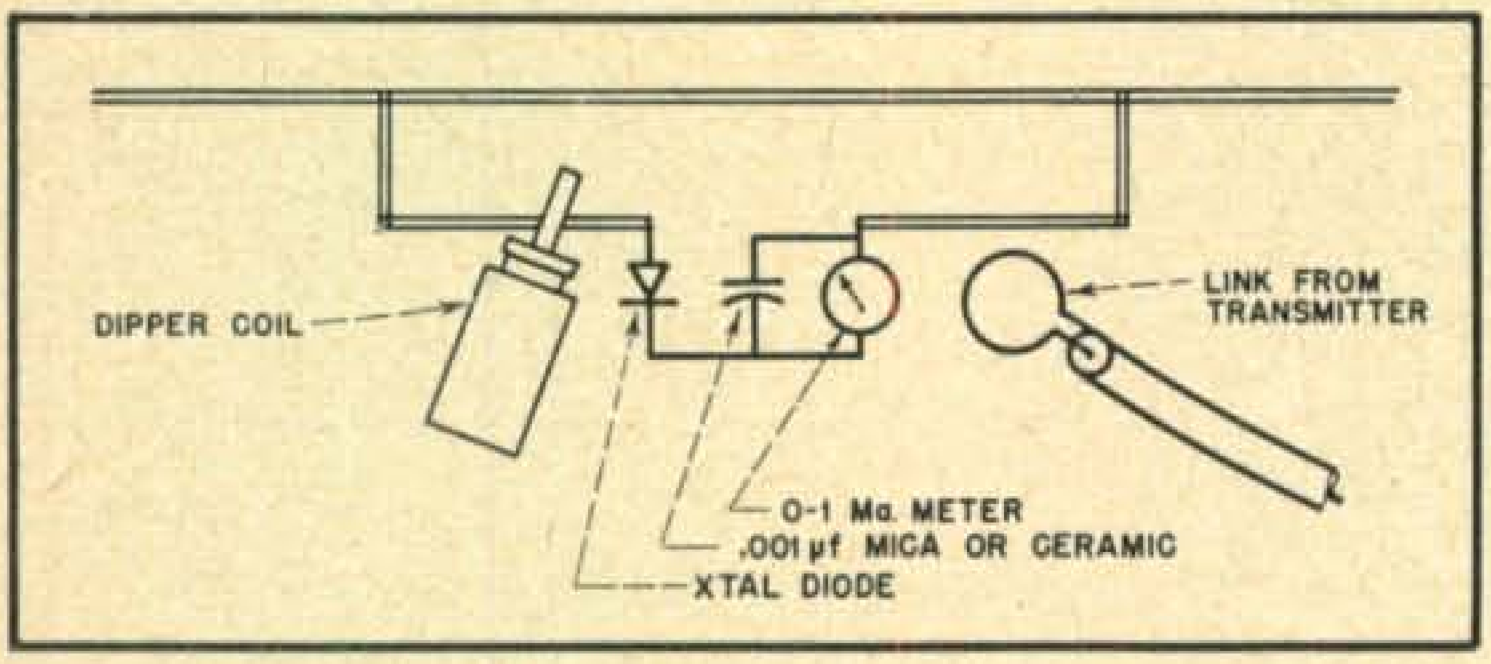


Fig. 3. Method of employing grid dip oscillator for T-match element tuning adjustments.

the Dipper (used as a signal generator) to the antenna or T-section, and tune the antenna for maximum reading on the antenna meter at the desired frequency.

If a Grid-Dipper is not available, this same method may be employed by replacing the Dipper with a coupling link of one or two turns connected to the transmitter via the regular feed line. The physical position of the link must remain fixed while tuning the antenna.

Resonating the antenna by shock excitation before the parasitic elements are installed is not recommended, because the resonant frequency will shift considerably upon installation of the other elements. This is true especially with close-spaced beams. Neither is shock excitation recommended with reflector and director elements installed and purposely detuned. Later, adjusting these elements to correct length will materially shift resonance.

Next, a standing-wave-ratio meter should be procured for use during the tuning and matching process. The schematic of the one used by the writer is shown in *Fig. 4.* It is simple, non-critical, and has been found to be accurate. A 150-µa meter is used in the instrument to increase its sensitivity and thereby permit the employment of the Grid-Dipper as the signal generator. This makes available a variable frequency source of r.f., which is really a necessity during any matching process. It also makes available an r-f source of low power to minimize useless QRM. The instrument is calibrated by adjusting the r.f. input level until the meter reads full scale when no load is connected to the transmission line terminals. When a load resistor (½-watt carbon) equal to that of R is placed across the output terminals, the meter reading should drop to zero. Load resistors of other values equal to 1.5 x R, 2 x R, 3 x R, etc., are then placed across the terminals and the meter readings are noted. The standing wave ratio is equal to: $\frac{R_{load}}{R}$ where R is equal to the line impedance as shown in *Fig. 4.* It is not necessary to calibrate the meter for any s.w.r. higher than 3:1. Actually, we are interested only in obtaining a close to unity ratio which is the case when the s.w.r. meter reads zero. No provision has been included in this meter for use with open radiators lacking a d.c. return path, since all our work has been done with closed radiators. A d.c. return may be obtained by placing an r.f. choke across the transmission line terminals and adding capacitance, equal to that of the choke, across R.

Originally some doubt existed as to the accuracy of this type of s.w.r. meter, because several of the local boys had difficulty in getting consistent readings. A reading of unity could be obtained but changing the length of the feed line resulted in a high s.w.r. reading. This, of course, should not occur if the s.w.r. were really unity. The same erroneous results were found when using non-inductive resistive loads in place of the antenna at the end of the transmission line. Since this also happened when using several different instruments utilizing the same circuit and with different antenna installations, it was decided to prove the instrument by checking for standing waves through some other method; namely, measuring the voltage across the line at quarter-wave intervals.

If an open-wire line or Twin Lead were to be used, no problem would have been involved in obtaining readings across the line; however, with coax some means was required to reach the inner conductor in order to connect the r.f. voltmeter. This was solved by inserting coaxial T-fittings at the desired points in the line. This then permitted a connection to the inner conductor. The circuit for the voltmeter is shown in *Fig. 5.* A 0-1 ma meter in series with a crystal diode is connected to the inner conductor through a 3-12 µµf variable ceramic capacitor. The other side of the meter is connected directly to the outer conductor of the line. The setting of the variable capacitor determines the sensitivity of the device. For convenience, two such meters were used and the variable capacitors were adjusted for identical meter readings when the instruments were connected across the same point in the line.

To determine the presence of standing waves, the meters are inserted in the line, via the T-connectors, one-quarter wavelength apart. The meters will read the same when the standing wave ratio is unity, but, under some conditions, even when standing waves are present, it is possible for the meters to read alike. To check this, another section of line one-eighth wavelength long is inserted. If

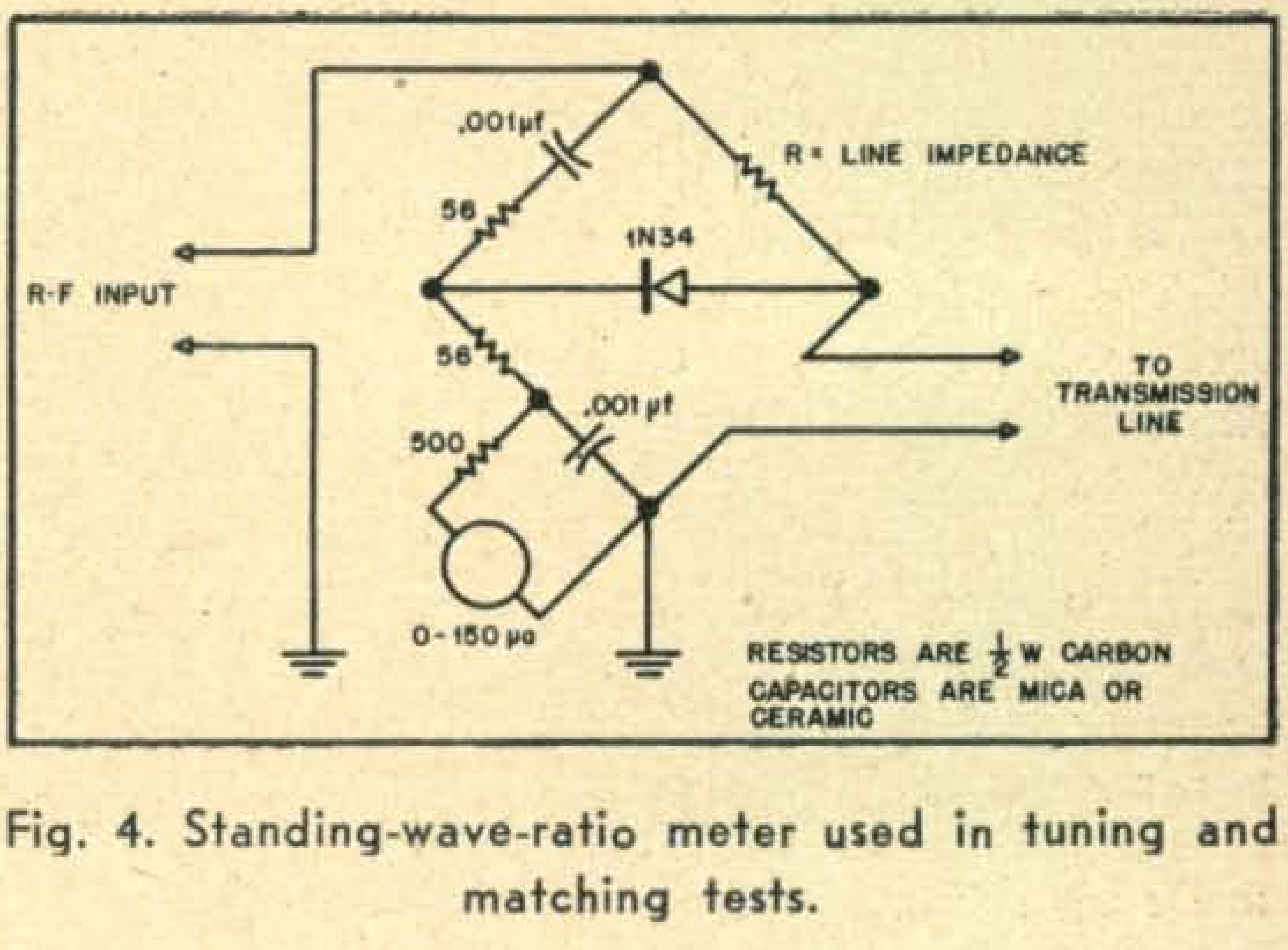


Fig. 4. Standing-wave-ratio meter used in tuning and matching tests.

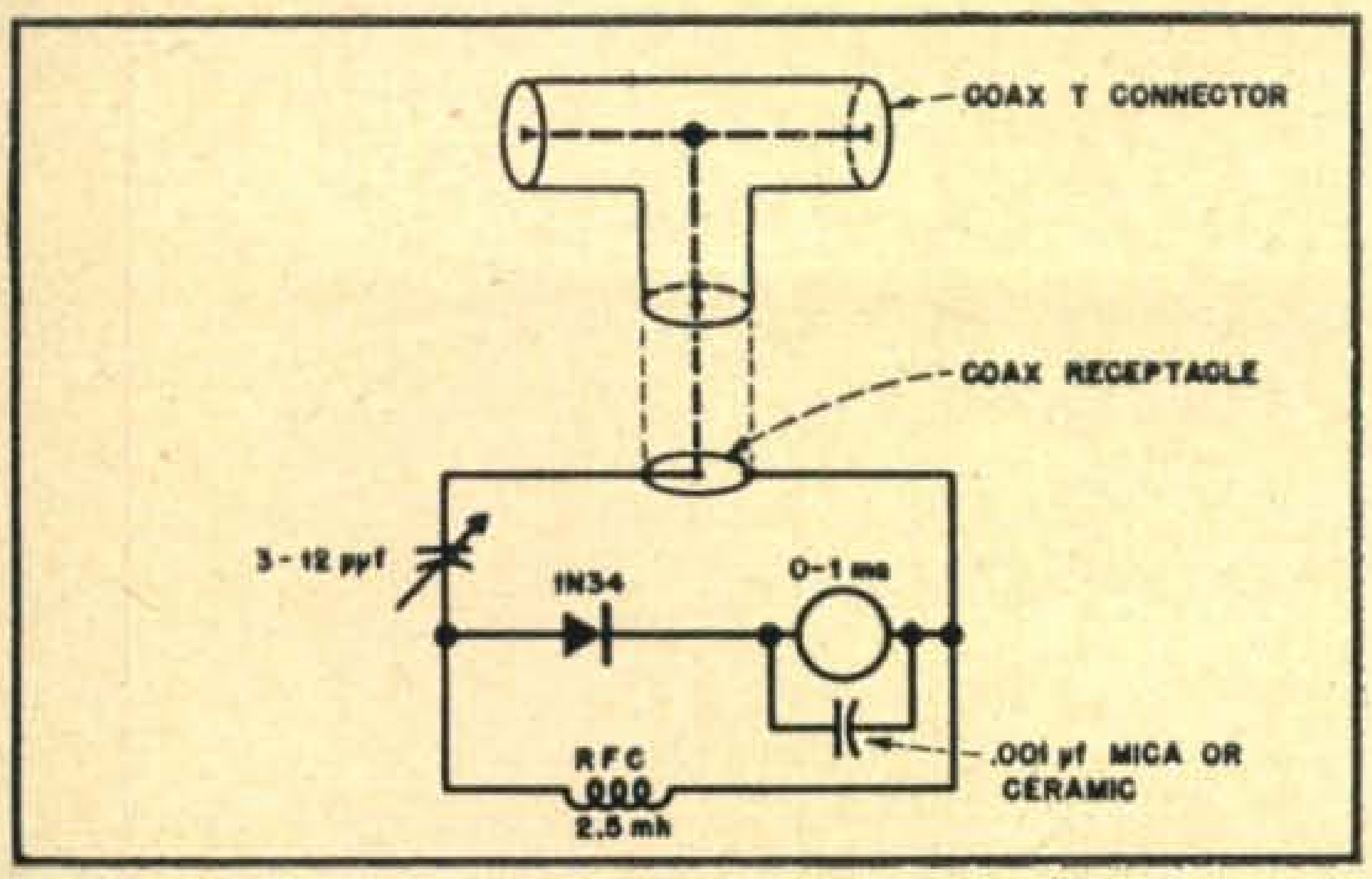


Fig. 5. Circuit of r-f voltmeters used for coax line measurements.

the s.w.r. is really unity, the meters will still read identically. This latter step is also necessary when using the regular s.w.r. meter, as will be mentioned later. Inserting the voltmeters at various points along the line caused no noticeable change in s.w.r.

Now, upon checking with the preceding arrangement, the same fallacious results were experienced as when using the s.w.r. meter. This called for some measurements of the surge impedance of the coaxial cable itself. This turned out to be 72 ohms instead of 52 ohms. Yes, the cable was unmarked and it had been sold to the same group of amateurs as 52-ohm line. Motto: Be careful when purchasing coaxial cable unless it has been marked by the manufacturer!

With the s.w.r. meter functioning correctly connect the balanced feed line to the T-match section. Couple the input of the s.w.r. meter to a variable source of r.f. such as a Grid-Dipper, standard signal generator, or v.f.o. controlled transmitter of low power. It is best to employ a variable source of r.f. because it will readily facilitate checking antenna resonance as the tuning process advances. The coupling to the r.f. source should be adjusted for maximum reading on the s.w.r. meter.

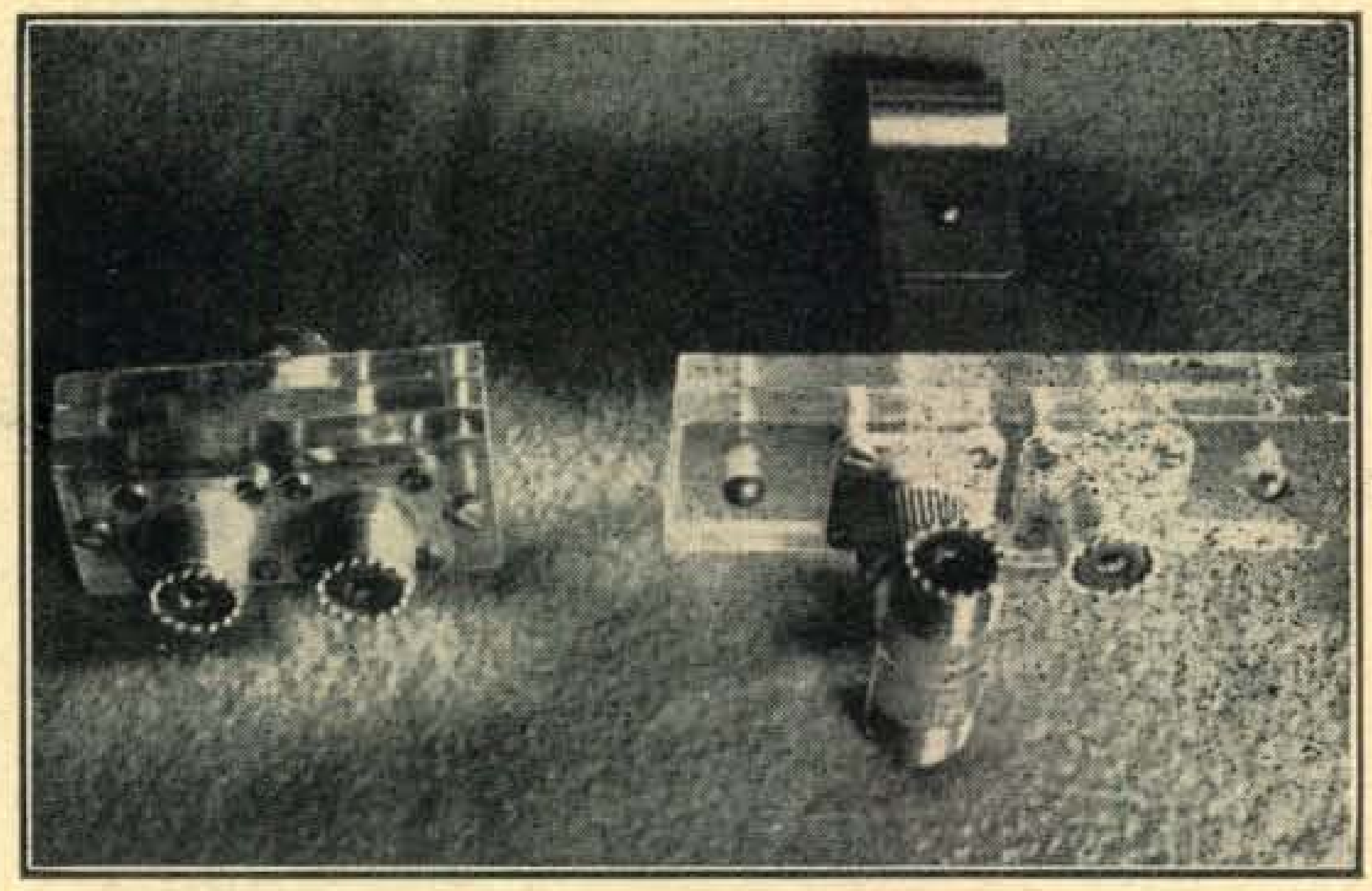
Then connect the transmitter end of the transmission line to the output of the meter. Vary the frequency of the r.f. generator to the point where a decided dip occurs in the s.w.r. meter reading. The frequency at this point should be near that of the antenna resonant frequency established earlier. Adjust the length of the T-match sections by sliding the end clamps an inch or two at a time toward or away from the center of the antenna until the s.w.r. meter reads as near zero as possible. The length of each leg in the T-match should be adjusted equally. After each adjustment, the frequency of the r.f. generator should be shifted for the greatest s.w.r. meter dip, because the resonant point may shift slightly after each adjustment. If, after the s.w.r. has been brought down to as near unity as possible, the frequency is other than that desired, the antenna length should be accordingly altered and the T-match pruned until near unity s.w.r. is found at the desired frequency. Under certain conditions it is possible for the s.w.r. meter to indicate unity even though this may not be the case. Therefore, as a final check, an eighth-wavelength section of cable should be inserted in the line and, if the s.w.r. is really unity the reading on the meter will not change.

It will be noted that we have mentioned unity or near-unity standing wave ratio. To many readers this may appear far fetched in view of the unsuccessful attempts by many amateurs to realize this condition; however, in the numerous tests made, using the methods described above, no difficulty was encountered in easily obtaining an s.w.r. of 1.1 to 1 and better.

Varying the frequency of the r.f. source will produce some interesting results in changes of s.w.r. An idea may be had as to how broad the antenna system is for a given s.w.r. On the average we have found conventional 28-mc parasitic beams to vary from unity to 2:1 over about 400 kc and run up to about 3:1 or 4:1 over a range of 1 mc.

As a final adjustment the parasitic elements should be adjusted for maximum forward gain or best front-to-back ratio, whichever is desired. The customary methods of so doing are satisfactory but for one very important exception; namely, that if the correct s.w.r. is to be maintained, the antenna must be checked and re-adjusted for resonance after each parasitic element adjustment. This could be quite a time consuming operation, but the time may be considerably reduced if a receiver with an S-meter is employed as the field strength meter to permit the use of the low power source of r.f. while the s.w.r. meter is connected in the line. Antenna resonance may then be quickly checked after each adjustment by noting the frequency at which the s.w.r. meter dips or is at unity. Final readjustments of the T-match may be required following the tuning of the other elements.

As a "final final" check, the beam should be rotated through its full 360 degrees to note the changes in s.w.r. or antenna resonance. Unless the beam is entirely in the clear in all positions, some shifts in s.w.r. and resonance will most likely be noticed due to detuning effects of nearby objects. Unfortunately nothing can be done about this condition, but it is not likely to seriously affect antenna performance.



Fittings designed to facilitate connection of coax lines to antenna. The one to the right, designed for a T-match, is illustrated in Fig. 2A; to the left is the coupling shown in Fig. 2B.

Symmetry for Efficiency

CHARLES M. GARVEY, W3WNN*

For the amateur who wants a conventional half kw amplifier, here is a design to duplicate.

SYMMETRICAL construction of a push-pull stage results in increased efficiency and trouble-free operation.

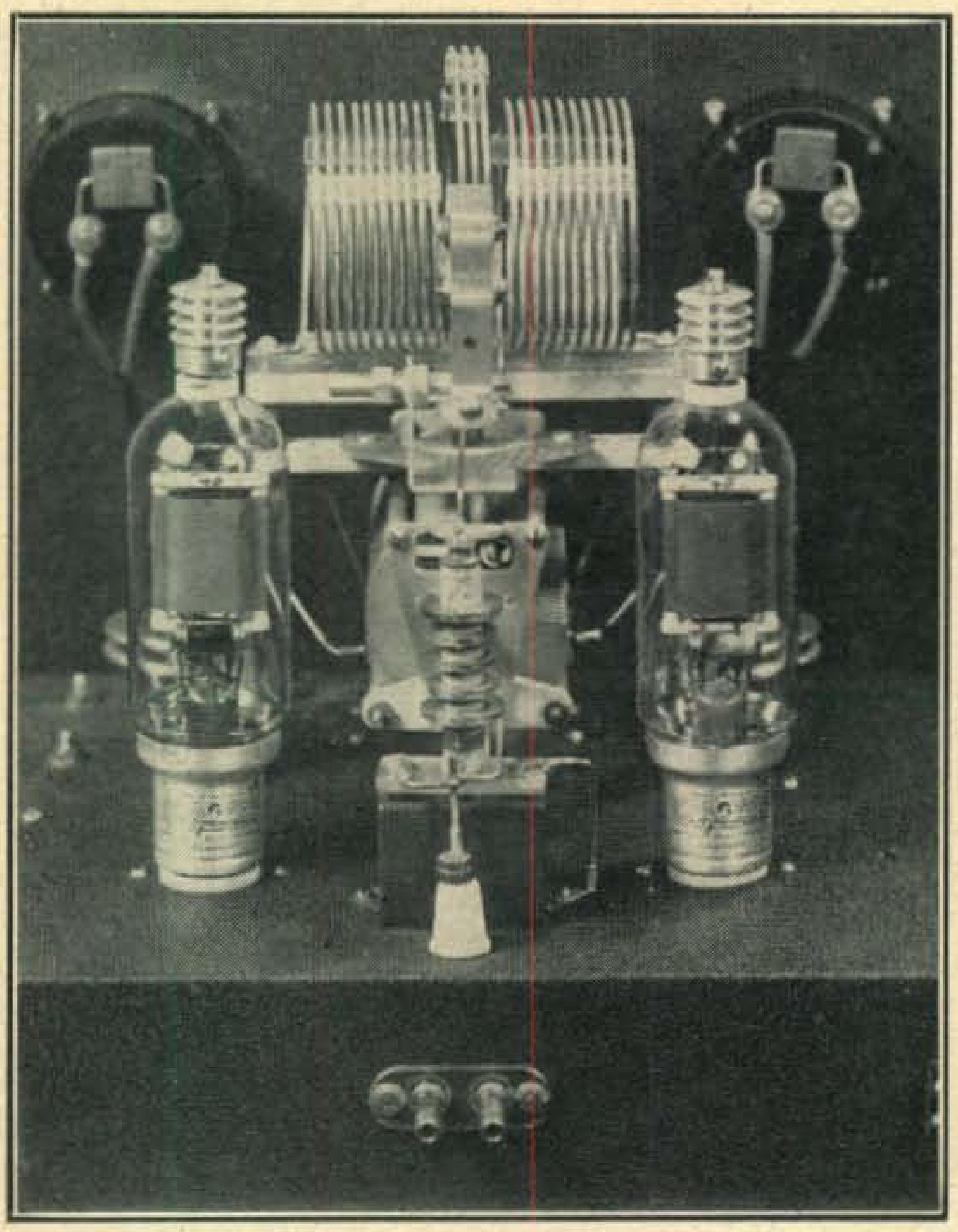
The amplifier shown in the photographs is built up around a pair of 812-Hs on a standard 10 x 17 x 3 inch chassis, and it will conservatively handle 500 watts input at a plate voltage of 1750.

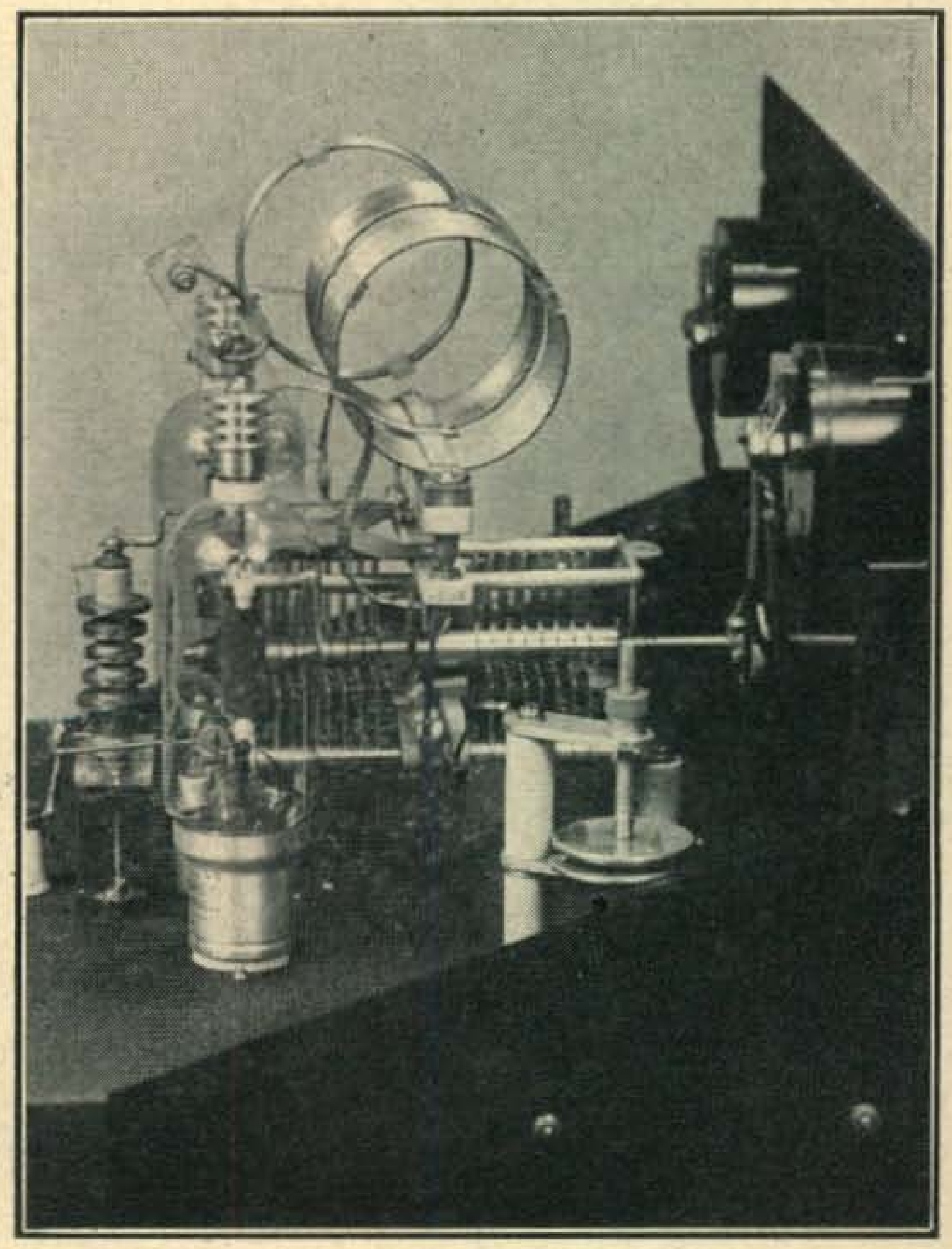
Construction of the unit, after determining a satisfactory layout, was begun by first mounting the plate coil on top and at right angles to the Johnson transmitting condenser. This arrangement not only placed the plane of the coil parallel to the metal panel and gave a better coil-to-panel balance as far as the magnetic field was concerned, but is also a step toward improving the overall symmetrical layout of the unit. The isolantite jack bar that accommodates the plate plug-in coils is fastened to the two parallel spacing rods of the plate condenser by homemade strips of metal.

*% *"Business Week", 330 West 42nd St., New York 18, N. Y.*

Small strips of metal were bent around the spacing rods, squeezed together, and drilled at the ends to accommodate screws. The screws that hold the swinging link assembly to the jack bar are passed through the drilled holes in the metal strips on the spacing rods to hold the whole assembly together. There is also sufficient space on the jack bar to insulate the condenser from the plate coil connections. The actual connections between the plate coil and the condenser are made with lengths of number fourteen bus bar. As shown in the photograph, the connecting points on the plate condenser are made at the center of the stator section where the stator plates are split. The screws that hold the stator plates in place against the isolantite insulating bars are used to fasten the leads, which are tipped with lugs, coming from the plate coil. These screws are easily loosened and tightened again without harming the condenser.

The lead coming from one side of the plate coil





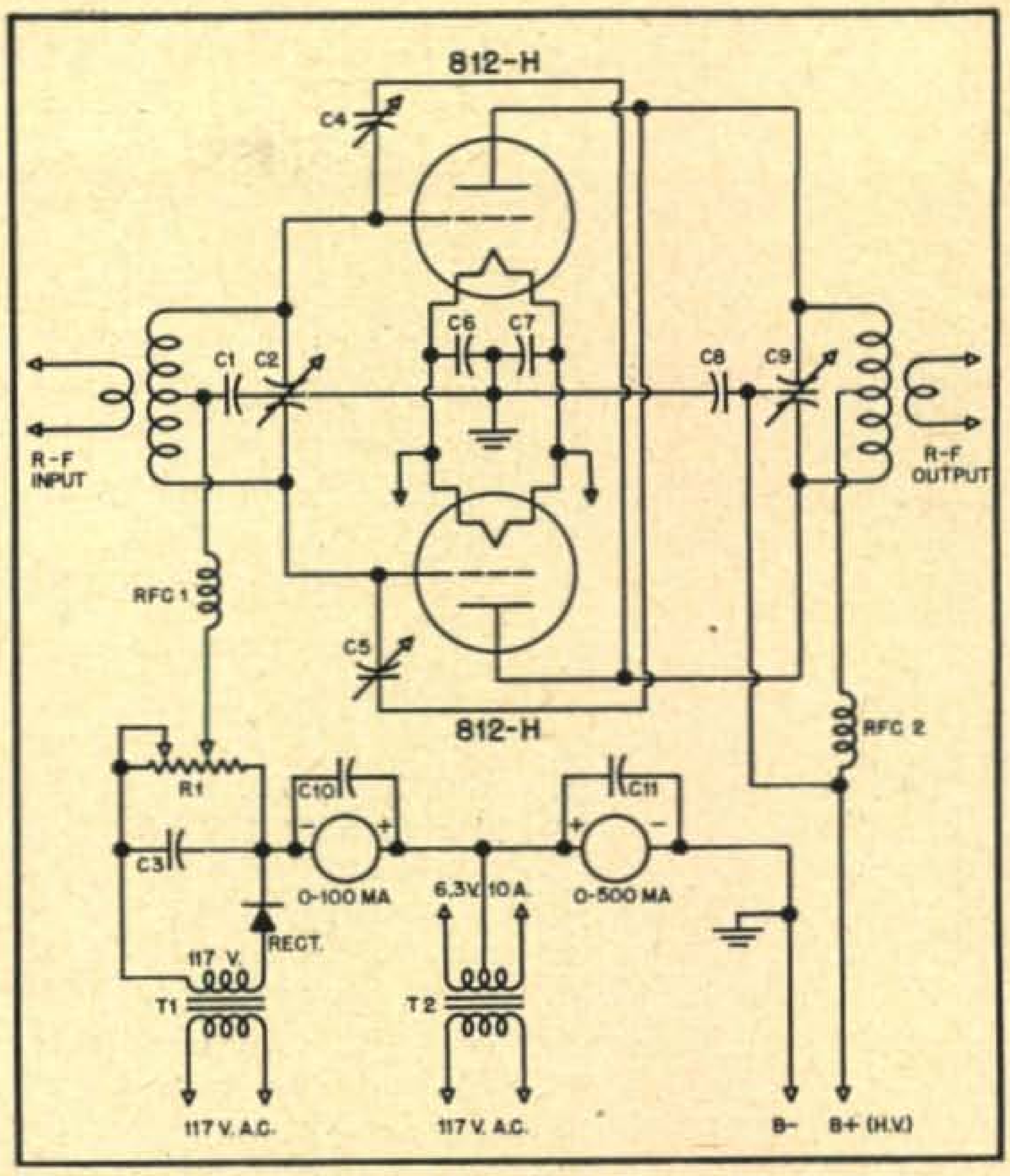
Left: Rear view of the plate tank circuit. The method used to mount the coil jack bar to the condenser can be seen here. Right: Side view of the plate tank circuit. The plate coil and neutralizing condenser connections at the center of the tank condenser are reversed on the opposite side to cross over the neutralizing leads. In areas where TVI is a problem the entire amplifier can be shielded with copper screen.

is connected to one side of the split stator section, and the lead from the opposite end of the coil is connected to the other side of the stator section. After these connections are made, and the assembly fastened to the center of the chassis, neutralizing condensers of the feed-through type are mounted and tied in. Their leads are connected to the two remaining screws on the stator sections at the middle of the plate condenser which automatically brings about the cross-over of leads necessary in plate neutralization.

The plate bypass condenser and r.f. choke also are made into one unit. With its mounting foot removed, the choke is screwed to a strip of polystyrene, and the strip in turn is mounted on top of the bypass condenser by its connecting screws. The choke and condenser are mounted directly behind the plate tank condenser where the high voltage lead from the choke to the center tap of the tank coil can be made short and direct. A small feed-through insulator is placed behind and below the bypass condenser, and the high voltage lead is connected through it to the choke.

Beneath the chassis the grid condenser and the grid coil of the 75 watt variety are placed parallel to the tube sockets, again for the sake of symmetry. Connections between the coil, condenser, neutralizing condensers and tube sockets are made with buss bar. The grid tuing condenser is mounted directly to the chassis through its mounting holes, and a five-prong socket for the grid coil is mounted off the chassis on small cone insulators. For compactness, however, a small receiving-type Hammarlund condenser is used, and a flexible insulated coupling connects the condenser shaft to a panel bearing at the front of the panel. A length of 75-ohm Twin-Lead is run from the appropriate pins on the grid coil socket back to the rear of the chassis and connected to a victron terminal outlet. The grid r.f. choke is mounted vertically next to the grid coil socket with its grid bypass condenser.

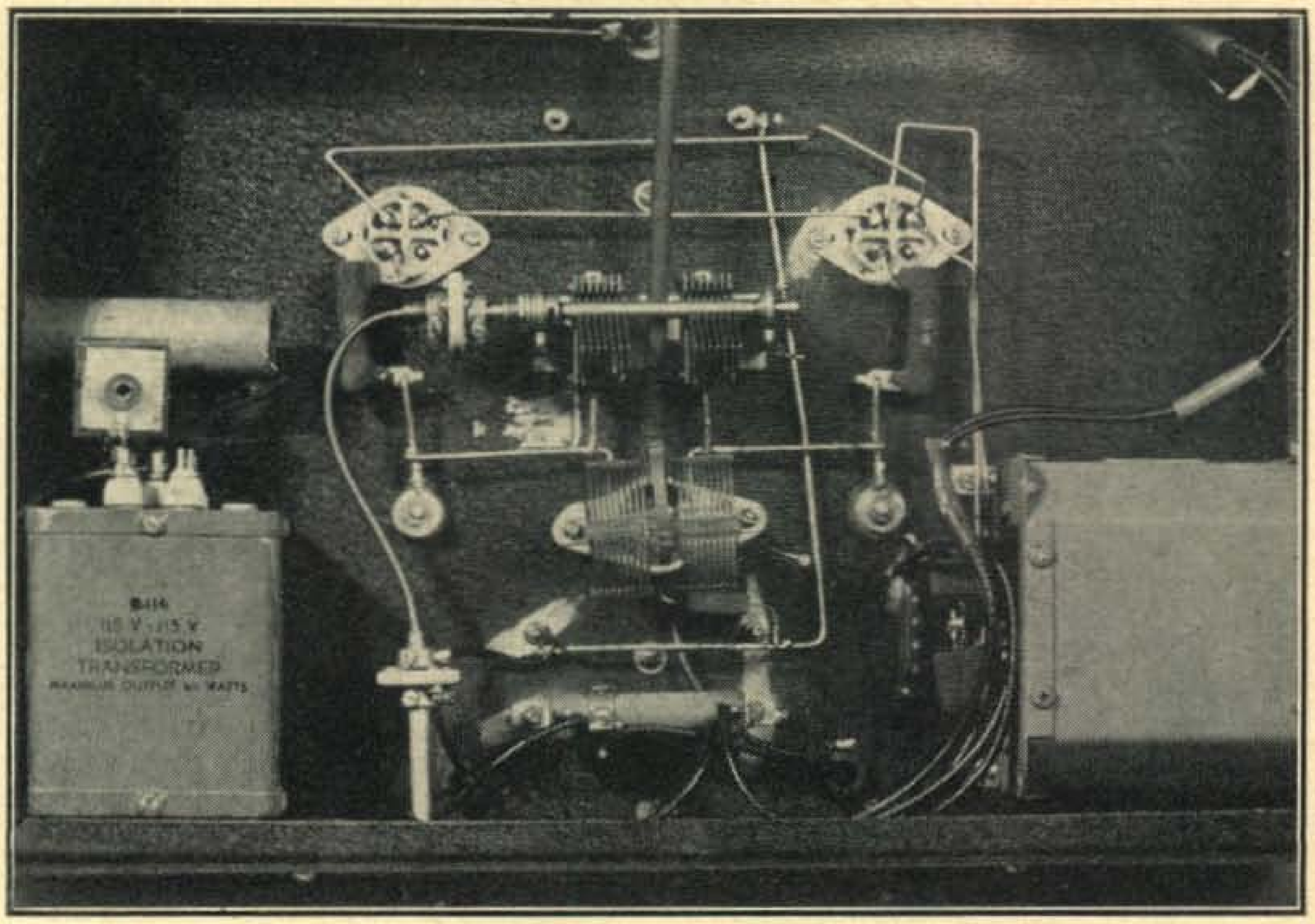
(*Continued on page 77*)



Circuit diagram of push-pull 812 amplifier. By using new heavy-duty types such as the 812A, power in excess of one-half kilowatt may be run.

C1, C6, C7, C10, C11—.005 μf, mica, 600 volts.
C2—100 μμf per section, variable. Hammarlund MCD-100-S.
C3—30 μf, electrolytic.
C4, C5—.5 to 6 μμf neutralizing condensers, Bud NC852
C8—.001 μf, mica, 4500 volts.
C9—100 μμf per section, variable. Johnson 100ED-30.
RFC1—1 mh., r.f. choke, National R154.
RFC2—1 mh., 600 mil., r.f. choke, National R154U.
T1—117-volt, surplus, isolation transformer.
T2—6.3-volt 10-amp. filament transformer.
R1—15,000 ohms, 50 watts, variable w-w resistor.
Rctfr.—100 mil., selenium rectifier.
Grid Coils—Bud OLS 75-watt.
Plate Coils—Bud VCL 500-watt.

Bottom view of the chassis. At the lower left and right sides are the bias and filament supplies. The controls coming through the panel at the bottom, from left to right, are the grid tuning, bias and filament supply switches. The bias resistor is below the grid coil, and the neutralizing feed-throughs are to the left and right of the coils.



Monthly DX Predictions - July

OLIVER PERRY FERRELL*

THE DX Predictions are based upon the following parameters:

A. 1000 watts effective radiated power.
B. Antenna gain factor is equal to 1.
C. Noise discrimination factor is equal to 1.
D. Service gain factor is 14 db.
E. Propagation over the shortest, or the direct route.

Values of maximum usable frequencies were obtained from "Basic Radio Propagation Predictions for July, 1949" (CRPL Series D-56).[1] Calculation of the optimum working frequencies (FOT) for radio amateur transmission was according to methods "Ionospheric Radio Propagation" (NBS Circular 462).[1] Additional material appearing in the November, 1948, issue of *CQ* also was used.[2]

West Coast to Europe

40 meters: Another month with very high polar region absorption. Possibly a few scattered signals deep in the noise level around 2000 PST, but not dependable. *20 meters*: C.W. will be noted well in the noise background around 1600 PST. Possibly phones audible between 1830 and 2100 PST depending on intensity of local atmospheric noise. C.W. fades out completely around 2230 PST. *10 meters*: No openings, MUF about 20.0 mc.

West Coast to South Africa

40 meters: First c.w. signals break through the noise around 1645 PST. Peak conditions from 1900 until 2115 PST with signals about 10 db above local noise level. Band closes rapidly after 2200 PST. *20 meters*: Fair c.w. opening starting around 1545 PST. Band closes gradually after 1730, possibly with signals strong enough for phone work. Band reopens around 2130 PST very suddenly with fair to good signals. Finally closes down just after 2330 PST, although on some days c.w. may last until 0030 PST the next morning. *10 meters*: No openings, MUF about 23.0 mc.

West Coast to Southeast Asia

40 meters: Some signals after 0230 PST. Peak conditions should be sharp, but centered around 0400 PST. Band fades into the noise level after 0600 PST. *20 meters*: Weak c.w. in the noise background after midnight. Slow buildup with broad peak from 0230 to 0600 PST. They may have trouble with high noise level, depending upon location. Band fades out around 0900 PST. *10 meters*: No openings, MUF about 24.0 mc.

West Coast to South America

40 meters: Band gradually builds up after 1645 PST. Broad peak conditions extending from 2000 PST to 0230 PST the following morning. Band closes after 0315 PST. *20 meters*: Band closes down erratically after midnight on poor days. Signals drop in strength and finally fade into the noise after 0530 PST. Band reopens with weak c.w. around 1500 PST. Phones become audible after 1800 PST and remain good until just after local midnight. *10 meters*: Band possibly will open with strong signals around 1230 PST. Peak conditions between 1400 and 1530 PST when the band closes. This opening not dependable.

East Coast to Japan

40 meters: Extremely high polar region absorption even on quiet days. Doubtful that any signals will break through this month. If an attempt must be made 0600 EST would be the best hour. *20 meters*: We may hear their phone and c.w. after 0130 EST while they will be troubled with very high noise backgrounds. Band erratic between 0330 and 0530 EST depending upon magnetic conditions. Possible c.w. peak around 0615 EST. Band fades out completely after 0900 EST. *10 meters*: No openings, MUF about 18.5 mc.

East Coast to South Africa

40 meters: First signals break through around 1730 EST. Conditions improve after 2000 EST with a broad peak from 2100 until shortly after midnight. Strengths should be very good. *20 meters*: Band opens suddenly with strong signals around 0030 EST. This should be a good phone opening, although conditions drop off rapidly and band fades out after 0245 EST. C.W. again breaks through around 1500 EST. Peak conditions from 1800 to closing at about 2130 EST. Phones in this second opening from 1700 to 2100 EST. *10 meters*: No openings, MUF about 23.0 mc.

East Coast to Australasia

40 meters: Band opens gradually after midnight with signals building up out of the noise background. Peak conditions between 0245 and 0430 EST. Band fades out after 0630 EST. *20 meters*: Band also opens gradually after midnight with signals slowly building up throughout the early morning hours. Possibly a sudden fadeout after 0445 EST. Phones readable from 0100 to 0400 EST. *10 meters*: No openings, MUF about 23.5 mc.

East Coast to Middle East

40 meters: On quiet days the first signals may be expected around 1730 EST. Peak conditions between 1930 and 2145 EST. Band fades out around 2315 EST. *20 meters*: Some c.w. and phone work during a short opening from 0330 to 0445 EST. Band then reopens after 1130 EST on quiet days. C.W. only until after 1500 EST when phones build up sufficiently. Peak conditions 1930 to 2130 EST. Band fades out erratically around 2215 EST. *10 meters*: No openings, MUF about 19.5 mc.

East Coast to South America

40 meters: Band opens rapidly after 1730 EST. Good signals slightly above the noise level from 2000 EST until about 0400 EST the following morning. Band fades out after 0515 EST. *20 meters*: C.W. breaks through after 1545 EST. Phones become readable with ease after 2130 EST. Band stays open until 0645 EST the following morning. *10 meters*: Erratic signals from 1300 until 1400 EST when conditions may improve slightly. Peak conditions from 1615 until 1715 EST when band starts to fade out.

(*Continued on page 68*)

**Assistant Editor, CQ*

1 Obtainable from the Superintendent of Documents, Government Printing Office, Washington 25, D.C.

2 O. P. Ferrell, "A New Method of Predicting Band Conditions", *CQ*, November, 1948, page 26.

Conducted by VINCE DAWSON, JR., WØZJB*

TRUE TO TRADITION the v.h.f. bands have become lively, as in previous years, beginning the latter part of April; and as this is being written at the end of May, the year 1949 will no doubt go down in the books as a very good season.

With the coming of warm days and cooler nights the 2-meter lads are now sharing their part of some nice extended coverage work, as well as giving the rest of us something to mull over in the way of just what can be expected to 144 mc.

On May 4, around 1250 CST, W4HHK, Collierville, Tenn. (20 miles east of Memphis), was tuning 144 mc, when he heard W7FGG, Tucson, Arizona, calling CQ 2 meters. W7FGG's signal was R-5 S-4 announcing that he was listening on both 2 and 6 meters. W4HHK called W7FGG, but to no avail, so he hurriedly placed a long distance telephone call to W7FGG, who confirmed his just having called CQ on 144 mc. At the time 50 mc was open for Es skip into Tucson, from WØ. Although they both transmitted and listened the rest of the afternoon, neither were successful in making any contacts. The transmitter at W7FGG was running 500 watts to a pair of VT-127As, and the antenna was two 5-element stacked arrays horizontal. W4HHK was using a cascode pre-amplifier into an HFS as a converter, into an HQ-129X, with a 16-element horizontal beam 66′ high. The rig is 80 watts to an 829B. The distance between W4HHK and W7FGG is 1200 miles, right on the fringe of a single Es hop.

During the auroral opening of April 7, W2RLV in western New York heard W1HDQ on 50 mc make a sked with a W8 in Ohio on 144 mc. Upon switching to 144 mc, W2RLV heard W1HDQ S7 with a T7 c.w. signal. Bill, W2RLV, mentions that although W1HDQ was unable to contact the W8, he did work W2RPO in Tonawanda, N. Y. On this same date WØKYF and W9ALU reported hearing aurora signals on 144 mc.

While the 144-mc gang have been given a shot in the arm for DX thrills, the 50-mc gang have been adding new states and working Es openings, far in advance of last year. On May 19 W7JRG, Sheridan, Wyo., was heard to say, that to date this year he had made 86 DX QSOs, and the same date last year he had made only 1 QSO. Yes, the general consensus from all the 50-mc reports indicate that this year is tops to date. Already double hop has been reported on April 27 from W4s to W7s; on May 15 from W7s in Washington to W2-3-4-8-9; on May 19 from W6s to W3-4-8-9—more double hop openings than reported for all of last year on Es.

TV-FM DX

While the 50-mc boys have been having their fling at working stations all over the U.S., the TV viewers have been having fun along with them. Channel 2 which is just above the 6-meter band has been providing TV viewers with pictures and audio from all around. The FM bands have also provided some out-of-town DX for the listeners of that spectrum. Just how high the Es MUF has been on the hot days is anyone's guess, but from the reports gathered, it appears that in several instances the Es MUF has been close to 144 mc, at least extending beyond the 108-mc FM band.

April 27 provided a hot 50-mc opening and the Houston, Texas, TV station on channel 2 was reported well received in Columbus, Chicago and Kansas City, with good video and audio. May 15, was another of "those" days. David Ronecker in San Antonio, Texas, caught the TV station on channel 2 in Detroit, Mich., from 1200-CST-2000 CST. Ronecker also heard the following FM stations, between 1230-1330 CST: WOAY Oak Hill, W. Va., WCOL Columbus, Ohio; WELD Columbus; WHBC Canton, Ohio; WSAI Cincinnatti, Ohio. The receiver was an HFS converter into an SX-42 and a 4-element beam. (Ed note: Ronecker is a blind boy whose hobby is logging v.h.f. stations. He is a cousin of WØKYF.) Hugh Foster of San Antonio, also heard the same FM stations mentioned above, mentioning that when WOAY was in a deep fade WYKO (Columbus, Ohio) peaked above S9. Twelve stations were coming

Adios party for XEIKE. Left to right, standing: XEIH, ex-ZL2AI, XEIFU, XEIKE and XEIGE. Kneeling: XEIFE and XEIZE. XEIPA was behind the camera.

**Send all contributions to Vince Dawson, Box 887, Gashland, Mo.*

through at one time, but the long lapse between station identification prevented logging their calls. Several TV viewers in Kansas City received excellent pictures from New York City, Buffalo and Houston.

The Honor Roll

While a few of the gang have written in correcting their honor roll standings, quite a number have neglected to do so, which has resulted in its becoming out-dated. In the August column we will again commence the 50-mc honor roll, using the listings of those who will advise us of their new standings. None of the old standings will be used, in order to present to you an up-to-date listing. Therefore, in order for you to be listed in the revised honor roll, drop us a card or jot it down on your monthly report to reach us by the 20th of the month, being sure to list the countries worked. A little note giving local activity or news of the openings will be appreciated.

The V.H.F. Gang

For a long time the 50-mc gang has been looking for an active 6-meter station in Cuba. Now it has become a reality for CO6WW in Cienfuegos is on and has heard U.S. stations on Es. On April 27, between 2030-2100 EST, CO6WW heard W4NMB or MNB, W4HBB (HVV), W4KIV (KIP?) and W4FQI, the latter 10 db over S9. Although Jose called many CQs he was unable to work anyone, yet his equipment is very good, running 90 watts to a 3E29, feeding a 3-element beam, and an RME-152A ahead of a National 173. A preselector using two 6AK5s is also used by CO6WW on weak signals, although all of the W4s he heard (off the back of their beams) were S7-9. Perhaps it would be well for all of us to drop Jose a card and welcome him to the band. His address is Box 112, Cienfuegos, Cuba. Welcome to 50-mc Jose, and keep with it for the Ws in the summer and South America during the winter.

Buzz, OA4AE, has been doing 50% flying since his return to Lima from the States last fall, and just got in on the last of the South American DX. An 813 with 200 watts is now on in Lima, but traveling more extensively has cut Buzz's operating time. On March 25, OA4AE and W5JLY were in contact for 2½ hours, the only signals on the band. Sorta maddening, says Buzz; surely some of the south Texas lads were taking their siesta, he theeenks! To date Buzz, OA4AE, has worked 13 countries, W, XE, TG9, TG12 (?), KZ5, YV5, HC2, PY, CX, LU, CE, PZ and OA4. The W contacts are Florida, Texas, Miss., Ohio and Arkansas, which OA4AE hopes to add to soon.

XE1GE reports that the South Americans came in practically every evening during the month of April, which has helped lots since XE1KE moved to the States. Jeff, XE1GE, was able to work XE1KE mobile, when the latter started for the land of sunshine, California. Contact was held with XE1KE for over an hour on 50 mc, until B.J. faded out some 50 miles down the Laredo highway. XE1GE wants W9ZHB to QSL even if the powerful postman objects—hmm, hmm!!

Texans all, left to right, W5VY, W5VV and W5JLY.

Via WØKRZ we find that WØKIW is now VO-2BN and has his 100 watts and 3-element beam up on 50.2 mc, and is looking for signs of 50 mc DX. In the meantime the hunting and fishing is good in Argentia, Newfoundland, which helps to while away the hours until he hears sign of a 50-mc signal, which shouldn't be too far off if the season keeps going at the pace it has been.

B.J., W3PH/6, ex-XE1KE, is now basking in the golden sunshine of California, and on his mobile rig, has been able to work the W5s and W7s on Es, until he gets the fixed station going, which is not far off. B.J. had his call of XE1KE transferred to XE1ZE's XYL, so don't get too excited if you hear her on 10 or 6 meters.

W8ZUL has changed the r.f. stage of his NC-173 to a 717A, which is the octal base equivalent of a 6AK5. The result is about 3 S units gain over the other. The only change required is to retrack the r.f. padder. This might be a hint for you who wish to get on 50 mc, but lack a converter, for W8ZUL has worked plenty of Es DX.

The May 15 opening was the best yet for W3-OJU in Washington, D. C., as double hop into Montana, Oregon and Washington was stupendous for over 2½ hours.

Timing Is Important

Gord Coleman, VE3ANY, is trying to pull an Eddie Cantor on us, for his wife just presented him with his third daughter. VE3ANY stuck out the May 15 opening, but had to rush the XYL to the hospital at 1950 EDT for the event. His brethren of the 50-mc band kept calling him at the hospital to tell him it was the best opening of the year and still rolling in. What should have been sweat, under these conditions, turned out to be blood, Gord says, but he hopes to get even with them.

Eglin Field, or as we should now put it, Eglin Air Force Base is now represented on 50 mc by W4COS, who says that he is getting a big kick out of 6-meter skip, even at his age. W4COS is a colonel, commanding officer of the air installations division at the school's base. He mentions that it's really a screwball band with plenty of thrills. Heck, George, just wait till you start meeting the gang in person, then you will be fully convinced.

Extended ground wave was good for the gang in the Shreveport-Vivian, La., area on April 29. W5DXB, EKU, ML, DC, PVR all worked W5-MXI in Monroe, La., 120 miles. They are able to work W5MAW (100 mi.) in four nights out of five, the other 20 miles seems to be the attenuation point.

According to WØVIK in Denver, the HC2OT-WØUEL contact was made when the rest of the Colorado gang couldn't be home, although it was on a Sunday. Colorado has an increase in activity now, with the gang raising power and putting up beams.

W8NQD says the band was open four hours on the 27th of April, really a mid-summer type opening for he was able to get W7BQX and W3CIR/7 for state 33.

The Akron, Ohio, lads are now having contacts with W3BGT in Pittsburg, the latter running a kw with very loud signals over the 95-mile mountainous path. No doubt W3BGT will become a member of the Potlickers Net, which centers around the Akron area.

W6WNN heard HC2OT calling CQ on April 22 at 1900 PST, but was unable to contact him. Things had better pick up quick on 50 mc in California, says Poncho, or there won't be any W6s left to work the band. Nope, sure didn't sound like it on May 19, when scads of W6s were heard working double-hop. Guess all it takes, Poncho, is that double-hop shot in the arm to get activity going.

W5LIU who used to be active in Ft. Worth is now at Texas Tech in Lubbock and says that he and W5KCP are active at the school's station, W5PXT, with W5LJG on in one of the dormitories. Herb, W5LIU, will really be pounding away on 50 mc from his Ft. Worth QTH, when the summer school vacation starts.

In Texas City, Texas, things have been fairly quiet since the explosion, according to W5PTV, until he took time off from his 28-mc operation on April 27 to tune 6 meters. The result was nearly as startling as the explosion, for he found his first 50-mc DX coming through. Now he is thinking more seriously of getting a rock for 50 mc.

W5JAK says that he was lucky and got North and South Carolina in one opening. Chas, W5JAK, runs 50 watts into a 4-element beam on top of a water tower 62' high, not mentioning if he has sprinkled salt in the water in the tower to get that perfect salt water reflection we hear so much about.

W9ALU would like to see the 50-mc gang point their beams southeast more often for reflected signals. W9HGE and Hod have been working that way, although the direct path is sometimes much better when bending is present. Of course, Hod, that ionized patch is needed to bounce the signals off. Anyone else tried the indirect path method for a contact, except in the mountains?

W7QLZ's Flying Antennas

Out with the Desert Rat, W7QLZ lost his antennas during a breeze the latter part of March. He then rebuilt them and added a 420-mc parabolic array on the top, which promptly came down also. Now he has learned to mount the "wind catcher" parabolic arrays on separate rotating mechanisms. Clyde made some checks on folded-dipole radiators and found that 4-inch spacing and 109" length resonated at 50.6 mc. W7QLZ says there are more openings this year, but not one on in the right place at the right time, for activity seems to be low in the areas the band gets hot for.

W5GTP of New Iberia, La., is on 50 mc because of the lower frequency QRM and no space for an outside antenna. So far he has been doing okay on his inside folded dipole, and after the first few openings is now figuring out a method to get a 3-element beam in the shack.

WØTKX says that WØKPQ has moved to Denver, but that we should be hearing him on the band shortly. On April 28, WØTKX heard the 7th harmonic of W6OTR on 50.8 mc, working a W5 on c.w. No 6-meter signals were heard and his i.f. frequency is not 7 mc either!

W5AJG picked up Wyoming and Montana in May to bring his states total to 46, the highest in the W5 territory. No doubt, Leroy, the State of Texas will add another star on their flag, when a W5 W.A.S. is completed on 6 meters—at least they should, doncha think so gang?

W5EEX shows just how easy it is to work LUs from down Texas way.

In Dayton, Ohio, W8NSS got out the steel wool and polished up his 7-element beam to be ready for the Es season, which started for him with gusto on the April 27 opening, when every W5 in Texas was worked.

Recently we had the pleasure of journeying to San Antonio where we met W5VY, W5JLY, W5-BUV, W5LBG, W5LIV, and to make it complete, W5VV flew over in his Bellanca for an evening session. All of the San Antonio gang had worked an LU except W5VV, for which he took a lot of kidding, as Austin is only 75 miles north. Now W5VV can face the gang there for on May 18, at 2030 CST, Wilmer contacted LU6DO to join the 50-mc immortals of Texas. Guess we should have another session at W5VY's, Wilmer, to discuss this achievement—say about 10 years from now after all of us have recuperated. Thanks, fellows, for the swell time.

Down Florida way we find W4EID busily studying for his final exams, 50 mc taking a back seat for the time being, but just watch Miles go to town after he removes the cap and gown on graduation day.

WØBPL in Fredonia, Kansas, is a newcomer to 6 meters and to his surprise worked XE2FC in Tampico, Mexico, on May 11, at 2110 CST, with no signals audible on 28 mc. Since March 20, when he first got on the band, WØBPL has worked 25 states and 3 countries, all with more thrills than any of the lower frequencies.

W7HEA has been noticing a peculiar condition on 28 mc, which has appeared three times of late. From 28.7-28.9 mc the band was open with the signals at 28.8 mc S9, then tapering off on each side so that they practically formed a sine wave on his panadapter. In this narrow band, signals were coming in from JA across to VE and Ws, thence to South Americans and on to VK and ZL. The direction of his beam has little effect on the signal strengths, those stations on 28.8 mc are loudest. Several of the locals have noticed the same effect, have any of you? Bish says the double-hop openings to him have been weak with louder signals on the coast, yet it's still double-hop so who cares as long as new states can be worked.

WØKRZ of Topeka, Kans., is another 10-meter

(Continued on page 53)

Conducted by HERB BECKER, W6QD*

This month's Column is by Andy Elsner, W6ENV, once again pinch-hitting for W6QD.

If you would just pick out your last December issue, turn to page 41, and read the first paragraph, you would save me a lot of work. Unfortunately, however, I'm afraid that either you don't have that issue (cold winter, remember?) or, being a DX man, you wouldn't know where to even begin to look for it, so—let's start all over again. Herbert is in—why, of all places, WNINELAND, and there's some kind of a—aw, you guys wouldn't believe it anyway, so why waste the space? I hate to admit it, but I've slipped to an S2 condition; just a push-over these days. Herb didn't even bother to bait me; just calmly announced that he would be in Chicago around the 15th of the month, and that he guessed I knew what that meant. Well, if I didn't know then, believe me, I do now!

A little matter of putting the microscope on 200 QSL cards allows us to congratulate the following newly awarded WAZer's:

122	CX1FY	Julio F. Badin	40	176
123	G5YV	Harold Beaumont	40	172
124	W6BVM	Don Rinaldi	40	148
125	W8BHW	Rolf Lindenhayn, Jr.	40	207
126	WØOUH	William Manson	40	131

No introductions are necessary. You have all heard these boys on time and again, prewar and postwar. To CX1FY goes the honor of being the first Uruguay station to achieve WAZ. G5YV is heard regularly on both c.w. and phone. I'm sure that everybody remembers Lindy. W8BHW, as W2BHW before the war. W6BVM and WØOUH have both been in and out of so many pile-ups in the past few years that we are going to send them a special flat certificate, in keeping with their present condition.

Add One More - Macquarie Island . . . VK1

There was a slight delay in getting joint approval of this one, maybe because it has a "CQ" in the middle of it, but here it is anyway. You will find it on your map at approximately 55° South 159° East, which is roughly South of VK and ZL lands. The island is rather well represented for its size, with *VK1ADS* on 14-mc phone, and *VK1RD* and *VK1AJT* on c.w. A number of you have already worked it, so send it along. According to Ross, W9RBI, VK1ADS is screen modulating an 803, with 55 watts to an inverted "V" antenna.

For those of you who were lucky enough to work SV6AA during his brief stay on Crete, it might be interesting to know that he operated a tiny 3-watt rig in a locked, darkened hotel room. His receiver used two tubes with a 45-volt battery. All districts were worked with the exception of the 7th. Too bad he was there for such a short time . . . but now he's back at TA3AA.

SM5WI adds some nice ones to his list, and mentions that there are two new UL7 stations on 20, *UL7AB* and *UL7KAA*, to which we will add *UL7AC*. So, don't wear out our old standby, *UL7BS*; there are other fish in the sea. The same is rumored to be true of UM8, but so far *UM8KAA* is the only one we've heard of. GM3CSM is still trying to get us to QRP to 100 or 200 watts. (Been reading editorials, I see.) Wonder if Herb might be a good one to debate this matter with Ian? He's happy, at least for the moment, with the addition of Zones 35 and 39. VE7HC and VE7VO have combined, and rebuilt. From the sound of their signal, they must have paralleled their finals.

If you worked *ZD3AF*, you probably have never received a card. You may not get the card, but relax, he *is* good. W6MEK has finally cracked the ice after trying for two years. The ZD3 is none other than GM3AFG, traveling all over Africa as radar officer for the RAF. The fact that his name is J. M. Thomson will explain many of the other calls that he has had, such as: ZD2T, ZD4JT, ZD6JT, VQ2JT, VQ3JMT, VQ4JMT, VQ5JMT, VQ4AWH, ZC1JT, ZS6OL and ZS9C. He plans to go to Bahrein Island in the near future, so if you hear something like *VU7JT*, put two and two together. His rig is an 807 PA and a BC-348 receiver, but he may be tough to catch, as he uses radio almost only for communication with home.

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

Second CQ World-Wide DX Competition—Phone Oct. 29 to 31, C.W. Nov. 5 to 7.

Coming up in August! Complete details of **CQ**'s Second World-Wide DX Contest! After one contest acclaimed by operators everwhere as the best DX competition on the air, to make it an even greater contest the Editors of **CQ** will announce new rules permitting operators who work only one band to compete for special awards. Full details will be printed in August **CQ**, and reprints of the rules will be circulated throughout the world to invite maximum participation. In the meantime send in for your contest logs, designed to make scoring simpler, logs neat and accurate. Sufficient copies to make carbons will be sent upon request. Enclose a stamped return envelope, and if you want more than four forms, use a large size envelope. For new countries and lots of DX, keep those all-important weekends open!

W. A. Z. HONOR ROLL

C. W.-PHONE

W6VFR	40	221
W6EBG	40	215
W6ENV	40	215
G2PL	40	213
W6ITA	40	212
W3BES	40	211
W3GHD	40	211
W6ADP	40	211
W6PFD	40	210
W2BXA	40	209
W2AQW	40	208
W8HGW	40	208
W6SN	40	207
W8BHW	40	207
W6SAI	40	206
W6MEK	40	204
WØYXO	40	202
W6TT	40	201
G6ZO	40	200
VK3BZ	40	199
W6GRL	40	198
W9KOK	40	198
VE7ZM	40	195
W6NNV	40	195
ZL1HY	40	195
W3LOE	40	194
W4CYU	40	194
W6MX	40	194
W7GUI	40	194
W6FSJ	40	193
W6MJB	40	193
W6DI	40	192
W6MVQ	40	192
VK2DI	40	191
W3EVW	40	191
W4BPD	40	189
W6PKO	40	189
LU6DJX	40	188
W6OMC	40	187
VE7HC	40	187
W6AMA	40	186
W2IOP	40	186
W2CZO	40	185
W6RM	40	185
W6PB	40	185
W6SA	40	184
W6AM	40	184
W9VW	40	183
W6KRI	40	181
ZS2X	40	181
W6SRU	40	181
W6ZCY	40	180
W6SC	40	180
W6AVM	40	180
VK2ACX	40	180
W6RW	40	179
W7DL	40	177
W7AMX	40	177
VE4RO	40	177
W6DZZ	40	176
ZL2GX	40	176
W6UCX	40	176
CX1FY	40	176
W6PCS	40	174
W6WKU	40	174
W7FZA	40	174
W6RBQ	40	174
WØNTA	40	174
G5YV	40	172
W1AB	40	171
W6BAM	40	170
W5AFX	40	169
ON4JW	40	169
WØUOX	40	169
W6ANN	40	167
W6GDJ	40	167
W6PQT	40	166
W6DUC	40	166
W6AOA	40	165
CE3AG	40	165
W6PZ	40	163
W6KUT	40	161
KH6IJ	40	161
W6IBD	40	161
W6TI	40	161

C. W.-PHONE

W6RLN	40	160
WØUOX	40	160
LA7Y	40	159
W6UZX	40	158
G3DO	40	157
W7BD	40	157
W7BE	40	156
G3AAM	40	154
W6BPD	40	152
VK2QL	40	151
W6LEE	40	150
W6FHE	40	150
OK1FF	40	148
W6DLY	40	148
W6BVM	40	148
W6TS	40	147
I1IR	40	147
W7DXZ	40	146
W6AYZ	40	146
W9NRB	40	145
W6MUC	40	145
W6QD	40	145
W6LER	40	145
W6PH	40	145
ON4TA	40	144
JA2KG	40	143
W6LRU	40	141
OK1LM	40	141
W6CEM	40	136
G3AZ	40	133
W6RDR	40	133
W6YZU	40	129
OK1WX	40	129
W7GBW	40	127
G8IP	40	127
G5BJ	40	126
PK6HA	40	124
W6NRQ	40	123
W6MLY	40	123
W6LN	40	117
W6BIL	40	110
W2PEO	39	202
W9IU	39	202
W2HHF	39	199
W2NSZ	39	197
W4AIT	39	195
W3KT	39	194
WØNUC	39	194
PY1DH	39	194
W2GWE	39	193
W2HZY	39	191
W3JNN	39	191
W3DPA	39	191
W3JTC	39	191
W6SYG	39	191
W8NBK	39	190
W1ENE	39	190
F8BS	39	189
W9ANT	39	185
W9RBI	39	185
W8RDZ	39	184
W1BIH	39	184
W2CWE	39	183
W6OEG	39	181
W3EPV	39	178
W4INL	39	177
W5ASG	39	177
W3DRD	39	175
W4GG	39	172
WØSQO	39	171
W9LNM	39	170
W1NMP	39	169
W2CYS	39	167
KH6MI	39	166
W8LEC	39	166
W4DKA	39	165
W2EMW	39	163
W4BRB	39	162
W3JKO	39	162
W6IFW	39	161
I1KN	39	160
G5DQ	39	160
W9LM	39	159
W9MXX	39	159

C. W.-PHONE

WØGKS	39	158
W6EAK	39	158
W4OM	39	158
WØAIW	39	157
W8SDR	39	157
G8KP	39	156
W9YNB	39	155
G6QB	39	152
W2RDK	39	152
G2AJ	39	151
W9VND	39	151
W6EPZ	39	148
G2WW	39	147
DL2KW	39	147
W2COK	39	146
W2GUR	39	146
WØEYR	39	145
W2MEL	39	145
SM5WI	39	142
W6JZP	39	141
W9DUY	39	140
G6BQ	39	140
G3FJ	39	139
W8VLK	39	137
OK1CX	39	133
G5RV	39	132
G2VD	39	132
W9FKC	39	131
VK4RC	39	131
W2BJ	39	131
WØOUH	39	131
W6ID	39	130
W6RLQ	39	130
G2FSR	39	130
OK1AW	39	129
W6BUD	39	129
W6LGD	39	129
G5VU	39	124
VR5PL	39	124
KH6PY	39	123
G3AAK	39	122
G5WM	39	120
G8RL	39	120
G6BS	39	117
W6NRZ	39	117
G3QD	39	116
W7ETK	39	115
G3TK	39	114
W6MI	39	113
W6MUF	39	112
W7GXA	39	105
KG6AL	39	104
W6LEV	39	103
W7ENW	39	101
W6WJX	39	101
W6AX	39	93
G6PJ	39	76
VE3QD	38	190
W1JYH	38	173
W2PUD	38	172
CM2SW	38	167
W3OCU	38	167
W1ZL	38	164
KP4KD	38	162
W3IYE	38	160
W3DKT	38	157
W8FJN	38	153
VO6EP	38	151
WØDU	38	151
W4VE	38	143
W8CVU	38	141
W3KDP	38	141
W3LVJ	38	141
TF3EA	38	135
W9FKH	38	135
W4FPK	38	131
G8IL	38	131
G5CI	38	130
W2PQJ	38	130
W3ZN	38	129
G6LX	38	126
W9MZP	38	126
W8WWU	38	125
GW3AX	38	123

C. W.-PHONE

W9TB	38	122
GW4CX	38	120
W8KPL	38	117
W5CPI	38	113
GM3CSM	38	112
W7EYS	38	107
G3ZI	38	107
G8IP	38	105
C1CH	38	84
G3BI	38	75
W2ZA	37	160
W1KFV	37	158
W2CNT	37	153
W4IWO	37	146
W4ML	37	135
GM2UU	37	133
W3WU	37	133
WØAZT	37	129
W2WZ	37	129
G4CP	37	117
VE1EA	37	116
W6CTL	37	111
G4AR	37	108
W7BTH	37	106
W8HSW	37	104
G5MR	37	100
W2BLS	37	99
G3AAE	37	99
W2SGK	37	95
KL7KV	37	88
W4LVV	36	147
W2RGV	36	136
W2GVZ	36	130
OA4AK	36	128
W3AYS	36	124
W2AYJ	36	124
W4DIA	36	121
W2WC	36	119
SV1RX	36	119
MD5AK	36	118
W2BF	36	115
G2CNN	36	114
G2AKQ	36	112
W3FYS	36	110
W5CD	36	108
W2JA	36	102
G2AO	36	100
W5BK	36	99
WØRBA	36	99
G6WX	36	95
W7PK	36	91
GM2AAT	36	75
W4DHZ	35	132
W8ZMC	35	131
W4HA	35	131
W9WCE	35	127
VE3AAZ	35	123
W9CKP	35	122
VE3ACS	35	117
W8AVB	35	113
W9LI	35	112
W6ZZ	35	112
VE1PQ	35	111
VE5JV	35	101
G8VR	35	100
W2HAZ	35	99
W6EHV	35	98
WØFWW	35	96
WØGBJ	35	94
G2AVP	35	89
W8JM	35	86
G8RC	35	78
G3BDQ	35	74
W7FNK	35	71
W4IYT	34	127
W9FNR	34	109
W1MRP	34	104
G8QX	34	99
WØFET	34	99
G8KU	34	96
W9ABA	34	92

PHONE ONLY

W6VFR	39	161
W7HTB	39	143
VE7ZM	39	121
W6DI	38	176
W4CYU	38	163
W2BXA	38	159
W1JCX	37	158
G2PL	37	154
W8REU	37	149
W8BF	37	146
W6WNH	37	139
W3JNN	37	136
G3DO	37	136
W1HKK	37	136
W6TT	37	130
G6LX	37	124
G2AJ	37	121
F8VC	37	115
C1CH	37	83
XE1AC	36	159
W1NWO	36	152
W9RBI	36	151
W1MCW	36	147
W6PXH	36	143
W9HB	36	136
W2DYR	36	135
W4ESP	36	130
W1FJN	36	128
GM2UU	36	127
G6BW	36	127
W4INL	36	125
G5YV	36	106
G6WX	36	105
VE3BNQ	36	101
W3DHM	36	96
W6SA	36	92
F8DC	36	87
VK3BZ	35	143
W9BZB	35	129
W6PCK	35	126
G8QX	35	123
W6KQY	35	120
W6CHV	35	117
G3FU	35	115
W2GHV	35	115
W9CKP	35	114
W5LWV	35	108
W4OM	35	106
W3PA	35	104
W6AM	35	102
W4HA	34	120
W8ZMC	34	113
W8BIQ	34	118
W2RGV	34	110
W1BPH	34	105
W8UIG	34	100
W4IWO	34	99
W8QBF	34	92
WØBFB	34	70
W2NXZ	34	65
W7MBX	33	120
W5ASG	33	119
W9RNX	33	118
W2ZW	33	115
W5ALA	33	111
WØHX	33	107
W4LZM	33	104
W6UZX	33	104
VE3ZM	33	100
W2PQJ	33	100
W2DRH	33	60
W9MIR	32	110
W9WCE	32	107
WØEYR	32	101
WØSQO	32	95
WØAIW	32	93
W2HY	32	85
W2SVK	32	84
W9GZK	32	72

XE1AC adds some more good ones on phone, as per usual, and reports hearing *EA6CU* at 14,442. EA6CM didn't turn out so good, and of course *EA6AZ* is still mysterious, so we'll have to depend on Al to work this new one and get the info for us. Incidentally, stop rusting your receiver condenser bearings at 14,400. *EA9AI* is now v.f.o., and may be found around Al's frequency, 14,303, if you're lucky. Who can line up Zones 23 and 26 for VE3QD? Roy is almost ready to give up on these two; they just don't break through there. There must be a way.

Here's a letter I just received from Herb:

Chicago, Illinois, May 20, 1949

Dear Andy:

Boy, am I chuckling! There you are in L.A. digging through all the DX news, and, I hope, cranking out the July column. And, here I am gallivanting around the East. I know you will say that I'm just having a heck of a good time. This is true; however, I don't want to have it spread around that it is just one gay whingding, otherwise my various and sundry bosses will be wondering what goes on with Becker.

Anyway, Andy, I had a darn nice get-together with some of the boys around Boston. This little gathering was cooked up by W1KKP and W1SZ. To record the evening for posterity, W1HKK had one of his photographer friends from the Gay Paree, or some such place, pop into the hotel and take our picture. Be that as it may, everyone tried to out-lie the other, and I am not sure who won. In addition to the above mentioned fellows, there were W1NWO, ENE, HX, ADM, LMB, and I have saved the high man until the last, our good friend W1FH. Quite by coincidence, W6HB was in town at the same time, so he was pitching with the rest of us. Since he is an old cohort of mine, being S. M. of Eimac, I figured he would have a pocket full of jugs he wanted to peddle. Anyway, the evening broke up with no casualties (personal, that is), and although we tried, we couldn't chop any more countries off the list of W1FH.

When I was in New York, LeKashman cooked up a gathering which was attended by the following W2's: MLO, HUG, GT, JB, IYO, YWR, AGO, GUR, ZW, PEO, NSZ, ALO, HMJ, CWE, OST, HHF, BJ, HZY, WC, IOP, and K2AC. In addition, W1DQH was there; I am sure he sneaked in the back door. Still by coincidence, W6HB found himself in New York and couldn't resist this DX powwow.

It was certainly swell to meet the gang, and as the waitress said, "You boys are the finest looking bunch of characters I have had in this joint for a long time.' Andy, they really aren't characters, but let's let the matter drop there. After spending some time in ye editor's office, I was finally booted out with no reason being given. I guess it was because I was heckling Larry's assistant, Louisa, W2OOH.

In Chicago, at the annual Radio Parts Show in the Stevens Hotel, there are so many hams flitting around . . . some even on their own power. . . . I have heard a lot of discussion about our DX Contest, and it looks as though many of the boys will enter into negotiations with the better half, so they can get into the DX Contest this coming fall. While it is nearly impossible to remember all the boys I have met here in Chciago, I must tell you that old W8BHW dropped in from his territory to spend a couple of days. As you know, BHW, although unofficial, looks as though he might turn out to be high man in the recent ARRL contest. An interesting highlight was when W2IOP (sure, he was here, too—you can't get rid of the guy) shook hands with Lindy, offering congratulations.

Andy, doggone it, once again, I am glad that I am here and you're there. If you run into unusual headaches, you'll find some Alka Seltzer in my upper right-hand drawer. 73,

Herb

In the numbered list of WAZ awards in the May issue, W6UCX has spotted award 68 issued to W6EGB. He questions whether this might be "Eager Geaver Bene"? We must confess that it is "Eager Beaver Gene," W6EBG in disguise. Our apologies to Gene for this grave error, or perhaps he is hiding from someone. He does seem to be jinxed, with his call printed wrong more than it is right. Maybe you should send the printer a bottle of something stronger than printer's ink, Gene. While still in the 6th district, we can't overlook W6TI. Horace has finally succumbed to a 3-element beam, and from the looks of his total, it must be almost as good as his old inverted vertical. This report brings him 7 new ones, while in the past he's been averaging one or two. Congrats, Horace, but don't work so much DX that you forget to forward our cards. W6BIL, among others, has finally found a sure-fire method of working a new country. He just sends us a letter with a list of his new additions, and presto, within about a half hour of finishing the letter, he raises a new one. It's sure

(*Continued on page 58*)

The second Boston "tea party." Left to right, standing: Tim Coakley, W1KKP; Herb Becker, W6QD; Dana Atchley, W1HKK; Al Dallberg, W1LMB; Carl Scheffy W1ADM; Norm Young, W1HX; Hank Brown, W6-HB, and Clark Rodimon, W1SZ. Seated: Bill Ready; John Roehrig, W1ENE; Charlie Mellen, W1FH, and Willard Bridges, W1NWO.

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Portable
communications receiver . . .
MODEL S-72
$79.95
• All set to go places with you this summer. Extra *sensitivity* for weak signal areas . . . extra *performance* for good Ham operation.
The newest thing in portables, just introduced by Hallicrafters.
One r-f, two i-f stages. Range 540 kc to 31 Mc in 4 Bands. 8 tubes plus rectifier. AC, DC, or batteries.
See it at your nearest Hallicrafters distributor now.
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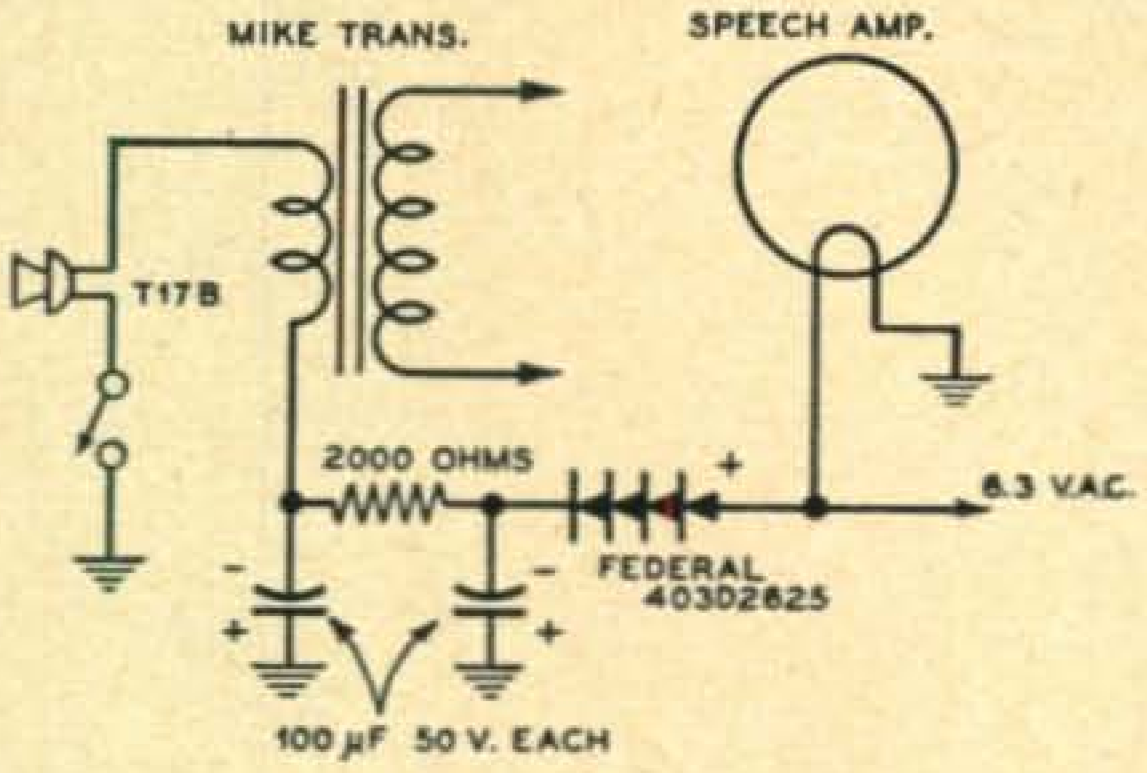
Inside the SHACK AND WORKSHOP

Bias Voltage for Carbon Mike

Quite often war surplus equipment can be quickly put on the air if the power connections are rewired for a.c. voltages. However, sometimes this leaves the carbon mike without a low-voltage d.c. source. A method used frequently in experiments at KP4FN is to connect a dry-disc rectifier between the 6.3-volt a.c. line for the filaments and



the primary of the mike transformer. A Federal model 403D2625 is suitable for this application, although a pair of 100-μf filter condensers must be used to keep the hum out of the audio input. A switch must be inserted in series with the microphone to open the circuit when the modulator is not in use.

Antonio Gelineau, KP4FN

Low Impedance Coupling to the BC-348

When most amateurs try connecting a v.h.f. converter into the BC-348 receiver they are often disappointed in the apparently low output of the converter. The usual converter is built with a low-impedance link-coupled output circuit. The input of the 348 is direct to the "hot" end of the r.f. grid coil. Thus, the link from the converter is virtually a short circuit of the 348 input. Much the same conditions apply when low-impedance antennas are coupled into the 348.

In order to overcome this, the now well-known R9-er input circuit is easily adapted to the 348 series. Two condensers, one of 10 $\mu\mu$f and one of 100 $\mu\mu$f are connected in series between the antenna terminal and the ground of the receiver. The 10 $\mu\mu$f free end is tied to the antenna terminal. The link coupling from the converter is then tied between the junction of the two series condensers and ground. Although an improvement should be noted with just fixed condensers, making the 100 $\mu\mu$f variable will allow a better match to be obtained. In some cases this extra external capacity will necessitate realignment of the 348 input circuit, although in some other models tuning the antenna series condenser will take care of this.

Robert H. Mitchell, W4RQR

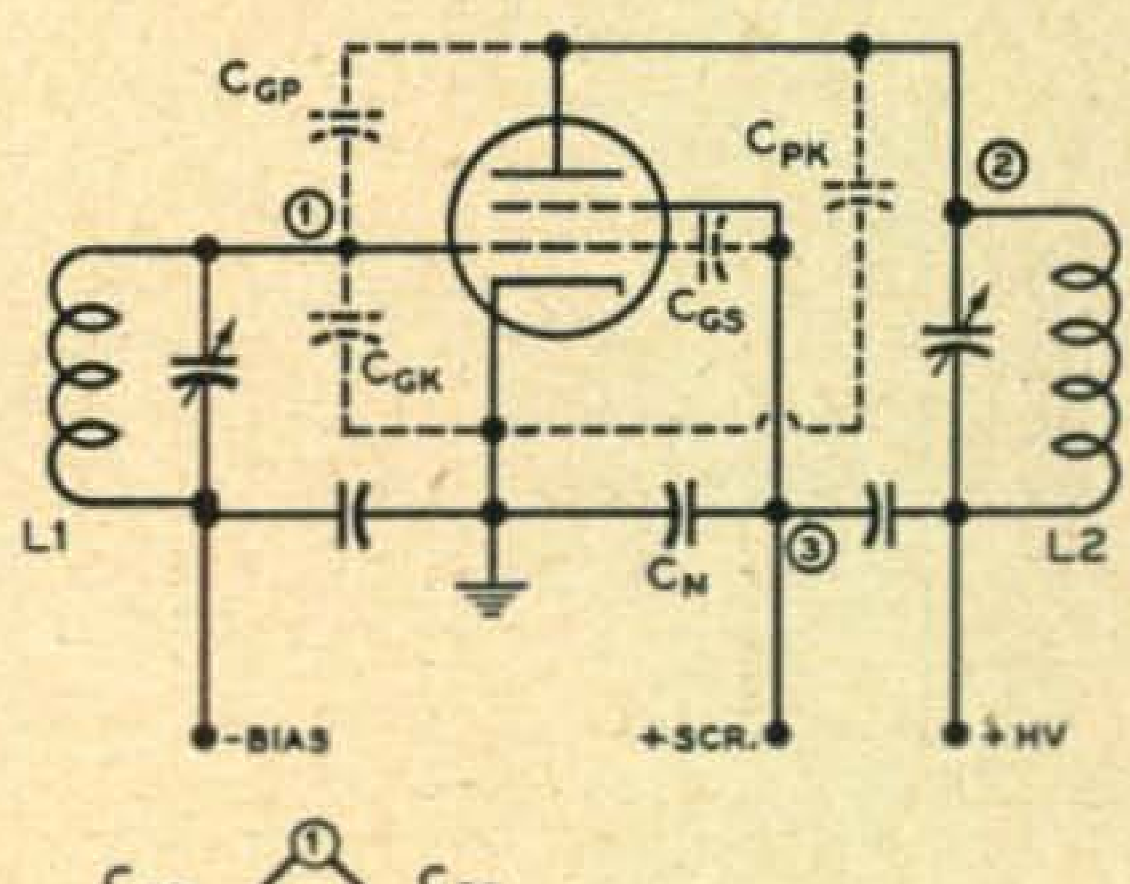
Polyethylene Open Line Spacers

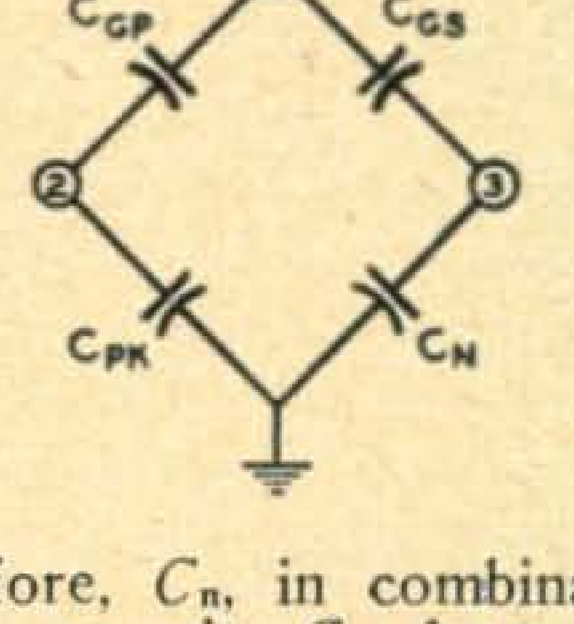
Almost every amateur has short lengths of coax cable of the RG-8/U variety lying around the shack. When looking for some kind of material to use as separators I hit upon the idea of using the polyethylene core of the coax cable. To prepare the spreaders, first cut the coax cable into lengths about one-inch longer than the desired wire spacing. Then slit the vinylite covering and remove. Pull off the copper braided shield. Make a small cut in the end of the polyethylene so that you can extract the center conductor wires one at a time using a heavy pair of pliers. Mark the desired wire spacing and drill through the plastic with a drill somewhat smaller than the diameter of the wire to be used in the feeder. The spacers can now be threaded on the wire one at a time and separated to the desired distance along the feeder line. No snubbing wires are needed if care is taken to use the small size drill. One of these open lines has been used at VE1BV for some time and has been found to be very light and have a low wind resistance.

C. S. Taylor, VE1BV

Neutralization of Tetrodes and Pentodes

This method of neutralization is frequently seen in the i.f. amplifiers of FM receivers. It has been adapted for use at W3BIM to neutralize an 807 final amplifier and has worked very well. The schematic shows that the proper arrangement of the plate and screen bypass condensers with the interelectrode capacities forms a bridge circuit. The out-of-phase voltage necessary for neutralization is best obtained by making the screen bypass condenser C_n common to the plate bypass condenser.





$$C_N = \frac{C_{PK} C_{GS}}{C_{GP}}$$

Therefore, C_n, in combination with the plate-to-cathode capacity C_{pk} forms a voltage divider across L_2 and the instantaneous current relationship is in such directions as to obtain the necessary phase reversal across C_n. The equation assumes that C_{gs} is small in camparison to the grid tuning condenser, and hence is only an approximate relation.

In practice the neutralization condenser value is not critical and has worked out to .003 μf for the 807 final amplifier used here. Picking the proper bypass is best done by trial and error while making the usual checks for correct neutralization.

Lee L. Toman, W3BIM

Conducted by LOUISA DRESSER DeSOTO, W2OOH

Because of the death of her OM, Clinton DeSoto, W2IU, as reported on page 9 of this issue, Louisa's column is not appearing this month. W2OOH will be back again in the August issue of *CQ*.

MARS Activities

TRUE to the tradition of amateur radio, that station in life creates no special privileges, the Military Amateur Radio System makes no distinction in rank in awarding MARS membership certificates. Major General F. L. Ankenbrandt, Director of Communications, Department of the Air Force, wishes Major General Francis H. "Butch" Griswold (W4OTZ), Assistant Deputy Chief of Staff, Materiel, and Pfc. Robert L. "Bob" Prather, (ex-W7LPO and prospective W3) the best of luck in their activities and presents them certificates which accords them the same privileges and recognition in MARS. It follows, too, that military personnel operating in the ham bands seldom, if ever, mention rank. In "Butch's" many hundred QSOs over KG6BN (when he was Commanding General of the 20th Air Force) and today in his rag-chews over W4OTZ there has never been a hint of two stars in his conversation any more than "Bob" when operating K3FAB at Bolling Field has mentioned that he is a Pfc.

The new MARS certificate, an elegant piece of wall paper, is designed to last the MARS member a lifetime. The original term of issue is for three years but succeeding indorsements make it a permanent station fixture. Major General F. L. Ankenbrandt, Director of Communications, Department of the Air Force or his Deputy or Major General Spencer B. Akin, Chief Signal Officer, Department of the Army or his Deputy, personally will sign all MARS certificates.

General "Butch" Griswold, W4OTZ, ex-KG6BN, KG6-AAF, etc., and Pfc "Bob" Prather, K3FAB, ex-W7LPO, get their MARS certificates from General "Ank" Ankenbrandt, Director of Communications, Department of the Air Force.

* * *

Relax, fellas, Uncle Sugar didn't forget you. . .

MARS Headquarters has been swamped with calls and letters wanting to know if amateur operators who are also Reservists will be able to get inactive duty credits and retirement points for MARS membership and participation in the MARS program.

The Military was way ahead of you in its planning. The behind-the-scenes activity was all in your favor, but it takes time to reduce a plan to A-B-C simplicity, and still more time is consumed disseminating a plan and getting it into the field.

The Chief Signal Officer and the Commander, Army Field Forces, have determined that retirement points and inactive duty credit may be awarded for participation in the Military Amateur Radio System if:

1. You are a Signal Corps Officer or Enlisted man of the reserve; or

2. You are a member of an active Reserve Component and hold a signal communications assignment. (Examples of individuals who CANNOT be awarded credit under the program would be Commanding Officers of the Army; Staff Officers other than signal communications personnel; Warrant Officers and Enlisted men who are not signal communications personnel).

Three one-hour periods of operation in the MARS network, not necessarily consecutive, are the basis for the award of one point for retirement purposes. This means operation in a MARS supervised net, utilizing Military Amateur Radio System frequencies and call signs.

Title III, Public Law 810—80th Congress, is the implementing legislation which provides retirement with pay for officers and enlisted personnel of the reserve components.

No individual may count more than 60 inactive duty points (including 15 points given for one year's service in an active reserve component) toward retirement in any year. Additional points, while they do not count for retirement, are encouraged by the ORC.

Further information may be obtained from your nearest Army-Air Force Recruiting Station or by contacting the Signal Officer of the Army Area where you reside.

SAVE REAL MONEY IN HARRISON'S SMASHING SUMMER CLEARANCE
FEATURING HUNDREDS OF AMAZING BUYS IN HAM RECEIVERS, TRANSMITTERS VFO'S, AUDIO GEAR, T.V., ETC. ETC. BUY NOW!

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TREMENDOUS SAVINGS!

All are in new, perfect condition with full factory guarantee. Naturally, quantity is limited so rush your order in now! Sorry!—no trades or terms on these clearance sale items.

RECEIVERS

HALLICRAFTERS S-40A—Special for operation on 115-250 volts, 25 to 60 cycles AC. Net $109.50. **Only $79.95**
HALLICRAFTERS SX-42—Continuous coverage 540 KC to 110 MC in 6 bands. Phono input - brilliant FM reception - superb audio system. The finest general coverage ham receiver available today! Less speaker $275.00. **Special $239.50**
HALLICRAFTERS SX-43—Broadcast, short wave and FM. 6 bands. Less speaker $189.50. **A real buy! $149.50**
HALLICRAFTERS S-47—High fidelity receiver for FM, broadcast and short wave. Push button BC and FM station selection. Separate bass and treble controls. Handsome gray cabinet. Net, less speaker $229.00. **Bargain $184.99**
HALLICRAFTERS S-47C—Same as S-47 but less cabinet for custom installations. Chassis, complete with panel is priced at $209.50. **BEST BUY OF LOT! $164.50**
HALLICRAFTERS S-53—Compact 7-tube communications receiver features continuous tuning 540 KC to 54.5 MC. Band spread dial. Regularly $98.50. **Save 30%. $54.75**
HAMMARLUND HQ-129X—Precision receiver, well known to all amateur operators. Less speaker $177.30. **Only $144.50**
PIERSON KP-81—Professional quality communications receiver. Slightly used. Absolutely like new and in perfect condition. **Complete with matching speaker. $298.50**
RME-45—High performance amateur receiver incorporating all desirable feature including "Cal-O-Matic" tuning. Complete with speaker $198.50. **One only $147.50**
RME-84—Nothing better for the beginner! RF Stage-tunes 540 KC to 44 MC—built-in speaker! Housed in compact gray cabinet. Net $98.70. **Special $76.00**

VFO'S AND NBFM ADAPTERS

BEE BEE—NBFM Modulator Unit. Designed for direct coupling to VFO or crystal socket. An easy and inexpensive way to get on phone. Net $18.95. **Display Model $15.95**
BUD VFO-21—High output VFO uses plug-in coils for lowest loss. Operates on 10-20-40-80. Supplied with coils for 40 meters. Net price $52.50. **A wonderful buy! $39.95**
COLUMBUS FMO-428—ECO Exciter and NBFM Modulator. Out-put on 20-40-80. Input for high impedance mike—visual deviation indicator. Voltage regulated power supply. Regular Amateur Net $79.50. **A Super Buy! $52.50**
ELECTRO-MECHANICAL VX-101 De-Luxe—Variable frequency exciter. Up to 20 watts output from 807 on 80-40-20-15-10. Also provision for xtal control. Each unit is carefully hand-calibrated. This well designed VFO is worth many times the amateur net of $118.50. **A real steal! Only $79.50**
SONAR XE-10—Famous phase modulated NFM exciter. Operates on 40-20-15-11-10-6-2 meters. Input for high impedance microphone. Built-in AC power supply. Complete with all tubes $39.95. **One display model $32.50**

CONVERTERS

CM LABORATORY BB-27 and 1120—Precision engineered 10-11 meter broad band converter and matched voltage-regulated AC supply. Output covers from 11 to 14 MC. Identical gray cabinets. Amateur net price for the two units $47.25. **Don't pass this up at only $29.95**
COLUMBUS HFC-101—Hot, slug tuned converter for 10-11 meters. 6AK5-RF, 6AK5-mixer, 6C4 HF Osc. and VR-105. Only 6" x 6" x 6". Regularly $41.35. **ONLY $29.95**
COLUMBUS HFC-610—High performance converter for 6, 10 and 11. Band switching. Self-contained AC power supply. Net $79.50. **Improve your reception! $52.50**
GONSET 6-Meter Converter—Ideal for mobile or fixed station. Regularly $39.95. **Display Model $32.50**
GONSET 20-Meter Converter. Use it for mobile or to get better reception on 20 with your present receiver. Regular net $39.95. **One nice display model $32.50**
GONSET 10-11—Famous Mobile Converter **$37.95**
GONSET 3-30—New 3 to 30 MC Converter **$37.95**
GONSET 6-15—Covers 6, 10, 11, 15 meters. 3 separate converters in one unit. Tremendous band spread. Built-in AC power supply. Brings in those hard-to-hear DX stations. Regular net $75.00. **Display model $57.50**

MARINE RADIO EQUIPMENT

ISLIP MRT-10—5-channel, 10 watt, ship to shore radiotelephone. Ready to operate on 3 channels—Ship to Ship, Coast Guard, and Land Station. Only one 12-volt DC model available. Regular $195.00. **A real buy $99.50**
ISLIP DF-1—Marine Radio Direction Finder. Receives marine radio signals, aircraft beacons, and standard broadcast stations. Built-in speaker. Regular price with self-contained batteries $200. **Terrific buy! $114.50**

TRANSMITTERS

ABBOTT TR-4B—2-meter xmitter-receiver. Just the thing for your vacation. Fine for portable, mobile or fixed installations. Reg. net $52.00 **Super Value! $29.95**
Kit of tubes for TR-4B including HY-75 **$6.95**
AUDAR-MECK T-60—60 watt, complete phone-CW xmitter for 10 to 80 meters. Crystal mike input. Regular price with coils for 10 meters $150.00 **Display model $138.00**
Additional coils for Audar-Meck T-60 **Per set $5.50**
HALLICRAFTERS BC-610—Used unit in very nice condition. Complete with speech amplifier and coils for 10, 20, 40, and 80. Bring your truck and pick it up. **Only $499.00**
(If shipped, add $60.00 for crating)
HALLICRAFTERS HT-17—Complete, compact CW transmitter for 10 to 80 meters. 6V6 Xtal Osc. — 807 final. Furnished with 40 meter coils. Regular $49.50 **Special $36.95**
LYSCO Model 129—Popular 10 meter mobile transmitter. Regularly $23.95. **Display model only $22.50**
LYSCO Model 175—75 Meter Phone transmitter for mobile or portable work. **Display model only $22.50**
SONAR MB-611—Mobile phone transmitter for 10-11 meters. NBFM with xtal control. Over 22 watts output from 2E26 final! Complete with all tubes less power supply. Regular net price $72.45. **An excellent mobile rig for only $54.50**
SONAR SRT-75—Complete 75 watt, all band transmitter for use on 10 to 80, CW or NBFM phone. Built-in VFO. Supplied with coils for one band. Net $203.67. **Special $179.00**
SUBRACO MT-15X—Finest 10-meter mobile xmtr available today! 30 Watts! **Beautiful styling! $79.95**
SUPREME AF-100—Complete transmitter for desk-top operation. AM, NBFM or CW. VFO control. Conservatively rated at 100 watts output! Complete with coils for 10 to 80 meters. Regular net $550.00. **Don't pass this up! $395.00**
TEMCO 75GA—Self-contained AM-CW transmitter with 75/100 watts output—3.5 to 29.7 MC. Built-in VFO. Coils for all bands. Ham net $475.00 **One demonstrator at $345.00**
TEMCO RA—Combination 2A—150 Watts AM phone and CW. Stable VFO built in! Beautiful cabinet styling. Sectionalized construction permits instant removal of any unit. Supplied with coils for 10, 20, 40 and 80 meters. Sold regularly for $695.00. **An unequaled xmtr buy! $495.00**

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Hundreds of other items similarly reduced during this demonstrator—display model clearance sale!

- **TUNERS:** Approved Electronics, Brooks, Hallicrafters, Howard, Browning, Meissner, Radio Craftsman, National, etc. etc.
- **AMPLIFIERS:** Bell, Bogen, Masco, Cardwell, Thordarson, Radio Music Corp., etc. etc.
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Postscripts

Glacier National Park Hamfest

The 14th Annual Glacier-Waterton International Peace Park Hamfest will be held at East Glacier in Glacier National Park on July 16-17, 1949. East Glacier is about eight miles toward Logan Pass from St. Mary, the east entrance, on the scenic Logan Pass Highway in Glacier Park. Available there, upon reservation, are one and two-room cabins, with or without housekeeping facilities as well as coffee shop, store and gas station. For further information write to Ray A. Fretz, W7DSS, Secy, 401 First National Bank Bldg., Great Falls, Mont.

Hoosier State Hamfest

The 1949 Indiana Radio Club Council Picnic will be held on Sunday, July 24, starting at 11:00 a.m. c.s.t. at Tippecanoe River State Park located 5 miles north of Winamac on Indiana 29 or U.S. 35. The cost will be 50c each for registration for those over 16 years of age and a State Park fee of 12c per person plus 10c per car.

Arctic Radio Club Hamfest

A hamfest will be held July 25—26 at Paxson Lake, Alaska, located between Anchorage and Fairbanks. There will be plenty of entertainment, prizes, rag-chewing, banquet, and special program for XYLs. For details write KL7EC, Radio Supply Co., Fairbanks, Alaska.

Honolulu Amateur Radio Club Hamfest

The Honolulu Amateur Radio Club is planning a hamfest on Saturday, August 6, 1949. The place will be the South Seas Restaurant; time, 6 p.m. to midnight, HST. Tickets are $3.

Transmitter Hunt

The Peninsula Amateur Radio Club of Newport News and Hampton, Va., have scheduled a transmitter hunt on July 17th, rain or shine, to be held at Newport News, with exact starting place to be announced. All interested persons are eligible, except PARC club members. Frequencies to be used include 80 and 10 meters (c.w.) and 2 meters (m.c.-w.). Each car will be registered as a team regardless of number of occupants. No commercial loop or RDF equipment permitted. (This does not apply to receivers, etc.) There will be two first prizes, made up of complete mobile rigs. The next prize will be a VHF-152 converter, with additional prizes totaling over $250. For registration blanks or additional information contact George N. Beaton, W4OHZ, Secy., 102 Shenandoah Rd., Hampton, Va.

Morristown, N. J. Radio Club

The Morris Radio Club of Morristown, N.J., has recently been reactivated with the following three primary objectives: 1) Emergency coordination with Red Cross, 2) BCI and TVI reduction, and promotion of good will with the public, and 3) introduction and assistance to new hams. Those interested may write the secretary, Tom Winternitz, W2YTH, 23 Jefferson Ave., Morristown, N.J.

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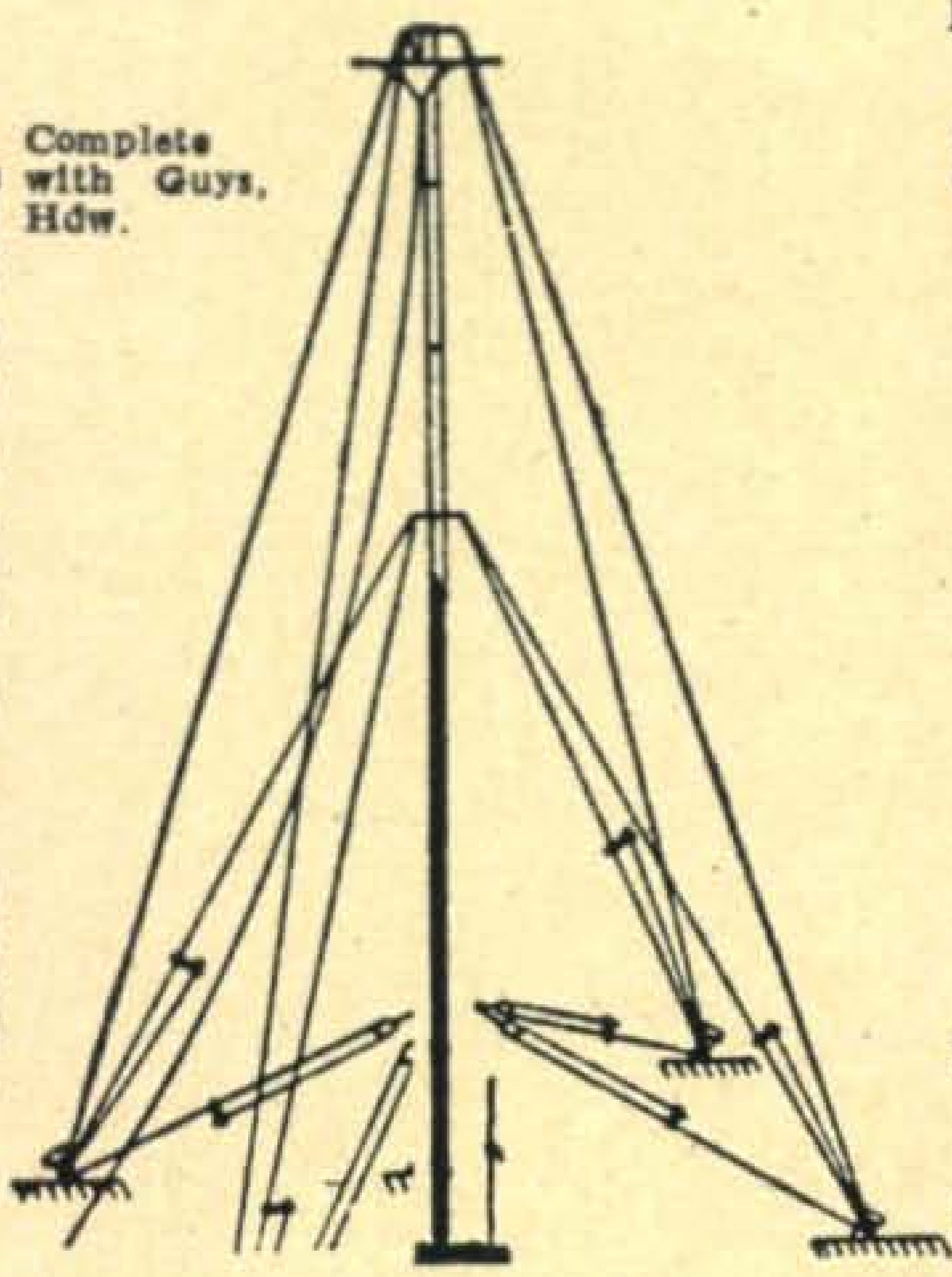


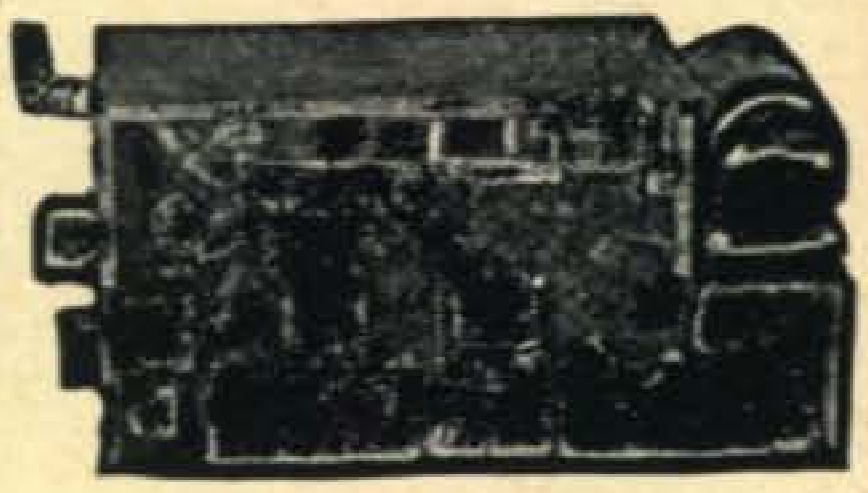
Doublet Antenna Kit used with the famous Hallicrafters BC-610, consisting of 7 steel-alloy mast sections in a handy canvas bag. Each section is 5' 6" long, 1½" OD with the last 6" rolled to a smaller OD to telescope into the end of the preceding section. No taper. Assemble high or shorter by any multiple 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.

Complete with Guys, Hdw.

SCOOP! 110 (MC) 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. USED CONDITION. Companion to the glide path receiver. Also contains 90 and 150 cycles 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, with dynamotor. Don't pass this up.



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5FP7, 5BP1, 5GP1

$1.95 each

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28 D7	.29
807	1.49
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803	7.95
12SL7gt	.29
211	.39
VR150	.75
814	4.95
12SK7gt	.75
845W	3.45
2051	.69
927	1.95

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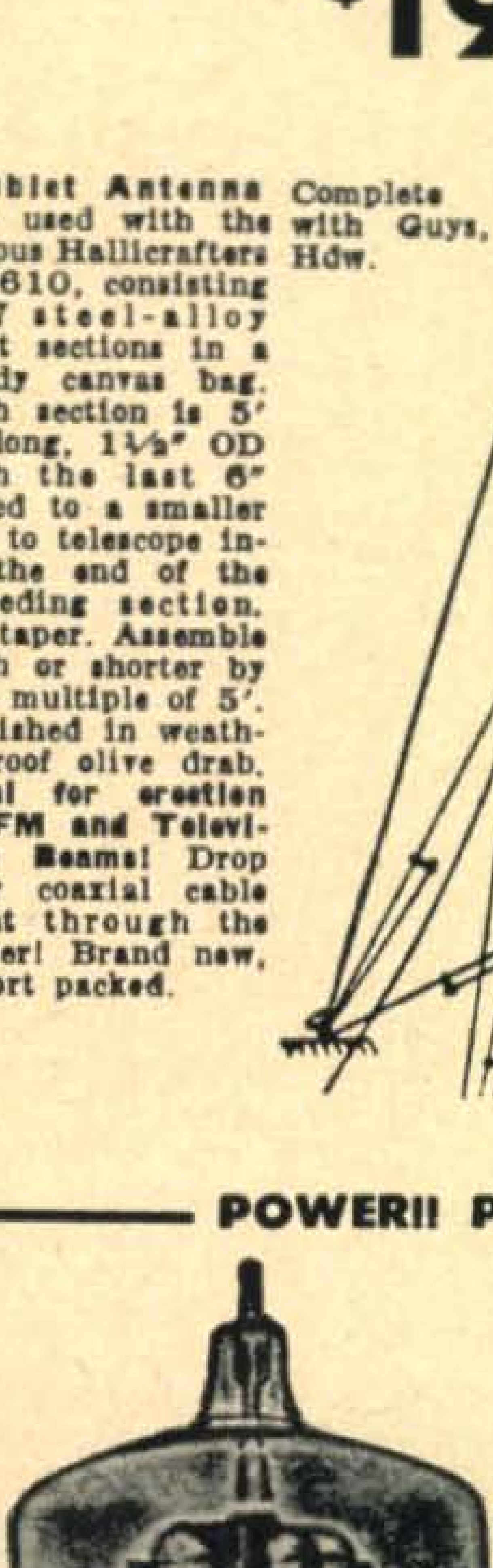
24V relays all types........ **90c** ea.
2 FOR **$1.49**

Gibson Girl Transmitter SCR 578B (New) $19.95

SPECIAL

150 ohms twin lead in 50 ft. coils with eyelets on one end........ **49c** ea.
3 Coils **$1.00**

POWER!! POWER!!



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BRAND NEW
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SUPER VALUE
BETTER ORDER 4 OR MORE

79c EA.

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While They Last Any Quantity

304TL SOCKETS BRAND NEW JOHNSON $1.20 ea.

SAVE ON THESE VALUES

300 ohm Amphenol. Per hundred	$2.34
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2 mfd. at 2500 W.V. Each	2.95
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100 ft.	5.50
Cable—Single shielded grid wire No. 20-AN Specs. Special—Per hundred foot coil	1.50

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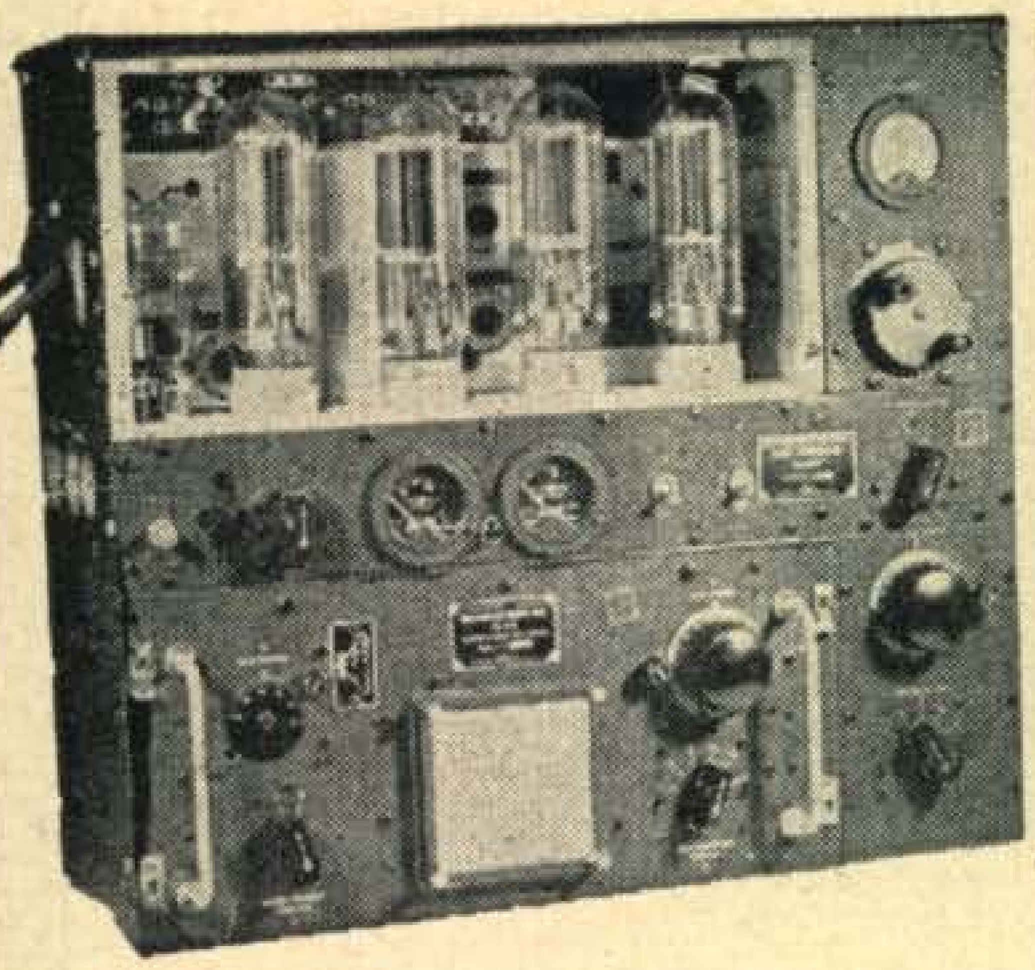
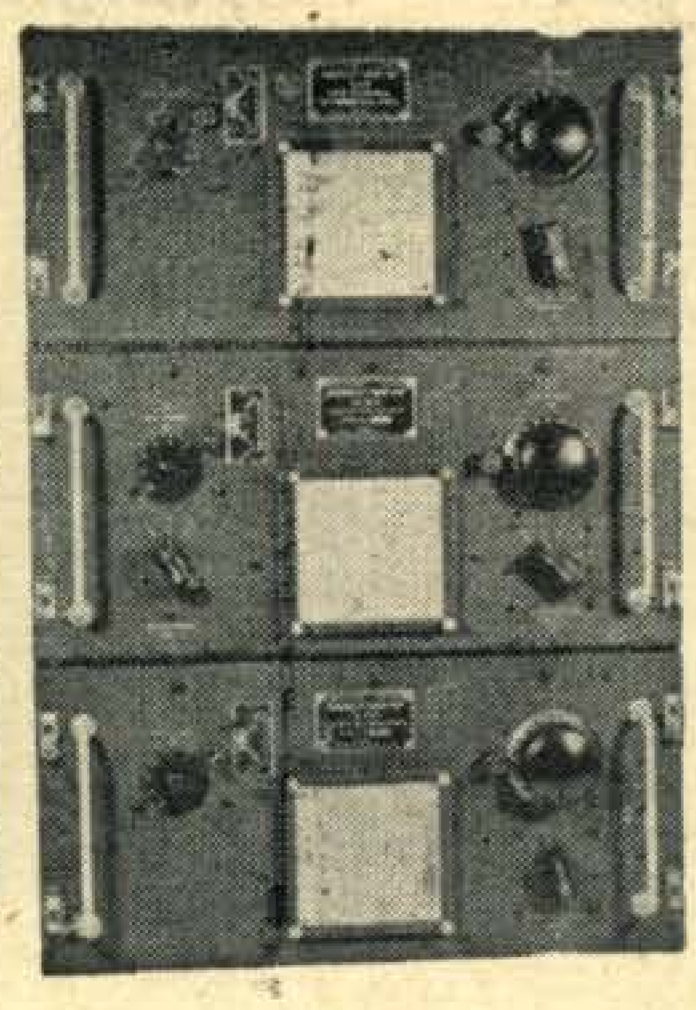
INDIANAPOLIS, INDIANA





BC-375 GE MOPA TRANSMITTER

The most famous of all surplus transmitters. Was used by the Army bombers and ground stations during the War. Frequency range is covered by means of plug-in tuning units as shown below. Each tuning unit has its own oscillator and power amplifier coils and condensers, and antenna tuning circuits all designed to operate at top efficiency within its particular frequency range. Transmitter and accessories are finished in black crackle, and the milliammeter, voltmeter, and RF ammeter are mounted on the front panel. **Frequency Range:** 200-500 Kc. and 1500-12,500 Kc. (Will operate on 10 and 20 meter band with slight modification). **Oscillator:** self-excited, thermo-compensated, and hand calibrated. **Power Amplifier:** neutralized class "C" stage, using 211 tube, and equipped with antenna coupling circuit which matches practically any length antenna. **Modulator:** Class "B"—uses two 211 tubes. **Power Supply:** Dynamotor which furnishes 1000 V. at 350 **Ma. Conversion** instructions and diagram for 110 V. AC furnished upon request for........**$1.00.**

PRICES: As follows—

Transmitter only	**$8.50**
Tuning units TU-6B, TU-7B, TU-8B, TU-9B, TU-10B, TU-26B, choice	**2.50**
Dynamotor PE-73C	**3.00**
Antenna tuning unit (BC-306A)	**3.00**

TELRAD 18-A FREQUENCY STANDARD

Checks signals in the range of 100 Kc. to 45 Mc. with a high degree of accuracy. Self-contained power supply is 110, 130, 150, 220, and 250 V. 25-60 cycle AC. Complete with tubes, dual crystal, and instruction book. Brand new.

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SCR-625 MINE DETECTOR

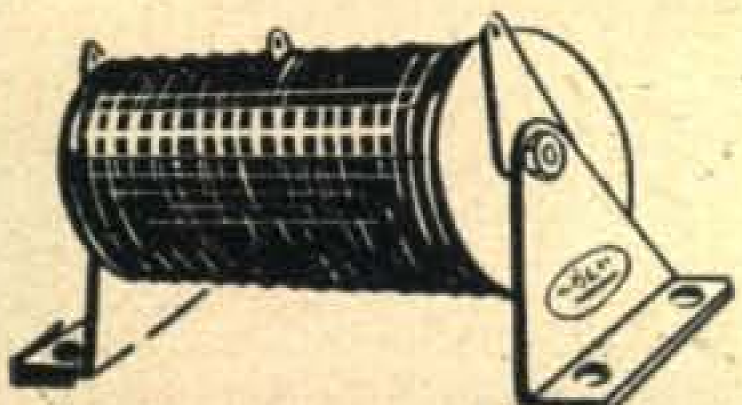
Brand New

Metallic Objects Only

Used by the Army to detect buried metallic mines. Its private use suggests the location of underground or underwater pipes, cables and ore bearing rock, the location of metallic fragments in scrap materials, logs, etc., and the screening of personnel in plants for carrying of metallic objects.

The unit consists of a balanced inductance bridge, a two-tube amp. and a 1,000 cycle oscillator. The presence of metal disturbs the bridge balance, resulting in a volume change of the 1,000 cycle tone. The tubes used are low-battery drain types such as 1G6 and 1N5. 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 from 110 V. may be used. Comes complete with spare tubes, spare resonator and instruction manual—in wooden chest 8¼"x28¼"x16". Weight in operation is 15 lbs. New, complete in original overseas packing container. Originally sold by War Assets for $166.00. The U. S. Forestry Service has recommended procedure for using the SCR-625 Mine Detector to find concealed metal in tree logs and other timber products.

PRICE	**$45.00**
BATTERIES	**$4.00** EXTRA



BL-SELENIUM RECTIFIER TYPE 23751

A must for the radio man for the much needed 110 V. DC source. 110-120 V. AC input, 110-135 V. DC output at .75 amp. Connect in parallel for highest current requirements. Size 3⅛x2⅝x1¾ inches.

PRICE—New ....**$1.00** ea.

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- Sloping front
- PM 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 (not 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 built to house coin operated radio.
- Worth several times our asking price.
- Price brand new

$4.95

OPEN VIEW

MARKER-BEACON RECEIVER

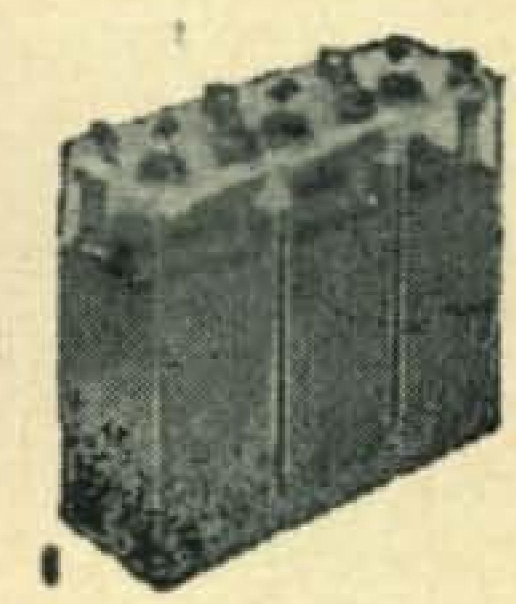
Can be adapted to radio controlled devices. Was used by pilots to flash a signal lamp on aircraft instrument panel when in range of a beacon transmitter. Responds to modulated signals over a variable range of 62 to 80 Mc. Tube plates and filaments operate directly from 24 V. DC. Can be adapted for radio control of experimental apparatus opening garage doors, etc. Circuit diagram and parts list included on either model shown below:

BC-357 — contains 12C8 and 12SQ7 tubes and sensitive relay (size 5⅝" x 5¼" x 3¼"). Price **$2.95**

BC-1033 — contains 6SH7, 6SL7 and 12SN7 tubes, sensitive relay (size 5⅝" x 5¼" x 3¼"). Price **$3.50**

WILLARD LEAD ACID CELLS

2



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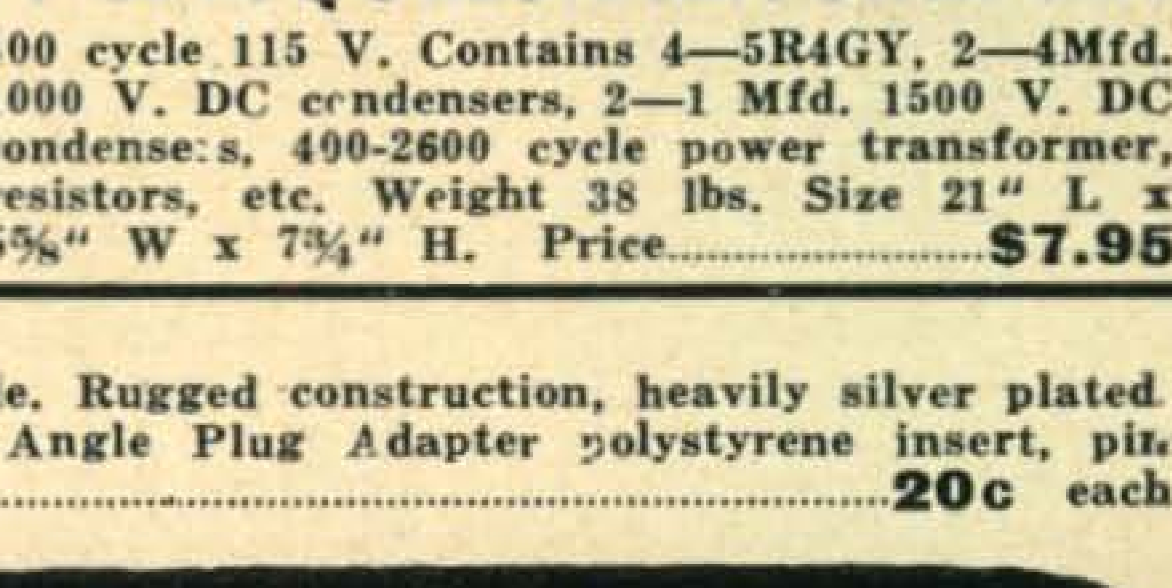
6 V. (New) (Dry-charged) **$3.00**

6 V. (In metal carrying case) (Add electrolyte specific gravity 1.265) (Drugstore) **$4.00**



PP-51/APQ-9 RECTIFIER POWER UNIT

400 cycle 115 V. Contains 4—5R4GY, 2—4Mfd. 1000 V. DC condensers, 2—1 Mfd. 1500 V. DC condensers, 400-2600 cycle power transformer, resistors, etc. Weight 38 lbs. Size 21" L x 5⅝" W x 7¾" H. Price **$7.95**

AMPHENOL LOW-LOSS UHF CONNECTOR for RG type cable. Rugged construction, heavily silver plated provides easy assembly and positive connection. Type 83-1AP Angle Plug Adapter polystyrene insert, pin and socket—very special .... **20c** each

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

(from page 39)

convert, who is having the time of his life on 6 meters. He and WØOPU are planning a v.h.f. club to get others interested in the Topeka area. Ed has heard WØINI, WØLQW and WØBPL on extended ground wave and would like for them to be on between openings, which seems like a good idea for it might revive the extinct Eager Beaver Net.

From W8DGG in Xenia, Ohio, we find that he is at the same QTH that W8ZVY operated from. No doubt W8ZVY left a little bug that bit W8-DGG, for he hopes to be active very soon. By the way, what has happened to W8ZVY, can anyone tell us?

The Houston 2-meter lads on May 15 did relay work for a turkey run of several motorcycle clubs. Headquarters were set up at Liberty, Texas, using a 150-watt 144-mc rig. On the outskirts of Houston was the first check point some 45 miles distant, but covered nicely with a 50′ antenna and a 522, battery powered. All messages and checks were right on the nose, too. According to W5ON, the Houston boys worked into Corpus Christi and Kingsville, 200 miles south on April 6-7, as well as the San Antonio and Dallas gang, all around the 250 mile mark, Dallas being best in the early a.m. Louisiana is perking up since W5JBW in Maplewood broke the ice. Thibedeaux, Opelousas and Baton Rouge are hearing the Houston roundtables and promise to be on soon.

W4EID would like the Miami crowd to look on 144 mc once in a while. Miles would like to get some one on in Savannah for another nice haul.

W5NLZ in Oklahoma City worked into W5-LGW for the first out-of-town contact, a distance of 65 miles. Now things are perking up as the boys are becoming interested, but as yet no signals have been heard from the Tulsa lads. Just keep watching it, fellows, things are bound to break for you soon.

The week-end of May 7-8, the Oak Ridge Radio Operators Club had a 2-meter expedition to Frozen Head mountain, near Petros, Tenn., 40 miles NW of Knoxville, 3400′ elevation. 100 watts to an 829B feeding a 3-element horizontal beam for transmitting and a 152A used for receiving. The antenna was mounted on top of a 70′ lookout tower, and a portable 800-watt a.c. generator furnished the power. The best DX was to W9FVJ, Toledo, Ill., 350 miles, and W4HHK, Collierville, Tenn., 340 miles. All agreed that conditions were far from good, but all enjoyed themselves, and to top it off they took a TV receiver along and saw the Kentucky Derby from WAVE-TV in Louisville, 160 miles distant, with very good pictures. Did anyone think of taking a mint-julep along, for it sounds like fun and v.h.f. work.

The week-end of May 7-8 was really a field day for 2 meters, down in Dixie. In addition to the above expedition, W4LSX/4 operated from a 16-story building in downtown Atlanta, from where Tenn., Ala., and other Ga., stations were worked. W4KHL/4 was atop Mt. Cheaha, near Anniston, Ala., with a 16-element beam and 20 watts, which allowed the Atlanta gang to have their first Ala., QSO, and aided W4KIP and W4FSW in making the first Atlanta-Birmingham QSO possible.

W4HHK, near Memphis, found May 17th good to Miss., when he worked W5JTI and W5NYH, sounding like locals, over the 160-mile path. W5-NYH, and W4BYN also contacted; now the fellows have nightly and early morning skeds to see if it will be a regular affair.

The Rochester, N.Y., V.H.F. Group contest was very successful in creating activity on 144 mc, for 22 stations took part. W2UTH was high scorer with W2RLV second high. Unfortunately the best DX was worked just 20 minutes after the contest closed, when W2UTH worked W3RUE in Pittsburg. Now, W2ZHB wonders if any of those participating will stay active. Perhaps another contest might help.

On April 25, W9EWO in Lebanon, Ind., heard W8CYE, W9JMS, ASM, FVJ, MBL, VXR, FPD, ZHL, GZQ and W9JIL and he was able to work W9ZHL and W9JIL, from 2100-0030 CST. Again May 7, heard were: W8CYE, RLJ, WRN, W9-ZHL, HKQ, LLA, JMS, CBU, ZHB, HJJ, TKL, RHL, EGH, JDD, NSF, WFC, ZJO, BPT, MBI and W2PBC/9, from 2200-0100 CDT. W9EWO runs 12 watts to a 4-element horizontal beam, 40′ high, and has worked 4 call areas and 5 states.

From Prospect Hill in Waltham, Mass., W1-JSM has worked portable into 10 states and 3 districts, with his best DX to Wash., D.C., 400 miles.

Propagation Log

As mentioned previously we will be presenting to you the highlights of each 50 mc opening, rather than listing every call of stations worked, for to do that would no doubt fill a good sized catalogue.

This month the propagation log has been omitted in order that the reports might be analyzed immediately for the Sporadic E Project. Details of this U. S. Government sponsored v.h.f. amateur research project will appear in August *CQ*.

F.C.C. PROPOSALS

(from page 24)

petent FCC Amateur Division might hurt the hobby this Board represents. Conceivably, by rejecting the new proposals, the ARRL Board hopes to prevent the establishment of a precedent, wherein new regulations would have their origin with FCC instead of ARRL. The complexity of such a situation is evident; the FCC is by law the designated body to issue communications regulations, irrespective of any quasi-governmental function previously performed by the ARRL.

Equally important is the fact that this ARRL Board is facing for the first time an FCC Amateur Division fully integrated and smoothly operating. It is virtually the first Board to face such a body. The FCC Amateur Division is charged by the Commission with establishing "a new overall plan or blueprint to provide scope and direction for the immediate and long range development of the amateur service." There is nothing to suggest that the ARRL would have continued to enjoy its unique position of establishing, *de facto,* the laws for the amateur service.

Let us carry this analysis a little bit further. Contrary to the statement of the ARRL Board of Directors, we feel that most amateurs favor the new proposals with certain exceptions, notably the 20 w.p.m. code test for Class A licensees and relicensing of Class A holders. For the sake of dis-

HARVEY for variety for bargains

TECHMASTER SUPER-16 KIT

31-tube kit with components for use with up to 20-inch tube. Don't confuse with cheaper kits. Pre-wired and aligned RCA front end, all major parts mounted, adjustable kine mounting brackets. Complete manual with service notes, all RCA. Ultra-simplified wiring instructions. Wire it over a week-end.

Complete, less kine tube.......$184.00
16" kine tube (sold separately)..$63.50

GE FM TUNER

Only a few left of this unusual buy. Covers 88-108 mc range, uses guillotine tuning. Designed for export and tropicalized, has power inputs for 110 to 250 volts 60 cyc. *Shpg. Wt. 30 lbs.*
HARVEY SPECIAL PRICE

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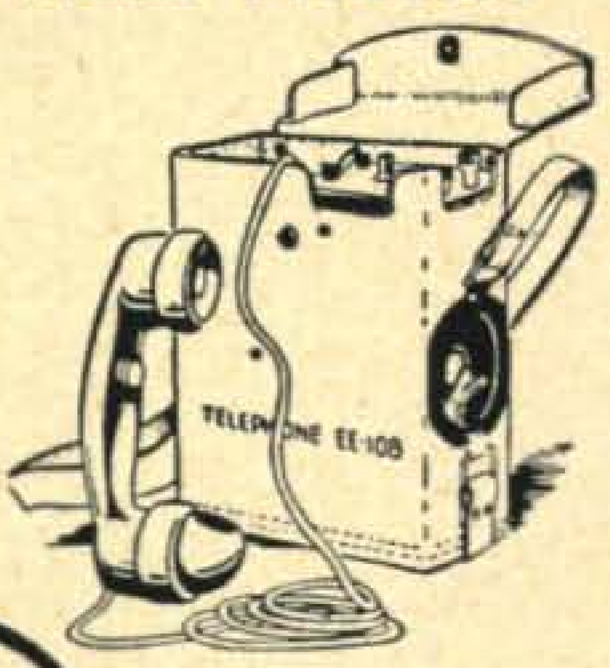
SOUND-POWERED FIELD PHONES



Army type EE-108. Any number can be hooked together on any 2-wire or grounded line. Max. range 12-15 miles. No batteries needed, simple, few parts. Complete instruction manual. Genuine leather case with strap. Each........ **$24.50**

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Brand New. We take great pleasure in announcing this new and improved xmttr with built-in TVI features. In addition, the 32V-2 features front panel switch for adding capacity for antenna loading. Tune-Operate switch permits operator to resonate final using low power, thereby prolonging life of final amplifier tube. Output terminals changed to a coaxial fitting and an L section has been added to antenna network which offers greater reduction of harmonic energy.... **$575.00**

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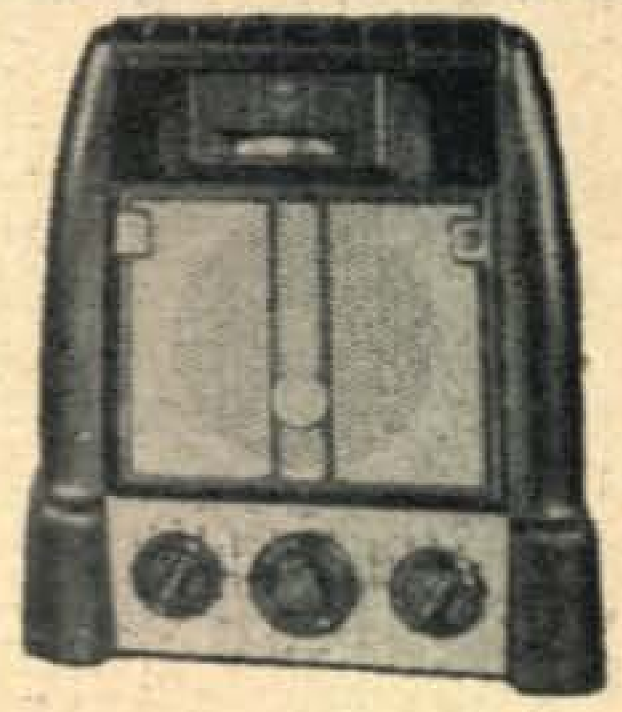

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DC supply, 5 amp. rating, consists of 36 V, 10 amp transformer; filter choke; 2400 mfd, 50 V condenser; 5 amp full-wave rectifier.............................. **net, $18.74**

Output may be raised to 10 amp by adding rectifier in parallel at $8.95.
Transformer only **$5.95**

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cussion, let us say that amateurs approve only 50% of the new FCC proposals, proposals that are based upon written briefs by ARRL, NARC, SARA, and FCC studies.

Who made the 50% of the proposals that most amateurs approve of? Was it the League? Unfortunately, the answer is in the negative. We are pretty safe in drawing the conclusion that if no one had made any suggestions to FCC except ARRL we would be denied a chance to write into amateur legislation the novice license, the technicians license, the extra class amateur—for not one of these were current proposals by the ARRL!

All right then, where do we go from here. ARRL, NARC, and SARA officials are sitting down at a conference on June 11 in an effort to arrive at a mutually satisfactory "united front." It took pressure to bring about the meeting, but it is to everyone's credit that it will take place. But bear in mind that if NARC and SARA withdraw their proposals or take any other actions, they do so with no guarantee of Board action in agreement, because the meeting is not with the ARRL Board, but rather with members of its executive committee. Let us assume anyway that they arrive at an agreement for common action that is subsequently ratified by ARRL, NARC and SARA and proposed to the FCC. If the arguments against the proposals are sound or if they have better proposals, we have no doubt the FCC will act upon them. Should the FCC act, at any time, in a manner that all amateur groups consider inimical to the amateurs' best interests, it is always possible to appeal over the heads of the Commission, but we do not conceive of such a situation arising.

We feel that the prerogative of the hams to decide among themselves what is best for their service is desirable, so long as ARRL does not consider itself omnipotent. We believe that the FCC Amateur Division would concur with us in saying they would welcome a single united proposal from the amateurs.

If the action of the FCC is delayed until the ARRL Board again meets, that Board will have another great opportunity to restore the League to its former prestige as a leader in amateur affairs. If it fails to bring forth a dynamically constructive program, then amateurs must look increasingly toward minority groups for virility in thought and action.

If the ARRL is forced to accept as law, proposals that they have publicly denounced there is no reason to believe amateurs will automatically lose their affection or esteem for the League. But if the League wants to dominate the amateur field it must show leadership, and the good grace to assimilate constructive suggestions regardless of their origin. Failure to do this, or a vacillating policy that is narrow in concept or scope, will do more than lose members for the League—it will lose the amateur bands themselves.

The first step in the right direction, we are firmly convinced, is the adoption of most of the new proposals made by the FCC. We fervently hope that they are adopted with the approval of the ARRL and towards this end we support ARRL whole heartedly, but with or without League approval, we say this is the hams' greatest chance to start a new golden era of amateur radio.

—W2IOP

LETTERS

(*from page 4*)

After a bit of "boning," I could pass a theoretical exam, but the principle of the thing is repugnant to me, and shows poor faith on the part of the FCC.

Paul Z. Haus, W2VH
Silver Spring, Md.

Editor *CQ*:

Think it over!

New amateur regulations have been proposed by FCC and represent a combination of ideas, some good and some bad, submitted by NARC, SARA, ARRL, and others. The bands are full of pros and cons and before July 20 arrives (FCC has asked for all comments by then), the babble will be louder than the week-end QRM.

Here's the point. "Of, by, and for the Radio Amateur" is supposed to be the motto for all amateurs. Supporting any proposal favoring any particular group, namely phone *or* c.w., is not adhering to that motto. No more certain method of "conquering by dividing" could have been devised by other interests, no surer way of weakening our claim to any frequencies at all could have been cooked up, and no better means of losing the support of our friends in the military could have been thought of.

Therefore, the time for some serious *impartial* thinking is today, not tomorrow. Obtain and study FCC docket #9295, and no matter with what organization you are affiliated, judge each proposal fairly on the basis of our motto above. If any proposal is not fair to the majority, does not stimulate the improvement of all our techniques by *all* groups, does not reduce unnecessary modulation widths, and does not provide incentives and privileges for both classes of operators, drop your director or ARRL a card and tell them so, plainly but fairly. Do not follow blindly any one group's theories when fair compromise proposals are in the making giving us all the best chance of survival.

Remember, united we stand, divided we fall!

R. T. Ellis W3NXN
A. B. Reppert W3LYV
P. E. Robinson W3EUQ

DX

(*from page 42*)

generous of George to let us all in on this secret, but I don't see how it's going to help me much. VP4TAN is now QRT and back in the States as WØQHT. He will take care of those missing cards from home; same goes for J9ACS, now WØHQF, for contacts between May 21 and November 10, 1948. See QTH column.

Thrown for a Loss

Prepare yourselves, gang; we are going to lose some countries one of these days, and perhaps rather soon. Newfoundland and Labrador have an excellent chance of suddenly disappearing from the list, and also possibly certain Chinese areas. Just how to handle these particular deletions is being given careful consideration, but we thought a warning, to soften the blow, might be in order. It looks like the VOs will still retain their calls, while becoming a part of Canada.

KG4AD, Don Dahl, ex-NY4DD, gives us the dope on the new calls assigned to Guantanamo Bay,

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Hallicrafters S-72 All-Wave Portable Radio

NEW

Enjoy powerful all-wave reception wherever you go—with this superb new universal portable. The S-72 covers 540-1600 kc, 1500-4400 kc, 4.3-13 mc, and 12-31 mc. Receives standard broadcast programs, foreign and domestic short wave broadcasts, aircraft, police and Amateur stations. Has two built-in antennas—loop for standard broadcast and 27" whip for short wave. Automatic Noise Limiter; sensitivity control; AVC; BFO; main and fine tuning controls; tone control; phone jack; provision for attaching external antenna. Brown leatherette-covered plywood cabinet, 14" wide, 12¼" high, 7¼" deep. For 105-125 volts DC, or 60 cycle AC, or self-contained batteries. Complete with tubes, less batteries. Shpg. wt., 16 lbs.

97-505. Hallicrafters S-72 All-Wave Portable. *NET* **$79.95**

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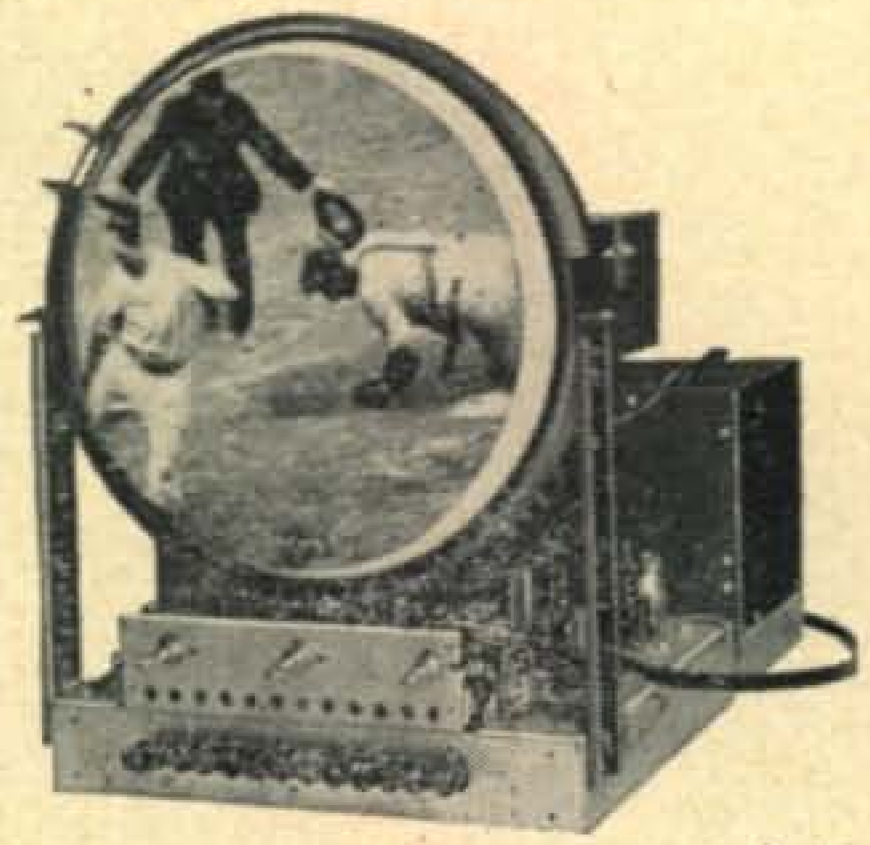

Tops for custom installations at low cost—a complete direct-view chassis for 10 or 12-inch tubes. With new Dual-Focus switch—10" tube gives you choice of big 64 sq. in. telescopic view for dramatic closeups, or large 56 sq. in. full-range view. Features: 12 channel push-button tuning; RF amplifier; 3 IF amplifiers; 2 video amplifiers; improved sync circuits; AGC; static-free FM audio system. Complete with power supply, speaker, picture tube and 15 tubes, plus 3 rectifiers. For 105-125 volts, 50-60 cycles AC. Shpg. wt., 60 lbs.

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Address..

City.......................... *Zone*........ *State*..........

as of April 29, 1949, as follows: *KG4AA* (ex-NY4BA), *KG4AB* (ex-NY4JB), *KG4AC* (ex-NY4LB), *KG4AW* (ex-NY4AW). All QTHs are the same. Don adds that they are all building big rigs, apparently trying to outdo each other. While down in this neck of the woods, we might hear a station at 7010 kc signing *VP5C*—which would be Cayman Islands. W4BRB, Gene, gladdens our hearts with this bit of info. Says his name is Dillen Tibbets, c/o Radio Station ZNA, Cayman BRAC, B.W.I., but that you will have to dig deeply to hear 20 watts from 32-volt mains. An HRO receiver will help this end, and a classy QSL supplied by W1FH will be handled by Gene initially to hurry things up. The line should start forming at about 6999.9, but who has heard him? Maybe pretty soon now.

KS4AI does operate on 14-mc phone, so look under your own signal, and you might hear him. Ralph is using a low-powered completely portable outfit, and because of the phone band QRM, sticks mainly to c.w. *KS4AJ* is on 28-mc phone with a TBS 50. *KS4AL* is mostly on 28-mc phone, with an occasional crack at 14-mc c.w. *VP9CC* will be leaving soon for Scotland, and after a month or two there, hopes to move on to either ZB1 or VS7, from where he will look forward to further contacts with his many "W" friends, made during his spell in VP9. He wishes to say "Au revoir and thank you," for all the pleasure they have given him in Bermuda. Andy QSLs 100% for all cards received.

From Roumania comes the good word, both direct and via W6AY, that a "legal" short-wave society called Asociatia Amatorilor de Unde Scurte din Republica Populara Romana (A.A.U.S.R.P.R.) has been formed, and that licenses should be issued shortly, using YO instead of the old YR, for the prefix. Power output will be limited to 50 watts.

If you missed *I1PL* or *I1HR/M1* in San Marino last year, better cancel your present vacation plans and stay home from July 2nd to 10th. I1IR tells us the A.R.I. will have its annual meeting during this period at Rimini, which is near San Marino, and many Italian hams will take their equipment to M1 and operate for their Field Day, by special permission from the Republic of San Marino. Both phone and c.w. will be represented, so don't miss it. We hope your copy of *"CQ"* isn't late this month!

Dave Brown, ZL1HY, makes our mouth fairly water by sending in his QSL from *VT1RF*, Kuwait. This station has apparently not been heard from since last November, so probably "is no more." His remarks are of interest, however. "I am operating by permission of His Highness Sir Sheikh Ahmad Jabir Alsubah (K.C.S.I. K.C.I.E.), and our political agent. The population of Kuwait is ruled by a sultan or sheikh, who in turn, is under the supervision of the British government. Most of the Kuwaities are Mohammedans. There are very, very few Christians among the natives in Kuwait. As a matter of fact, there has been an American missionary at work here for twenty years, and during that time he has converted only *one* Arab. Most of the people are either merchants or fishermen. Although to us, as foreigners, their life seems very hard and bitter, they are a happy people, and very interesting."

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Are you interested in working the Russian Zones 16, 17, 18 and 19? Probably you are, that being the most common question asked by the phone men. We are therefore about to give you a blow-by-blow

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description of how it's done. First we skip Zone 16, because you should have been lucky enough to have worked UA1AB a year or so ago, we hope. Next we come to Zone 17. The alarm starts you on the stagger to your receiver. After a few minutes, you find that there is nothing even resembling a Russian on phone, so you get out your list of dots and dashes and start to comb the c.w. band. Sure enough, there is *UA9KCA* calling CQ. You call, and if you are lucky, he comes back with a "569 here in Sverdlovsk." You nervously poise your left foot, excuse please, your operating hand on the key, and after the usual pleasantries, ask him to please test your phone. He returns with a jovial, "Sorry, not phone here, QRU, etc." Your face falls slightly, but not as much as when you discover a few minutes later that the band has suddenly become devoid of Russian signals.

The next day you repeat, only this time it is *UA9DP* that you hear. Your heart pounds to the rhythmical groan of your input choke (all phone men use input chokes), and again you are lucky. How long can this go on? You again ask your question, and sure enough, back he comes with, "Sorry, not phone here." You are jinxed. He should have phone, but you have the wrong operator, one who doesn't speak English, and of course could not do you much good on phone. After a week of searching, you are somewhat downhearted and discouraged, but suddenly you hear *UA9KCA* calling CQ. You either have forgotten that you tried him before, or else you are very persistent. You call again, and after he has worked two other stations, you get him. By this time, you are not so rusty on the key, and he has no difficulty reading you. You are jubilant when he replies, "FB, will test fone. Fone freq?" You give him the frequency, and boy, you're in. He says, "FB, will QSY to your frequency". You get panic stricken. You say, "No, no, stay where you are; I will QSY". You do this, and call frantically. You carefully listen for a steady carrier, but none is there. You listen for c.w. but no UA9. You call some more, but he is not there. By now you are desperate, so you get a brain storm. You look on your own frequency in the phone band, but he is not there either. You are now badly disillusioned, but you haven't given up yet. You change to your trusty key, and call again. Lo and behold, a W9 goes off and there he is, on your frequency in the phone band, calling you on c.w., but by now too weak to read.

So, you didn't make it. So, what? Well, you have learned at least three important things: (1) If the station you are after is a "Club" station, the first assigned letter being "K" to denote this, and you have heard that the station has phone, don't be surprised if you get the "sorry, not phone here," because you probably have one of the operators who does not speak English. Don't give up on this particular station, keep trying. (2) In spite of what arrangements you may think you have made for your QSY to the phone band, don't fail to listen on your own frequency, if you don't again hear the Russian station on his original spot. (3) Although he appears to speak English, he probably doesn't understand everything you say. Limit yourself to simple, common words and phrases. If you keep on the job long enough, assuming you are young to start with, you will someday have WAZ on PHONE! Simple?

Our apologies to W6ZZ, and we quote, "Who's this guy *W6ZE* to whom you credited my final

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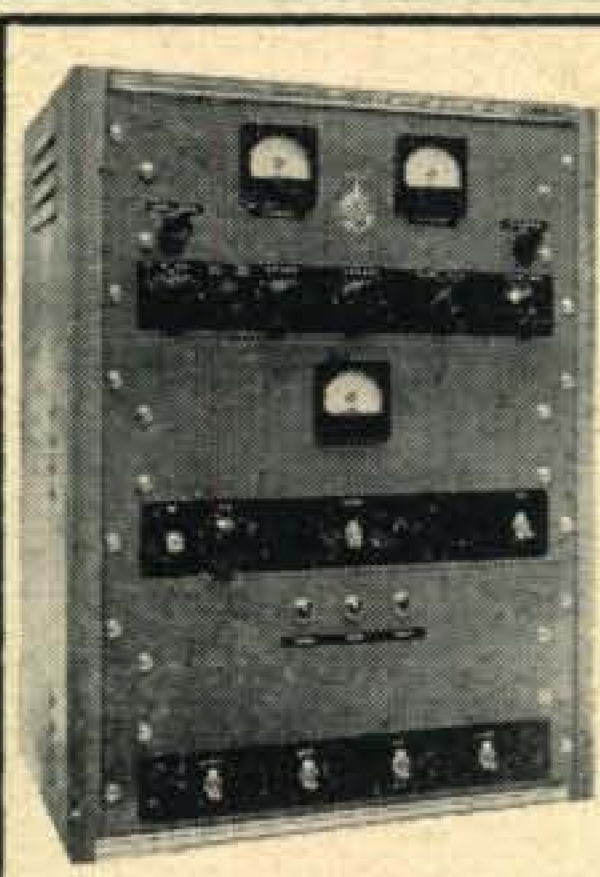

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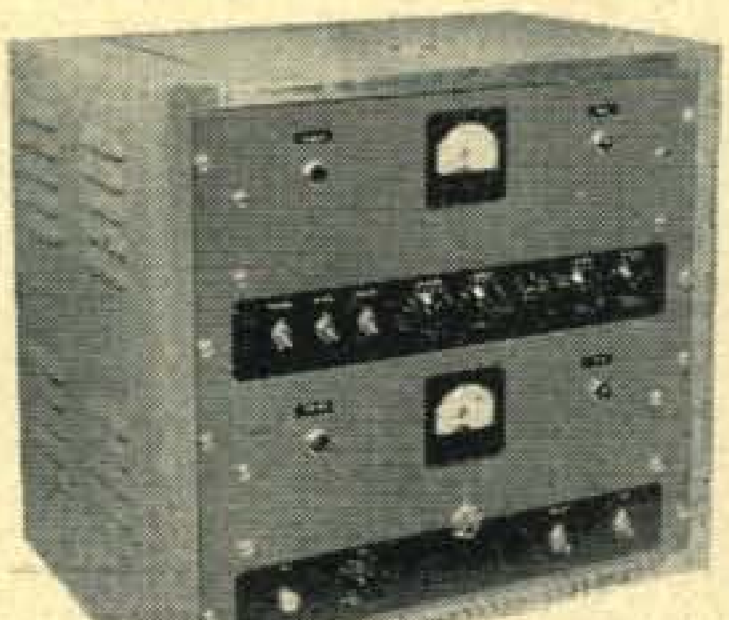

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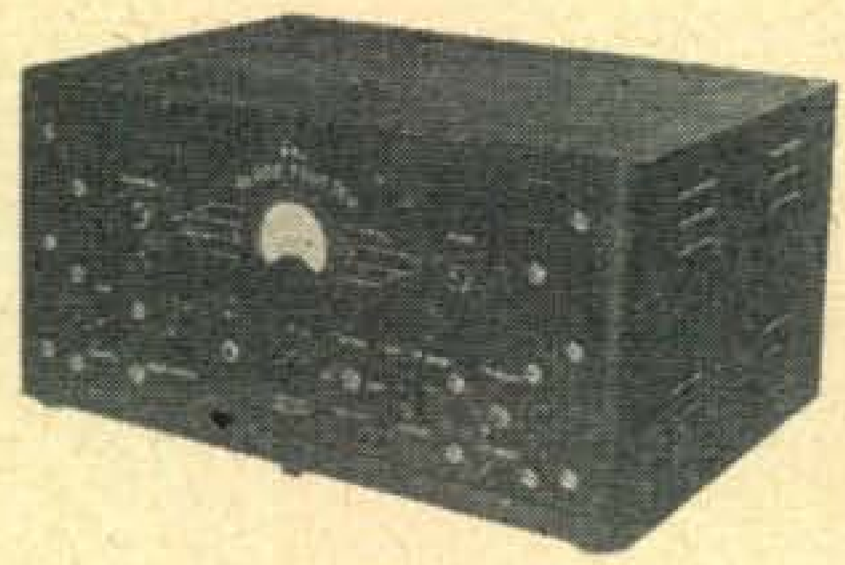

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score in the DX Marathon??? Tut, tut! Don't tell me it was the printer's fault, hi." Miles is one of the lucky-unluckies who also worked *EA6AZ*, the good one, of course! More arguments with the printer come from Smitty, W9NRB, who seems to resent being called W9NR*D* in the May roster of WAZ's issued thus far. Smitty also thinks that the printer knocked him down one country in his total. Sorry to say, Smitty, 'twarn't the printer that did this part. We removed a bum UM8 from your list, and didn't know where to reach you down there in Florida. Horace, W1AB, has the obvious answer to the occasional grousing heard regarding the combining of phone and c.w. totals. Says Horace, "A little listening will demonstrate that a lot of stuff is easy to work on phone, while being practically impossible on c.w. I suppose your answer to that would be, 'Well, get a modulator'. Herb, I shrink at the thought that I should succumb to phone after all these happy (?) years on c.w., but since I'm obviously handicapping myself in the current rat race, I am considering it—faintly!" Horace claims the blow of the month to be when *VR2BH* came back to him and said, "Glad to QSO, OM. Hrd u in there with the rest of the low-power boys. I know how it is, OM, only hv 25 watts hr myself."!! W1AB's 250THs and rotary are really working FB. Reminds me of my RST 329 from *UL7KAA* one dim morning. 559 was the lowest anyone else could get from him. What a rare honor!

As most of you know by now, the German nationals were officially licensed as of March 23, 1949, with DL1 and DL3 calls. DL2 is British military, DL4 American military and DL5 French military. The DK7, 8 and 9s are unlicensed and with no possibility yet of becoming licensed, DK7 being in Berlin (all sectors), DK8 the Soviet Zone and DK9 the French Zone.

Phonies for the Month

No matter what rumors you may have heard regarding a CR1Ø, and even if you worked one recently, relax and forget it, 'cause 'tain't so, and he warn't there (*CR1OFU'?*). 'Nuff said. Dick, W2PUD, and several others, suggest that we add to our list of phony stations, *CT2BN*, who peaks NW from Rochester, and also *ZP2KI*, who has a fist that is a ringer for CT2BN, both lids! Gene, CO6AJ, also confirms that ZP2KI is indeed a pirate. His signal is 599x at the wrong time, and is not coming from South America. When Gene tried to get his QTH, he QRT! So, file them away with *FG8AK* and other infamous characters. We're getting a nice new list of "phonies" prepared, for delivery early next year. At the moment we have our eyes on *VU4AC* and *FY8AD*. Who knows anything good about either of them? G2PL worked *CR1ØAC* who seemed to be a European phony. Incidentally, Pete has a new QTH which should be much better for DX. Why does he need it?

Bob Shaffer, W3JKO, worked both *PX1A* and *PX1AC* a few weeks apart on 10. PX1AC sez, "I am not a pirate. QSL to address on my QSL card." Of course Bob is still waiting, and when he told him that he had worked many stations signing PX calls, 1AC sez, "I have never met another PX ham here." That appears to be his most truthful statement, and very logical! By the way, the present gentleman signing *PX1A* does not look like the one of his many predecessors who actually sent out cards from Mexico. Our eye is on him, or "they," as the case may be. We wonder how many different individuals have indulged in the popular, modern DX game of signing PX1A, during the past few years? Any guesses? But to continue with W3JKO, "On April 17, 28 mc, I hooked up with a character signing *CK4AG*, who gave his QTH as "Algive Islands," 70 miles East of Malta. I inquired as to the nationality, and he said he was Greek. I haven't found it on any map I have". According to the maps we have, Bob must have worked the first "N" in Mediterranean. Good DX!

In spite of the fact that there was an indirect reference to *UA3MR* as Poland in the May issue, we are not crediting same. We may be wrong, but we don't believe UA3MR is in what is currently considered to be Poland. Don't forget that large areas of "Old Poland" have been incorporated into the White Russian and Ukranian SSR's. Many times this column will report a number of stations worked by someone, but this is by no means to be construed as our guarantee, or even recognition, of any or all of them. We're merely reporting what someone has worked, good or bad. If the station is a controversial one, you can be sure that there will be more than a casual reference made to it. We understand from Jerry, W3BES, that he has a letter from *SP2RD*. Several others have also received letters from this SP, and a couple of ZLs strongly vouch for *FK8AN*, New Caledonia, who operated several years ago on 28 mc. These two stations were on our list of probable phonies, so if anyone needs credit for them, please send them in again and we'll be glad to oblige. They appear to be the only ones out of more than 100 in the list that have a legitimate background. We had hoped that there would be more.

W6YC, who last September worked *VK3ACD* on Heard Island on 7 mc, has received a QSL card telling him that penguins are as "good eating" as a tasty steak, and remind one of a steak. This is for the "birds;" give me the steak. *OX3J* is the most northerly ham in existence we are told by VE8MD. He's at 82°North and 32°West, and is active on 7050 kc.

KL7PJ enters the Honor Roll with 33 and 85, including *C8FP* (Zone 23) just worked. Chuck's XYL has just received her ticket, KL7YG, and is getting on right away. Says she promises to be a DX hound also, and will work c.w. exclusively, mostly on 20, since 10 is dead until late September. Anyone wanting a YL in Alaska had better start looking. She doesn't call CQ though, so you'd better stalk her like real DX! W4IWO sends in a phone list this time, 34 and 99, and sounds a little sad, having just moved from a fine location in Annandale, Va., near W4KFC, to an apartment in Falls Church, where no outside antennas are allowed. A little r.f. from an attic antenna should help keep the house warm in the winter.

G8QX enters the H.R. with 35 and 123, phone only, using 150 watts from TZ40s, modulated by 807s. Ken says he can not find anyone on in Zones 17, 18 and 19 who can speak English, and wonders if he will have to resort to whistling c.w. at them like other hams have done! Hey, what goes on here? This doesn't sound like two-way phone, does it? KH6AW, ex-K6GAS, etc., now turns up in Orlando, Fla., and will pay off if he owes anyone a QSL card. Henry wants his old time 20-meter phone friends to know that he is still with the air warning outfit, and that he will only be on with 30 watts, mobile, at 29.4 mc.

There has been considerable puzzling of late over *VK4SI/VR1*. The VK gang say that his call has not been legally issued, and hence he is a pirate. However, it appears that he is on the Gilberts OK, and he recently told W6VFR that the situation regarding his call would be straightened out in the near future. We have his QSL QTH in the usual spot. If you should need Zone 19, look for *UAØKFD* with a tremendous signal, coming from Provideniya Bay, on the Bering Sea, just across from Alaska. From Bob Donovan, W7EYS, comes some news from Reg Fox. Soon there should be three AC4 stations, *AC4YN*, *AC4RF* and *AC4NC*, the latter expecting to leave Sikkim for Tibet. They will try to get the man who relieves AC3NC to start up, so there will be an "AC3" active. *VU7-AF*, whose nickname is "Tootoo," is the Indian Dominion Ambassador to the Government of Nepal. In the near future, AC4YN and AC4RF will have brand new American receivers and transmitters, which should help a lot. By the way, you no doubt know that Bob Ford, AC4RF is ex-AC3-SS. Bob has QSLs on order, and will QSL 100%, so be patient. He is moving to a new QTH in Lhasa, and expects to be more active with some 8JK beams.

LU8BF, a ten-meter phone enthusiast, speaks very casually of working *CR4LF* in Portuguese Guinea! Why not CR5? He also mentions *LU1ZA*, *2ZA* and *3ZA*, all in the So. Orkney Is., as well as *LU1ZB* in Argentine Antarctica.

PK4DA is still going strong, with WAS and 117 countries on phone in about six months of operation. He has two transmitters, each running about 50 watts, an HQ-120X receiver, and 3-element beams for both 10 and 20 meters. W6UZX is handling his cards for him, as all PK stations are still under cover. In fact, the PTT, Dutch equivalent of

FCC, has just ordered a ban on the operation of PK stations by PAØs. Again from Jim is a message from *PK5HL*. He wants the gang over here to realize that he cannot continue to work them on c.w. if they don't stay off the frequency of the station he is working. Do not call him while he is in QSO, or he will forsake c.w. in favor of phone exclusively. 14,050 kc, or thereabouts, is his usual spot for c.w. and at about 1400 to 1600 GMT. *PK5HI* will also be heard these days. W6UZX will handle cards for all three.

From the DXER, the Northern California DX Club Bulletin, we lift the following: VR5PL confirms that *VR5R* is a pirate, and alleged to be near the W2 area. Cards for *LX1SO* have been returned by the Luxembourg QSL Bureau, bearing their official "Pirate Stamp." Scratch one. A phony, on a one night stand, was calling CQ recently, and signing *ZA2AA*, loud and clear. Add *TZ4CG* to this one! The W.A.P., Worked All Pacific, award has been instituted by the NZART to encourage operation in the Pacific. Briefly, the award is available to any amateur sending, by registered mail, confirmations of contacts with 30, or more, countries in the Pacific area, ie., Zones 27 through 32, to NZART HQ, P.O. Box 489 Wellington, N.Z. A list of countries claimed must accompany the cards, as well as sufficient postage (coupons) for the return of the cards. All contacts must be with land stations, no ships, and must be since November, 1945, with a minimum report of S3 and T8.

W6PH tells us that *WØMCF/C3*, now at Takao, Taiwan (Formosa), is leaving there, and would like his cards sent to his home QTH. Don Wallace, W6AM, has been entertaining himself visiting W7AMX, W7MBX, W7DL, W7RT and W7VY. W6MVQ has increased power to 950 watts, and assumes that he is now a full fledged member of the medium power group. How you talk, Rich. After reading about W7GC, Reno, W7JUO in Boulder City thinks we ought to put in a plug for the South end of Nevada. OK, Frank, consider yourself plugged. You fellows overseas, that need Nevada, now have two to shoot for, both on 14-mc phone, but again W7GC outdoes W7JUO by offering to even go on c.w. if someone wants a sked. How horrible, Bert, don't even think of it. Make 'em build a "wodulator." You'll find him, almost nightly, at 14,252 kc.

G5WI and W6AY have made a record, we think, having kept an almost daily sked since June, 1947, which has resulted in over 500 QSOs, with a maximum of 85 watts at G5WI. Les will be leaving England soon, and expects to settle in W6 land. He has had QSOs with around 1700 different "W" stations. Wonder who the high man is in the number of different "W" stations worked? He should be given a gold something-or-other. A message just received from *FB8AB*, via ZS2X and W6ADP, says that he is still not on the air, but hopes to be soon. He has most of the equipment, but still needs some tubes, etc. We think that *ZS7B* is about finished in Swaziland; should have left around the first of June. *ZK2AA*, via W6EBG, wants it known that he has more QSL cards on order, and will send them out in due course. *YJ1AA*, New Hebrides, is a nice catch on 14,396-kc phone, but reads c.w.

too! Runs 20 watts to a dipole, and is on around 0600 to 0800 GMT frequently.

No fancy wind-up, just a plain QRT. Thanks again for bearing with me. 73, and maybe we'll see you again someday.

DX QTH'S

AC4RF	Robert Ford, Lhasa, Gyantse Post Office, Tibet, via Siliguri, West Bengal, India
AC4YN	R. N. Fox, Same as AC4RF
AR8XA	Francis Semeraro Orsini, Hotel Normandy, Beyrouth, Lebanon
C1MCC & C1ZZ	Joe Pilarsyk, W5PSH, 3015 W. Elm St., Denison, Texas
CO6AJ	Eugenio de Llanos B., P. Quintero 186, Cienfuegos, Cuba
CR4LF	Luiz A. Rodrigues Fernandes, Casilla de Correo No. 4, Bolama, Port. Guinea
DL1 & 3	DARC, P.O. Box 99, Munich 27, Germany
EA2CQ	P.O. Box 115, San Sebastian, Spain
EA3MA	Ramon Llebaria Regalado, 57 Layetana, Barcelona, Spain
EA5AF	P.O. Box 3, Valencia, Spain
EZ1MS	Helga Kinzel, Saarbrucken I, Zeppelinstr. 27, Saarland
FA9RW	Boite Postale 21, Maison, Carree, Algeria
HA4SA	(exHA4EA) Dr. L. Radnai, Szolnok, Jaskurt-U2, Hungary
HA5BC	C/o M.R.R.L., Budapest, Hungary
HA5BF	Paul Barna, Csepreggy 2, Budapest, Hungary
J9ACS	Joe Rainey, WØHQF, 3404 Morrell, Kansas City, Mo.
KH6AW	Maj. Henry S. Lau, 650th ACW Squadron, Orlando AFB, Orlando, Fla.
KL7JD	(New QTH) Gerald J. Nelson, Box 632, Petersburg, Alaska
KL7RI	(New QTH) P.O. Box 1928, Ketchikan, Alaska
KL7SB	(New QTH) C. L. Coner, c/o C.A.A., Bethel, Alaska
LU2ZA	Alfredo Torres, Isla Laurie) So. Orkney Is.,
LU3ZA	Carlos Colson, Isla Laurie) QSL via Radio Club of Argen.
LU1ZB	Jose R. Vieta, c/o LU5DJD, B. Marquez, 255 San Isidro, Buenos Aires
MD2KP	Sgt. Mackintosch, 1st Sqdn., 1st Inf. Div., Signals Reg., Tripoli, Libya
OE1AD	Via W2NFR
OQ5DE	C/o Symetain Compagnie, Kalima, near Kindu, Belgian Congo
PK4DA, PK5HI & PK5HL	Via W6UZX
PK5AA	H. Devos, c/o Shell, Balikpapan, Dutch Borneo
PK6XZ	Swortlaan 3, Makassar, Celebes, Indonesia
SV1AH	James Liverios, P.O. Box 255, Athens, Greece
TI2AFC	Antonio Canas, Apartado Postal 517, San Jose, Costa Rica
VK1AJT	(Stn. Macquarie Is.) 56 Leonora St., So. Como, West Austr.
VK4SI/VR1	Ren Foster, Navy Base, c/o 3234, Box M-33, c/o FPO, SF, Calif.
VP2AJ	A.P.O. 855, c/o P.M., Miami, Fla.
VP4TAN	S/Sgt. Victor L. Felix, WØQHT, 91st Strst. Rcn. Sqd. Photo, Mcguire AFB, Fort Dix, N.J.
VP7NU	Box 703, Nassau, Bahamas
VS1CV	P.O. Box 907, Singapore, Straits Settlement
VS4WL	Bob Wellspring, 8 Green Lane, Ilford, Essex, England
XZ2SY	Major Soe Ya, 21 Fraser Road, Rangoon, Burma
YM4AW	C/o Walter Schlichting, 85 Park Ave., Amityville, L.I., N.Y.
ZD1RA	C/o Army Post Office, Freetown, Sierra Leone, B.W.A.
ZD1SW	P.O. Box 99, Freetown, Sierra Leone, B.W.A.
ZE2KH	Box 390, Salisbury, So. Rhodesia
ZS7B	Via S.A.R.L.
4X4AD	P.O. Box 2713, Tel Aviv, Israel

PREDICTIONS

(*from page 86*)

Midwest to Equatorial Africa

40 meters: First c.w. signals build up around 1700 CST. Peak conditions extending from 1900 until 2200 CST. Band fades out completely after 2315 CST. *20 meters*: C.W. should be heard after 1400 CST, although well into the atmospheric noise background. Conditions improve gradually throughout the afternoon with a broad peak from 1830 until 2300 CST. Band fades out finally after 0130 CST the following morning. *10 meters*: No openings, MUF about 23.0 mc.

Midwest to Southeast Asia

40 meters: Extremely high polar region absorption. Doubtful that any signals will be heard through this entire month, except during freak conditions. *20 meters*: Very erratic polar conditions are expected and the only possible opening should be between 0515 and 0645 CST. Weak c.w. only, no phones expected to be readable. *10 meters*: No openings, MUF is about 18.5 mc.

Midwest to the Balkans

40 meters: High polar absorption is expected although a few scattered, but very weak signals may be expected around 2000 CST. Not too much promise, however. *20 meters*: First c.w. signals expected on ionospherically quiet days after 1415 CST. Buildup throughout the afternoon with phones probably best after 2000 CST. Phones fade out after 0100 CST and c.w. after 0245 CST the following morning. *10 meters*: No openings, MUF about 19.0 nc.

SCRATCHI

(*from page 6*)

are rig, completely debugged. All channels clear of TVI except one, which are clear when Scratchi looking at receiver but not when Scratchi not. Deciding to make another check of rig with neons bulb, but when picking up bulb it are burning out faster than miniature toob with one kilowhats input.

Now I are knowing that Scratchi are plenty hots kid, but are not before having trouble handling neon bulbs. Friend are handing me another bulb, and as soon as getting it in my hand—phoof, no bulb. Amateur friend at this point getting strange look in eyes, and he are coming over to me with field strength meter set to read on TV frequency. Even before getting close, meter are way off scale. Next he are taking pencil and—Hokendoke Hackensake, Hon. Ed., are you ever having fellow pulling inch long arc with pencil from your ear??

There are no doubts about it now, Scratchi are redhots with r-f. By careful measurements with tape measure are finding that I are exactly half-waves long on channel we having trubbles with. In some ways I are picking up main signal from rig and re-radiating it at TV frequency.

Next thing I know I are flat on my back and my amateur friend are rapidly leaving latter category as he are tying me hand and foot. Not being interested in half-way measures he are cutting off all my hair, then taking shoes off. Meanwhile he are mumbling something about detuning me. Some spot Scratchi are in, tied up tighter than halyard on antenna pole after high wind, and a fellow with wild look in eye about to detune scared old Scratchi. Before he are getting any ideas like cutting off legs I are thinking fast and asking him why not bypassing me to ground.

He are evidentally liking idea, as he are wrapping me well with wire, and connecting condenser to this and then to radiator. Then he turn on rig and go downstairs. This are working ok, I guess, as he are coming back and untying me. Needless to say, I am leaving hurriedly with instructions not to coming back until have grown cupple more inches.

I are sorry to be leaving so soon, as were about to try out antenna idea. Being he so high in air on top of building, couldn't Scratchi using metal framework of building for vertical antenna?

Respectively yours,
Hashafisti Scratchi

BC-624 NOISE LIMITER

[*from page 25*]

noise. Resistors need not be more accurate than 10% because a little clipping on occasional voice peaks is not objectionable in amateur communications. Distortion is so low that no provision has been made for cutting the limiter out of the circuit, or for adjusting the limiting level.

The 18,000-ohm resistor (R6) in the cathode lead from the 6B8 has no effect on detector and noise limiter performance. Its function is to provide a bias which delays the a.v.c. so that it does not act on weak signals. The amount of delay can be varied by changing the size of this resistor. In some receivers the a.v.c. diode load resistor, R8, is returned to ground rather than to the cathode. This more conventional connection should be retained. No changes were made in the audio amplifier other than adding a 6800-$\mu\mu$f condenser from the plate of the 6J5 (or 12J5) to ground. This serves to bypass the higher-pitched audio components of input noise which previously had been attenuated by the audio transformer.

DISCONE

[*from page 15*]

with shunt coaxial transformers to the RG 8/U line were requested from stations worked. By "carefully matched," we mean actually measuring the voltage standing wave ratio with a laboratory slotted line and matching until the line to the ground plane was as flat as it could be made. No matching of any kind was used on the discone at any of the frequencies used.

Out of twenty-two contacts made, nineteen reports gave the discone a 2 to 3 "R" advantage; one station called it a draw, and two other reports (on the three-quarter meter band) gave the discone anywhere from 3 to 5 R-units greater signal strength but had to be reluctantly discarded because the stations concerned were estimating by ear, not meter.

The smaller version of the discone shown mounted on an automobile top (model B, *Fig. 5*) was

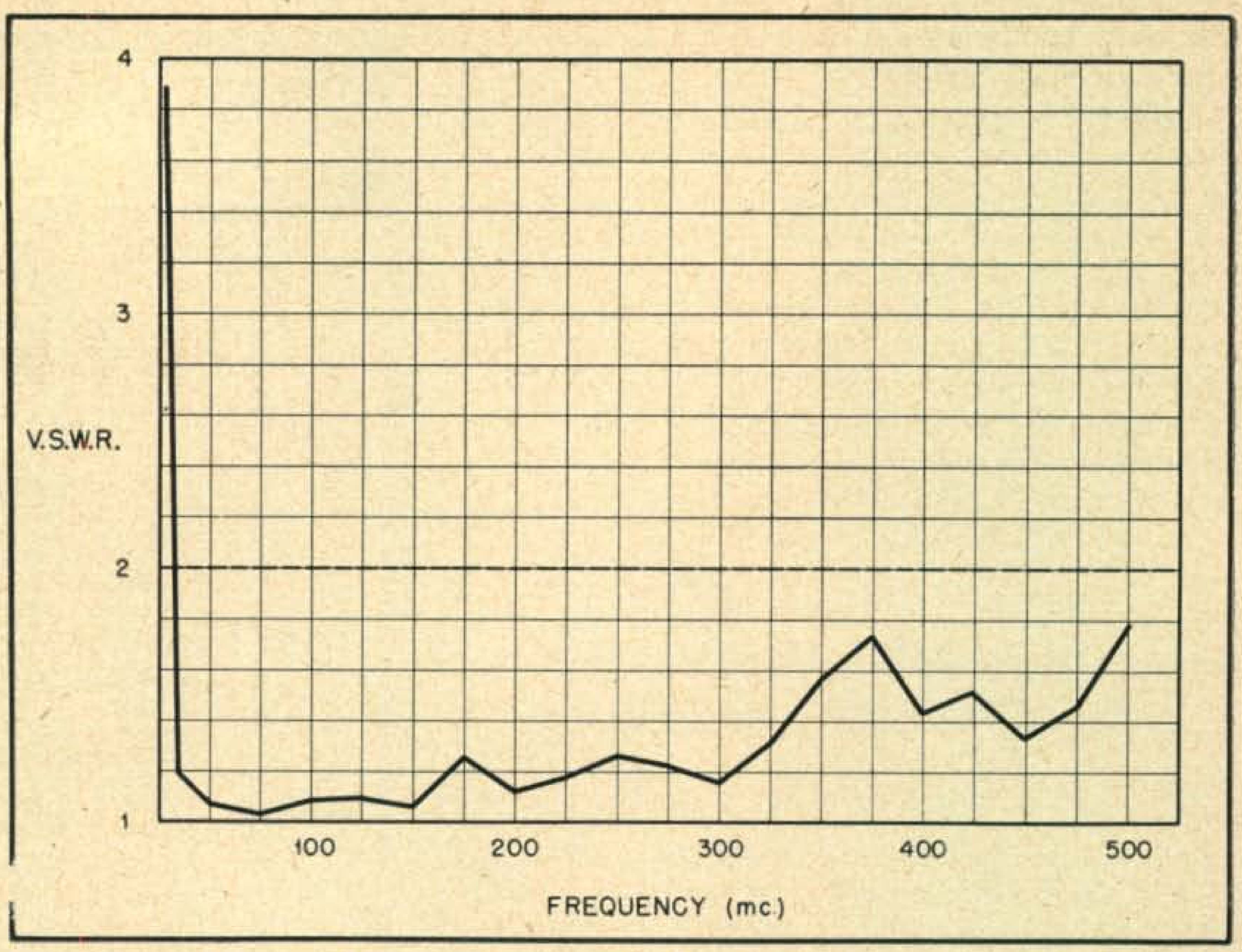

Fig. 7. Voltage standing wave ratio existing in a 52-ohm coaxial line for model A discone. A v.s.w.r. magnitude of 2 represents only 3 per cent power loss due to impedance mismatch. Measurements were made on a laboratory slotted line.

necessary in order to test the antenna for suitability under mobile conditions. Operation was in the 420-mc band. Only two schedules could be arranged between the mobile unit and the home station in the time allotted for mobile operation. In both instances contact over a 12 mile path could not be established with ground plane antennas being used at both ends of the circuit. After a five minute call the home station switched to the model A discone and was heard about Q3 R3 by the car. The mobile unit then tied in its discone and the signal was Q5 R4. The least that can be said from the above results is that the discone looks like a good, efficient antenna for members of the fraternity who do not desire a roof bedecked with an antenna for each v.h.f. band they operate in. For the experimenter who wishes to work with combinations of discones, possibilities appear extremely bright.

A point of interest about the mobile installation is that the base of the discone is welded to a flat ring of .064 brass. This ring is drilled and tapped for 12 type 10-32 screws which go directly into the car top which then acts as an excellent ground plane. Little change in the input impedance results when this is done, but the radiation pattern changes slightly. In this case a lowering of the major lobe was noticed. No attempt was made to secure permission for transmissions in the Citizens Band, although voltage standing wave measurements were carried out to 500 mc and, as can be seen from the curve, *Fig. 7*, predict excellent results for a band many hams will probably be tempted to try.

Construction Notes

Several suggestions for construction of a discone are given in *Figs. 2* and *6*. Due to the fact that the alternative designs in *Fig. 6* are only approximations of a solid surface they will not perform as efficiently over the higher range of frequencies as the models shown in *Fig. 2*. These sketches show, however, how simply the antenna can be made. In one case a "jury rigged" discone (*Fig. 6*) was constructed and put on the air in less than twenty minutes. It is recommended that if a permanent installation is contemplated that the builder pay the slight charge for having the inner support cone machined by a local shop. The author's model A antenna cost a total of $25.00; this cost covered all raw materials from surplus sheet aluminum and bar stock to the machining fee. Wind loading is considerable on a structure offering as much surface as the discone, therefore a very rigid guying system or tower is suggested when mounting the antenna permanently more than a few feet above the roof.

DUAL CONVERSION SUPER

[*from page 23*]

capacity can be used across the coil for the same purpose, if desired.

The pitch control is an air trimmer of approximately 35 $\mu\mu$f maximum capacity. Actually, it is a standard 50-$\mu\mu$f air trimmer from which two stator and three rotor plates were removed, leaving nine plates in all. In order to avoid trouble from b-f-o harmonics, the pitch control condenser is mounted directly under the b-f-o coil so that its stator lead can be made as short as possible. A ¼ inch brass shaft and a pair of flexible couplers are used to couple the trimmer shaft to a bearing assembly mounted on the panel. In wiring the second i-f and detector circuits, be sure to keep all components close to the chassis to allow clearance for this shaft.

The send-receive switch, SW_4, is a double-pole-double-throw toggle switch, one pole of which is used to apply 117 volts a.c. to a pair of terminals on the rear of the chassis to operate antenna and transmitter relays in the "send" position. The other pole grounds the proper terminals of the gain control potentiometers in the "receive" position, and in the "send" position inserts resistor R_{34} between these terminals and ground. This places a high bias on those tubes whose gain is controlled, permitting the local signal to be monitored during sending periods with c-w operation. With a little experimenting, a value can be found for R_{34} which will give a comfortable signal level from the local transmitter with the switch in the sending position, without requiring a change from average gain control settings after going from "receive" to "send." The value given is that which works best with our particular setup, but it cannot be expected to hold for every case. R_{34} could have been made about 50,000 ohms variable and mounted on the rear of the chassis, in order to take care of all cases.

This scheme will not work with phone operation, of course, and those who operate phone should use the more conventional method of opening the power-transformer high-voltage center tap lead, unless they are willing to reduce the audio gain control setting each time they are about to transmit.

The power supply is strictly conventional, except for the 500-ohm resistor which was found necessary to hold the output voltage down to rated values for the tubes. This resistor is connected in the circuit so as to take advantage of whatever small *R-C* filtering action it can provide.

Although a 5V4G rectifier is shown in the diagram, a 5U4G can be substituted if the value of the dropping resistor is changed to 400 ohms.

Assuming that the wiring has been checked and that the audio stages are operating properly, the first step in the tuning-up process is to set the beat oscillator to the proper frequency. Probably the easiest way to do this without a calibrated signal generator is to listen for the second harmonic of the beat oscillator on a well-calibrated broadcast receiver. An insulated lead from the antenna terminal of the broadcast receiver looped around the diode end of the b-f-o coupling capacitor should give adequate pick-up. The b-f-o tuning slug should be run in or out as required to bring the

Dollars for Watts

second harmonic to approximately 912 kc. For preliminary alignment, it should be possible to set the b-f-o frequency with sufficient accuracy by locating a 910-kc broadcast station on the b.c. receiver and then tuning the b.f.o. so that its second harmonic produces a fairly high beat note on the high side of the b.c. station.

If a signal generator with modulated output is available, the alignment of the i.f. should be carried out in the usual way. With the b.f.o. off, apply a strong signal to the second i-f grid and tune the primary and secondary of the output i-f transformer for maximum audio signal, reducing the output of the signal generator during the process if necessary. Then, with the selectivity switch in the "crystal off" position, apply a weaker signal to the first i-f grid and tune the crystal filter input transformer for maximum signal. Do not attempt at this point to tune the output circuit of the crystal filter. Next apply a fairly strong signal to the mixer signal grid and tune the first i-f transformer primary and secondary for maximum signal.

If no signal generator is available, the b.f.o. can be used for preliminary alignment. Disconnect the diode end of b-f-o coupling capacitor, C_{55}, and attach a lead to it sufficiently long to reach the i-f and mixer grids. Connect this lead directly to the second i-f grid, and connect a 1000-ohm-per-volt (or higher resistance) voltmeter, set to about 10 or 15-volt scale, across diode load resistor R_{44}. The voltmeter will practically short-circuit the load resistor, but it will be possible to obtain sufficient indication to enable the approximate peak settings to be found on the output i-f transformer. After these are determined, loop the b-f-o lead around the grid terminal of the first i-f tube (but do not connect it directly). With the selectivity switch in the "crystal off" position, turn the r-f gain up and tune the filter input transformer for peak indication. Then, with the b-f-o lead connected to the mixer signal grid, tune the first i-f transformer for peak indication.

After preliminary alignment by either method, it should be possible with the 7-mc r-f coils in place and the antenna connected to locate a signal sufficiently strong and steady to permit the i.f.'s to be peaked precisely at the crystal frequency. The station v.f.o. can probably be used as a signal generator, if it can be located by tuning the 7-mc oscillator trimmer. Switch the selectivity control to maximum position, and with the b.f.o. on listen carefully for the crystal peak as the signal is tuned in and out. With the signal tuned precisely to this peak, adjust the b-f-o tuning slug for zero beat with the pitch control set at the middle of its range. Then adjust the pitch control for a satisfactory pitch and retouch the i-f settings for maximum signal, making sure that the signal remains at the crystal peak throughout the process. Now tune to a spot where there is no signal, and with the r-f gain full on, peak the r-f and mixer coils for maximum noise. Set the selectivity control to the first crystal position, and adjust the crystal

filter output trimmer, C_{45}, for maximum noise (indicating maximum bandwidth).

The next step is to check crystal filter action. Again tune in a steady carrier exactly to the crystal peak with the selectivity at maximum. Set the pitch control to give zero beat. Then tune well to one side or the other of the signal so that a very high-pitched beat note is obtained, and note where the phasing control must be set to phase out this beat note. When the crystal filter is operating properly, the phasing control will be very nearly at middle position (rotor half meshed with each stator) for this condition. If the rotor is meshed considerably more with the hot stator than with the grounded stator, trimmer C_{43} will have to be added to the circuit and adjusted so that the phasing condenser is at about middle position when the high-pitched beat obtained as described is phased out. If the rotor was only slightly more meshed with the hot stator, it may be possible to obtain sufficient trimming capacity by using an inch or two of enameled wire connected to each of the proper phasing condenser terminals, twisting the two wires together a little each time and checking the phasing setting until it reaches the proper point.

On the other hand, if in the original test the phasing condenser rotor was meshed more with the cold stator than the hot one, the crystal-holder capacity will be over-neutralized with the rotor at mid-position. This is likely to occur only with a crystal whose holder capacity is very low, and it may indicate that capacitors C_{41} and C_{42} are not well-matched. Try swapping these capacitors, or replace one of them with another of the same nominal value, until a combination is found which enables the proper phasing setting to be obtained.

After these adjustments are made, note the various phasing settings as the signal is tuned closer and closer to the crystal peak (still at zero beat note). As zero beat is approached from one side, the phasing setting should move further and further from the center position. As it is approached from the other side, the phasing setting should be further and further from center in the other direction. The normal operating setting for c-w operation, of course, is that which will phase out one side of zero beat with the pitch control set for a satisfactory tone when a signal is tuned to crystal peak on the other side. This will occur near the center of the phasing control range when adjustments are correct.

This completes the i-f adjustments. The next step is to set the trimmers in the r-f oscillator coils so that the 3.5 and 7-mc bands are centered in the range of the main tuning dial. Next set the r-f and mixer coil trimmers to peak at the low end of the band in question. Then tune to the high end of the band with the main tuning dial and note whether the settings of these trimmers have to be changed appreciably to give peak response. If their capacity has to be increased, the bandspread tap is too high in the case of the 7-mc coils, or the number of coil turns is too great with the 3.5-mc coils.

and a little experimenting will be necessary with slightly lower tap locations or slightly fewer turns, as the case may be. If the trimmer capacity had to be decreased in the above test, the opposite will have to be done, of course. When proper tracking can be obtained for signals at opposite ends of the bands, tune to the middle for each and peak either the r-f or the mixer coil, leaving the other set to peak at the ends. The result will be excellent tracking over the entire range on each band.

The next step is calibration, which can best be accomplished with one of the popular frequency standards which give 100-kc and 10-kc marker signals. A well-calibrated v.f.o. will serve the purpose, however.

This completes the alignment and adjustment of the low-frequency receiver.

Alignment of the High-Frequency Converter

With the low-frequency receiver tuned to 7.3 mc, the antenna switch thrown to the high-frequency position, and with the converter gain control set at zero, adjust the mixer output tuning slug (or trimmer, if used) until a definite noise peak is found. The receiver gain should be set high during this adjustment, because the mixer noise is not very great. Even though the converter has not been aligned, it should be possible now to locate the desired band by running the h-f oscillator coil slug up or down. Set the slug so that the desired band is centered in the dial range.

The next step is to set the antenna, r-f amplifier, and mixer input coil slugs so that the overall response is uniform over the band. If the layout shown is followed, the coil dimensions given in the table should give coils which can be peaked without any trouble. A quick check on the coils can be made by removing the slug from the form and holding it with a pair of insulated pliers, inserting it rapidly in and out of the coil. The peak will then be much more pronounced than that obtained by the relatively slow movement of the slug as it is run up and down in the form with a screwdriver. The antenna loads the input tuned circuit down rather heavily, and the peak in this circuit will be considerably less well defined than the others.

In the final settings, the antenna coil should be peaked at about the center of the band, and the r-f and mixer coils should be peaked somewhere near the band edges. The response, as indicated by the intensity of atmosphere noise, etc., should be reasonably constant as the tuning dial is swung rapidly over the band.

After it has been determined that each coil can be resonated with the slug to the desired frequency, the coil should be removed carefully, so as not to disturb the windings, and given a coating of liquid polystyrene coil dope. After this has dried, the slug setting should be re-checked and then the slug should be sealed with a few drops of coil dope.

With the converter adjusted as described for the 28-mc band, the response will be down somewhat in the 27-mc band with the same antenna, r-f, and mixer coils, but it will still be entirely adequate for normal operation, and there appears to be little justification for using separate coils for 27 mc for these stages.

Operating Hints

The only respect in which the operation of this receiver differs from that of most receivers is that two r-f gain controls are available on the higher-frequency bands, one for the low-frequency portion and one for the h-f converter. The best signal-to-noise ratio will be obtained with the converter gain set high and the low-frequency gain set correspondingly low, for c-w operation. For phone reception with a.v.c. on, both should be set at maximum for most receiving conditions.

On 14 mc, however, the amplification of the stages preceding the high-frequency mixer is so great that with a high-gain antenna, very strong signals in the band may cause rectification at the signal grid of the mixer if the h-f gain is wide open, causing some "birdies" and spurious signals. This will occur only during periods of high signal levels, however. During such periods the converter gain should be reduced somewhat, if this trouble is experienced. During periods of generally low signal level, the full gain of the converter can be used.

When coils are changed, care should be taken to push the h-f oscillator coil firmly down in its socket, otherwise the unengaged length of the prongs will add inductance to the circuit and change the calibration slightly. If any slight changes in calibration should occur over a long period of time, they can be compensated for by adjusting the main tuning to slightly above or below 7.3 mc to bring the converter back into calibration.

SYMMETRY FOR EFFICIENCY

[from page 35]

The filament transformer is bolted into a corner of the chassis. This allows short and direct leads to the tube sockets. From the center tap on the transformer a common ground of bus bar run along the bottom of the chassis and is tied in with the filament, grid, and plate bypass condensers. The grid bias power supply which is in the corner opposite the filament transformer consists of a surplus 117-volt isolation transformer, a selenium rectifier, and a 30-μf electrolytic condenser. It supplies adequate and well-filtered bias voltages for the 812-Hs. To provide a wide range of bias voltages if needed, a 25-watt variable resistor, is placed across the output of the bias supply, and is mounted in front of the grid coil socket. The resistor acts as both a grid leak resistor and a bleeder for the bias supply.

When the final was finished, it neutralized completely without any difficulties. Neutralization was checked by several common methods instead of relying on a single test. Conventional methods were also used in testing the final for parasitics. At every possible setting of the grid and plate tank condensers of the completed amplifier there were no indications of low or high frequency parasitic oscillations.

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WANTED: 300-1000 megacycle or 500-900 megacycle equipment. ASB and APR receivers, LAE signal generators, slotted lines, UHF tuning units, etc. Give details and price. W6LWP, John Poole, 2140 Ocean Blvd., Balboa, California.

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

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.

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

HOTTEST SURPLUS LIST in the country. Electronics-hydraulics-aircraft gadgets. Dick Rose, Everett, Wash.

QSL's. SWL's. MADE the way you want them. Samples? W9BHV QSL Factory, 857 Burlington, Frankfort, Indiana.

WANTED: AN/ART-13, BC-348, RTA-1B, AN/APN-9, R5A/ARN-7, AN/ARC-1, AN/ARC-3, BC-788-C, I-152, MN-26, test sets with TS- or I- prefix, dynamotors, control boxes, transmitters, receivers, power supplies, etc. State quantity, condition and best price first letter. HI-MU Electronics, Box 105, New Haven, Conn.

FOR SALE: Collins 30K transmitter, complete. Used about 40 hours. Cannot be told from new both inside and out. Guaranteed perfect. First $1200. F.O.B. Wakefield, R. I., Transmitter Exchange.

HT-19, never used, complete, $275.00, express collect. J. Redlingshafer, W9FRH, 1429 So. Crescent Avenue, Park Ridge, Illinois.

WANTED: Several 300-1000 megacycle tuning units for APR-1 or APR-4 receivers. Also want ASB-5 receivers. Advise number, condition, price. W6LWP, 2140 Ocean Blvd., Balboa, California.

WANT SIGNALS INSTEAD OF HISS? Get proved idea-packed circuit diagram and home construction suggestions for a high performance, very low noise level receiver. Use elements to improve your receiver or as a hot converter. Send one dollar to Dan Poteet, W2UDT, P. O. Box 7, Little Silver, N. J.

SILICON STEEL TRANSFORMER lamination cut to order. Magnet wire, supplies. Write for price list. Morton Electrical Service, Maywood, Ill.

MUST SACRIFICE Collins 75A and speaker. Used under 20 hours. Best offer over $300. James F. Hubbard, WØ-EPK, R. F. D. #1, Monticello, Iowa.

FOR SALE: RME-45, complete. Dumont 274 scope, like new. $100 for each is a steal. First come, first get. Herbert W. Gordon, W1IBY, 12 Sunnyside Avenue, Wellesley, Mass.

QSL SWL quality cards, W5FAY Press, 6118 Goliad, Dallas, Texas.

FOR SALE: Capitol Radio Engineering course. Advanced with math. 12 volumes in 1st class condition. Postage prepaid. $60. W. E. Ethier, W4HKJ, 444 Ponce de Leon Blvd., Coral Gables, Florida.

WANTED: APR-4 Receiver, spare tuning units. Send your surplus list, prices in first letter. Charles Littell, 222 Lonsdale, Dayton 9, Ohio.

BARGAINS — NEW AND USED TRANSMITTERS — receivers—parts: Globe King $299.00; new 150 watt phone, $199.00; 60 watt phone $99.00; Globe Trotter $57.50; R9'er $15.00; Millen exciter and VFO $25.00; TR-4 $19.95; HT-9 $295; MB-611 $39; Silver 701, 800, 801, 802, $29.50; NC-173; SX-28, $149; NC-240C, HQ-129X, HRO, $139.00; RME-45, SX-25, $99.00; DB-22A, $49.00; S-38 $29.95; S-41, $25.00; and many others. Large stocks—trade-ins. Free trial. Terms financed by Leo—WØGFQ. Write for catalog and best deal to World Radio Labs., Council Bluffs, Iowa.

SWAP STAMPS, QRV magazines for parts. Gunther Kogerup, Hamburg 21, Goethestr 36, Germany.

RME-45, and new BC-375 transmitter for sale. P. J. Straccia, 569 N. Main St., Mansfield, Mass.

SALE: DB 22A, new condition, used few hours, $50,00. Telrad frequency meter, $20.00. Irv Fishelberg W2ZLD, 223 Pacific Ave., Atlantic City, N. J.

FREE QSL-SWL samples! Prices reasonable. W1HJI, Box 32B, Manchester, N. H.

SALE: 3-30 mc. Gonset, nearly new, $28.50. Harvey-Wells TBS-50, used one week, $80. PE-103, less base, with cables, $7.50. Millen 500 watt final with pair 5514's and new filament transformer, $80.00. Kaar mobile rig for 160 or 75, vib. pwr. supply, instant heating tubes, $24.95. Write for list of additional equipment. W9DSV. Box 261, Webster, Wisc.

SMALL ENOUGH to give you personal service, yet large enough to supply you with all top quality, nationally advertised and accepted lines of radio parts, tubes and equipment. Evans Radio, Concord, N. H.

SELL: National HFS receiver, less power supply, used 10 hours. Perfect. $110.00. W5BRR, 1018 Camelia Avenue, Baton Rouge, La.

BARGAIN: Will sell McElroy photo keyer with 2 full-length practice tapes for only $15.00. Excellent for code practice. F.O.B. C. C. Selby, W2VPV, 36 Beverly Road, Mt. Kisco, N. Y.

FOR SALE: National NC-2-40 receiver, recently overhauled, excellent condition, less speaker, $80.00 postpaid. R. E. Lewis, W4JUU/1, 9 Carter St., Newburyport, Mass.

50 KC IF. TRANSFORMERS, powdered iron cores and shells, pair $7, 3 for $10. Pair 282A's, $3.; BC453, $11.; Valpey 1000 kc xtal, $3. Want miniature 200 microampere meter. W8MGQ, 1745 West Boston, Detroit 6, Mich.

SALE: all perfect condition. Best offer. Complete 300 watt 10-20 fone with v.f.o. RCA CR91, 12" spkr. 4-element 20 beam, 15 foot tower, rotator. Converted 522 with power supply. W3GIB, Roy Hinkel, 228 Heather, Upper Darby, Pa.

SELL: HRO-5 with full coil set, Stancor 110-CM transmitter, also complete two-meter 100 watt station including superhet receiver. Send for complete list. R. W. Houghton, Littleton, Mass.

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WILL TRADE a BC-348, converted or unconverted, in excellent condition for an AN/ART-13 in similar condition. Also Abott TR4 for Gonset or similar converter. John Sherman, Box 40, Stanford, Calif.

FOR SALE: Latest BC610E transmitter with coils, tuning units for all bands: new tubes plus new set spares, antenna network and all relays for push-talk, fifty crystals, D104 and T17B microphones, Hammarlund Super-Pro, RME VHF-152, HF30X receiver, Millen rack scope, crystal frequency standard, stored in Spokane, Washington. Very reasonable. Answer all queries immediately. Jack Simpson, Route 2, Box 494, Campbell, Calif.

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Gunther Kogerup, Goethestr. 36, Hamburg 21, Germany, ex-DA2KW, would like to exchange radio parts for stamps.

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W.I.M.U. HAMFEST—The annual Wyoming-Idaho-Montana-Utah hamfest will be held on July 15-17 near Glenrock, Wyo. Bring your camp gear and grub and spend as many days as possible. A few cabins are available. No registration fee. For details write Duane Williams, Casper Amateur Radio Club, 1022 Cherry, Casper, Wyo.

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