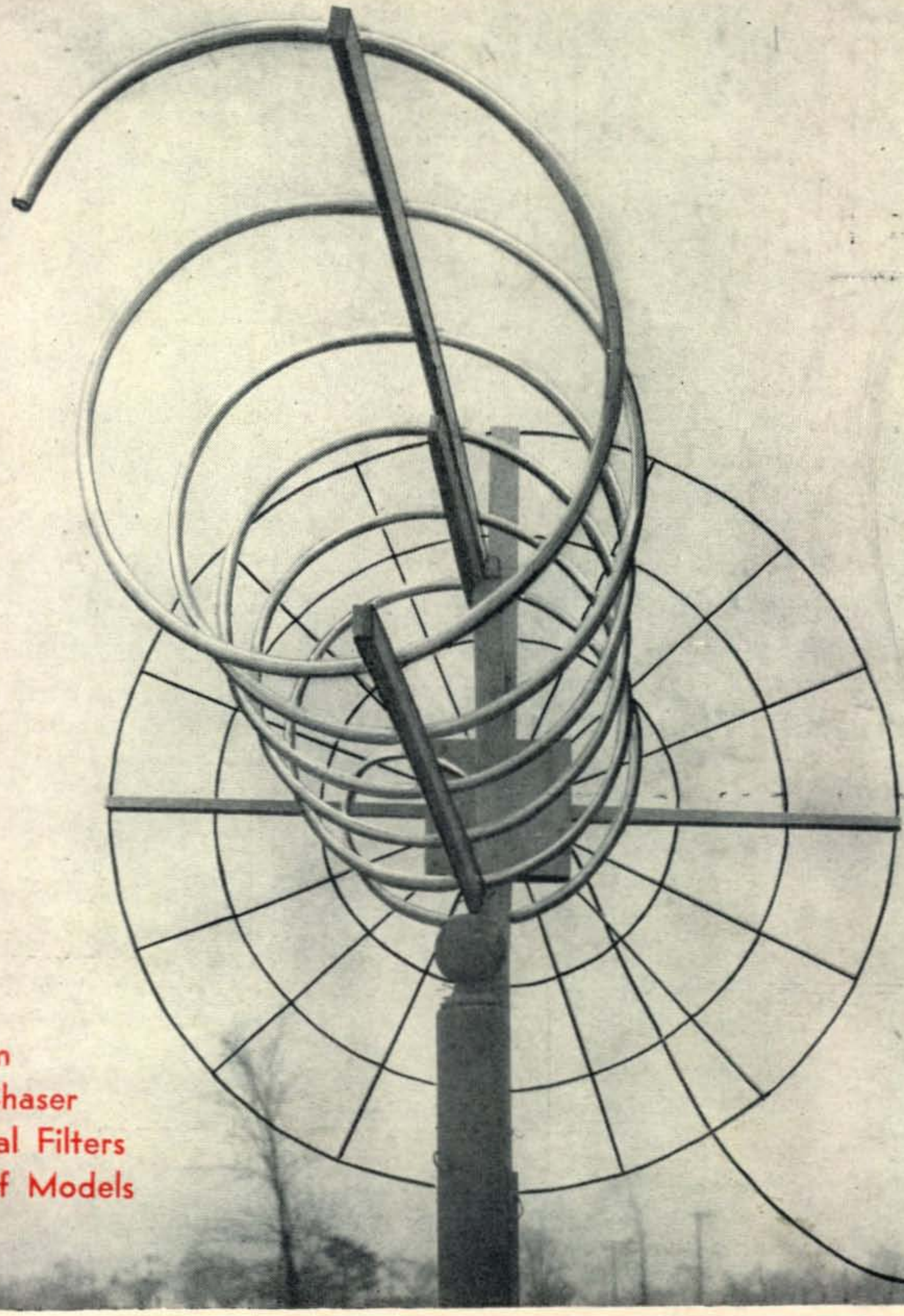
CQ

APRIL, 1949

The Radio Amateurs' Journal

35¢

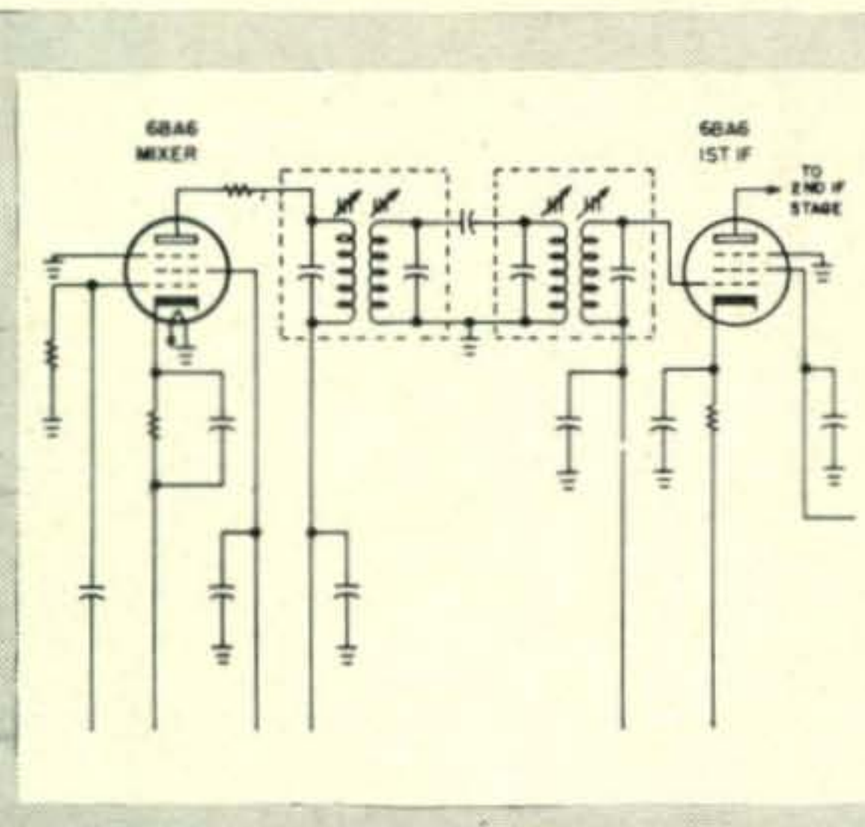


THIS MONTH:

The Helical Beam
The Harmonic Chaser
Notes On Crystal Filters
Radio Control of Models

Published by RADIO MAGAZINES, INC. Subscription $3.00 a year

Two Reasons for Superior Performance in the S-53



2.075 Mc IF . . . for high image rejection. Avoids images from other Ham stations within Ham bands. Possible with high-Q ironcore IF coils developed during the war. Pre-war coils of comparable Q were too cumbersome for such compact design. Extra coupling transformer gives added skirt selectivity.

MINIATURE TUBES . . . for lower minimum circuit capacitance, better high-frequency performance. The S-53 is the lowest priced set with all miniatures in RF and IF sections. A concrete example of Hallicrafters high engineering standards plus their endeavor to give you ever increased value.

BEFORE YOU BUY, see and try the S-53. Compare its features, learn the thrill of its superior performance. Lift its top and examine its compact, precision-engineered chassis. You'll agree, here is advanced Hallicrafters design!

RANGE 540 kc to 31 Mc plus 48 to 54.5 Mc in five bands. 6-Meter Band calibrated on bandspread scale. Other features include series-type noise limiter, phono input jack, built-in speaker. 7 tubes plus rectifier.

S-53 $89.50

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As for power—a pair of GL-8005's has all you are apt to require, taking 600 w max input CW or 480 w phone (ICAS). Frequency is up to 60 mc, or well beyond the 6-meter band. Drive needs are low.

Primarily useful as r-f amplifier or final, the GL-8005 also serves as a good Class B modulator. Two in this service will produce a healthy 300 w of audio output.

The tube has a 10-v heavy-duty filament. It's a husky, able to stand the gaff. It's a triode, so easy to apply and use. Investigate its good qualities, check the high value it offers . . . by visiting your nearby G-E tube distributor, or writing *Electronics Department, General Electric Company, Schenectady 5, New York.*

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Typical operation, one tube (ICAS)

	Class C telephony	Class C telegraphy
Plate voltage	1,250 v	1,500 v
current	190 ma	200 ma
Driving power	9 w	7.5 w
Power output	170 w	220 w

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Vol. 5 APRIL, 1949 No. 4

In This Issue

COVER—Circular polarization is the most effective answer, to date, to the burning question of horizontal vs. vertical polarization. A circularly polarized field with high gain is not only feasible but practical. W8RNC and W8VRQ introduce to hams the helical beam, an antenna that is destined to play an important part in future v-h-f amateur operation.

Letters

Progress or Die

20-12 24 St., Astoria 5, L. I., N. Y.

Editor, *CQ*:

Is amateur radio in the mass becoming decadent technically?

If we are to judge by the attitude expressed by many amateurs toward recent advances in communication technique—notably single-sideband 'phone—the answer regrettably must be "yes." This is not only discouraging but ominous.

Let's review a bit. There are two significant factors. (1) There was a time when amateurs could make claims toward advancing the radio art technically—by new contributions, in the case of a few of the more gifted, and by refinement and simplification of techniques, on the part of the larger body of intelligent experimenters and practitioners. (2) There was a time when amateurs could claim the greatest occupancy per unit bandwidth, the most economical use of spectrum space in terms of number of stations, and the maximum information transmission per channel, as compared with other services.

How do we stand now? Under (1) it would be fatuous to assert that amateurs, as such, any longer can make significant technical contributions, even in the application sense. Our last important "assist" in this direction was in showing the military the way toward compact, simplified communications gear at the outset of World War II. Once we had taught them those lessons, they took the ball for a long end run down the field. We're still trying to catch up—or are we?

Are we even trying? That's the point of this little dissertation. Before proceeding to consider point (2), stop to compare the average ham shack of 1949 with that of 1939. In the typical case it is better only to the extent that reliable, efficient manufactured units have replaced the haywire of the experimenter. We have better receivers, transmitters, rotatable beams, frequency standards, and the like—but who built them? Who did the engineering and design and construction? Who developed the new tubes that made possible improved performance? Who evolved the improved components? Who conceived the complex circuit theory that boosted the *S* side of the *S/N* ratio? Not the amateurs—the professional engineers. The typical amateur today is alarmingly akin to the owner of a new automobile. He has a vague general knowledge of the basic theory of combustion, carburetion, ignition, torque, and like factors, and possibly sufficient comprehension of the construction of the mechanisms involved to make certain adjustments and repairs. But how much does he know about the actual design of a car? How much about the metallurgical research discoveries that make his motor lighter and more efficient? How much about the chemical construction of new fuels that make it run faster with less consumption? And so on, ad infinitum.

You may ask, is it important that he understand these factors, let alone make any contribution to their development? Isn't it sufficient that he leave the solutions to these problems to the research laboratories, and their embodiment into usable mechanisms to the factories, and make his responsibility only that of employing them properly?

There is ample room for argument even with

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that thesis, in the case of the licensed radio amateur, who is by definition and statute supposed to be technically qualified. But even accepting it provisionally, where does that leave us under point (2) above?

Continuing the motor-vehicle analogy (while bearing in mind its obvious limitations), the private driver is entitled to his fair share of the road along with trucks and busses so long as his equipment and his operating techniques are comparably modern, efficient, and safe. But the driver of an antiquated jallopy with defective brakes which requires ten times the stopping distance of a new truck with air brakes is not entitled to ten times as much interval in the crowded traffic lanes. And so on. You can figure out further comparisons; space doesn't permit dwelling on the subject.

Such comparisons as these apply right now—today. But already there is concerted thought toward still more rigid limitations. These will evolve around a "volume of transportation (or transmission)" factor; in other words, a bandwidth factor. Already in crowded Manhattan there is serious question as to whether one individual is entitled to utilize transportation (and parking) space which could serve five to fifteen individuals. Steps already have been taken to mitigate this problem, and they will become increasingly more stringent. In the future we can expect private driving in crowded areas to be severely restricted.

No reader of *CQ* needs to be told that the traffic congestion on the air is equally as severe as that on the streets. The problems are comparable, and the trends, inevitably, must be the same. Here is where point (2) demonstrates its ominous significance.

The days when the commercials were lumbering behemoths who took up a disproportionate share of the air highways compared with the fleet-fisted, dexterous amateur operators are fast going. Even now, many other services transmit more information volume per spectrum unit than is done even in the most crowded amateur bands—more passengers and more freight per square foot of highway. They have devised techniques to do this, techniques of new and far-reaching importance. And of these techniques the amateur has not yet generally adopted even the most elementary.

Single-sideband 'phone is an example.

It is only one example, and this proliferation is not intended to be a special plea for s.s.b. alone. The problem is much broader than that. S.s.b. is only a first step, and the fact that it is the only one so far to have been explored by amateurs to any extent at all is in itself alarming. We should be much, much farther ahead than we are in simply thinking about applying these new techniques and new systems. The technical leadership of amateur radio is fast falling behind in the race.

But there is a case for leadership's lingering, in that—once beyond the planning stage—it can lead only as far and as fast as its followers will follow. And that is where the example of s.s.b. becomes of special and disturbing significance. If the amateur fraternity generally will not adopt such an obvious, relatively simple, and demonstrably necessary first evolutionary step as s.s.b., how can the technical leadership of the amateur fraternity even begin to contemplate adapting the more recent and more greatly advanced techniques? If the re-

(*Continued on page 78*)

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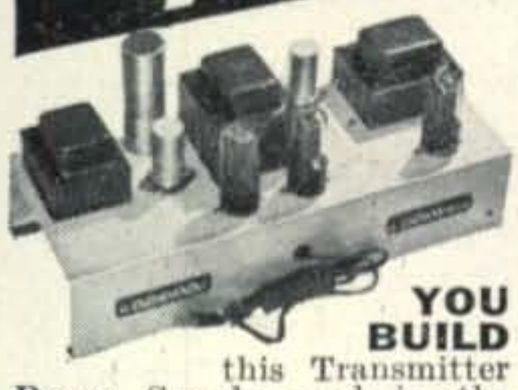
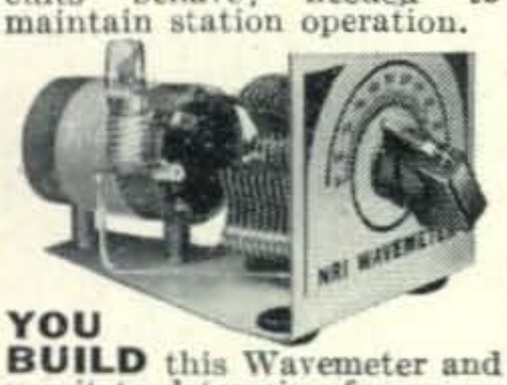


YOU BUILD this Transmitter Power Supply used in the basic experiments in RF and AF amplifiers, frequency multipliers, buffers, etc.

YOU MEASURE current, voltage (AC, DC and RF), resistance and impedance in circuits with Electronic Multitester you build. Shows how basic transmitter circuits behave; needed to maintain station operation.

YOU SET UP code amplitude and frequency modulation circuits (put voice, music, etc., on "electrical signal" you produce). You learn how to get best performance.



YOU BUILD this Wavemeter and use it to determine frequency of operation, make other tests on transmitter currents.

Ever think HOW FAST Radio-Television Communications is changing, developing, growing? Have you considered what this amazing progress can mean to you?

In 1945, there were 943 Broadcasting Stations. Today 2,694 are on the air! Result—THOUSANDS OF QUALIFIED MEN STEPPED INTO GOOD JOBS. Only 19 Television Stations were on the air in 1947. Today there are more than 50 and experts say there will be 150 in a few months, 1,000 within three years. That means thousands of well-paid jobs for trained Operators and Technicians. Then add development of FM, Two-way Radio, Police, Marine, Aviation and Micro-wave Relay Radio! Think what all this means! New jobs, more jobs for beginners! Better jobs, better pay for experienced men!

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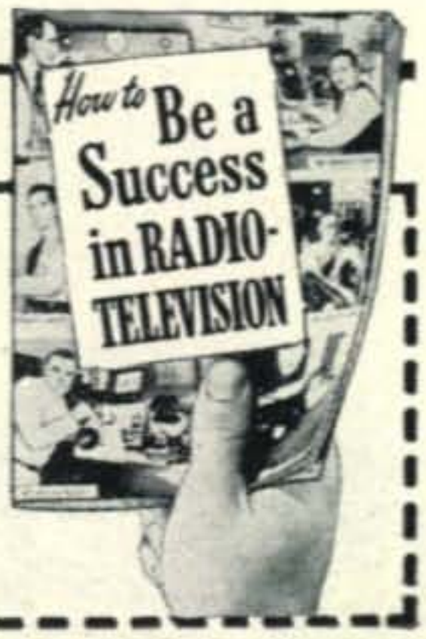


VETERANS GET THIS TRAINING WITHOUT COST UNDER G. I. BILL

Feenix, Ariz.

Deer Hon. Ed:

By gollies, this TVI problem are becoming something fierce lately. Why, should you be believing it, Hon. Ed., some hams are even going off the air when the TV programs are coming on! Now I are knowing that TV owner are having sunk lots of bux in his set, but then us amateurs are also having had to corner plenty of green stuff for our rigs. I are deciding that some tecknical genius are going to have to get to work and figure out ways to licking problem.

So, I are getting to work on it. First, I are studying like fury the insides of average TV receiver. Hokendoke Hakansaki but it are using more different stages at more different frequencies than two dozen hams all on air at once using superregenerative receivers. Not knowing if you are familiar with same I will going into tecknical details.

First part of TV set are very cleverly arranged so that it are able to tune to twelve different channels, each channel being six megacycles wide. This width, Hon. Ed., for one channel, are slitely less than all the space available to hams up through six meters band. These twelve channels are also very cleverly devised so that no matters what band the ham is on, TV owner are ables to getting one of his harmonics by proper tuning.

But this are only beginnings. Signal in TV set are now split (figuring it easier to pick up hams signals if are spreading out) into two IF channels, one being for audio and the other for video. Inasmuch as there were still a cupple of places hams would be likely to having signals, these two channels are being fixed for 22 to 28 megacycles for video and 22 megacycles for audio. Video range are reel wide as are being easier to see results of ham interference on face of scope tube, and TV set are not wanting to miss any bets.

Now, Hon. Ed., comes part that are diabolical. Video IF amplifier are feeding into detector and video amplifier what are designed to detect and amplify any signal from zero up to 4.5 megacycles. This are meaning that anything from dog scratching his back up to beyond 75 meter phone are liable to be coming in on TV set and making owners face turning purple from interference. Also, outputs from sound IF are feeding into detector discriminator what are liking to see anythings from zero to ten kilocycles, but this are such little potatoes comparing to zero to 4.5 megacycles that I are thinking this is afterthoughts.

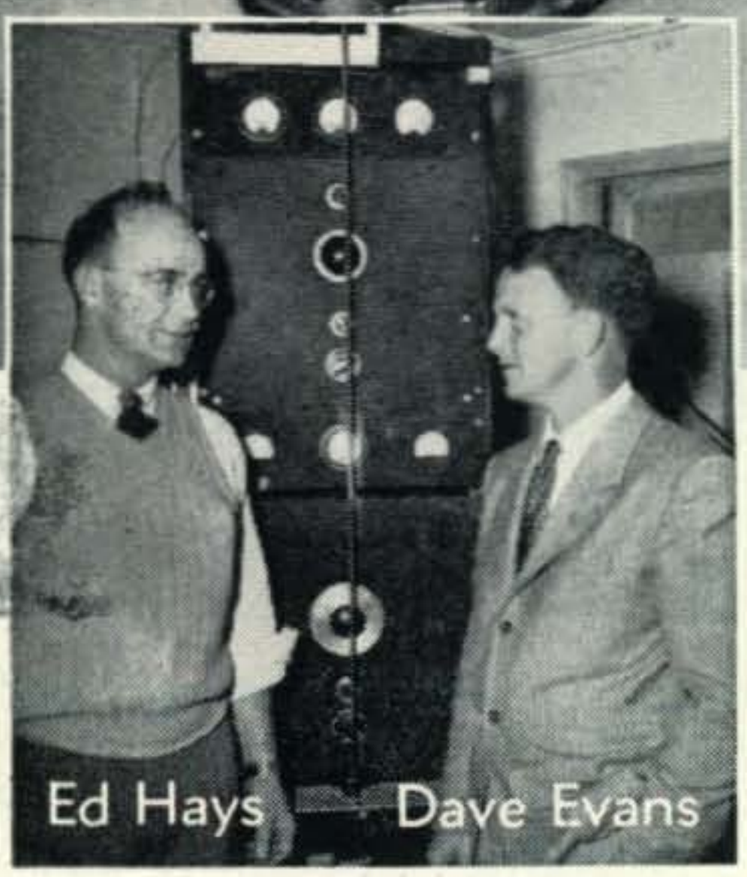
And this are not all, if you are believing it. TV sets are also needing sync seperator, with vertical sync working on sixty cycles like. sixty and horizontal sync working on 15.75 kilocycles. This last are nasty trap for all dog owners. This frequency

(*Continued on page 70*)

Follow the Leaders to

Eimac TUBES

The Power for R-F



Ed Hays — Dave Evans

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Like other leading amateurs Ed Hays*, W6SA and Dave Evans*, W6SZY are long time users of Eimac tubes. Ed and Dave have several important things in common. They share the same shack, antenna arrays, and in the final stage of their respective rigs are Eimac 4-250A tetrodes. These Eimac tetrodes were chosen because of their high power-gain, input-output circuit isolation, and ease of drive.

Whatever your power aspirations, for CW or phone, there is an Eimac tube to do the job . . . and do it better. Write direct for complete descriptive data.

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EDITORIAL

"CQ 160" Sounds pretty good doesn't it? Well, OM, it's true. We're back in business on 160. True, it is on a shared basis with Loran, and there are some exacting restrictions, but nevertheless it is a decisive achievement.

The confidence of the United States government in the amateur, by permitting resumption of operation on 160, is emphasized by their statement in the general frequency proposal for the forthcoming Fourth Inter-American Radio Conference. States the FCC: "The United States has studied the problem of sharing among (these) authorized services and has reached the conclusion that it cannot be done in Region 2 without interference to the existing Loran system. However, it recognizes the desirability of taking a calculated risk and intends to permit amateur operation under the following conditions on a non-interference basis to Loran. The areas in which the amateur service will be permitted to operate and the power it may use are based upon the existing Loran system and the maximum permissible interfering signal to the Loran skywave signal at maximum service range. It should be noted, however, that the tolerable degree of interference can only be determined by actual operation. Furthermore, the Loran system may be expanded in specific areas. Either or both of these factors may operate to require revision of the following conditions." The conditions are stated in the FCC order, given in its entirely, permitting resumption of amateur operation on 160 meters.

At a session of the Federal Communications Commission held at its offices in Washington, D. C. on the 17th day of February 1949

The Commission having before it the matter of amending Part 2 of its Rules in order to show a change in the United States service allocation for frequency band 1800-2000 kc;

IT APPEARING That, during and since 1941 the frequency band 1800-2000 kc has been allocated for the **United States** exclusively to the amateur service and is shown as so allocated in the Commission's rules at this time; and

IT FURTHER APPEARING That since the outbreak of hostilities directly involving the United States in 1941 the amateur service has not been permitted to operate within the band 1800-2000 kc and, because that band has not yet been reactivated, is not permitted to do so at this time; and

IT FURTHER APPEARING That since 1943 this band has been used by the United States exclusively for the operation of United States government Loran stations: and

IT FURTHER APPEARING That, during and after 1945 the Commission by its public announcements in connection with its proceedings in Docket 6651 and in other connections indicated its purpose of supporting an international service allocation of this band to navigation aids, subsequently (partly in response to the requests and recommendations of persons and organizations representing the amateur service) changed to include also the amateur, fixed, and mobile services and further changed to show that Loran was the particular system of navigation aid contemplated by the United States for operation under such a service allocation; and

IT FURTHER APPEARING That, the continued present and future operation free from harmful interference of United States government Loran stations is essential to the national security and, therefore, is in the public interest and necessity: and

IT FURTHER APPEARING That, after due consideration, it has been concluded that the amateur service is the only radio service which, in the light of the national security interest involved, it is feasible for the United States to permit to share this band on the basis of non-interference to Loran; and

IT FURTHER APPEARING That, in view of the national security interest involved, the only feasible basis upon which the amateur service may be permitted to share the use of this band with Loran stations is in accordance with such a plan as may be formulated from time to time by the Interdepartment Radio Advisory Committee and the Commission and that an initial plan to this effect has been formulated; and

IT FURTHER APPEARING That, in view of the foregoing considerations, it is in the public interest and necessity that the United States service allocation of the frequency band 1800-2000 kc be changed to provide for the operation of United States government Loran stations and stations in the amateur service as therein indicated; and

IT FURTHER APPEARING That, in view of the national security interest involved, it would be contrary to the public interest to deal with the reallocation of this band in accordance with the public notice and procedure for proposed rule making provided by the Administrative Procedure Act and, therefore, that such public notice and procedure are not required in this instance; and

IT FURTHER APPEARING That, for the reasons set forth above and also because the effect of this reallocation ultimately will be to permit a degree of actual use of this band by the amateur service which is not now possible, thereby relieving an existing restriction, this reallocation should be made effective immediately: and

IT FURTHER APPEARING That, legal authority for the realloction described herein is vested in the Commission under Sections 301, 303 (a), (b), (c), (d), (e), (f), (g), (o), and (r) of the Communications Act of 1934, as amended, and Article 7 of the General Radio Regulations (Cairo Revision, 1938):

IT IS ORDERED that Section 2.104 (a) of Part 2 of the Commission's Rules is amended to show that the United States service allocation of the frequency band 1800-2000 kc is as follows:

Band, kc	Service-Allocation
1800-2000 kc	(a) Amateur
	(1)
	(b) Radio navigation
	(Loran)
	(2)

1. (a) The amateur service may use in any area whichever bands, 1800-1825 and 1875-1900 kc, or 1900-1925 and 1975-2000 kc, are not required for Loran in that area, in accordance with the following conditions. The use of these frequencies by the amateur service shall not be a bar to expansion of the radio navigation (Loran) service:

(i) The amateur service shall not cause harmful interference to the radio navigation (Loran) service;

(ii) Only classes A1 and A3 emission shall be employed:

(iii) Amateur operation shall be limited to:

Area	Band, kc	Power (watts) Day	Night
Mississippi River to East Coast U. S. (except Florida and states bordering Gulf of Mexico)	1800-1825 kc 1875-1900 kc	500	200
Mississippi River to West Coast U. S. (except states bordering Gulf of Mexico)	1900-1925 kc 1975-2000 kc	*500	*200
Florida and states bordering Gulf of Mexico	1800-1825 kc 1875-1900 kc	200	No operation.
Puerto Rico and Virgin Islands	1900-1925 kc 1975-2000 kc	500	50
Hawaiian Islands	1900-1925 kc 1975-2000 kc	500	200

* Except in State of Washington where daytime power limited to 200 watts and night time power to 50 watts.

(Continued on page 78)

"... very delighted," says ZL1MP

ZL1MP (David S. Mitchell, above) has written us about the performance of his Collins amateur equipment:

"I enclose registration card in respect of my 32V transmitter," he says, "and in doing so I would like to say how very delighted I am with it.

"I have been an amateur operator for 18 years (G2I1 1931-1936, and GW6AA 1936-1948), and during all this time I have never possessed any piece of equipment which has given me more delight than my Collins 32V, with the possible exception of my 75A receiver.

"Within three days of receiving my New Zealand license I had worked all continents with the 32V, with reports varying from S.7 to S.9.

"The first call brought a reply from DK7AQ 11,000 miles away, and since then the 32V has proved to be a splendid link with many of my old ham friends back in England.

"The 75A is also a joy to operate and has enabled me to work G stations using powers as low as 8 watts—some of these fellows have told me that they have never had reports from New Zealand before.

"Best wishes to you, and may you continue to produce the superb equipment which is serving hams so excellently all over the world."

NOTE to amateurs who make their living in radio broadcasting or communications: The advanced engineering and high performance typical of Collins ham gear are also characteristic of Collins AM and FM broadcast station equipment and Collins airborne and ground station radio communication and navigation equipment.

FOR SUCCESS IN AMATEUR RADIO, IT'S ... COLLINS

COLLINS RADIO COMPANY, Cedar Rapids, Iowa

11 West 42nd Street, New York 18, New York **458 South Spring Street, Los Angeles 13, California**

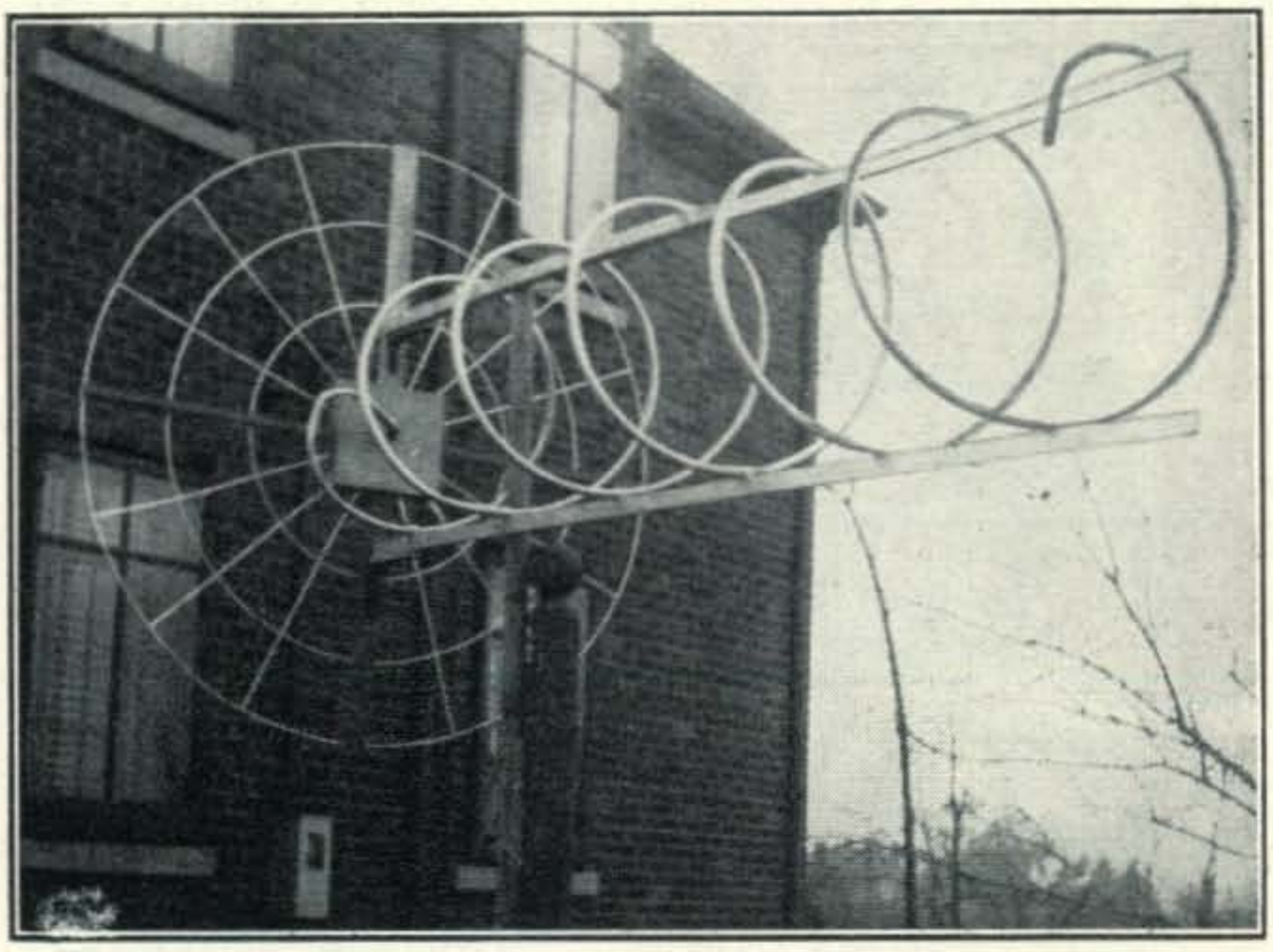
A V-H-F Helical Beam Antenna

HAROLD E. TAYLOR, W8RNC* and DON FOWLER, W8VRQ*

Circular polarization, with high gain, is the decisive settlement of the vertical vs. horizontal dispute.

THIS article describes a new mode of operation of the helical [1] type antenna. It has been found that the helical beam as developed by Dr. John Kraus, W8JK, has several advantages of great significance to amateur v-h-f practices.[2,3,4,5]

The helical beam is derived from the excitation of a helical conductor having the circumference of approximately one full wavelength. The generated lobe pattern of such an antenna shows that maximum power is radiated along the axis of the helix (*see Fig. 1*). The beam width — and to some extent the power gain — depend largely upon the number of turns in the helix. The radiation in this axial mode is substantially circularly polarized, i.e., the field intensity is nearly equal on both horizontal and vertical type receiving antennas. In addition, the terminal impedance characteristic is unusually uniform over a very wide frequency range. Thus, the radio amateur will find in the helical beam a broad-band antenna that contains the answer to the v-h-f antenna polarization question. Power gains greater than 10 db over simple circularly polarized sources are to be expected.



The imposing appearance of the helical beam creates an impression of mechanical complexity. Actually its construction is less involved than a multi-element array. Size though, does limit its use almost exclusively to the high frequencies.

To understand the operation of the helical beam let us re-examine *Fig. 1*. Note that since one complete turn of the helix equals one wavelength it will be found that at any given instant the positive and negative charges appear near opposite ends of a bisecting diameter. Throughout one complete cycle of the radiated frequency these charges will revolve and the pattern perceived directly along the axis is one of revolving or circular polarization. This axial mode condition depends upon certain mathematical and physical relationships of the diameter of the helix (D) and the spacing between turns (S). The region of axial mode excitation is shown graphically in *Fig. 2*. Operating the helical antenna beyond the prescribed diameter spacing limits (i.e., too high or too low a frequency) distorts the radiated pattern. Such antennas do not retain the axial mode pattern, but instead, may radiate a conical lobe pattern[3] or even if the frequency is too low, a normal mode pattern.[6]

The antenna described in this article is based upon the optimum design suggetsions given by Dr. Kraus in the October, 1948, issue of the *Proceedings of the I.R.E.*[5] Helical beams may be fed in a variety of ways. Balanced, double layer and folded helical elements have been tested.[3] However, the most convenient uni-directional beam is built around a helix mounted normal to a small ground plane. The terminal impedance is then about 130 ohms affording a good match to the RG-63/U coax line having a characteristic impedance of 125 ohms.

The antenna shown in the photo and *Fig. 3* was built and tested by W8RNC and W8VRQ on the 2-meter band. Over the entire 144-148 mc range the helical antenna had a gain of 11.5 to 13 db over a non-directional circularly polarized antenna. The

*℅ *Michigan Bell Telephone Co.,*
33 State St., Detroit 26, Mich.

1 Helical: Of or pertaining to, or in the form of, a helix; spiral.. —Webster

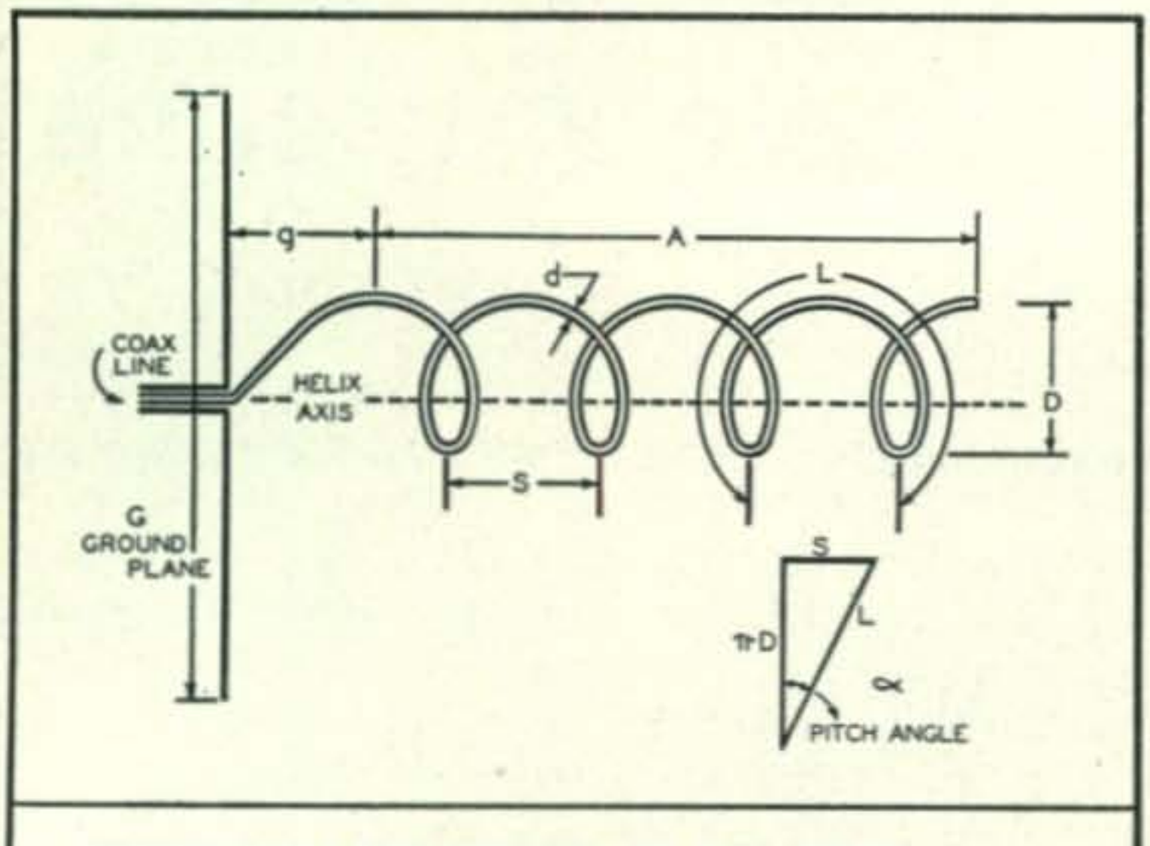
2 J.D. Kraus, "Helical Beam Antenna," Electronics, vol. 20, April, 1947, page 109.

3 J.D. Kraus and J.C. Williamson, "Characteristics of Helical Antennas Radiating in the Axial Mode," Jour. Appl. Phys., vol. 19, Jan., 1948, page 87.

4 O.J. Glasser and J.D. Kraus, "Measured Impedances of Helical Beam Antennas," Jour. Appl. Phys., vol. 19, Feb., 1948, page 193.

5 J.D. Kraus, "Helical Beam Antennas for Wide-Band Applications," Proceedings I.R.E., vol. 36, Oct., 1948 page 1236.

6 H.A. Wheeler, "A Helical Antenna for Circular Polarization," Proceedings I.R.E., vol. 35, Dec., 1947 page 1484.



DESIGN DATA FOR 146.0 MC HELICAL BEAM

D -	DIAMETER OF HELIX	24"
S -	SPACING BETWEEN TURNS	19½"
L -	LENGTH OF ONE TURN	6' 9"
N -	NUMBER OF TURNS	6
A -	AXIAL LENGTH = NS	9' 8½"
α -	PITCH ANGLE	14°
d -	DIAMETER OF HELICAL CONDUCTOR	⅞"
q -	DISTANCE HELIX FROM GROUND PLANE	9¾"
G -	GROUND PLANE DIAMETER	66"

FOR OPTIMUM 14° PITCH ANGLE

$$q=\frac{S}{2} \qquad A+q=S\left(N+\frac{1}{2}\right) \qquad N=\frac{A+q}{S}-\frac{1}{2}$$

IN WAVELENGTHS

WHERE:

$$S = L \sin \alpha \qquad A = NS$$

Fig. 1. A helical beam may be designed for another band if the dimension L is one wavelength in free space and the pitch angle maintained around 14°. Dimension q is not critical, although if the helix is too far from the ground plane, the feed impedance will be affected.

helix consists of 6 turns. The beam width between half-power points for the vertically polarized component was 56° and for the horizontally polarized component it was 52°. The six-turn helix is a compromise between power gain, terminal impedance, directivity, and constructional problems. It is possible to increase the power gain slightly by adding more turns to the helix. However, the mechanical difficulties would then probably offset the additional gain. Adding more turns would noticeably sharpen the radiated pattern, but would not appreciably change the feed point resistance of the antenna.

The helical antenna also will work well with a fewer number of turns and at some loss of power gain. The terminal impedance will remain fairly constant (about 130 ohms) with any helix of more than three turns. The six-turn helix will react in the axial mode over a frequency ratio of about 1.7:1 (about 110 to 180 mc). The SWR is well under 1.5:1.

Constructing the 2-meter Helical

The 144-mc helical beam consists of a 66-inch diameter ground plane and a 24-inch diameter helix. The ground plane is constructed of sixteen radials cut from ¼ inch soft drawn aluminum tubing. The helix is wound with ⅞ inch (O.D.) soft drawn aluminum tubing. The shield of the coax line is connected to the center of the ground plane and the center conductor to one end of the helix. The remaining helix end hangs free and is not electrically connected. Open-wire line cannot be used satisfactorily with this type of antenna.

The materials required to construct a 2-meter helical are as follows:

42 feet ⅞ inch O.D. aluminum tubing (soft)
78 feet ¼ inch aluminum tubing (soft)
One 12" x 12" aluminum plate
One 5-foot length 1" x 1" wood (ground-plane crossbrace)
Two 11-foot lengths 1" x 2" wood (helical supports)
One 66-inch length 1" x 3" wood (ground plane upright)
One 12" x 12" plywood ¾" thick
One support pole, misc. hardware, staples, coax cable, etc.

Ground Plane

Each of the sixteen radial elements is 30 inches long. These are spaced and supported in the ground plane by three concentric circles, also cut from the ¼-inch aluminum tubing stock. The first of these circles is wound from a piece 47 inches long, placing it about 15 inches from the center of the ground plane. The second circle is 151 inches long (concentric 24 inches from center) and the third is 207 inches long (concentric 33 inches from center). The ground plane tubing for each concentric circle was bent into partial shape by wrapping the tubing around the tub of a conventional washing machine.

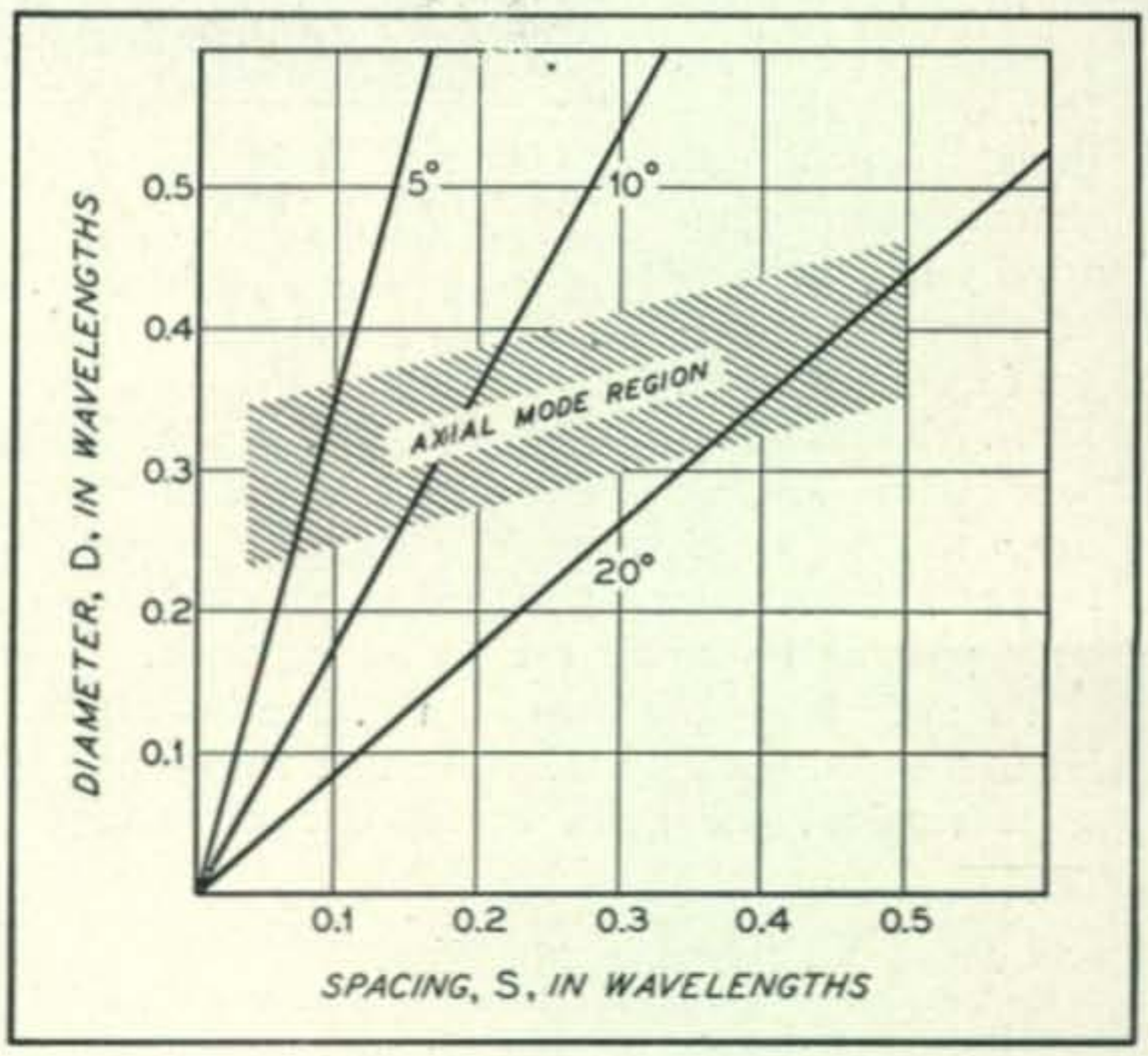


Fig. 2. The ratio of diameter to spacing of the helix will determine the mode of operation and the type of pattern radiated. Helical beams radiate in the axial mode. Parameters are pitch angles between adjacent turns. The frequency ratio corresponds to the length of the paramenters in the shaded area. For the 144-mc beam with an angle of 14° it extends from about 110 to 180 mc.

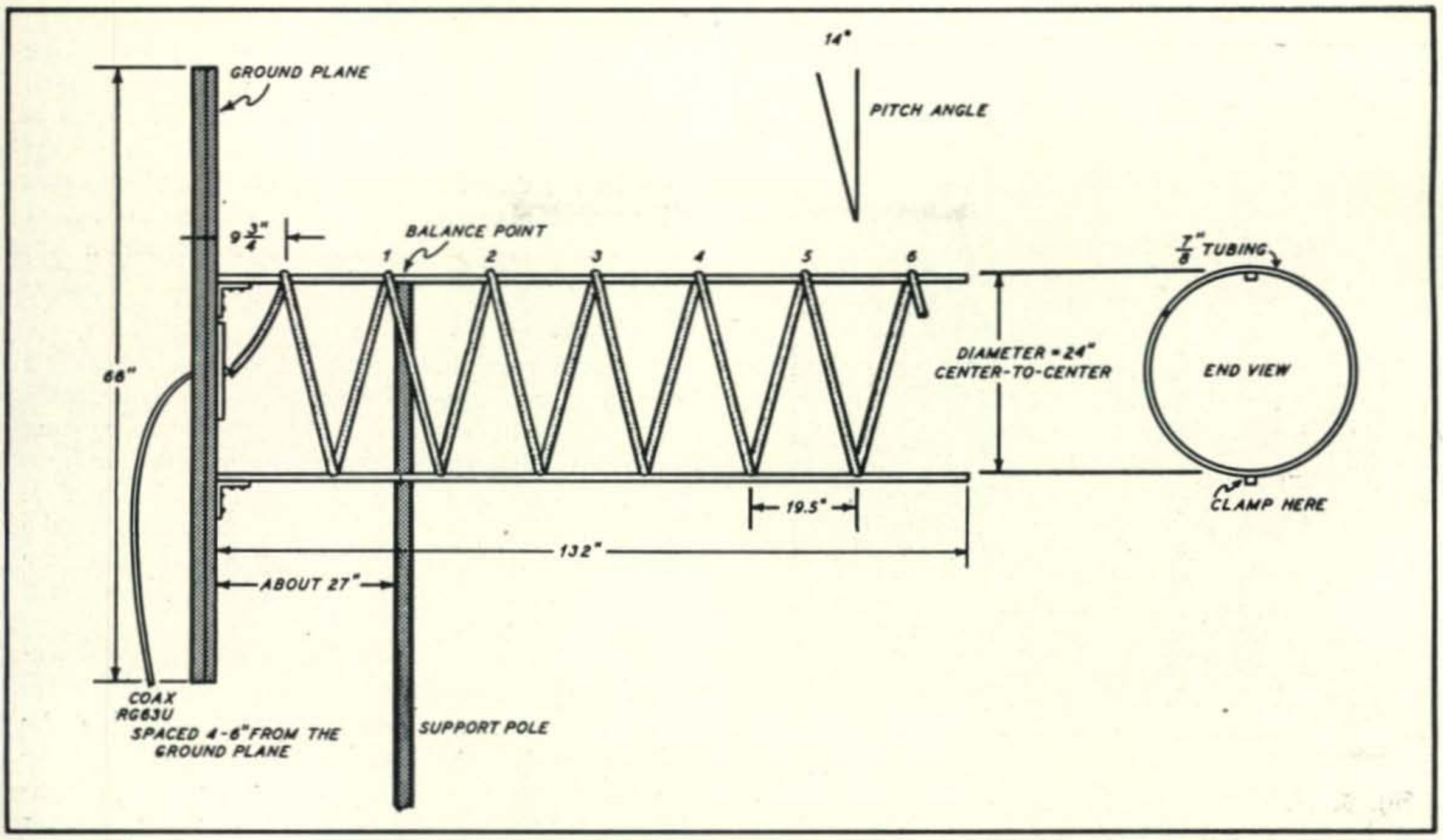


Fig. 3. Side constructional view of the 2-meter helical beam. The ground plane is attached to the helical supports by two 8-inch metal brackets. The array is held aloft on one pole located at the balance point.

Details of the ground plane construction are shown in *Fig. 4*. Each connection between the radials and the concentric circles is fastened with brass bolts. The center of the ground plane is an aluminum sheet about 12 inches square. A 6-inch diameter circle is scribed from the center of the aluminum. Each radial is cut off at this circumference line and is then hammered flat, so that the plywood and the aluminum sheet may be sandwiched together. Each radial is fastened to the plate with small nuts and bolts.

Once the ground plane has been assembled, a ½-inch hole is drilled through the support pole and the center plates. This is for the coax transmission line. The shield of the line is connected to the ground plane by inserting one or more metal screws through the wooden back plate to contact the aluminum sheet. A wire is brought over from each screw to the coax shield. These wires should be kept very short, about 1 inch long.

The ground plane tubing is clamped to the wooden supports with small saddle staples. Although the washing machine was not of the proper diameter for the concentric circles, it does, however, serve as a means to assist in shaping the tubing so that very little extra manipulation is required. Altogether, it takes two men about three hours to form, cut and assemble all the aluminum in the ground plane using a small electric power drill.

The Helix

The tubing for the helix is not a continuous length, but consists of five lengths of tubing joined together by small pieces of telescoping tubing and fastened in place with self-threading sheet metal screws. Each length is bent into shape before joining. The helix tubing is wrapped or bent around an oil drum having a diameter of 24 inches. When

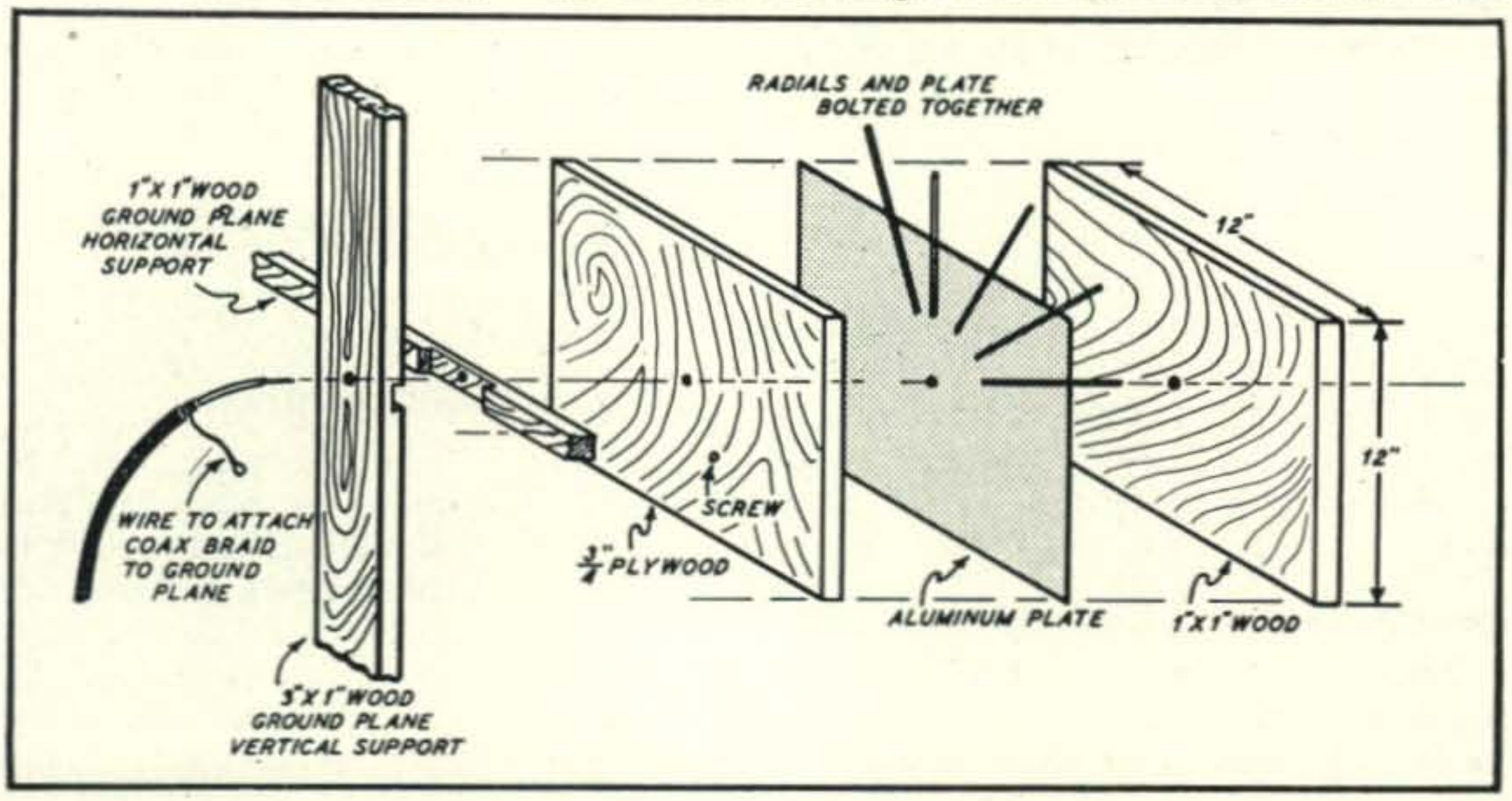


Fig. 4. One suggested method for constructing the ground plane center. Radials are hammered flat at one end, then drilled and bolted in two places. A one-half inch hole is drilled through the supports and the ground plane center for the coax conductor which is attached to the end of the helix. Heavy aluminum material with radials directly supported and a coax connector for the feedline will also prove effective.

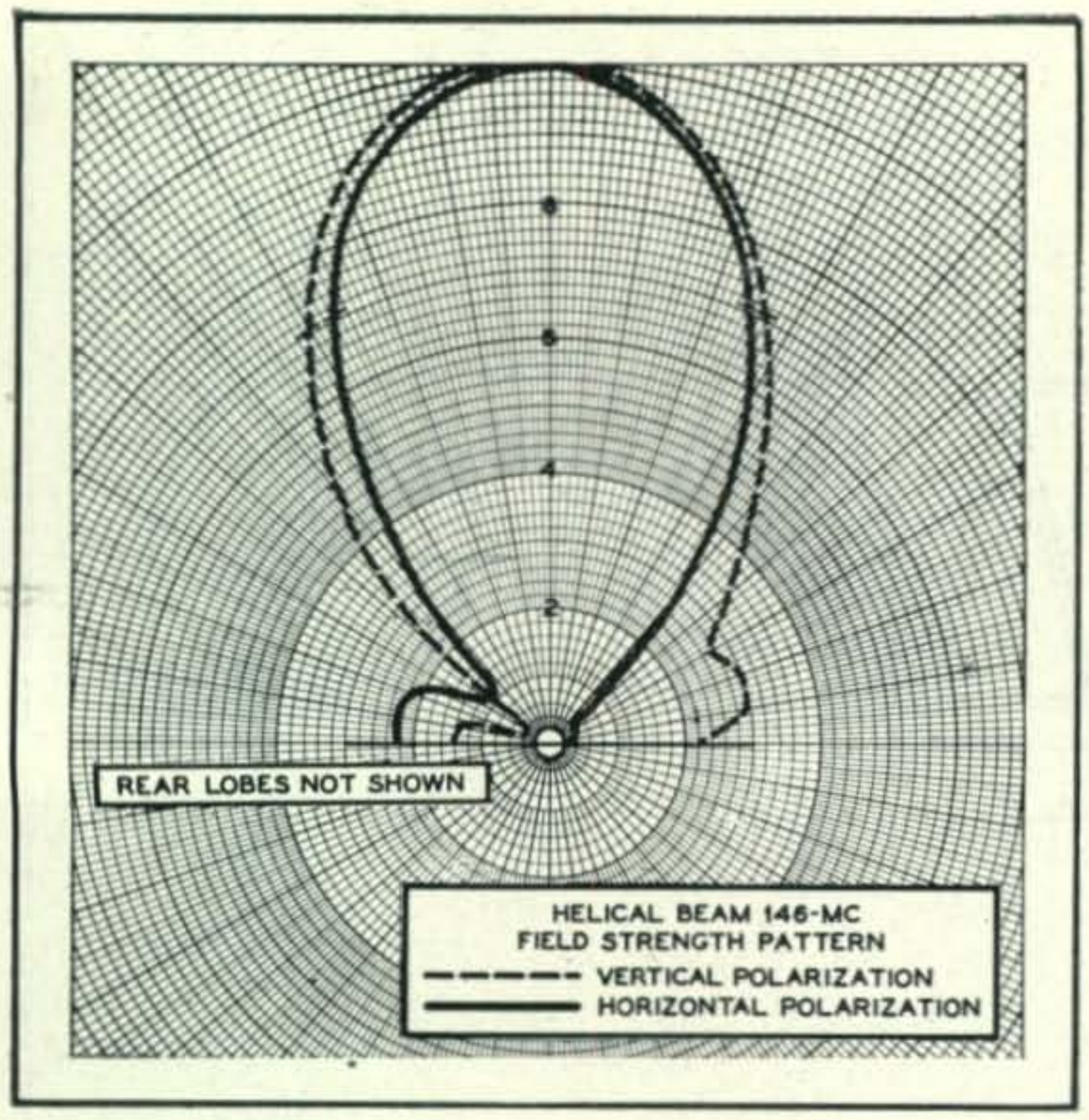


Fig. 5. Field strength patterns showing the similiarity in the vertical and horizontal polarizations as received and transmitted by the helical beam.

the tubing is removed from the oil drum a slight expansion takes place, so that if possible a slightly smaller diameter drum might be preferred. Some distortion can be tolerated in bending the tubing, although the same diameter tubing should be used throughout the entire length of the helix (except for the telescoping sections).

Each turn of the helix is fastened to the horizontal supporting member with small aluminum clamps. It is desirable that these wooden supports be varnished so that good insulation will be maintained in all types of weather. The helix supports are secured to the ground plane upright by two 6-inch kitchen shelf brackets. These are fastened to the vertical member of the ground plane with small bolts.

For ease of rotating and mounting the helical, the array is supported at the balance point. This is the point where the beam will hang horizontally. Using the materials described this will be between two and three feet from the ground plane along the helix supporting members. At the balance point only a vertical load is being exerted and, thus, a single vertical wood pole may be used to hold the beam in the clear. By rotating the pole, the helix and ground plane assembly can be turned in any direction. Additional details on construction are shown in *Fig. 3.*

Tests and Conclusions

The constructional tolerance of the helical is much greater than with other beams of comparable gain and dimensions. It may truly be cut according to physical dimensions, connected up and put into immediate operation with no further adjustments. The model just described was constructed in the basement of W8RNC's residence. By removing the ground plane, the helical was taken out doors without knocking down any walls.

Figure 5 shows the field strength pattern for both the horizontally and vertically polarized components. These tests were made by rotating the helical beam about a horizontal axis. During the time of these tests the helix became coated periodically with sleet, but no change in the 2-meter final amplifier loading could be detected. Some minor lobes are observed on the reversed side of the ground plane, These will be well down and are not shown in the field strength plots.

The diameter of the helix tubing is definitely a factor in the operation of the helical beam. It is recommended that tubing be used with a diameter of at least ¾ inch. If the 6-turn helix is inconveniently large, it can be reduced to 3 or 4 turns with a reduction of about 3 to 4 db in gain. Also, a ground plane consisting entirely of copper screen mesh might be constructed having the same area. A square ground plane having 66 to 70-inch sides also might be used.

The helical beam possesses the outstanding feature that it transmits and receives both horizontally and vertically polarized signals. Since the impedance is relatively constant over a very wide range this antenna might find useful applications in television fringe areas. For the amateur, however, it is the answer to a big problem.

Postscripts

Texas Hamfest

The South Plains Amateur Radio Club is sponsoring a hamfest in Lubbock, Texas, on April 23-24. It will coincide with the Electrical Engineering Show held at Texas Technological College and the hamfest will include a trip to the show. The Lubbock XYL Club will have a program for the XYLs. For reservations write Rogers Orr, W5NIC, 2501 23rd St., Lubbock, Texas.

●

North Shore Radio Club Hamfest

The North Shore Radio Club of Long Island will hold its fourth postwar hamfest on Tuesday, April 19th, at Lost Battalion Hall, 9329 Queens Blvd., Elmhurst, L. I., at 8:30 p.m. The program will include speakers from ARRL, *CQ*, and FCC, with entertainment and prizes headed by a Collins 75 A-1 receiver. The Hall can be reached by the Independent subway to the Woodhaven Blvd. station. Tickets, available at New York equipment dealers, through the committee, or at the door, are $1.50.

●

San Diego Hamfest

The Helix Amateur Radio Club is sponsoring a hamfest on Saturday, April 30th, at the Imig Manor Hotel, San Diego. The program will consist of technical talks, demonstrations and contests in the afternoon, followed by a banquet and entertainment in the evening. Main door prize will be a television receiver. For information and tickets ($4.25 per person) write E. Soltez, W6NQK, 350 Gavin St., San Diego 2, Calif.

Every Day is Contest Day at ZC8PM

PAT MILLER, W2AIS/ZC8PM*

Report from a W whose dream of being on the other end of the line came true.

I USED TO FEEL SORRY for those poor VP9s and KS4s who would fearfully "CQ NO W," only to be greeted by a barrage of USA calls. Well, sad as it is to say, we have European equivalents too, loads of them. But gripes will be saved for later paragraphs.

ZC8PM is the kid brother of the United Nations Radio Station, 4UNN Nablus. Nablus is an Arab town of some 70,000 people, and nestles against the side of Mount Ebal deep in Central Palestine. The United Nations has a military observer here whose main job is to see that the truce is observed by the Iraqis who control a large salient of which Nablus is the center.

The radio station is located about two miles up the side of Mount Ebal and is accessible over a rough camel path. The main job of the radio station is to keep in touch with Haifa in ZC6 and the other stations of the UN net (on UN frequencies) which include: Beirut, Damascus, Amman, Tel Aviv, Jerusalem, Gaza and Tiberias. Most of the traffic consists of reports on violations of the truce or complaints from either side that violations have been committed. At times incidents flare up and reports as to who is at fault begin to conflict. When this occurs, our group sends out our radio jeep to meet the UN group from the other side in No Man's Land. The radio jeep serves as a liaison between the "home" office and the teams at the front.

A typical radio operation was a report that Iraqis were building new positions in area so and so. If this did not cease within 24 hours, the Israelites threatened to open fire. Our team checked immediately and was able to report that the Iraqis were only putting roofs on old positions to keep out the rain. The usual result of these exchanges is peace and quiet once again.

The station here is a regular Signal Corp 399 type hut consisting of a BC-610E transmitter, BC-342N receiver and BC-312N receiver. The antennas used for receiving are two 21-foot whips (that should make you 40 and 80-meter lads swell with pride). The transmitting antennas are a 3500-kc doublet for those hard to get USA QSOs and a 165-foot long wire that loads on 40, 20 and the UN channels. Power is obtained from a Signal Corp PE-95 gasoline generator.

The location is a ham's dream. Nablus itself is about 2500 feet above sea level and the shack is located another 1000 feet about Nablus on the northwest slope of Mount Ebal. From back of the long wire antenna you can see the lowlands of Israel and the whole stretch of the Mediterranean Sea. But it does have some blind spots, such as Polynesia and the Northwest Pacific Islands.

The following data has been compiled from the log of ZC8PM. Normal hours of operation were from 0300Z to 0700Z and 1300Z to 1900Z with only sporadic operation at other hours. Duration of operation, November 5, 1948, until January 15, 1949. QSOs 1735, countries 111, WAC 20 and 40 with five continents on 80, South America being the hard catch. Of the 1735 QSOs, 770 have been with the USA and 56 with Canada. Here again we have a blind spot running north and south through the center of the USA and Canada. For example, QSOs with VE1-10, VE2-4, VE3-13, VE4-6, VE5-2, VE6-5, VE7-16, W1-89, W2-184, W3-82, W4-57, W5-26, W6-199, W7-30, W8-56, W9-34 and WØ-14. Despite the relatively high concentration of hams in the W9,Ø,5 areas, you will note they have fared badly as far as getting into Palestine is concerned. 80 and 40 have been a pleasant surprise. I had promised my 80-meter friends to give them Asia on 80 when I got out to Palestine, but I said so with my tongue in my cheek. Now after 75 W/VE QSOs up there, I have made an 80-meter WAC somewhat commonplace. 40 has come through in fine fettle with all districts worked except that elusive W7. Hundreds of QSOs have been effected on 40 and many a new WAC has been made stateside. A big pile of Xmas traffic found its way home on this band through the efforts of some topnotch operators on the east coast.

JUST ROOFING AN OLD POSITION

DX Conditions

Twenty has been only fair with the States heard well around 2000Z during November. After that hour reception was sporadic. W6 usually is good

(*Continued on page 72*)

*48 West 53rd St., New York, N. Y.

Radio Control of Mobile Miniatures

E. L. SAFFORD, JR.,* W5FKZ

ONE OF THE MOST fascinating phases of radio and electronics is that of radio control. Numerous articles have been presented on radio control methods. Some of these have been applied to large vehicles and are far too complex for the average ham or experimenter. On the other hand, there are also many types of radio-control systems, such as those developed for model aircraft, which are the ultimate in simplicity but which are so tricky to operate and adjust that they fall short of the order of reliability and range that an experimenter would like to attain.

In an endeavor to develop a simple and yet a rugged system which would eliminate the above two disadvantages, the system to be described came into being. While it is not adaptable for model-aircraft control, it is ideal for control of small model boats or cars, and it was in the control of the former that it found its first use.

Basic Ideas

The first approach to designing a control system is to decide what functions the control de-

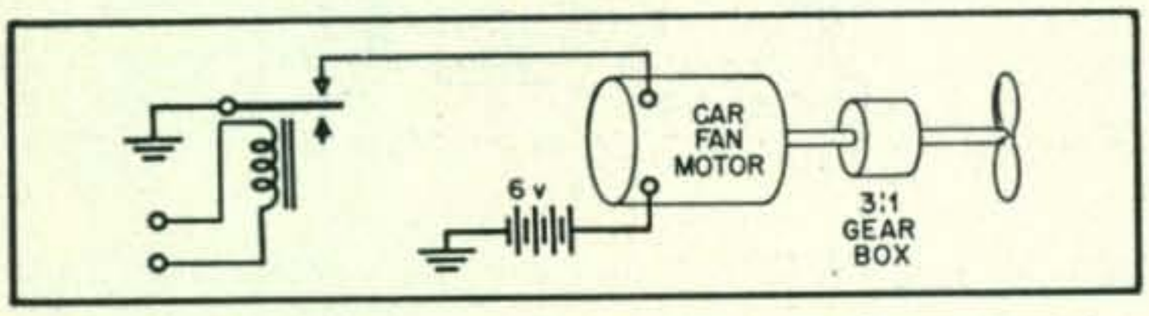


Fig. 1. Switching circuit to start and stop motor.

vices may be called upon to perform. Let us consider that radio control is to be applied to a model boat, which has for a source of power an electric motor, and from that derive the desired functions. Obviously, the first thing that will be required is a means for starting and stopping the vehicle at will. Second, we must be able to steer it. Thus, listing the functions, we find that they add up as follows:

1) Start motor
2) Stop motor
3) Left rudder
4) Right rudder
5) Neutral rudder.

The last was found advisable as will be explained, although not absolutely essential.

Let us start with the first two functions. To be able to turn the motor on and off requires a simple switch. Let us use a relay and, for the time being, assume that this will operate from a receiver. See *Fig. 1*. On the shore we will have a transmitter, and will arrange it so that when

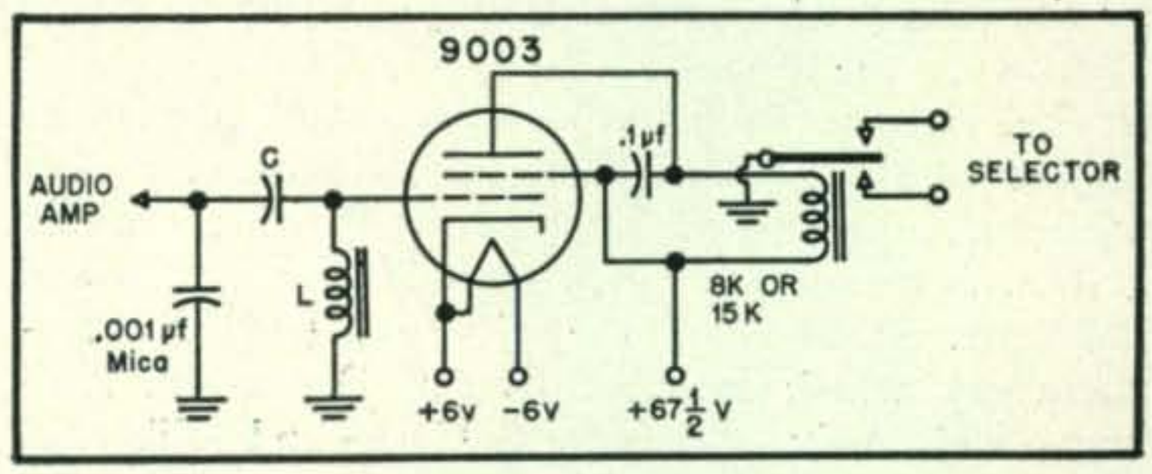


Fig. 2. Relay stage of the receiver.

we send a signal the relay will close, starting the motor, and when we turn the signal off, the motor will stop.

Now let us look for a moment at the receiver and see what arrangements we can make in order to close a relay. Let us examine the last audio stage of any receiver. Suppose we were to bias this last tube to cut off, using a battery (cathode biasing will not be desirable because, as will be shown, we will desire an increase of plate current with a signal, and the resistor would tend to limit this). Thus we connect the cathode to the 6-volt positive battery terminal.

Now we can connect a relay in the plate circuit, using an 8000 or 10,000-ohm relay requiring 2 or 3 ma for closure. If we send a signal to this tube, it will draw current on the positive

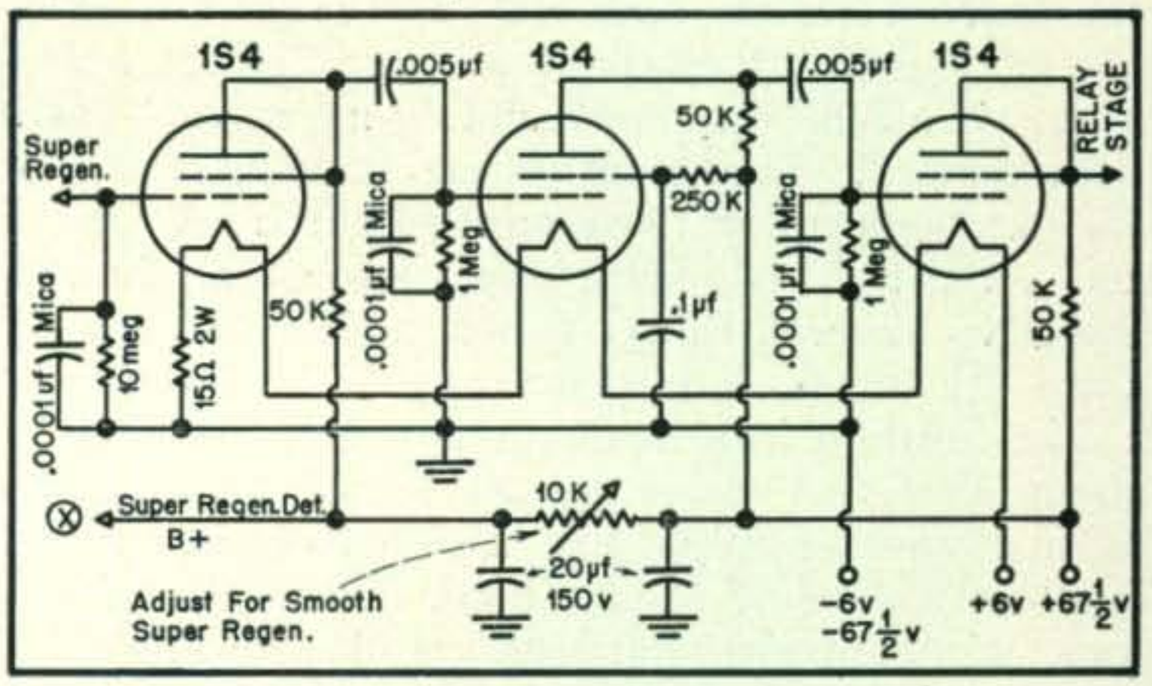


Fig. 3. Three audio stages required to give necessary gain in receiver.

*3215 Aurora St., El Paso, Texas.

Left: The author, W5FKZ, and his son demonstrate the simplicity of operation in controlling the test unit shown on the opposite page.

Ham radio and model making are an ideal combination for experimenting in the increasingly important field of radio control.

peaks and conduct, closing the relay and thus causing the motor to operate.

It was found after considerable experimentation that a 9003 makes an ideal relay tube, since it requires but 67½ volts on the plate and screen, and can be biased to cut off with 6 volts bias. It draws about 3½ ma when the grid goes positive. It also fills the requirement for small size. Thus the relay stage of the receiver emerges as shown in *Fig. 2.*

Now the question arises as to the type of signal best suited to operate the grid. Since this is an audio stage, an audio signal will be required, and thinking ahead to what will be required in the transmitter, and remembering that it would be a simple matter to create a tone oscillator around a modulation transformer, let us decide that the signal will be an audio tone.

In order to make the receiver a small unit, the best arrangement seems to be to use a superregenerative detector operating on the higher frequencies and giving a high gain. By adding a few stages of audio to build up the signal to operate the relay tube, the job is done.

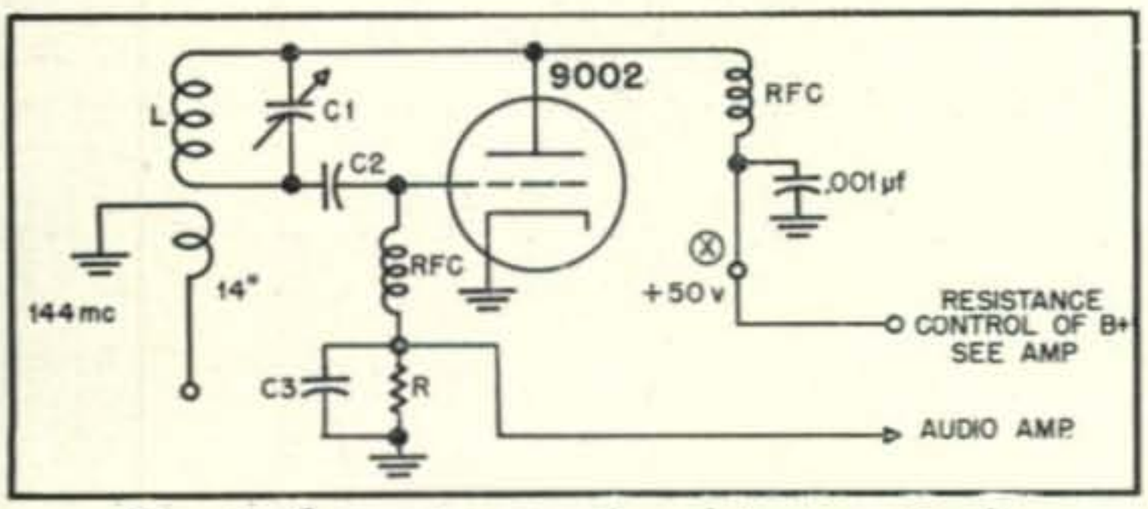


Fig. 4. Superregenerative detector circuit.

It was found that three stages of audio would give the gain required with the transmitter to be described. They are diagrammed in *Fig. 3.* The grid choke method of coupling for the relay stage prevents increased bias when the relay tube draws current. The by-passes on the grids are to reduce the superregenerative (s.r) noise. These stages will operate from a 67½-volt battery and, by using a filament-dropping resistor, they can be series-connected across the same 6-volt supply necessary for the 9003.

The superregenerative detector circuits can be found in most handbooks and so will not be described in detail except to say that the leads should be kept short. A general circuit diagram is given in *Fig. 4* and the physical arrangement is shown in *Fig. 5.*

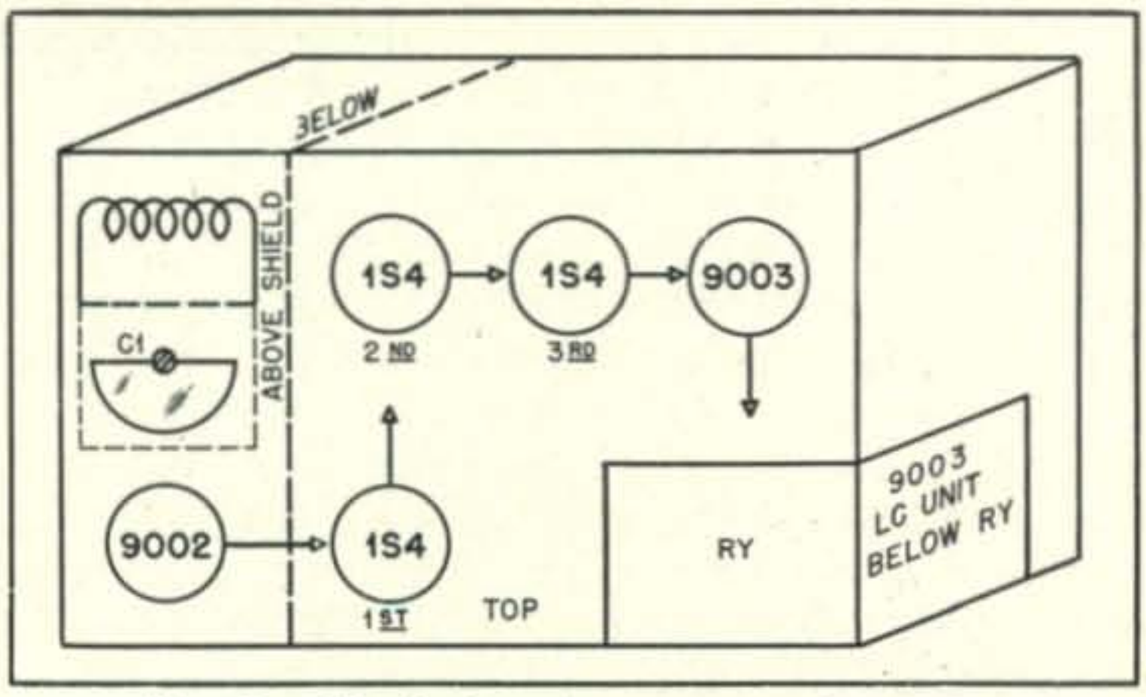


Fig. 5. Physical arrangement of receiver.

Turning now to the transmitter, this section is simplicity itself, as can be seen from the circuit in *Fig. 6.* It is powered from a 300-volt 100-ma vibrapack. With the 6C4 used for the r-f oscillator, the plate current to the r-f stage should be limited to 25 ma. The audio oscillator tube is keyed by the shore switch.

To summarize, we now have a basic transmitter and receiver for radio control, and if the construction has been correct, the system should have a range of about one mile.

The procedure to follow for testing is to adjust the superregeneration control on the receiver until a hiss is heard, decrease the s.r. plate voltage until the hiss becomes the loudest, which will be just at the superregenerating point,

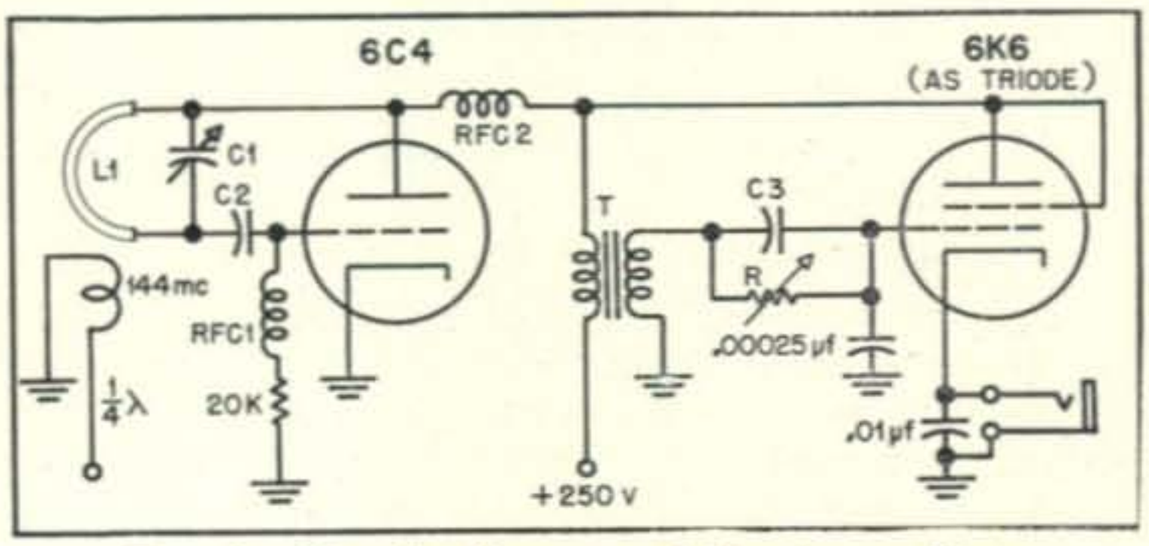
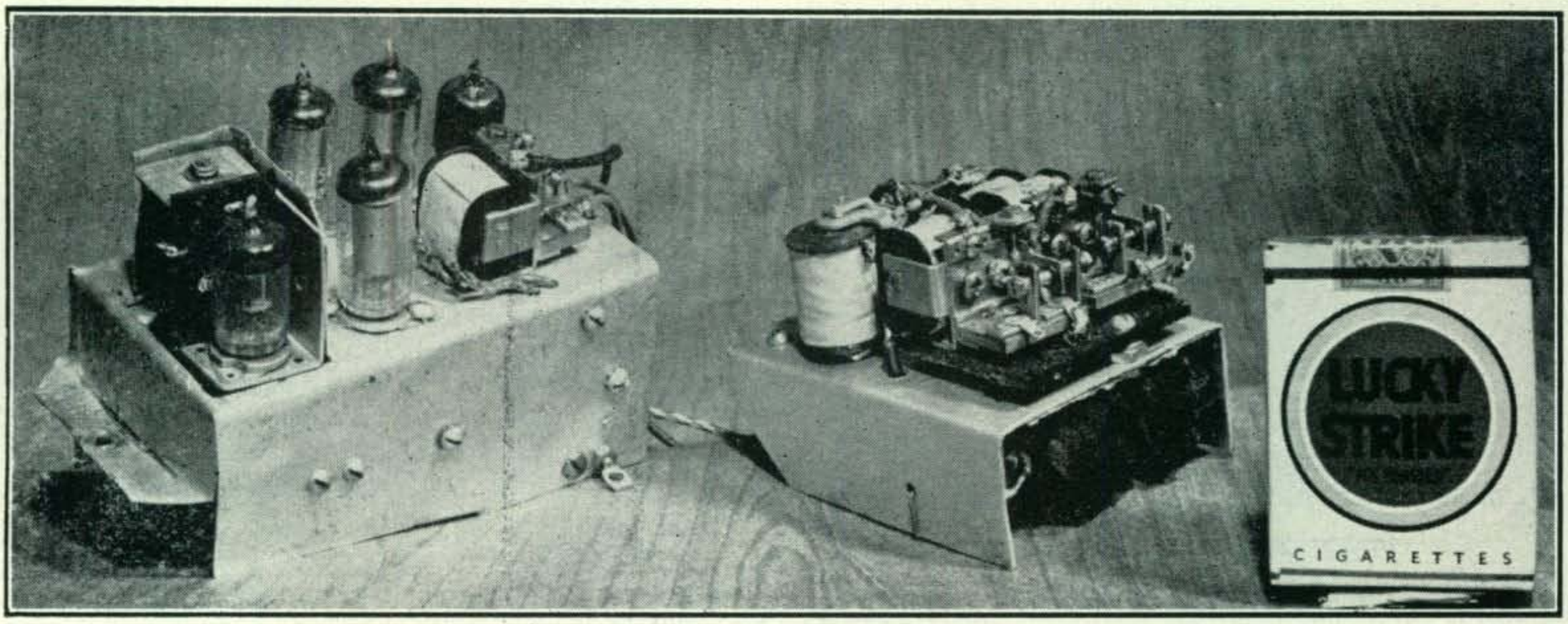


Fig. 6. Circuit diagram of the transmitter.



The receiver and selector. Note size as compared to cigarette package.

then back the control off a small amount so that the hiss becomes soft and steady. Next, turn on the transmitter with the tone switch open. When the receiver is tuned to the transmitter frequency, the hiss should disappear. Close the tone switch and the relay should operate, staying closed as long as the tone switch is closed and opening when the tone switch is opened.

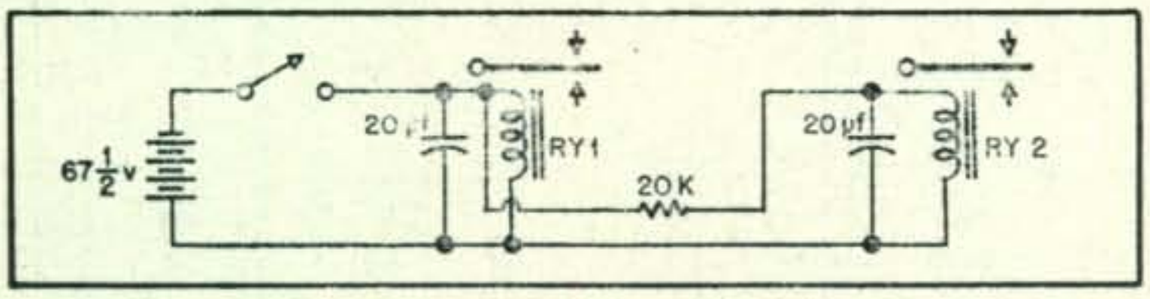


Fig. 7. Contacts for left and right control.

A note of warning: If the relay is adjusted to a very sensitive condition, it may chatter when the receiver is turned on and the transmitter is off. This is due to the s.r. noise. The correct way to adjust the tension on the relay is to turn the receiver and transmitter on with tone off and then set the tension so that the armature just remains open.

The Selector

Remembering the other three functions that the unit should perform—the rudder functions—let

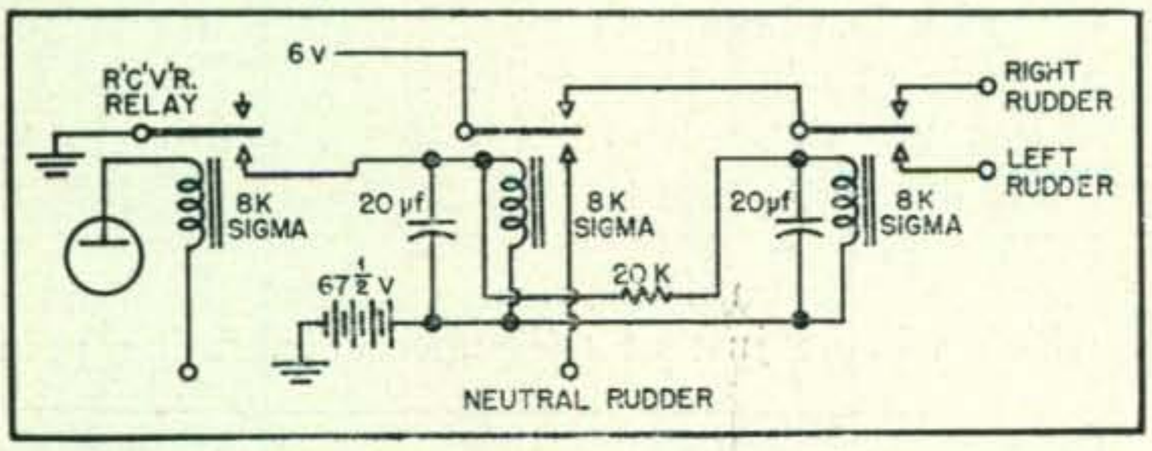


Fig. 8. Wiring from contacts to rudder motor.

us look again at the contacts on the receiver relay. In effect, we have a single-pole double-throw switch. How are we going to get the remaining functions out of this switch? Let us first look at the rudder power source and see what will be required. We can use a reversible d-c motor geared to an arm. This means that we must have a contact for right, and a contact for left; the neutral can be accomplished by switching directly on the rudder control itself in the absence of rudder signals.

Let us take a simplified circuit to explain how we can get these two extra contacts. Notice in *Fig. 7* that we have two relays (8000-ohm Sigmas) connected in parallel with a 20,000-ohm resistor between them, and connected to a battery through a switch. Each relay has a 20-µf condenser across it. Now let us close the switch and then open it in such a manner that the closed time is short. Relay No. 1 closes, holds closed over the break period, and thus remains closed as long as the short pulses are sent. Now let us close the switch so that the closed period becomes longer. The second relay then closes also, and both relays remain closed as long as the long

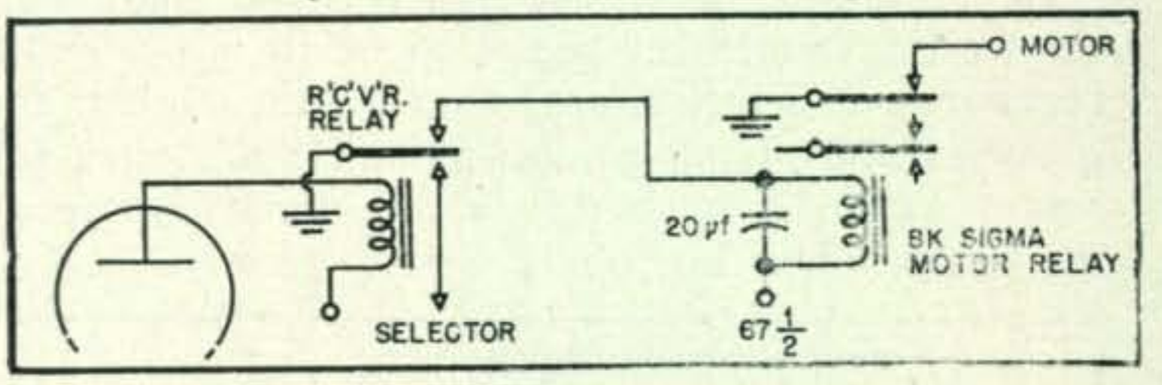


Fig. 9. Time delay relay circuit used with remote receiver.

pulses continue. When the switch is opened, both relays open after a short delay (insignificant for models).

Completing the wiring from the contacts to the rudder motor as shown in *Fig. 8*, we have the rudder section almost complete. If we use the *back* or normally open contact of the receiver relay for this section of control, it can be visualized that, by breaking the tone, transmitting short tone pulses will cause a long dwell time on the

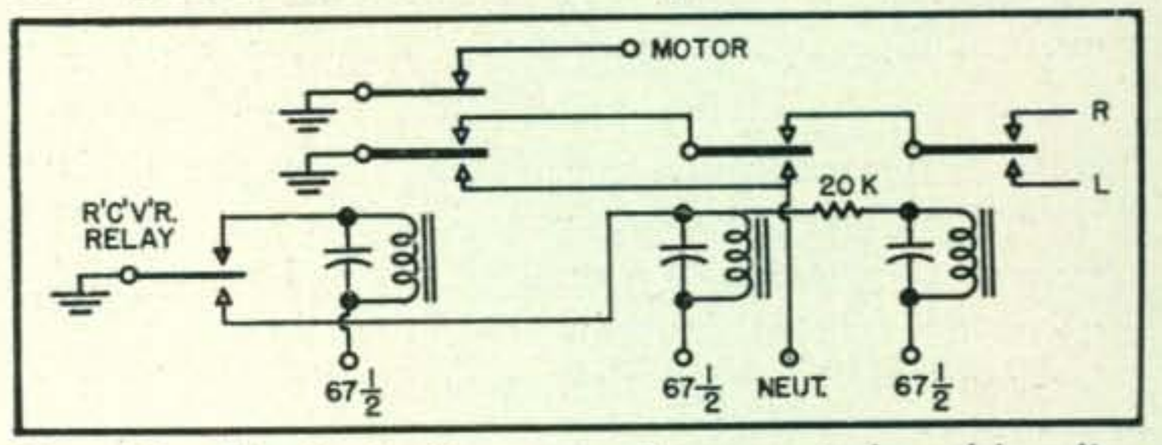


Fig. 10. Contacts for operating neutral rudder line while disconnecting the right-left rudder line.

back contact, and sending long tone pulses will cause a short dwell time on the back contact. Thus by giving the required signals to cause either one or both relays to function, we can have either right or left rudder. If the tone is continuous, the dwell time on the back contact is zero, and thus the rudder relays open and the rudder will neutralize (when we add the neutralizing circuit shown in *Fig. 11.*

The question at once arises: What happens to the motor when rudder signals are being sent? Let us overcome that difficulty by incorporating a time-delay relay on the normally closed side of the receiver relay as shown in *Fig. 9.* The shunt condenser is 20 μf and will hold this relay closed over the pulsing periods.

Now a difficulty arises. Unless we make some provision for it, when we turn the transmitter tone off the receiver relay will fall on the back contact, and although the propelling motor will cut off, the boat or vehicle will make a quick

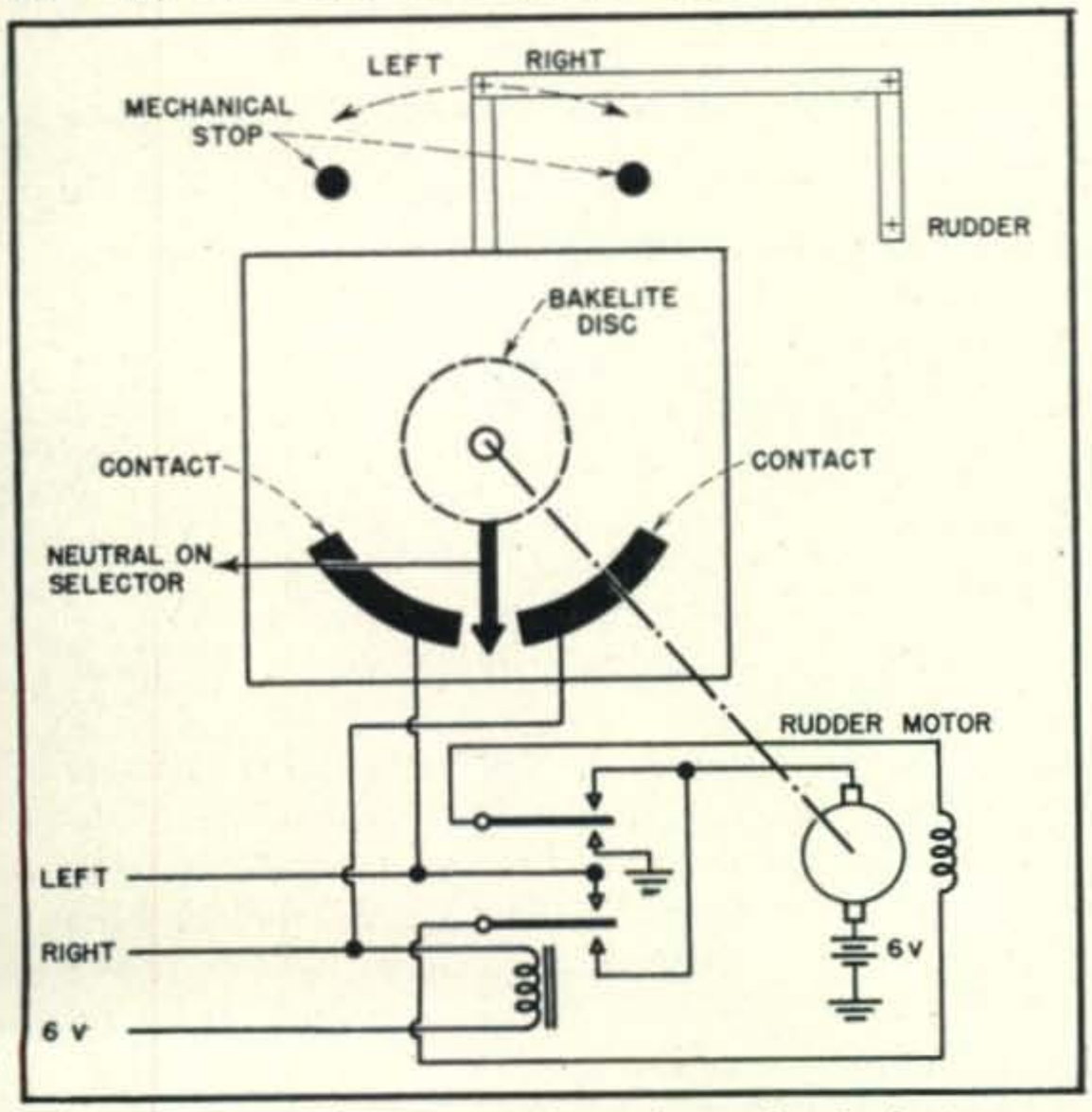


Fig. 11. Neutralizing switch and mechanical stops on rudder arm.

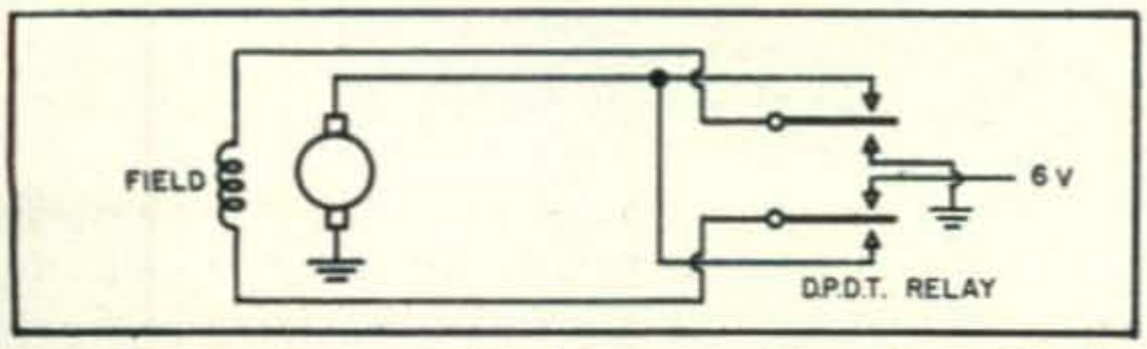


Fig. 12. Reversing relay for use with automobile fan motor.

turn just as it approaches the dock or point where its motor is stopped. This difficulty can be overcome by running the neutral rudder line through a set of contacts on the motor relay in such a manner that, when the motor relay opens, it operates the neutral rudder line while at the same time disconnecting the right-left rudder lines; this is illustrated in *Fig. 10.*

The boat section will now be complete with the

The transmitter and transmitter pulser. Pulser was changed as per Fig. 6 after this shot.

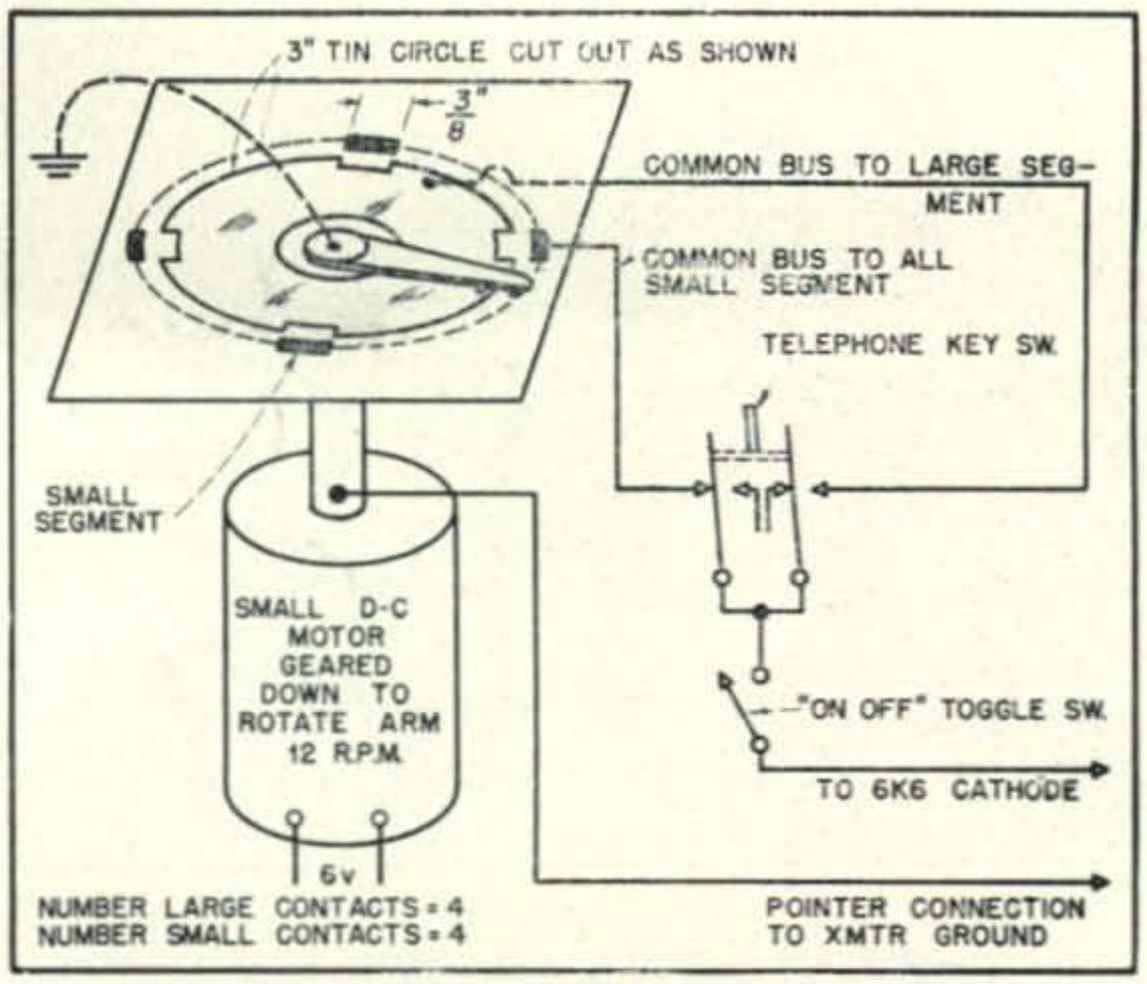


Fig. 13. Method for controlling pulse transmission.

addition of the neutralizing switch on the rudder motor, and a set of mechanical stops or limit switches on the rudder arm. These are best explained by the diagram of *Fig. 11.*

It might be mentioned here that if an automobile fan motor is used as the power source, it can be made reversible by opening it up and bringing out the brush and field leads separately, adding a reversing relay as shown in *Fig. 12.* The connection to this relay then would come from the selector section for, say, left rudder.

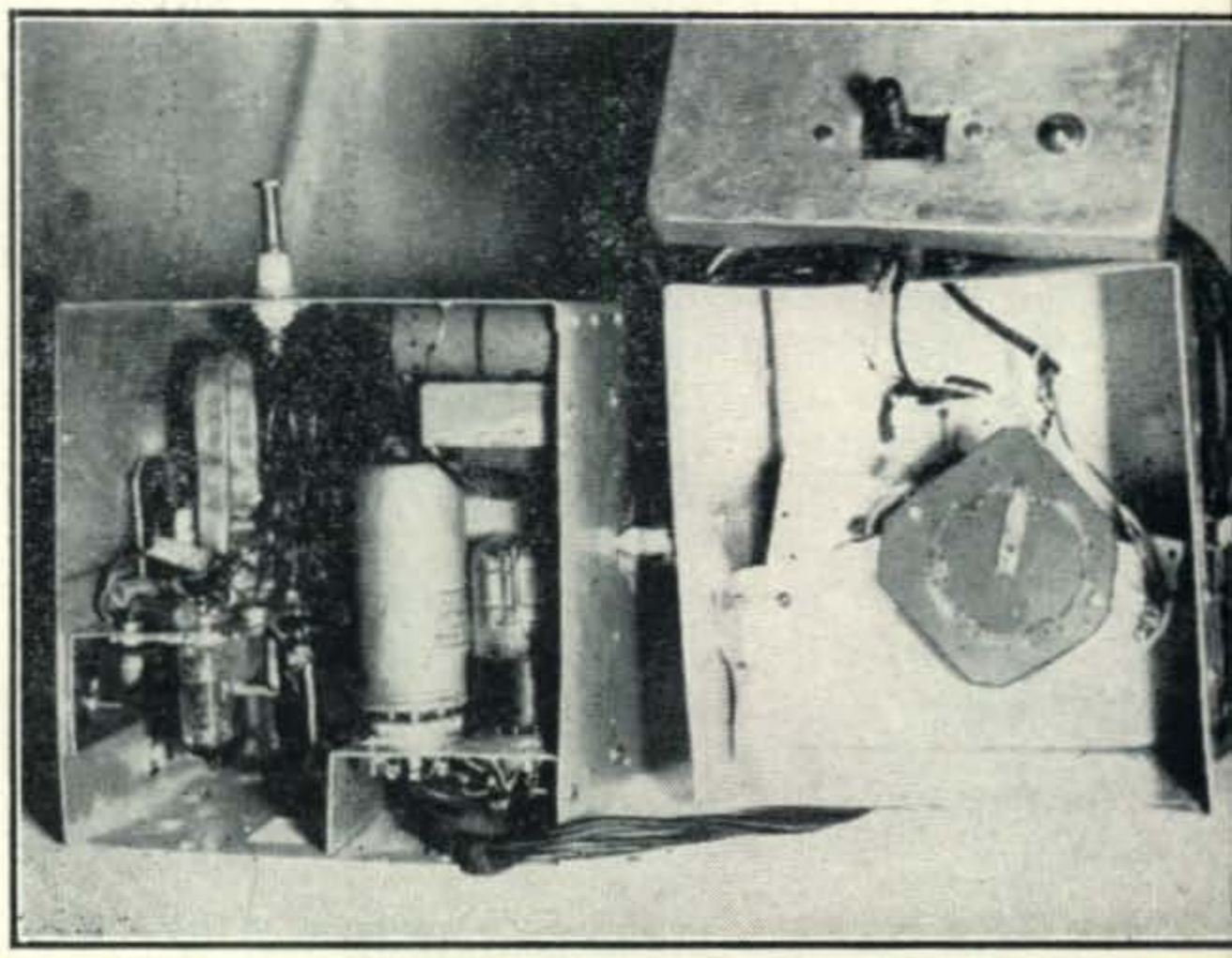
The neutralizing switch referred to earlier can be made quite simply, and is so arranged that when the rudder arm moves to the right, it moves a sliding contact connected to cause counter rotation when the neutral line is energized.

Shore Pulser

All that remains is to provide some means at the shore location of sending out either long or short tone pulses, a continuous tone, or no tone. This can best be done by a mechanical device. A small d-c motor is geared down so that it will move an arm at about 12 revolutions a minute. A brush is connected to this arm and so positioned that it will slide across contacts arranged about a circle as in *Fig. 13.* The contacts are then connected (all the short ones and all the long ones respectively) and run to a steering switch.

If they are properly spaced, when the steering switch is in neutral, the arm will make contin-

(*Continued on page 71*)



The Harmonic Chaser goes to work. The super-sensitive field-strength meter uses the communications receiver as the i-f channel and the receiver S-meter for the intensity indicator. The all-too-familiar pattern on Channel 2 is harmonic interference from a nearby transmitter.

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WILFRED M. SCHERER, W2AEF*

The HARMONIC CHASER

No every amateur has a television receiver, which is the most positive way of checking how effective interference elimination steps are. The next best thing is this field-strength meter having a sensitivity approaching that of the average TV receiver.

WHEN checking or making transmitter adjustments, while working toward the elimination of TVI caused by harmonics, some sort of device is required for measuring the strength of the interfering signal. The ideal situation is to have a TV receiver available. But many amateurs do not possess a TV set. Depending on a neighbor's set, to say the least, usually is a nuisance to all parties concerned and not always an agreeable procedure.

In the absence of a TV set, the amateur generally must resort to the use of a field-strength meter. However, the types in general use are lacking in the required sensitivity. The sensitivity of the best crystal diode field-strength unit in conjunction with a 20-microampere meter employed by the writer, is far from adequate for harmonic measurements. On several occasions, after only one harmonic remedy was installed, no reading was obtainable even with the meter connected directly to the transmitter coupling link (but TVI was still present). This left no indication available for checking improvements resulting from additional remedies. Stray field readings, which are equally as important as those obtained from the antenna output circuit, are unobtainable except in extremely close proximity to the transmitter components.

After several disappointing experiences, it was deemed essential to have a field meter of sensitivity near that of the average TV set. Many designs were considered to fulfill this requirement. Our ideal setup was an entirely self-contained unit including a battery power supply, but due to the number of tubes required and the complexity involved, it became apparent that it would be an expensive and unattractive project for the amateur.

A superregenerative receiver, used by some amateurs for this purpose, seemed to offer a simple solution for a sensitive device, but the only indication of signal intensity would be that obtained by aural means, a method which is deceptive and which is of little aid as far as definite values go. Visual indication could be added but this would mean added expense.

The final answer for a simple and inexpensive sensitive unit resolved around a wide-range high-frequency converter for use with any existing communications receiver having an "S" meter. This field meter, or "Harmonic Chaser" as we have named it, is able to record not only 2nd, 3rd, and higher order harmonics at distances measured in hundreds of feet, but will also indicate the strength of television signals for comparision with the intensity of the offending harmonics. The range of the instrument is 50 to 115 mc. An added feature is that the unit is small and flexible enough to permit its use as a probe for checking r.f. along power leads, leakage in shields, etc. It can be placed at a remote location, such as in another room or under the transmitting antenna, while the indicating meter on the communications receiver remains at the transmitter location for observation while attenuation work is being done. The cost of the Harmonic Chaser is equal to or less than the typical diode arrangement.

Circuit

The circuit is shown in *Fig. 1*. A 9002 triode is used for the detector while a second 9002 functions as the local oscillator. At first a single 12AT7 dual triode was employed, because a single tube appeals to those desiring simplicity. Even with complete shielding between tuned circuits and only stray oscillator coupling, pulling effects between the de-

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tector and oscillator sections were extremely bad. Use of the single dual-purpose tube therefore resulted in complications and proved not as simple as the two-tube combination.

The oscillator is tuned to a frequency 10 mc higher than that of the incoming signal. The resulting 10-mc beat frequency is then taken from the cathode of the detector and is fed to the antenna input terminals of the communications receiver which must be tuned to 10 mc. The coax cable feeding the converter output to the receiver is terminated at the converter end by a resistor equal to the coax impedance to eliminate standing waves and, therefore, the possibility of r-f pickup at the detector cathode. The cathode follower output arrangement is used for simplicity; however, the output is about half that obtainable from a 10-mc tuned circuit at the detector plate. The circuit for the latter is shown as an alternate in *Fig. 1*, and if used, *L4*, *L5*, and *C9* must be completely shielded within the Harmonic Chaser case.

From the standpoint of images, an i-f beat frequency in the 25-mc region was at first considered, but a frequency of 10 mc was selected because many receivers do not cover the higher region and, those which do, often have a considerable drop in sensitivity in this range.[1]

The oscillator and detector circuits are tuned separately because tracking problems are eliminated: the cost is less using the single capacitors shown, and the identification of images is made easy by noting the setting of the calibrated detector dial. The oscillator dial is also calibrated and a trimmer for fine tuning of the oscillator is also included.

Power for the unit is obtained, via a shielded cable, from the receiver with which it is to be used. The drain is small, requiring 6.3 volts at .15 amperes and 100 to 250 volts at less than 10 ma. Many commercial receivers are equipped with spare power terminals at the rear of the chassis, but if not available and if the necessity of digging into the receiver for filament and plate power is deemed inadvisable, a separate power supply may be used. It is entirely practical to build it into the same case with the converter.

Construction

Actual construction, both mechanically and electrically, is subject to variations already suggested. The Harmonic Chaser illustrated is the instrument in its simplest and most compact form. Details are shown in the photograph.

The case is a homemade aluminum box 5" x 3" x 3". 50-$\mu\mu$f Hammarlund APC type variable capacitors having ¼" extension shafts are mounted directly on the front of the box. The capacitor at the top tunes the detector input circuit and the one at the middle is the oscillator tuning. Below these is mounted another APC type capacitor with all but three plates removed. This is the oscillator fine tuning. The miniature sockets for the 9002s are mounted at the rear of their corresponding variable capacitors and are fastened to the side of the case by a 6-32 screw inserted in, and soldered to, the center shield stud of the socket.

Capacitors and resistors for each tube are closely grouped around the terminals of their respective sockets. All grounds are made short and directly to the case at one common point for each socket.

The detector inductor is mounted at the side of its tuning capacitor and at the left of the tube. In order to minimize mutual coupling, it is placed at right angles to the oscillator inductor which is mounted near the bottom of the case, at the rear of the oscillator fine tuning capacitor. The antenna coupling loop is held in place by its own leads soldered to a ground lug and the center terminal of the coax fitting mounted at the top of the box.

Power leads are brought through a plug at the rear of the case. The B+ and the hot side of the 6.3 v. filament leads are by-passed to the case directly at the plug. The ground side of the filament is also connected right at the plug (it is assumed that the unit will be used with a receiver having

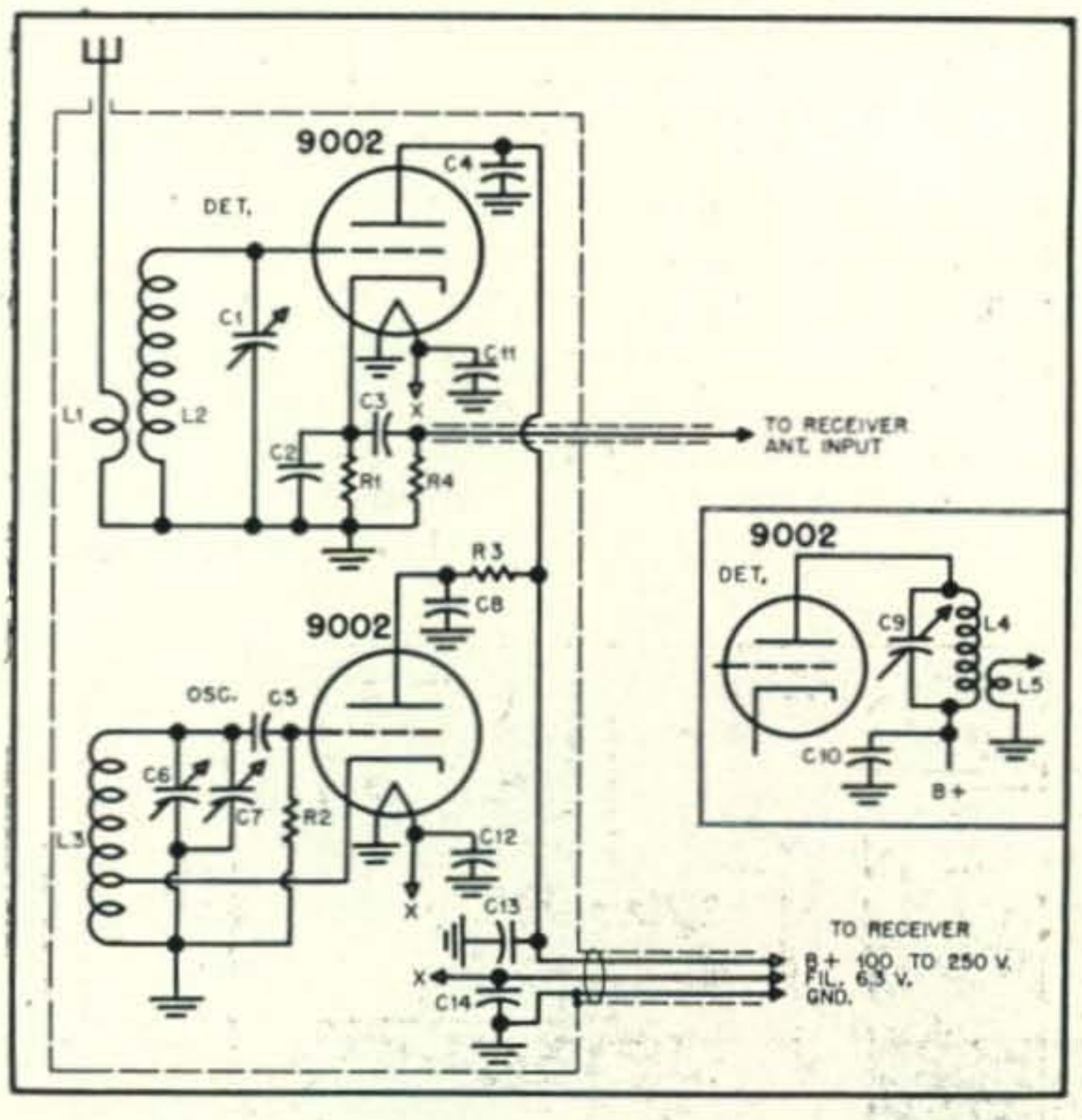


Fig. 1. Circuit diagram of the Harmonic Chaser with alternate output circuit indicated in box.

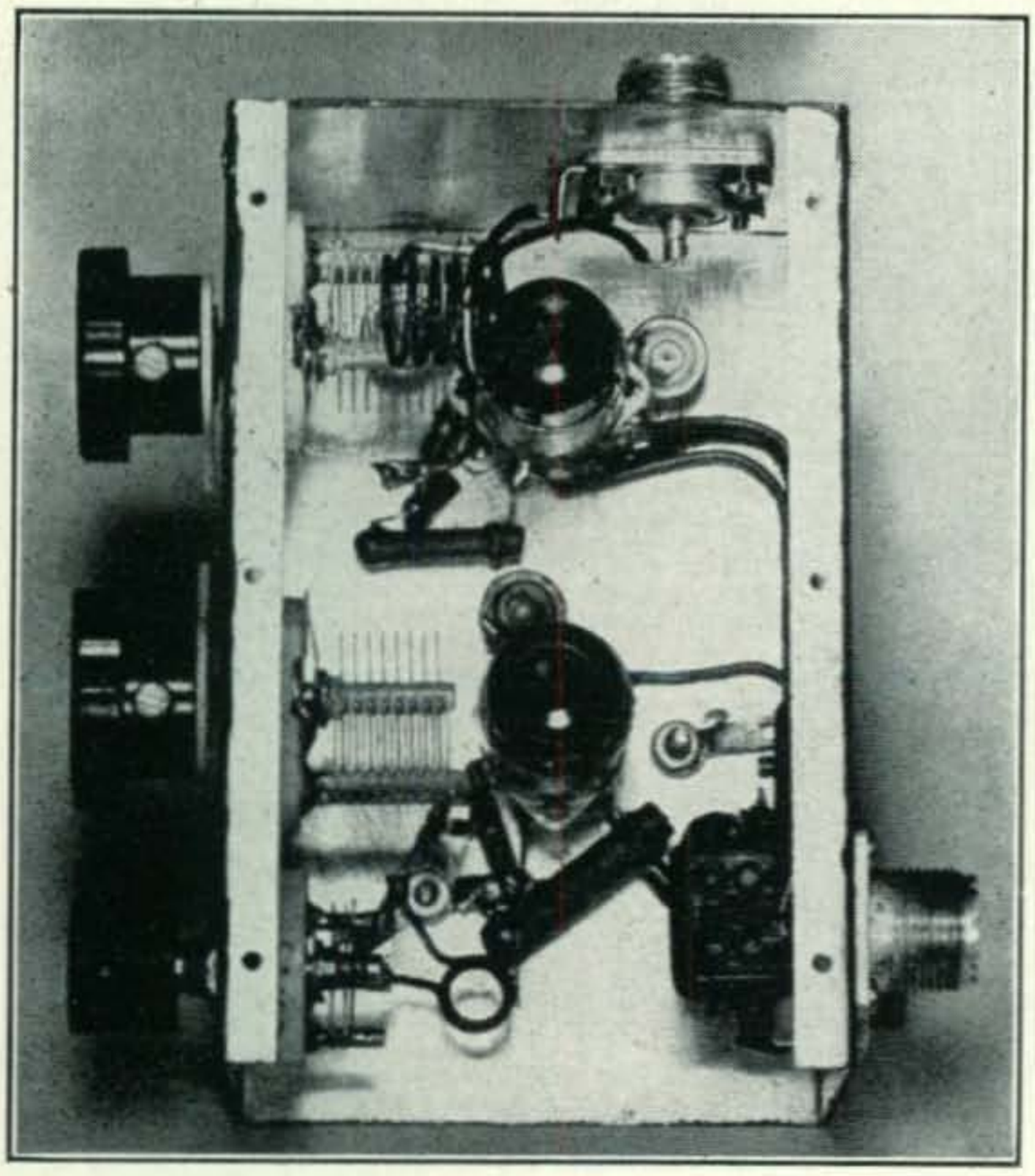
C1, C6—50 $\mu\mu$f Hammarlund APC type.
C2, C11, C12—400 $\mu\mu$f, silver mica or ceramic.
C3, C10, C13, C14—.01 mica or ceramic.
C4, C8—.001 mica or ceramic.
C5—500 $\mu\mu$f silver mica or ceramic.
C7—3 plates—Hammarlund APC type.
C9—7-45 $\mu\mu$f ceramic.
R1—2250 ohms, ½ watt.
R2, R3—15K, ½ watt.
R4—Equivalent to output coax impedance, ½ watt.
L1—2 turns push-back wire at cold end of L2.
L2—4 turns #16 enamel, double spaced, ½" diameter, self supporting.
L3—4 turns #16 enamel, close wound, ¼" i.d., self supporting, cathode tap 1½ turns from bottom.
L4—32 turns #26 enamel, close wound, ½" diameter.
L5—3 turns #26 enamel, close wound at bottom of L4.

1 If the receiver covers only the amateur bands, a different i-f frequency may be used. The calibrations of the oscillator dial will then be off by an amount equal to the difference between the new i-f frequency and 10 mc.

one leg of the filament circuit grounded). Next to the power plug is mounted a coax fitting for the 10-mc cathode output line feed to the regular receiver. Both the power plug and the coax fitting may be omitted for the sake of economy and the cables may then be permanently connected directly to the unit; however, detachable cables are much more convenient when either transporting or storing the instrument.

Knobs with pointers are used for the regular tuning capacitors and paper scales for calibration points are cemented to the case. The oscillator fine tuning knob need have only a small dot or arrow scribed on it for general reference setting.

Certain general precautions should be undertaken, especially if it is desired to modify the Harmonic Chaser. Place the detector and oscillator tuned circuits as far away as possible from each other and mount the two inductors at right angles to each other. No shield is required between detector and oscillator sections of this particular unit, nor are tube shields required. However, if pulling between circuits is experienced in a modified unit, a shield may be required between sections. Run all power leads close to the case, make all grounds short and direct, and mount resistors and fixed capacitors rigidly. The inductors should also be mounted firmly, particularly that of the oscillator which must not be subject to frequency changes due to vibration when the unit is moved around as a probe. Use silver mica or ceramic fixed capacitors. If a 10-mc tuned plate output circuit is installed for higher output, its inductor and trimmer capacitor should be mounted at the rear of the box and it should be isolated by a shield running down the box immediately behind the tube sockets. The box itself should be rigid and not subject to twisting when handled.



The Harmonic Chaser in its simplest and most compact form. Variations may be made to suit individual requirements.

Adjustment and Calibration

Several methods may be employed to check and calibrate the instrument. These involve the use of a Dipper[2], standard signal generator, signals from local TV or FM stations, or an amateur transmitter.

Employment of the Dipper is the simplest and quickest method, so this will be described first. With no power applied to the Harmonic Chaser, use the Dipper as a grid-dip-oscillator to check the range of the detector and oscillator tuned circuits. The detector should cover 50 to 115 mc and the oscillator should be 10 mc higher or 60 to 125 mc. The inductors may be squeezed or spread until the proper range is acquired. Next apply power to the unit and determine if the oscillator is functioning by using the Dipper as a diode detector inductively coupled to the oscillator inductor. R.f. should be detected at each end of the tuning range. If the oscillator fails to function, particularly at the low frequency end, the cathode tap most likely will have to be moved slightly up on the inductor toward the grid end. When using the Dipper as a g.d.o., temporary calibration points may be marked on each scale for reference during final alignment when the Dipper is used as a signal generator as described in the next few paragraphs.

When a standard signal generator is to be used, connect the output of the Harmonic Chaser to the communications receiver and apply power. The generator may be hooked directly to the input of the converter and set at a moderate output level. If the Dipper is used as the generator, a six-inch antenna connected to the converter will be required for r-f pickup. Set the receiver at 10 mc and turn on the b.f.o.

It will be assumed that each tuning knob has been mounted so that the pointer will be at the extreme left (9 o'clock) when the capacitor plates are fully meshed or at the low-frequency setting. The oscillator fine tuning should be set at center position (12 o'clock).

Set the signal generator on 55 mc and the Harmonic Chaser's detector tuning at about 10 o'clock. Then slowly rotate the oscillator tuning control, starting at the low frequency end (9 o'clock), until a beat is heard in the receiver. Since the range is wide the tuning will be sharp, so it will be necessary to trim with the oscillator fine tuning control. Then peak up the signal with the detector control. If the construction of the unit has been followed closely as described, the relative position of the two pointers should be approximately the same (around 10 o'clock). If no beat is heard when tuning the oscillator over the low frequency half of the scale, reset the detector about ¼", one way or the other, and again tune the oscillator for the beat. The tuning of the detector is fairly sharp and it may be too far off on the first try.

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2 Scherer, "The Improved Dipper," *CQ*, February, 1949.

After tuning in the beat and peaking same, slowly rotate the detector control clockwise. The beat will disappear and will again appear near mid-scale. This is rather unique and at first may be confused as a direct image. At this point the detector is tuned to the oscillator frequency and absorbs energy from the oscillator r-f field. Oscillator injection to the detector grid, which is normally small due only to stray coupling is thereby increased and a beat is produced with the incoming signal which is still of sufficient strength with the circuit detuned. Since the oscillator functions at a frequency higher than that of the incoming signal, the correct setting for the detector is at the lowest frequency point at which the signal peaks. Peaking at the correct point will be smooth and gradual, while that at the incorrect point will be sudden and may even "bloop" due to slight pulling.

After the correct settings have been found, mark the scales accordingly. Then rotate the detector control about ¼" clockwise (near 11 o'clock), set the generator on 60 mc, and rotate the oscillator tuning clockwise until the beat is heard. Peak up as described above. The generator may then be set at 70 mc and the preceding operation followed, except this time start with the detector control advanced further clockwise to slightly past mid-scale. Each set of the three points so far obtained should occur at approximately the same relative positions of the tuning knobs. If they are considerably off, either the detector or oscillator inductor should be trimmed by squeezing or spreading. The remainder of the calibration points should be found in the same manner.

When the incoming frequency is 70 mc or higher, direct images may appear when the oscillator tuning is set 20 mc lower in frequency. As an example, a 70-mc signal may be heard with the oscillator tuning set at either 70 or 50 mc. The true identity of the incoming signal may be ascertained by noting the point at which the signal peaks when the detector is tuned. The true signal will peak smoothly and gradually when both controls are in the same relative position. In the case of an image, the peak will occur with the detector set at a frequency 20 mc higher than the oscillator calibration.

Signals from local TV or FM stations may be used for calibration in a manner similar to that described above. An outdoor high frequency antenna should be connected to the input terminal of the Harmonic Chaser. The sound carriers of TV channels 2 to 6 should be employed first because the audio is generally quite strong and it will aid in identification during station announcements (the FM audio will be distorted on the AM receiver, but sufficient intelligibility may be had by tuning slightly to one side). TV channel frequencies have previously been listed in *CQ*.[3] The video carriers may next be employed. These will be found 4.5 mc lower than the sound carriers and may be identified by listening for a carrier at this point predominant in low frequency audio tones. Standard FM stations may be used for frequencies above 88 mc.

If an amateur transmitter is to be employed for alignment, the transmitter should have a fundamental frequency of 14 or 28 mc. Connect an antenna no longer than 6 inches to the unit and set it at least 6 feet from the transmitter to reduce the possibility of picking up weak harmonics from the lower frequency stages. Proceed as with the signal generator. The first harmonic encountered should be the 4th of 14 mc or the 2nd of 28 mc. This will be around 56 mc. If the first point found brings the controls to mid-scale or slightly past this point, most likely the unit will be tuned to the 5th or 6th harmonic of 14 mc or the 3rd of 28 mc. In this case the inductors may have to be adjusted to enable pickup at 56 mc towards the lower end of the scale. After locating 56 mc, proceed with the higher frequency harmonics. If a transmitter operating on the 50-mc band is available, it will be useful in locating the low frequency end of the range.

Approximate settings of the controls should be as follows:
50 mc—9 o'clock, 60 mc—11 o'clock, 70 mc—between 12 and 1 o'clock, 80 mc—1 o'clock, and 100 mc—2 o'clock.

Operation

Unless a transmitter is well shielded, the stray r-f harmonic field is very strong regardless of whether or not attenuation measures are employed. Hand or body movements, the position of miscellaneous wires, or even the snapping on and off of a light switch may disturb this field in relation to other sources of r-f pickup, such as the Harmonic Chaser, in the immediate vicinity. It is therefore best to place the instrument a good distance away to minimize these effects. If sufficient coax and power cable is available for connections to the

(*Continued on page 74*)

[3] Scherer, "The Trap Box," Television Frequencies Chart,

Notes on Crystal Filters

PHINEAS J. ICENBICE, WØNKZ*

What to expect from a crystal filter, and how to make it measure up.

IT IS THE PURPOSE of this article to acquaint the non-mathematical readers with sufficient information to understand, operate, and service crystal filters.

The usable excursion of a 30-db attenuation notch can be controlled over a range of approximately 100 to 4000 cycles per second either side of the desired carrier. This rejection notch or slot is actually the parallel resonant crystal circuit controlled by the phasing capacitor and normally labeled "phasing." Let us stop a minute and analyze what we are attempting to accomplish with the phasing capacitor. We are attempting to insert an adjustable parallel resonant circuit in series with our intermediate signal path to eliminate an undesired heterodyne and retain our desired signal. The common solution is obscured by the back-fence method used to insert this adjustable parallel resonant circuit effectively. The notch may be controlled lower in frequency by connecting in parallel with the crystal a variable inductance to resonate the capacity which the crystal represents at low frequency.

Normally a parallel resonant rejection notch *is not* controlled by a variable inductance in parallel with the crystal, but an equivalent circuit is employed consisting of a variable (phasing) capacitor in series with a tapped transformer which provides a 180° phase shifted voltage. At minimum capacity, the phasing capacitor allows the parallel or anti-resonant point *B* of *Fig. 1* to exist higher in frequency than the series resonant point *A* of *Fig. 1*. This phasing adjustment eliminates heterodynes of low pitch higher in frequency than the series resonant crystal frequency. A heterodyne of high pitch and higher in frequency than the desired signal is then effectively eliminated by increasing the phasing capacity almost to the electrical center. Adjustment of the phasing condenser to a point higher in capacity than the electrical center attenuates a high pitch heterodyne lower in frequency. It should be obvious that the maximum phasing capacity attenuates the lower pitched heterodynes lower in frequency, especially when one realizes that we are electrically increasing the current flow in a circuit which appears inductive across the crystal.

When a desired carrier is converted to the series resonance of the crystal, the phasing condenser should not change the "S" meter reading. The series resonant crystal appears as a very low resistive component in one arm of the bridge circuit (approximately 200 ohms) and the phasing condenser at mid-range is many times greater (approximately 50,000 ohms). The S-meter reading decreases very slightly in the Collins 75A receiver because the transformer *T1* is low impedance and presents a nearly constant voltage to the variable load in the five selectivity positions which vary from 330,000 ohms to 4700 ohms. The secondary of *T1*, *Fig. 2*, should not be resonated to the series crystal frequency. Anti-resonance of *T1* presents a high resistive load which materially reduces the composite circuit *Q* and increases the bandwidth. Some manufacturers utilize this feature for variable selectivity control.

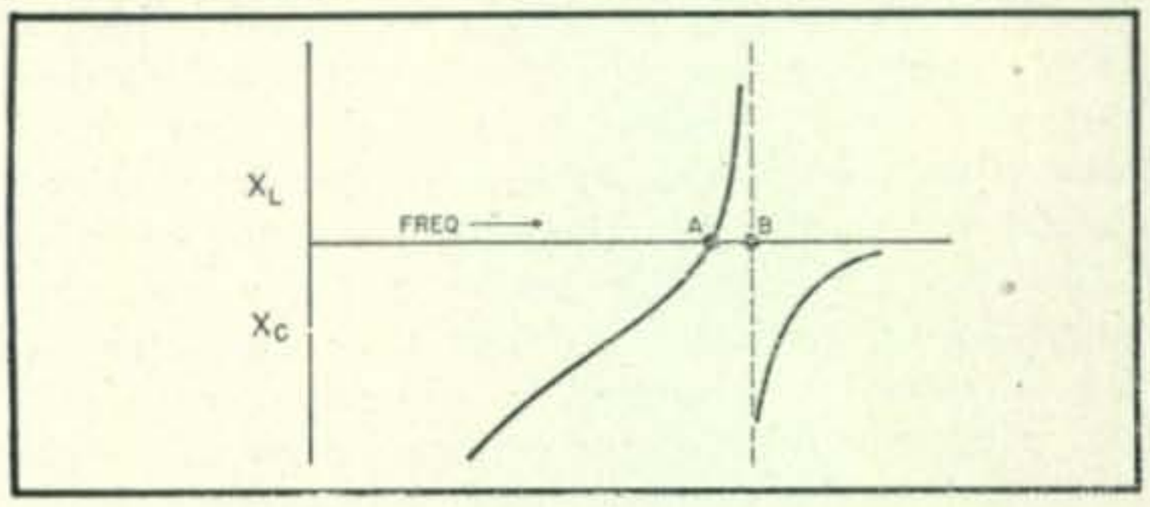

Fig. 1. Typical crystal reactance curve.

The circuit controlled by *S11* of *Fig. 2*, labeled selectivity on the receiver, decreases the bandwidth as the resistance is lowered. At first glance this may appear untrue; however, further analysis of *Fig. 3A* reveals the basic circuit to be a series divider. Decreasing this resistance may be carried to a point which results in a small unusable voltage at the detector. The operation of the bandwidth or selectivity control (*S11 Fig. 2*) can be explained by referring to the simplified diagram *Fig. 3B* which diagrams a very low-impedance (essentially constant voltage input) source and a resistive voltage divider. Assume R_B presents 200 ohms to the series resonant frequency and 10,000 ohms to a frequency, say 2 kc, higher in frequency. If R_C is very high, say 500,000 ohms,

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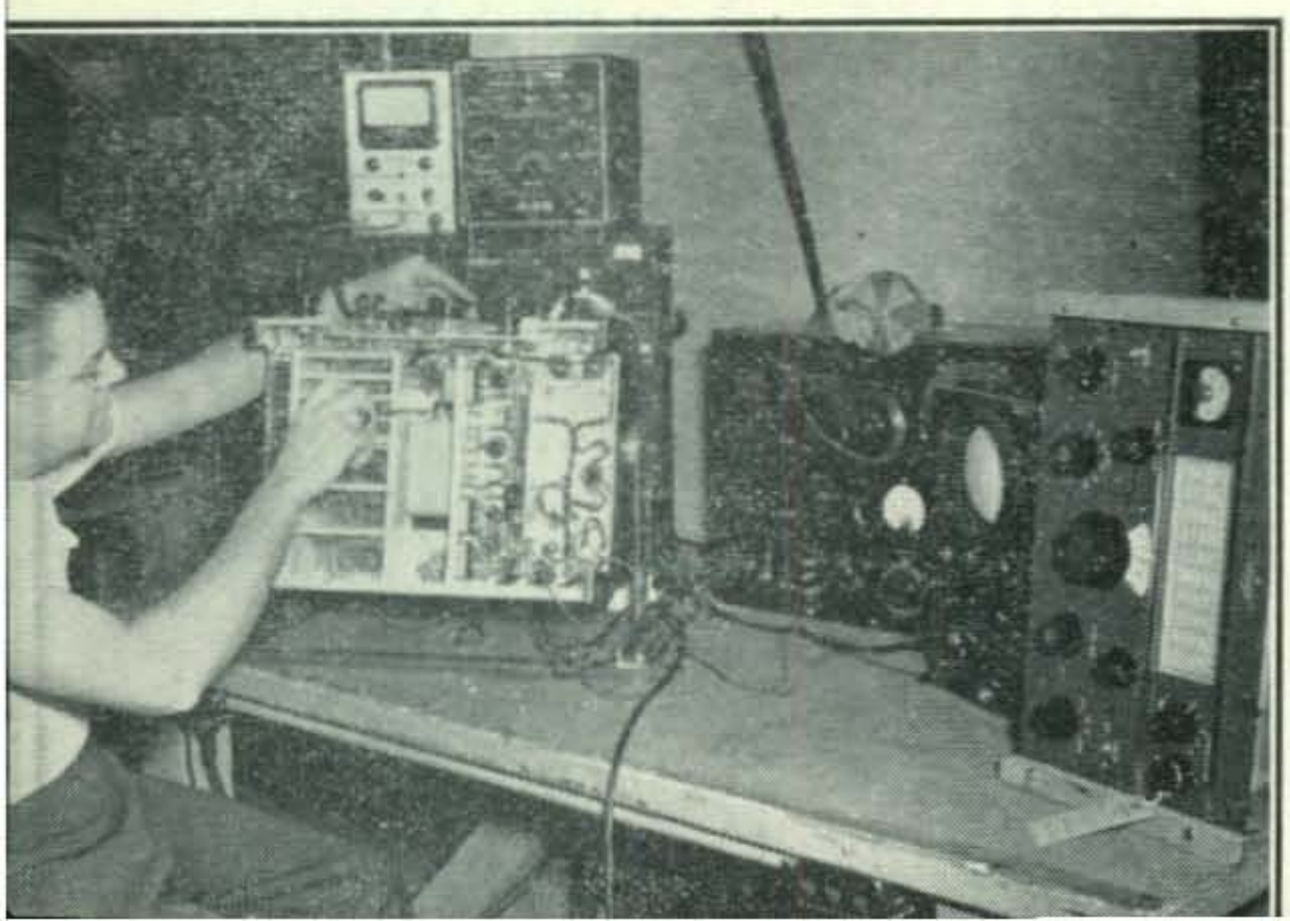

Rex Bishop, WØPEO, working on a 75A filter to put it on the nose.

the voltage E_{OUT} would be nearly the same, as R_B is changed from 100 to 50,000 ohms. Let us assume R_C to be rather low, say 2,000 ohms; then R_B would have a very marked effect as it varied from 200 to 50,000 ohms and E_{OUT} would be frequency conscious or selective.

The Q of a crystal used for filter operation can be in the vicinity of 10,000. A very high Q circuit produces a selectivity curve with a very steep slope. This steep slope may create a large change in output when the crystal shifts frequency due to vibration. Measured shifts under vibration of usable filter crystals indicate 10 cycles to 100 cycles may be expected at the fundamental frequency. Plated crystals tested were found to average lower in Q than the air gap type; however, the plated crystals exhibited less microphonic tendencies.[1] Audio or oscillator instability should not be confused with that of the crystal filter. Troubles may be isolated with the crystal switched out of the circuit.

The differential type condenser, *C71*, has a two-fold purpose. First, section *A* varies from three to ten $\mu\mu$f in capacity introducing a voltage 180 degrees displaced from that introduced slightly off crystal resonance by the crystal to the grid of *V6, Fig. 2*. An undesired frequency, one other than the series crystal frequency, may be suppressed by inserting a voltage of comparable magnitude displaced 180 degrees from that of the voltage passed by the crystal path to the next grid. *C71B* serves the second purpose of the differential capacitor by maintaining a nearly constant capacity across *T2*, as section *A* increases section *B* decreases. *C86* adjusts the coincidence of the mechanical centering of *C71A* with desired frequency bridge balance.

A frequency modulated signal generator used with a sweep rate of 4 cycles per second, and a frequency excursion of about 20,000 cycles has been used successfully for production alignment. Decreasing the repetition rate and/or the sweep width minimizes the prolonged damped oscillations as viewed on the oscilloscope. With excessive frequency excursion (sweep frequency) or excessive repetition rate, a high-Q circuit selectivity curve may be obliterated by the damped oscillation resulting from the dynamic voltage shock exciting the high-Q circuit for a very short time. A long persistent oscilloscope screen eliminates flicker and is used for such measurement on very high-Q circuits which necessitate a slow repetition rate. This damped oscillation is, however, useful for aligning the powdered iron core of *T2, Fig. 2*. If

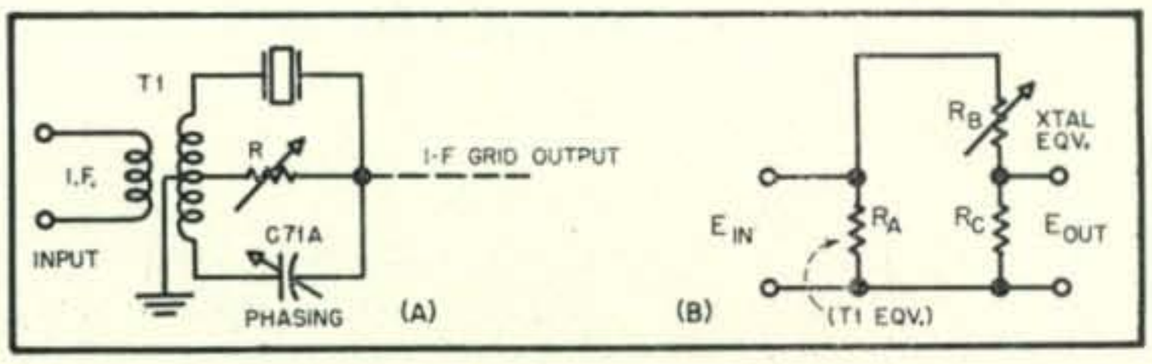

Fig. 3. Basic crystal filter circuit and simplified interpretation.

the powdered iron core of *T2* is adjusted for minimum damped oscillation as indicated by the panoramic presentation, the broad-nosed steep-sided selectivity curve desired for phone reception may be secured. An alternate alignment procedure requiring limited facilities is offered for the reader's convenience. Adjust a stable frequency source for a signal of approximately S9 (500 microvolts). The transmitter crystal or stable e.c.o. may be used. Set the selectivity selector in the most selective position, and very carefully tune for maximum S-meter indication. Adjust all transformer trimmers for maximum a-v-c voltage or S-meter indication. The adjustment of *T2, Fig. 2,* of the 75A or equivalent circuit may be optimized by lowering the intermediate frequency, inserting the crystal filter and tuning the signal source (lower intermediate frequency) for approximately 6-db S-meter loss (one S point). This is the point at which *T2* is peaked. An alignment check should reveal approximately the same S-meter reading with the crystal selectivity, or the phasing condenser, in any position. It is very important that the signal is, or has been, converted to the series crystal frequency. A maximum of one and one-half S-units (approximately 9 db) can be tolerated as the selectivity control (*S-11*) is varied from 0 to 4.

For the final test here is a simple procedure to determine how well your crystal filter is functioning:

1. Tune in a stable signal using the "S" meter and a selective crystal filter position of the receiver.
2. Adjust the main dial to a new frequency approximately 500 cycles higher in frequency than the stable test signal. Search for the minimum S-meter indication by rotating the phasing capacitor. The depth in db of the rejection notch is indicated directly by the "S" meter.
3. Repeat step 2 using many different dial frequencies above and below the test signal in order to determine the usable excursion of the rejection notch. A written record or cardboard dial may be useful for future comparison.

[1] Ed. Note: Q and microphonic tendencies are a function of crystal mounting and mode of vibration. Generally speaking, a plated crystal will have a higher Q than an unplated crystal. Thus, for example, a plated unit clamped at a nodal point by a high impedance clamp (a resonant bar or wire, for example) will exhibit extremely high Q and be substantially unaffected by shock. The cheap I-f filter crystals are unplated X cuts, fixed air gap mounted and, unless the over-all crystal size is a good fit for the holder cavity, susceptibility to microphonics will be high.

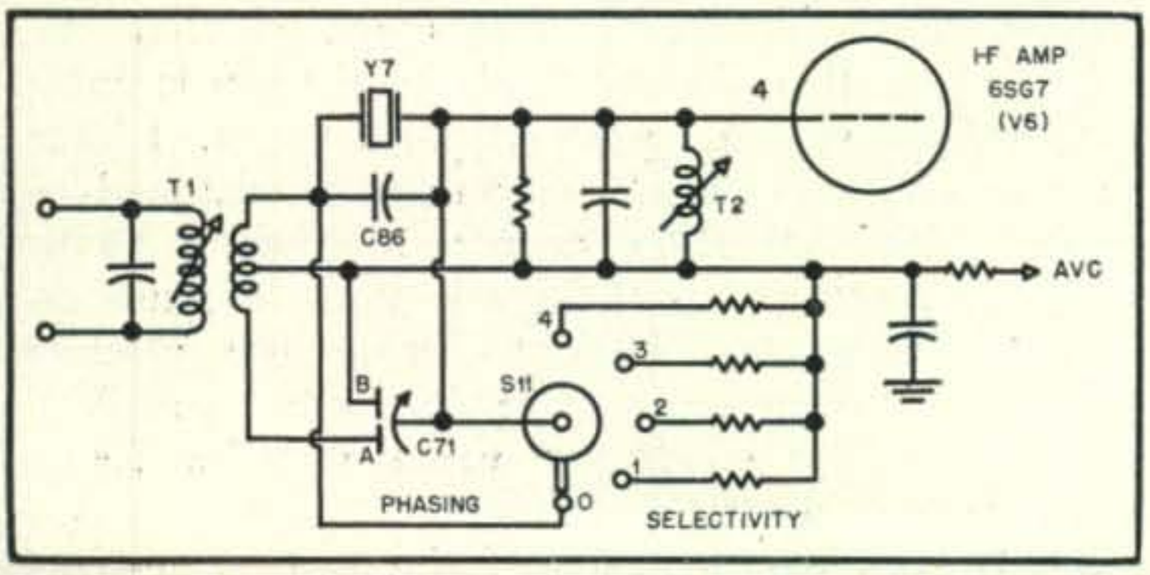

Fig. 2. Crystal filter circuit in Collins 75A receiver.

Versatile Single-Sideband Exciter

DONALD E. NORGAARD, W2KUJ*

PART II -- With a month's head start on building the exciter, you should be about ready to put it on the air. Here are detailed instructions on its adjustment and operation.

CONTINUING the description of the versatile single-sideband exciter, the following adjustment procedure should be followed carefully, unless the alignment of circuits such as the ones used in this exciter is a technique that you have really mastered. The steps given should prove easy to follow and will assure correct operation of the exciter unless something is incorrectly wired or assembled.

The first step in the alignment of the exciter is to adjust the audio phase-shift networks. An audio oscillator capable of output over a frequency range from 35 cps to 11,000 cps and an oscilloscope having separate horizontal and vertical deflection amplifiers is required for the job. The waveform and calibration of the oscillator must be quite good. It would be a good idea to check the calibration of the oscillator over its entire range (using WWV's 440-cps tone as a standard) if there is *any* doubt about the calibration.

Apply power to the exciter and remove the 6AK6 oscillator tube (V_1). Set the gain equalizer at its halfway point and couple the audio oscillator by means of a 1-μf condenser to point *A* of *Fig. 3*. The speech amplifier tube V_9 may be removed from its socket temporarily. Ground the other audio oscillator lead or terminal to the chassis of the exciter and adjust the signal level to about 2 volts, peak-to-peak as measured with the oscilloscope. Set the oscillator frequency to 10,840 cps within 1% or better and connect the horizontal and vertical input terminals of the 'scope to point *B* with separate leads. Adjust the gain controls on the oscilloscope to obtain about one inch deflection along each axis. If the oscilloscope has negligible internal phase shift, a straight line of approximately 45° slope will be observed. If the 'scope has internal phase shift (most of them do, depending on the settings of the gain controls) the display will be a narrow slanting ellipse. This may be corrected by inserting an adjustable 50,000-ohm resistor in series with one of the deflection amplifiers at the input terminal and adjusting it so that a single line is seen. If no setting of the compensating control permits closure of the ellipse put the control at the other 'scope terminal and adjust it for a single line. Generally speaking, the compensation will have to be checked whenever the frequency is changed or the setting of either 'scope gain control is changed.

Now shift one of the input leads to point *C* and adjust C_{155} so that either a circle or an ellipse with axis parallel to the deflection axis of the 'scope appears. Adjust one of the gain controls on the 'scope for equal horizontal and vertical deflection (about one inch total) and check the compensation as described earlier. Then go back to point "C" and set C_{155} *very carefully* to get a *perfect* circle of about one inch diameter. Look directly at the face of the 'scope when doing this to eliminate errors caused by an oblique viewing angle. The waveform of the oscillator output must be very nearly perfect in order to get a perfect circle. If it is not, some sort of a filter may be used to improve the waveform, or a better oscillator is needed. "Egg shaped" circles are caused by harmonic distortion either in the oscillator output, the phase-shifter coupling tubes (due to operation at too high level) or in the oscilloscope amplifiers themselves. It does not pay to compromise at this point in the adjustment procedure, since correct phase-shifter alignment is necessary to assure really good single-sideband performance.

The alignment of the other stages of the phase-shift networks is accomplished in the same manner just described, using frequencies listed in the phase-shifter alignment chart (*Table II*) and observing the circle with the scope connected between the points indicated. Always check oscilloscope phase shift at the test frequency and gain control settings used. At low frequencies it may be necessary to put a condenser in series with one of the 'scope leads for phase compensation. Values from about 0.01 to 0.1 μf generally will do the job. The adjustment procedure for the phase-shift stage which incorporates the variable resistor is the same as that for the others. The only difference is that the resistor is adjusted to obtain the circular display. If everything goes well, each of the six stages will allow a perfect circle to be seen on the scope at the test frequency. If difficulty is experienced with some of the stages (and the test procedure is correct) this means that the *RC* product that is required in that particular stage is not within range of adjustment. Either the resistor or the condenser may be changed to a value that will allow correct alignment. Ordinarily, it is easier to make up parallel combinations of mica condensers to bring the product into a range where correct settings can be made—and usually the condenser value will be found to have been wrong.

The overall performance of the two phase-shift

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*Research Laboratory, General Electric Co., Schenectady, N. Y.

networks may be checked by connecting the vertical 'scope input to the point *Z* and the horizontal input to the point *H* and applying frequencies from 70 cps to 5500 cps to point *A* from the oscillator. If the oscilloscope is compensated for zero net internal phase shift over this range a circle of constant diameter (with a slight wobble as the frequency is changed) will be seen at all frequencies. This wobble corresponds to phase variations of plus or minus one degree from 90 degrees, and is one step in assuring at least 40 decibels sideband suppression. The alignment, once completed, need never be done again unless some component changes value. Tube replacements will not affect alignment.

R-F System Alignment

Next, the alignment of the r-f system is in order. A vacuum tube voltmeter or a crystal (such as the 1N21 diode) r-f indicating device and an oscilloscope are needed. Plug in the 6AK6 oscillator tube, couple the primary of T_1 to its secondary (T_{1b}) as lightly as possible and tune the primary circuit for maximum as observed by maximum r-f signal at point *X* of *Fig. 3*. (Caution—there is d.c. at this point—use a 0.001 μf coupling condenser to the voltmeter). Be certain that this maximum occurs at some point within the range of the tuning condenser, preferably near 90 $\mu\mu$f or so. This assures that the primary is resonated. If resonance cannot be obtained, the coil should be altered to permit this condition. Next, tune the secondary of T_1 after first making certain that the coupling is as loose as possible. (Replace the shield.) Measure the r-f voltage at point *Y*, and then check that at point *X*. Now adjust the coupling so that the voltage at *Y* is within 10% of that at *X* when the secondary is in resonance and the shields are in place. (The voltage at *X* will drop as that at *Y* increases, so several easy steps are indicated to avoid overcoupling which will add confusion aplenty.) Of course, if resonance cannot be reached on the secondary, the coil must be changed to reach resonance near (but not at) full capacity of the tuning condenser C_{113}. The r-f voltage at each of the points *X*, *X'* and *Y*, *Y'* should be approximately equal and about 0.5 to 0.75 volts rms. If the voltage is over about 0.8 volts reduce the screen voltage on V_1 by using a higher screen dropping resistor (R_{102}), or, conversely, increase the screen voltage if the signal level at these points is too low. The activity of the crystal determines the correct adjustment of the screen dropping resistor, so it is difficult to be specific about the correct value of screen voltage in writing about it.

Adjust the coupling between primary and secondary windings of T_2, T_3, and T_4 to be as loose as possible. Connect the oscilloscope to grid No. 3 of V_7 direct to the deflection plates for r-f observation. Any sweep frequency will do. Advance the carrier level control to full on position (zero bias) and tune the primary of T_2 for maximum deflection. Make certain the primary is resonated and not just at one limit of its adjustment range. The additional capacity of the shielded plate lead in this circuit may require that the coil be altered so that resonance is possible. Remove the 'scope connection from V_7 and supply 9.0875-mc signal from the v.f.o. at about 5 volts rms across the 50-ohm load resistor R_{131}. Do not burn out this resistor with too much signal! Advance the r-f gain control to full on and tune the primary of T_3 to resonance at either the 3.825-mc fre-

TABLE II

Adjustment Schedule for Phase - Shift Networks

Apply test signal to point A, *Fig. 3*, at 2 volts peak-to-peak (see text).

Test tone frequency in c.p.s.	Connect vert. to	'Scope horiz. to	'Scope pattern	Adjust
10,840	B	B	45° line	'Scope compensation & gain
10,840	B	C	1″ diam. circle	C_{155}
140	C	C	45° line	'Scope compensation & gain
140	C	D	1″ diam. circle	C_{157}
997	D	D	45° line	'Scope compensation & gain
997	D	Z	1″ diam. circle	C_{158}
2710	E	E	45° line	'Scope compensation & gain
2710	E	F	1″ diam. circle	C_{161}
35	F	F	45° line	'Scope compensation & gain
35	F	G	1″ diam. circle	R_{185}
382	G	G	45° line	'Scope compensation & gain
382	G	H	1″ diam. circle	C_{164}
70 to 5500*	Z	H	1″ diam. circle	Test frequency

*Over-all check if oscilloscope is compensated between 70 c.p.s. and 5500 c.p.s.

quency or the 14.25-mc frequency, whichever band is chosen for the design of the coils for T_3 and T_4. A wire from the antenna post of a receiver tuned to the correct frequency brought to a point about ¼" from the plate lead of V_7 will enable determination of resonance. Next, tune the secondary of T_2 for maximum signal, backing off the r-f gain control R_{135} as needed to get a suitable indication.

Now connect the oscilloscope to the plate circuit of the output stage (the inductive coupling loop might give enough signal to be seen at this time) and tune the tank condenser for maximum indication. Set the r-f gain control to maximum. If the signal is too small to be seen on the 'scope use the receiver as an indicator until subsequent tuning provides enough signal to permit use of the 'scope. Next, resonate the primary of T_4 and then the secondary of T_3. Avoid operation at too high a level (this masks the tuning if an amplifier is saturated) by keeping the output reasonably below the maximum obtainable. Use the r-f gain control in the same manner as the manual gain control of a receiver for this purpose.

Preliminary Modulator Balance

Assuming that enough signal is available for operation of the oscilloscope at about one inch or more deflection, things are ready for a preliminary modulator balance. As a starting point, set the two APC-25 trimmers (C_{116} and C_{121}) to approximately half mesh (about 15 $\mu\mu$f). Leave the oscilloscope connected to read the output signal. Turn the carrier control to its full off position and set the PM-AM-SSB switch (S_2) to PM and adjust modulator balance control No. 1 (R_{118}) for minimum deflection on the oscilloscope. Next adjust C_{121} for further reduction of the signal level, then go back to R_{118}, reducing the signal still further. Continue this process until the output signal really is balanced out. It will be noticed that the sharpness of adjustment increases as each control approaches its correct setting. Switch to AM and balance modulator No. 2 in the same way, using, of course, C_{116} and R_{111} for this. If the job of shielding the leads to the four modulator tubes and the carrier tube is really good, switching to the SSB position should not disturb the balance, except momentarily. Small amounts of total unbalance observed in the SSB position of S_2 can be compensated by alternate "touching up" of R_{111} and R_{118}, but do not attempt to balance out fairly great amounts of stray feed-through that is caused by inadequate shielding.

With S_2 in the SSB position apply a 1000-cycle test tone to the audio system (to J_1, for example, after replacing V_9) and adjust the level so that the output as seen on the scope is of usable magnitude but definitely below overload. Probably some envelope will be seen. Adjust the gain balance control R_{176} for minimum envelope, and then reduce the envelope still more by careful setting of the r-f phase adjustment C_{113}. Go back to R_{176} and minimize the ripple, then tune C_{113} for further reduction, *etc.*, just the same sort of process as balancing the modulators. The idea is to balance out the *ripple* in this case. What is actually happening is that you are balancing out a sideband, or, at least trying to. If the minimum obtainable ripple is still visible (and especially if C_{113} was turned very far) check individual modulator balances again, recheck the composite modulator balance in the SSB position and then repeat the sideband balance procedure.

If it is found that the balancing adjustment (R_{176} and C_{113}) does not really take out all the ripple, the difficulty may be caused by distortion in the test signal (the 1000-cps tone). If the signal generator is known to have extremely good waveform, the distortion is somewhere in the exciter. Try advancing the a-f gain control (R_{154}) to full on and reducing the oscillator output. If this makes no appreciable difference, it is possible that the signal level supplied to the modulators is too high. Signal voltage on each No. 3 grid of the modulators should be no greater than 0.75 volts rms for low distortion. Don't spend too much time trying to improve the sideband balance at this preliminary stage of adjustment—the trouble may be remedied after the procedure recommended under "initial operating adjustments" is followed.

It will be found that the modulator balance will be maintained quite well over long periods unless one or more of the modulator tubes is pretty much of a "dud." Replacement of any of the five "grouped" tubes should be followed by a re-examination of balance settings both phase (C_{116} and C_{121}) and amplitude (R_{111} and R_{118}), and then the sideband balance, principally the gain equalizer R_{176}.

Bandpass Coupling Adjustment

The coupling between the windings of T_2, T_3, and T_4 should next be investigated. Set the carrier level control so that a definite correlation is noticed in the r-f output as seen on the oscilloscope monitoring the 807 output signal. The audio tone should be removed from J_1. It would be well to check the tuning of T_2, T_3, and T_4 for maximum response when the v.f.o. is set so that the out-

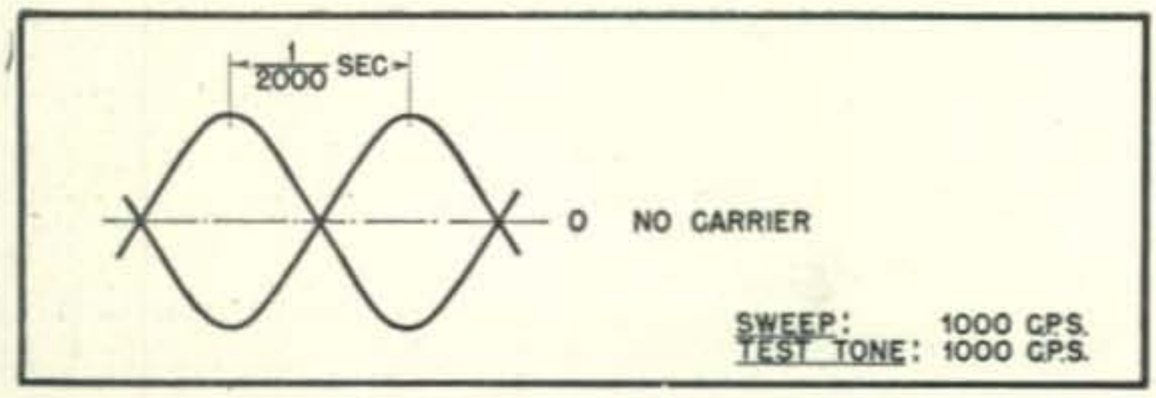


Fig. 6. Pattern for two 1000 cps sidebands with zero carrier. Addition of AM carrier will result in Fig. 8. Addition of PM carrier will result in Fig. 9.

put frequency is in the center of the band (either 3.825 mc or 14.25 mc). Remove the shield from T_2 and increase the coupling between primary and secondary until the output fails to increase with increased coupling. This should be done in several steps with the shield can *in place* when checking. Make certain that the output level responds to reduction of the carrier level control to avoid overload. Again check the tuning of both primary and secondary of T_2, in that order. Now tune the primary of T_3, then secondary with loose coupling between windings. Increase the coupling in several steps as described for T_2 until the output fails to respond to increased coupling, making certain to avoid overload. Again, the shield can must be in place when checking levels. Repeat this process for T_4 with the v-f-o setting as before. If this procedure is followed correctly, the v.f.o may be varied now from one edge of the band to the other with negligible change in the output of the 807 stage if only its plate tuning (front panel control) is set for optimum at any chosen frequency. Transformers T_3 and T_4 have been adjusted for broad-band operation and need never be tuned again if the band limits are not changed. Cement the coils in place once you are certain that the windings of each transformer are coupled correctly.

Correct Loading

About now one can load the exciter either with a dummy antenna or with a following power stage. Correct loading is necessary whether working into an antenna, a dummy load, or a succeeding stage. Adjustment for this condition depends on the voltage of the power supply used, so that correct loading for 350 volts is *not* correct for 600 volts (and vice-versa). Do not use an incandescent lamp load. The resistance of such a load changes widely, so that in general it is never right.

Let's assume that the 350-volt internal power supply is to be used for the 807 stage which works into a dummy load. Take the carrier "out" and set S_2 to the PM position. Apply a 1000-cps test tone to J_1. Turn the r-f gain control full on and advance the gain control R_{154} until the pattern (which should look like *Fig. 6*) at low levels begins to flatten out on peaks. Adjust the loading (coupling to the load) until the r-f voltage as seen on the 'scope across the load is maximum at an excitation just below the overload point when the plate tuning is optimum. Now advance the a-f gain control a little (to produce overload) and detune the plate of the 807 slightly—toward higher capacity. If the overload becomes less, the load should be coupled tighter (or whatever adjustment made that *reduces* the effective resistance into which the 807 works). The unqualified ideal loading is that point of adjustment where a slight detuning just starts to improve the overload but does not cure all of it. This indicates that both the driving signal and the output circuit overload simultaneously. In practice, however, the plate should overload first as the excitation is increased, since this indicates the maximum peak power that can be obtained with a given plate supply voltage and a given input circuit.

If a higher plate voltage is used, the loading procedure is the same, but the correct load will be different. The load resistance into which the tube itself should work (the reflected load) will be higher, and, of course, the power output will be greater by a factor of a little more than two for doubling the plate supply voltage.

In any case the maximum peak level at which the output stage can be operated is that level just below the overload point. Do not ever try to exceed this level under any condition (except possibly with PM, see "operation") since high distortion will result. A little time spent in determining the overload point and in getting the most power output without distortion is a necessary step in assuring a beautifully clean signal. The procedure outlined above assures maximum peak power output power, which, fortunately, coincides with the point of low distortion. Any attempt to get greater output by increasing excitation or changing loading will result only in lower output or a distorted signal.

When the exciter is used to drive a higher-powered amplifier stage several precautions and changes are necessary. First of all, correct results will be obtained only when the driven stage is matched into the driver (and of course the driver is matched into the driven stage). The method most generally used requires dissipation of half of the output power of the exciter into a non-inductive resistor (the "swamping" resistor) directly across the 807 plate tank. The value of this resistor is plotted as a function of the plate supply voltage in *Fig. 7*. A similar sort of load-

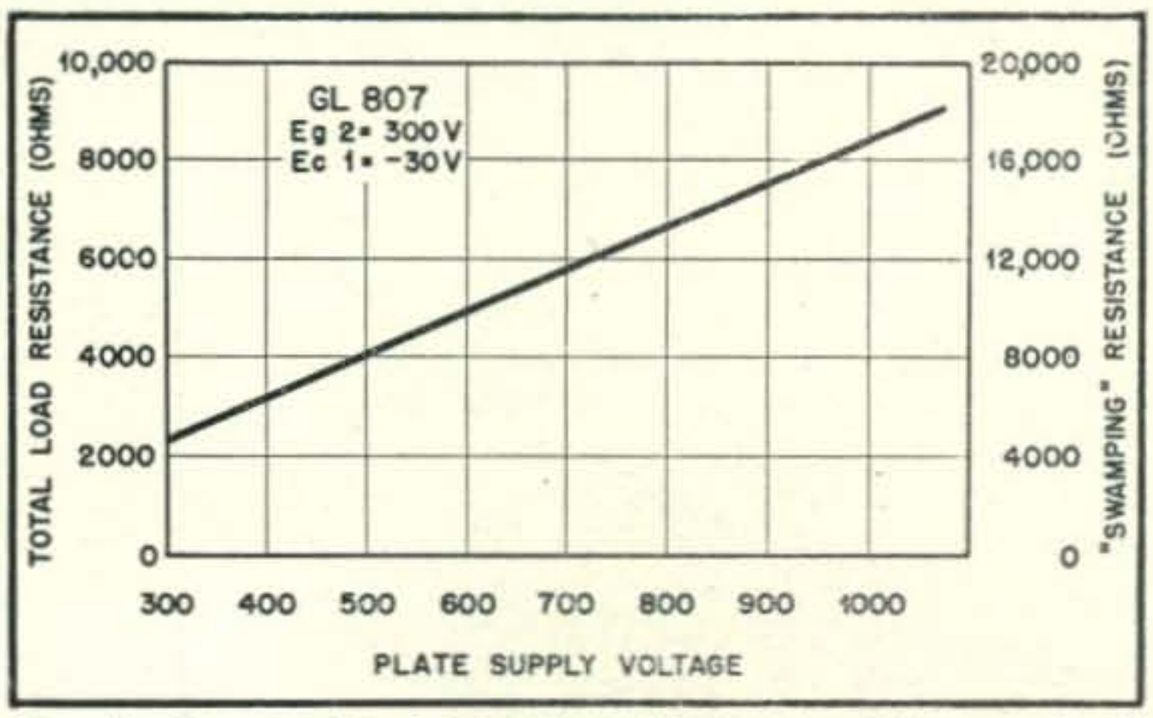


Fig. 7. Curve of total load resistance and "swamping" resistance for plate tank when driven stage reflects similar resistance.

ing is required on the input tank of the driven stage, assuming that it has the same *LC* ratio as the plate tank of the exciter. This then provides the correct total load resistance for the output stage. In any case, the idea os dissipate one-half of the output power in the "swamping" resistor on the plate tank circuit of the exciter and an equivalent amount in the input circuit of the driven stage. It is beyond the scope of this article to cover this subject thoroughly, but a few words of caution in this matter are distinctly in order:

1. When the exciter is used to feed an antenna or dummy load its entire output can be delivered to the antenna circuit. The "swamping" resistor across the plate tank circuit should be disconnected when the exciter is used in this manner.

2. When driving an amplifier the recommended plate tank loading must be used, and so must an equivalent loading on the input circuit of the driven stage. In the case that these circuits are common, the same statement holds true.

3. Class A, AB_1, AB_2, or Class B operation is essential for the driven amplifier. It may be push-pull or single-ended. The coupling to the driven amplifier must be adjusted so that the exciter is properly loaded. The method for checking this has already been explained. A really low impedance bias supply is required if grid current flows on signal peaks. Parasitic oscillations must be eliminated.

4. The output stage of the transmitter must be loaded by the antenna in exactly the same manner as described for the exciter. No "swamping" resistor is needed.

Failure to observe these simple precautions will undermine much of the really fine performance of which the exciter itself is fundamentally capable. Be sure you understand "why" and "how" before you plunge. If the amplifier stages are not properly loaded and driven, both power output capacity and signal quality will be impaired. Fortunately, checking for correct loading is a simple job.

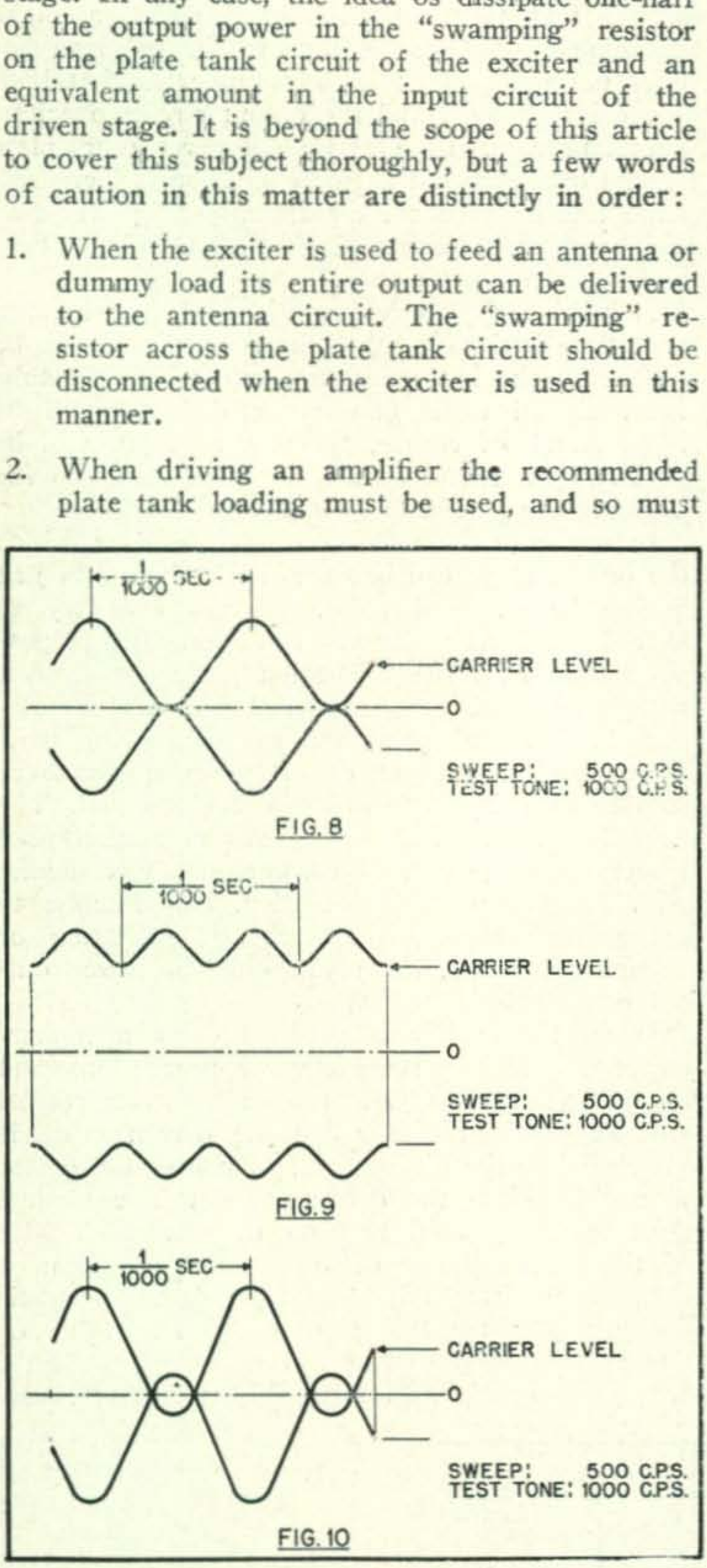
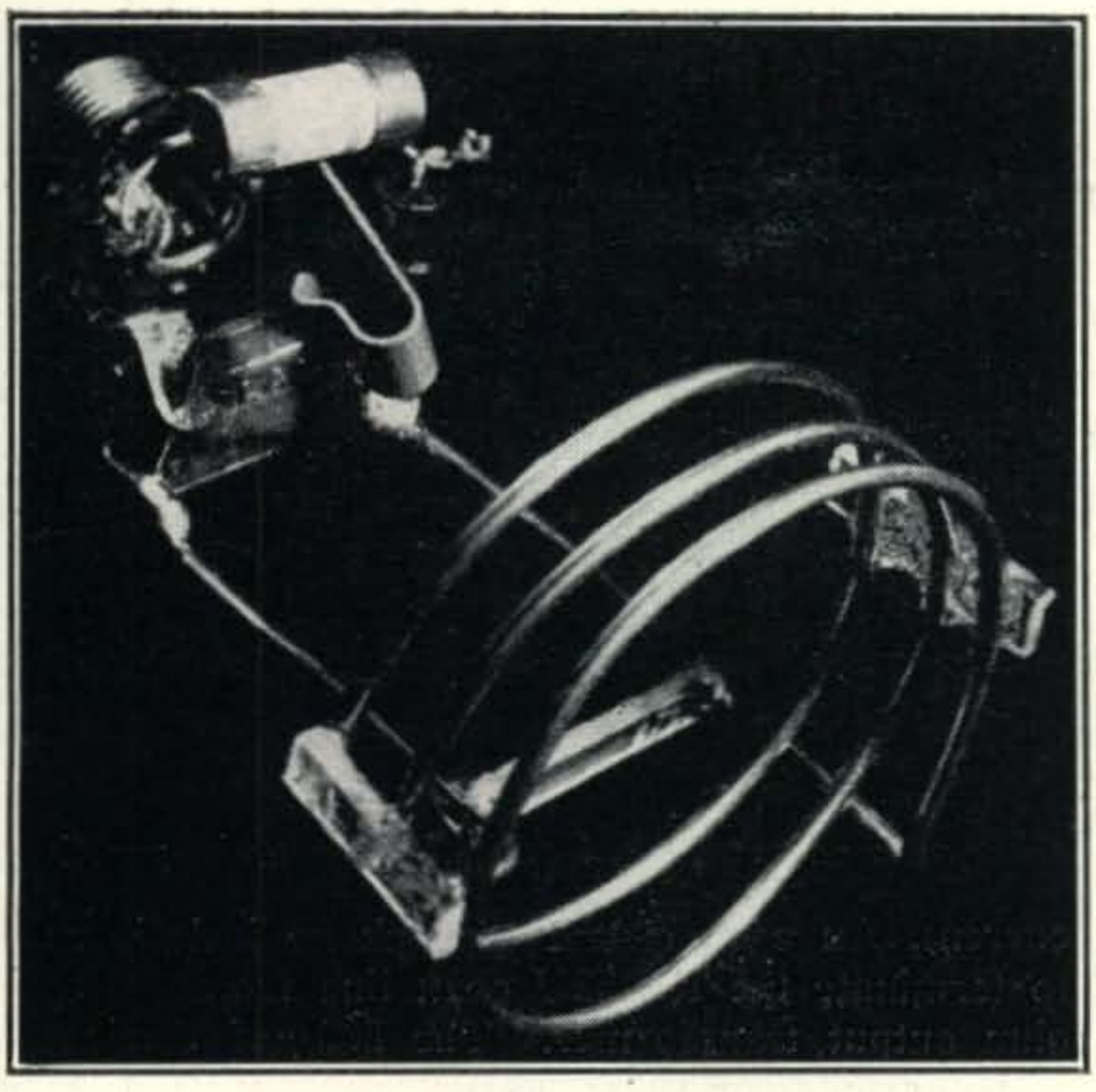


Fig. 8. Pattern for 100% amplitude modulation. Decreasing carrier or increasing modulation will result in Fig. 10. Fig. 9. Phase modulation of 0.785 radians modulation index. This pattern corresponds to 100% amplitude modulation in sideband power, carrier power, and frequency spectrum occupied. Class "C" operation of following stage (s) will remove "upward" modulation and produce second-order sidebands at the expense of greater spectrum. Fig. 10. Example of 150% modulation. As long as peaks do not limit, this signal produces NO SPLATTER. Conventional receiver will reproduce positive half of envelope in its output. Single-sideband receiver produces no distortion on this signal.

Initial Adjustment for Operation

Before trying a QSO with the exciter it is advisable to check signal levels at the modulators. Apply a 1000-cycle tone to the microphone input (J_1) and read signal voltage with a vacuum-tube voltmeter, an oscilloscope, or a rectifier type of a-c voltmeter connected between point *Z* and the chassis. Since there is d.c. at point *Z* put a 1-μf condenser in series with the measuring instrument. Set the signal to read somewhere between 0.5 and 0.75 volts rms. Remove the voltmeter connections and set S_2 to PM, check the modulator balance with the carrier control set for zero carrier. Now check the output of the correctly loaded 807 output stage with an oscilloscope, setting the r-f gain control so that the peaks reach a value just under the overload point. Leave the r-f gain control at this position and replace the 1000-cps tone generator with the microphone you are going to use. Conduct a "talk test," setting the a-f gain control so that the speech peaks fall just below the overload point determined by the tone test. When the exciter is used to feed an antenna directly, the overload point represents the maximum possible peak output level from the exciter. When used as a driver for an amplifier, the output stage of the transmitter should reach its overload point at an exciter output level lower than its maximum capacity. Adjust the r-f gain control (in this case with a tone applied) to a point just below the amplifier overload point when the test tone read at point *Z* is between 0.5 and 0.75 volts rms. Then adjust the a-f gain control so that speech peaks fall just below the permissible peak output when the microphone is used as you normally operate. *Never try to exceed this maximum peak output.* The signal quality will suffer if this is attempted, and the peak output *will not* be greater.

(*Continued on page 76*)



Heart of the mechanical FM system is the inductive reactor.

AN INDUCTIVE REACTOR

LAWRENCE R. WALSH, W5SMA*

There is no simpler way to work phone than with mechanical FM.

WHEN narrow-band FM was authorized for use on 20 and 75 meters, harassed by broadcast interference I was ready to try anything to establish peace with the neighbors. Having a pre-war model Meissner Signal Shifter as my exciter, I started with a fairly stable v.f.o. After trying a reactance tube and plate resistance variation method, I decided that neither method gave me exactly what I wanted.

The reactance tube changed the calibration of the v.f.o. and, frankly, the results were not exactly "narrow." The plate resistance variation method also changed the frequency—especially when changing to c-w operation. The net result was unsatisfactory until I began to remember the old days when we coupled a carbon mike around the oscillator coil and obtained a sometimes readable, most of the time unreadable, signal.

In order to obtain a good, stable, clean signal, adapting the original method of FM, the speech amplifier was designed to cutoff at 200 cycles on the low side and at 2000 cycles on the high side. The audio amplifier output is coupled by means of a 500-ohm output transformer to an "inductive reactor." The result is a clean, stable signal with very little change in the v-f-o calibration if coupled to the grid coil, and no calibration change at all if coupled to the plate coil of the oscillator. Also, upon changing over to c.w., the modulator has no effect and only the mike gain need be turned down to avoid any "stray" modulation when keying.

*3119D "F" St., Los Alamos, N. Mexico.

The Speech Amplifier

As mentioned before, the response of the speech

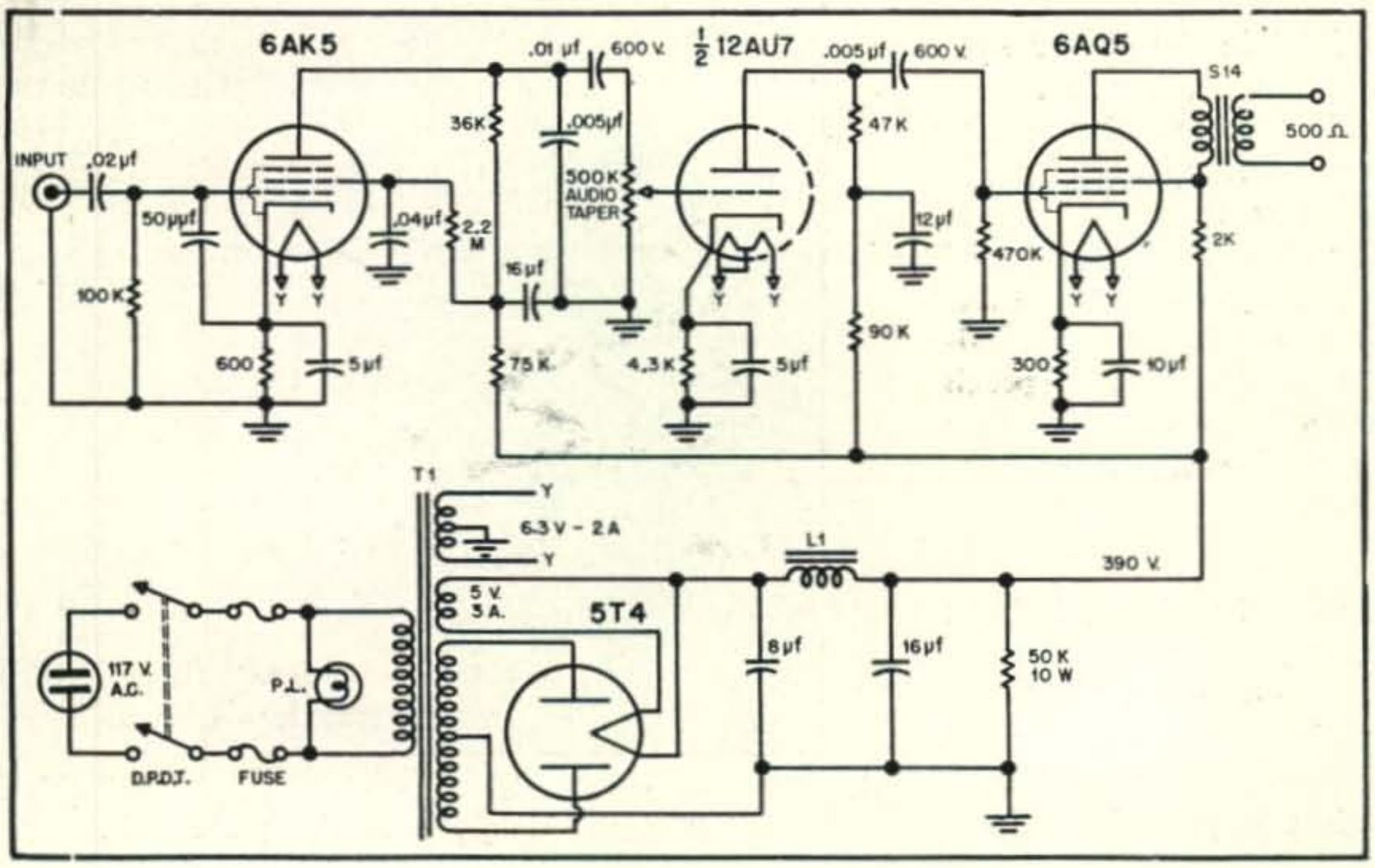


Fig. 1. Circuit diagram of the speech amplifier.

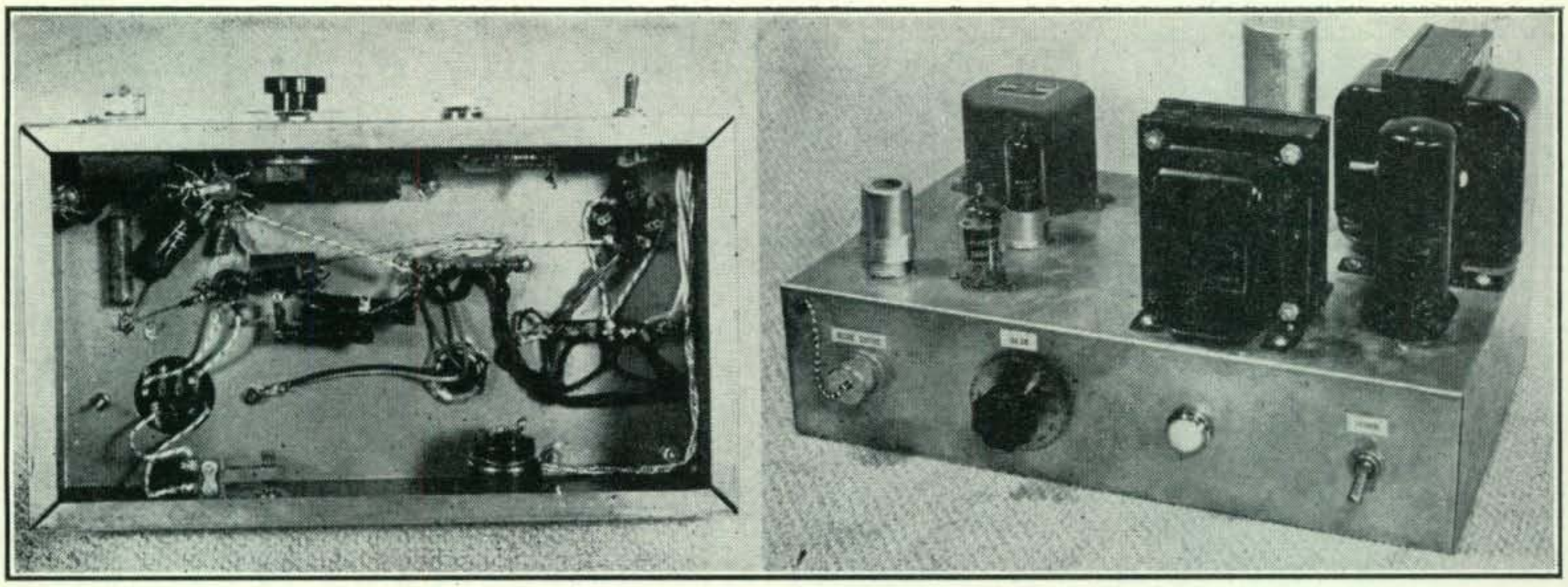


Fig. 2. The speech amplifier with a pass band of 200-2000 cps, is conventional in appearance and operation.

amplifier was limited to the audio band required for voice intelligence. The pass band chosen was 200 cycles to 2000 cycles. In order to obtain the low frequency cut off the screen by-pass condenser on the input stage was made one-half the usual size, the cathode by-pass condenser was made smaller than usual, and the coupling condensers and grid resistors were made smaller. These condensers have the purpose of reducing the low frequency response of the amplifier. Although not absolutely necessary, use of a decoupling resistor and condenser in the plate supply leads of the 6AK5 and 6C4 is strongly advised.

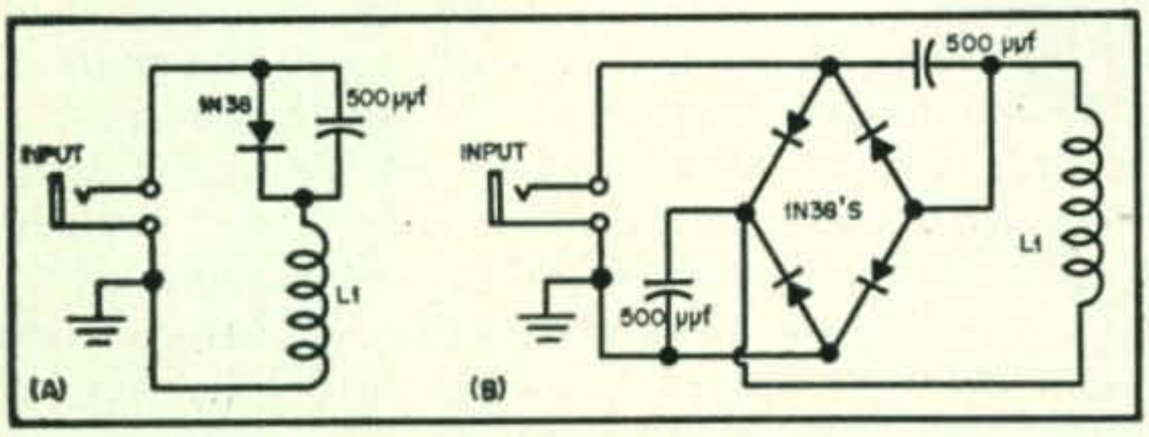


Fig. 3. Two models of successful inductive reactors.

The power supply requirement for this amplifier is 300 volts at 50 ma. The supply shown in *Fig. 1* is somewhat larger, but only because it happened to be available. The value of *L1* in the power supply can be anything greater than six henries.

In case the miniature tubes indicated are not available, a 6SJ7, 6J5 and 6V6 line-up would work equally well with the values shown.

Incidentally, this particular speech amplifier need not be built for the narrow-band frequency modulation scheme to be described. By inserting a 500-ohm output transformer in your present speech amplifier and a DPDT switch, you can change from amplitude modulation to frequency modulation at the flick of the switch.

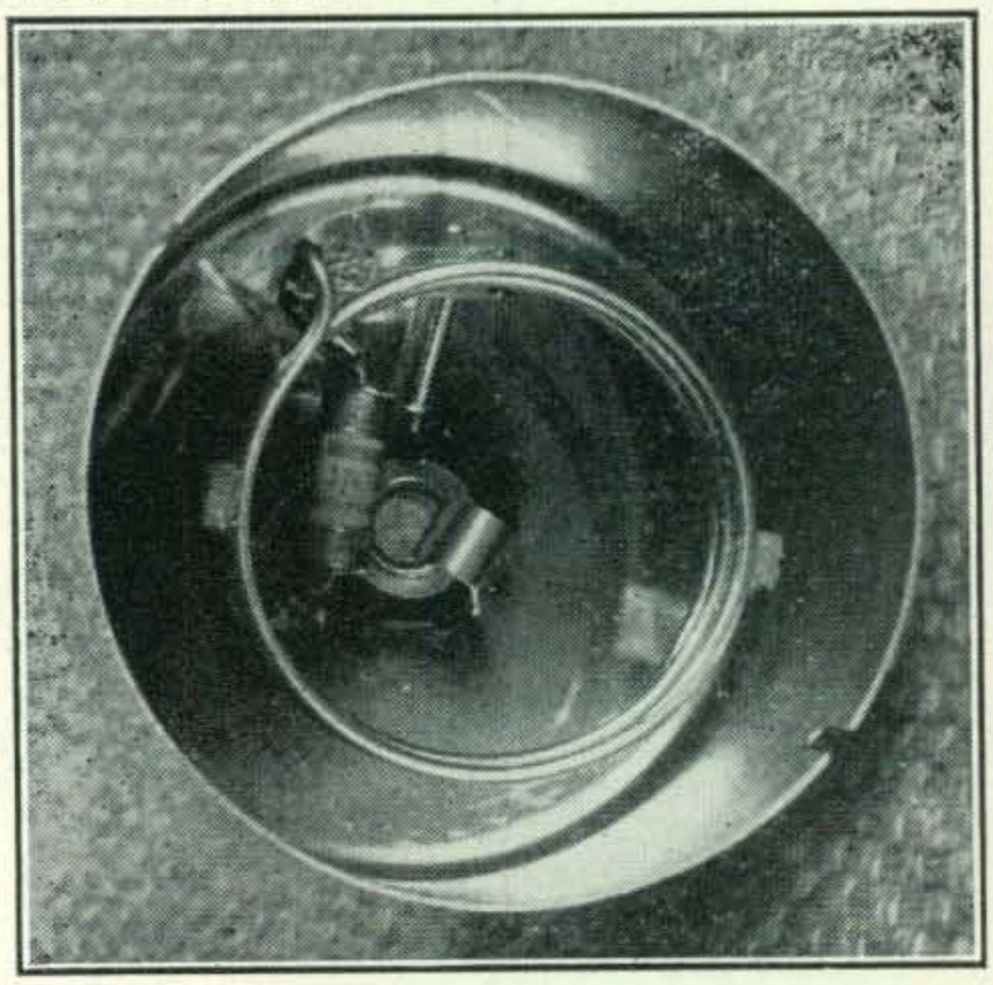
The Inductive Reactor

This is the real heart of the scheme and is built into one of the shield cans of the signal shifter.

Figure 3A shows the first type used. The idea is simply that a pulsating direct current coupled to a reactance coil causes this reactance to change in value in accordance with the pulsating direct current. An open circuit type phone jack is used to terminate the RG-52U coax line from the 500-ohm output transformer.[1] The 500-$\mu\mu$f condenser is not critical in value, as its only function is to prevent rectification of any r.f. picked up by the coupling loop. This was the easy solution to a nasty problem. It was noticed when the unit was first put on the air that when the receiver was adjusted to the very sharp crystal position, a large amount of distortion appeared. It was found that this was due to r.f. being picked up by the coupling loop and then rectified by the 1N38, thereby changing the frequency of the oscillator. As can be seen in the pictures, a small inductance choke was tried. However, this choke had more inductance than the coupling loop with the result that very little modulation was produced. It worked if the gain on the amplifier was advanced far enough. However, bypassing the 1N38 accomplished the job and allowed the amplifier gain control to be just barely open.

(*Continued on page 77*)

[1]The coupling loop (LI) is made of No. 14 or No. 16 wire, 1½" I.D. and 2¾ turns. The I.D. is the only critical dimensions, since it just fits over the Signal Shifter coils. The coupling loop is mounted so that it is coupled to the bottom or cold (r-f) end of the Signal Shifter coil.



The inductive reactor is mounted inside the coil shield can and fits snugly over the plate coil.

V. H. F. – Horizontal vs. Vertical

OLIVER P. FERRELL*

To our knowledge, this is the first time the v-h-f polarization question has been viewed on the basis of careful scientific study. This report is actually an abstract of a full-length article now under preparation. Until every possible war-time research report can be studied, CQ Magazine does not endorse the use of one or the other polarizations on the v-h-f bands.

THE PROGRESS OF AMATEUR RADIO in the v-h-f bands has been seriously impeded, both before and after the war, by the arguments pro and con, horizontal vs vertical polarization. Propaganda emanating from proponents of both sides so far has been lacking in any show of scientific evidence. This, surprisingly enough, contrasts sharply with the immense quantity of research work done in this field within the past eight to nine years.

Recently, a number of research reports [1-13] were examined in order to shed a little experimental, as well as theoretical, light on this problem. In general terms the findings are summarized below:

1. From 30 to 300 mc over a fairly uniform earth (4/3 radius) there is little, if any, difference in the propagation of horizontally polarized waves across either good or poor soil.**
2. From 30 to 300 mc over a fairly uniform earth (4/3 radius) there is a difference in the field strength of vertically polarized waves across poor and good soils**. At 150 mc and 40 miles, the difference is theoretically shown to be about 10 db in favor of the good soil.
3. From 30 to 300 mc over a fairly uniform earth (4/3 radius) there is theoretically a small difference of 1—2 db favoring horizontal over vertical polarization when propagated across good soil. However, this has not been fully substantiated by experiment.
4. From 30 to 300 mc over a fairly uniform earth (4/3 radius) of poor soil the field strengths may differ by as much as 10 db, in favor of the horizontally polarized signal.
5. From 30 to 300 mc over a fairly uniform (4/3 radius) near the coastline, or over short or medium stretches of sea water, vertical polarization is from 16 to 30 db better than horizontal polarization.
6. The following are comparative field strength losses encountered when propagation is through moderately wooded areas.

Frequency	*Horizontal*	*Vertical*
30 mc	negligible	1 - 2 db
100 mc	1 - 2 db	5 - 10 db
200 mc	5 - 6 db	18 - 22 db
250 mc	8 - 10 db	12 - 14 db
500 mc	12 - 13 db	14 - 16 db

7. No evidence has been obtained to show that either vertical or horizontal polarization is affected to a greater extent by conditions of sub-refraction or super-refraction. However, there is evidence of slight polarization twisting, but whether this is from vertical to horizontal, or horizontal to vertical has not been determined.
8. It is generally recognized that in the v-h-f spectrum, maximum signal range transmission depends upon the frequency, power, receiver sensitivity, cosmic noise, antenna gains, height gains, average atmospheric conditions, type of soil, obstructions and polarization. It is clearly possible, that for maximum normal coverage, a change in polarization may be necessary when considering difference paths.

**Assistant Editor, CQ*

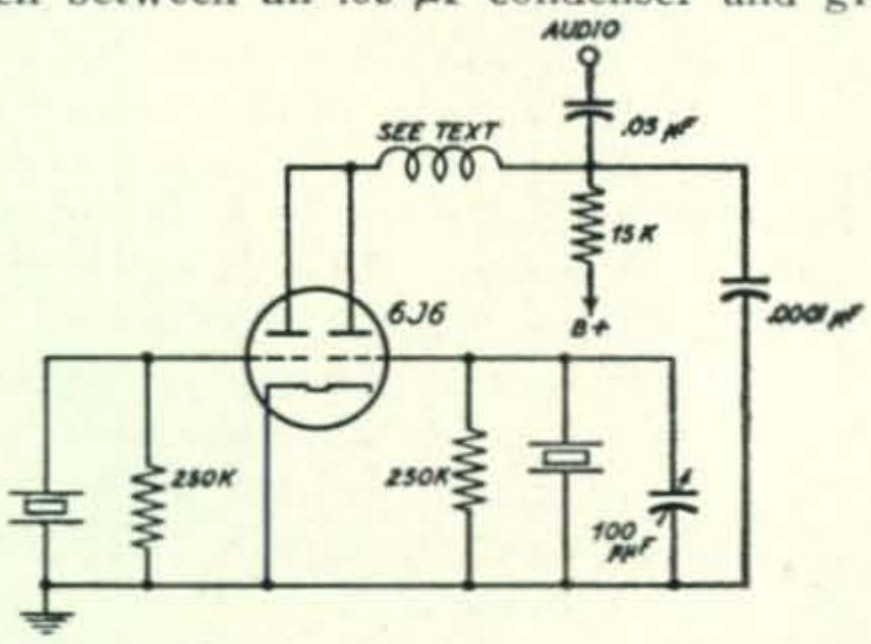
1"Propagation Curves," Report 966-6C, NDRC, Division 15, Oct., 1944.
2"Relation of Radar Range to Frequency and Polarization," J. A. Stratton and R. A. Hutner, RL-C-6, Nov. 3, 1942.
3"Notes on the Comparison of Vertical and Horizontal Polarization in Ground Wave Propagation," G. Millington, BRL-TR/442, Jan., 1940.
4"Horizontal and Vertical Polarization," T. L. Eckersley, BRL-TR/441, July, 1942.
5"Alexandria Palace Tests," T. L. Eckersley, BRL-TR/-498, Oct., 1944.
6"Vertical Polarization vs Horizontal Polarization," R. C. Loring, CESL No. T-1, Oct. 22, 1943.
7"The Investigation of Horizontally and Vertically Polarized Direction Finding on Frequencies of the Order of 20 to 70 Megacycles per Second," T. L. Eckersley, BRL-TR/451, Sept., 1942.
8"Effects of Hills and Trees as Obstructions to Radio Propagation," D. C. Ports, OSRD 3070, Final Report, Nov., 1943.
9"Propagation of Radio Waves in the Standard Atmosphere," CP Vol. No. 3, NDRC.
10"Change of Polarization as a Means of Gap Filling," R. A. Hutner, RL-C-7, 1942.
11"Properties of the Diffracted Wave Field Intensity," R. A. Hutner and E. Lyman, RL-C-8, 1943.
12"Graphs Useful in Determining Optimum Height of Jamming Antenna," H. Clark and E. F. Shaw, Harvard Univ. Radio Res. Rpt. 411-202, August, 1945.
13"Photographic Polarization Tests," G. A. Garrett and K. L. Meley, RL-93-3, 1943.

**Good soil referred to as having a high conductivity (0.02 mhos per meter) and high dielectric constant (30) such as clay, loam or an alkali soil. Poor soil refers to a low conductivity (0.001 mhos per meter) and low dielectric constant (4) such as rock, gravel or sand.

Inside the SHACK AND WORKSHOP

Crystal Controlled Audio Oscillator

This is single frequency crystal-controlled audio oscillator. The principle of operation is based upon the heterodyne created by two adjacent radio frequencies. In this circuit the actual crystal frequencies are unimportant, except that the crystals should be separated by the difference frequency corresponding to the desired audio frequency. The part values are not critical and liberal substitution from the junk box can be made. The audio output is taken between an .05-μf condenser and ground.



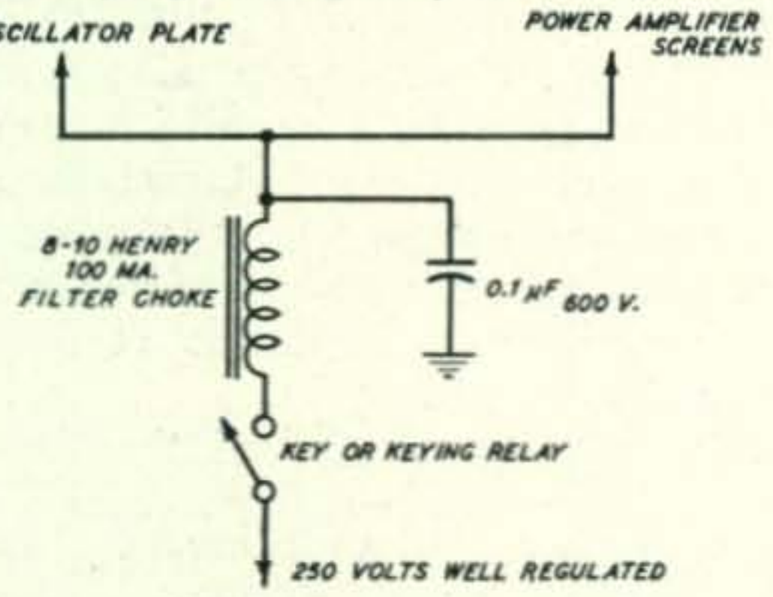
A refinement is the shunting of one crystal with a variable condenser. This will have the effect of lowering the frequency of the crystal in that particular side of the circuit. If the pitch is too high the range may be shifted by simply reversing the crystals. The value of the coil is not critical except that it should be self-resonant within a half-megacycle of the crystal frequencies.

This unit was devised to use the components in the BC-746 tuning unit.

Scoots Lipman, W2PGZ

SCR-274N Keying Filter

There seem to be thousands of different ways of keying the 274N transmitters, but judging from the number of chirpy and burpy notes on the air, a lot of them are pretty bad. Plate, cathode, or center-tap keying will give you two choices. One,



a signal with lots of chirp and no click, or two, a signal with lots of clicks and no chirp. This all depends actually on the amount and type of keying filter. We have examined these different methods using oscillographic techniques. The circuit shown was finally worked out as the best solution. Using the BC-696A we have absolutely no chirp or click on 80 meters. With the BC-459A on 40 meters there is a very slight chirp of about 10 cycles. Keying the oscillator alone is not entirely satisfactory as this will allow the final to break into parasitic oscillations.

Bill Orr, W6SAI

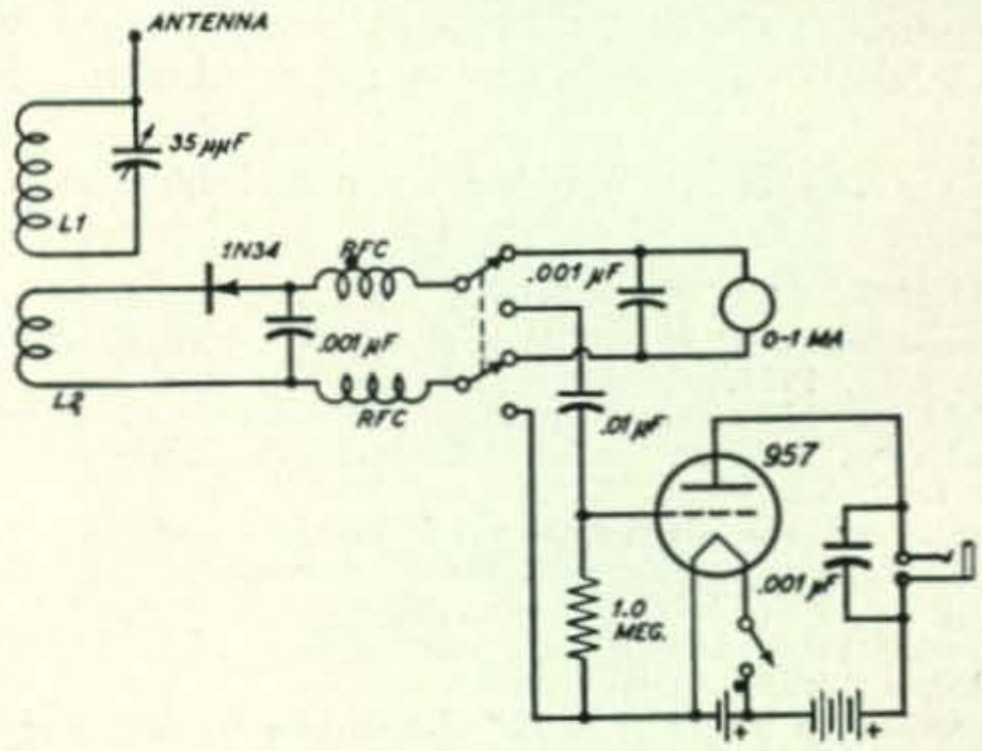
Additional BC-348-P Gain and Selectivity

The BC-348-P receiver has an i.f. of 915 kc and suffers from loss of selectivity and gain. This may be increased by using a simple home broadcast receiver as a second converter, i-f amplifier, detector and audio. Pick off the 348-P i-f voltage from the second detector by merely wrapping several turns of insulated wire around the plate pin. The other end of this wire goes to the broadcast receiver antenna post. Naturally, a broadcast receiver with two i-f stages is preferable because of the additional selectivity, but even a 5-tube a.c.-d.c. "cracker-box" will work very well. The audio output tube in the 348-P can be removed since it is no longer used.

Jack Najork, W2HNH

Combination V-H-F Monitor

This is a combined v-h-f monitor, frequency meter and field-strength meter. Plug-in coils are used and the unit which can be made quite small



and compact can be built into any small portable chassis. The DPDT switch controls the purpose of the monitor. In one position it reads field strength as rectified by the 1N34 crystal. In the other position it is a monitor using a battery acorn 957 tube as an audio amplifier. The dial may be calibrated and the unit used to approximate frequency. The coils are wound as follows:

*L*1—10 meters: 10 turns #18 enamel, ¾" dia.—1¼" long.
6 meters: 6 turns #18 enamel, ½" dia.—1" long.
2 meters: 3 turns #16 enamel, ¼" dia.—¾" long.
1½ meters: 2 turns #16 enamel, ¼" dia.—½" long.
¾ meter: 1 turn #16 enamel, ¼" dia.
*L*2—2 turns #16 enamel, ¼" dia.—¼" long at cold end of *L*1.

Leonard J. D'Airo

Monthly DX Predictions - April

OLIVER PERRY FERRELL*

THE METHODS DESCRIBED in National Bureau of Standards Circular 462 ("Ionospheric Radio Propagation")[1] making use of the CRPL-D series ("Basic Radio Propagation Predictions Three Months in Advance")[1] permits a fairly accurate estimate of radio transmitting conditions to be predicted in advance. Also of special interest to the radio amateur are the modifications outlined in an article in the November, 1948, issue of *CQ*.[2] Using the methods described in this latter text the following prediction was prepared based on these parameters:

A. 1000 watts effective radiated power.
B. Antenna gain factor is 1.
C. Noise discrimination factor is 1.
D. Service gain factor c.w.-to-phone is 14 db.
E. Receiving location free of man-made noise and interference.
F. Transmission entirely over the direct or shortest route.

West Coast to Middle East

40 meters: Path is now 24 hours in daylight and as a consequence suffers high normal plus auroral absorption rate. Possibly a few very weak signals around 1800 hours PST, but certainly not dependable. *20 meters*: Band builds up under the noise and absorption levels with *their* signals becoming audible after 1400 PST. C.W. until after 1730 PST when phones become readable in both directions. Band drops down after 2030 PST. Last c.w. around 2300 PST. *10 meters*: No opening predictable. MUF probably not greater than 24 mc.

West Coast to Europe

40 meters: Although path is largely in daylight, expect some signals on ionospherically quiet days between 1815 and 2130 PST. Peak around 1930 PST. Noise level on this end is high, so they may hear W6-W7 without managing to break through the noise themselves. *20 meters*: Band builds up after 1315 PST, but may die out before phones can be readable. Peak between 1430 and 1515 PST. Closes down suddenly. *10 meters*: No openings predictable. MUF probably not greater than 25 mc.

West Coast to South Africa

40 meters: It will be a close race between atmospheric noise and signal strengths. However, if you can take the noise, look particularly from 1815 to 2045 PST. *20 meters*: Extensive good opening. C.W. becomes readable after 1400 PST. Phones after 1700 PST with good strengths. Band closes slowly after 2200 PST C.W. possibly until 2330 PST. *10 meters*: Weak signals appear just before 0700 PST. Build up between 12 and 14 db until band fades out between 1400 and 1500 PST. Good opening.

West Coast to Southeast Asia

40 meters: Fairly strong signals from 0245 to 0630 PST. Peak around 0500 PST. They will be bothered with very high noise level and may have difficulty. *20 meters*: Band slowly opens just before midnight. Weak signals at first, but band improves after 0230 PST. May be a short fadeout around 0430 to 0500 PST, but band comes back rapidly with good signals until 1000 PST. Phones best 0530 to 0730 PST. *10 meters*: Should be a regular opening from 1745 to 2015 PST with good signals.

West Coast to South America

40 meters: Good signals from 1730 to 0230 PST the following morning. *20 meters*: C.W. after 1500 PST, phones after 1645 PST. Band closes for phones and c.w. shortly after 0500 PST the following morning. *10 meters*: Band opens suddenly with good signals around 0700 PST. Signals drop down a little during midday, but build up to high levels in the afternoon. Band closes around 1545 to 1615 PST.

West Coast to Japan

40 meters: Signals become audible around 2315 PST. Peak from 0200 to 0515 PST. Band closes just before 0800 PST. *20 meters*: C.W. breaks through after 1900 PST, phone after 2100 PST. Good conditions until 1000 PST the following morning. *10 meters*: Excellent signals from 1345 to 2015 PST.

West Coast to Australasia

40 meters: Band opens between 2230 and 2330 PST. Good conditions until 0715 PST the following morning. Peak between 0330 and 0630 PST. *20 meters*: C.W. after 2000 PST and then phones after 2230 PST. Generally good conditions until about 0700 PST. Closing time will be irregular. Peak time between 0300 and 0600 PST. *10 meters*: Sudden opening around 1130 PST with very good signals. Some signal decrease during midafternoon, but signals build up about 12 db after 1800 PST. Band closes sudddenly around 2100 PST.

Midwest to Equatorial Africa

40 meters: Signals come out of the noise level between 1630 and 1715 CST. Good strength from 1900 to 2200 CST, then band slowly closes. *20 meters*: C.W. after 1400 CST, then phones after 1700 CST. Peak time from 1815 to 2300 CST. C.W. until 0200 CST the following morning. *10 meters*: Steady conditions from 0800 to 1400 CST with fair signals. However, conditions after 1400 are very unreliable. Band may close on some occasions as late as 1700 CST. Peak signals from 1230 CST until just before closing.

Midwest to Eastern As'a

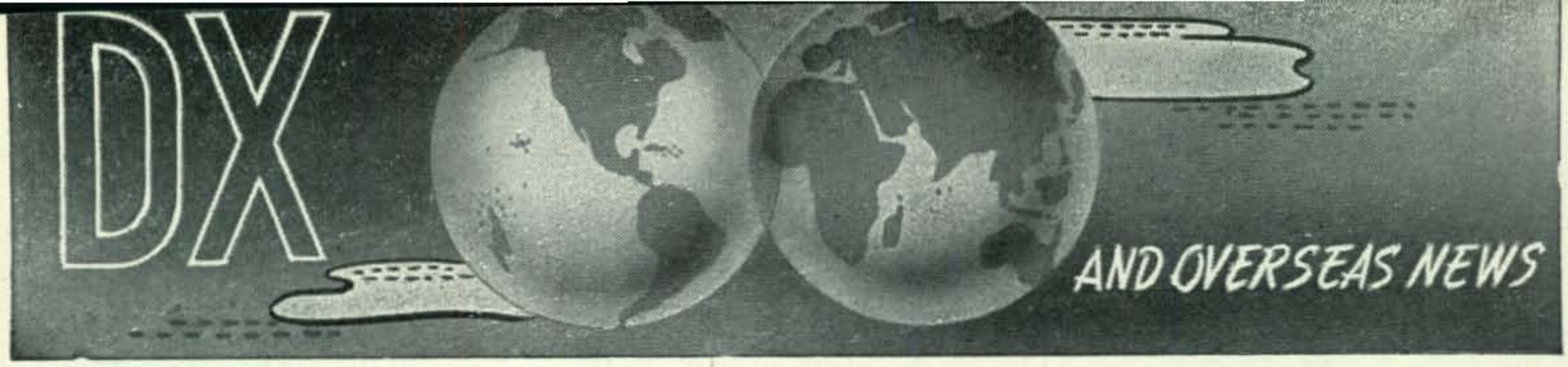
40 meters: Path is now completely in daylight during each 24 hours. Absorption and auroral zone conditions should prohibit openings. *20 meters*: Band opens suddenly around 0645 CST with c-w signals. Strengths drop off rapidly after 0745 CST. No phones, due to their high noise level. *10 meters*: No openings predictable. MUF should not exceed 21 mc.

(*Continued on page 69*)

**Assistant Editor, CQ.*

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

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



Conducted by HERB BECKER, W6QD*

THE first weekend of c.w. of ARRL's DX contest has just finished, and judging from what little listening I did, it looks as though it should be a ding-dong battle. There was quite a lot of W6 competition, and if it is the same way elsewhere in the country, a lot of fairly new calls should make their way into the column of scores. I understand W2IOP dropped his blue pencil long enough to get in the DX brawl, but due to his secretive nature, I don't know how he made out.

W. A. Z.

Our sincere congratulations to the following in achieving W.A.Z. during the past month:

102	W6MVQ	Richard J. Lawton	40	175
103	W6RBQ	William A. Ladley	40	174
104	W6GRL	Charles E. Stuart	40	194
105	W6TS	Ed Willis	40	147
106	I1IR	Ing. Roberto Ognibene	40	144

Most of the above don't need introduction to any of you. W6MVQ got started a litle late after the war but when he did get settled he went to town. W6RBQ, who is director of the Pacific Division among other things, really surprised many of us. Bill never took his DX seriously until about a year and a half ago . . . then he saw the light. Need I say more? W6GRL probably has had his 40 cards for some time but the tooth-pulling business was so good he didn't have time to send in the cards with a country list. W6TS, another old-timer, was given moral suport by his XYL, also a DXer, and methodically racked up his 40 zones. I1IR was awarded an all-time certificate a short time ago, lacking only Zone 29 for postwar W.A.Z. Now, with Zone 29 tucked away, he has the honor of being the first Italian station to W.A.Z. since the war. Nice going, fellows.

VK2QL has been awarded an all-time W.A.Z. certificate for which we want to extend our congratulations. He lacks only one zone for the postwar W.A.Z. but he thought he had better take the all-time certificate as he may not last long enough to get that last zone. That's what the man said!

TG9JK is another one of the boys who is going to miss our not having the Marathon this year. He says he was only able to get on 10, 11, and 20 in the DX contests this year since his 40 and 80-meter rig needed some work done on it . . . Bet he still did all right.

ZL1HY gives with another report on a few of the boys down there, and says *ZL1FT* is now on Norfolk Island, but, as yet, not on the air. Looks as though Norfolk is getting to be a very ham-minded spot, as Dave overheard *VK9NR* say that *VK9DG* and *VK9FM* were also on the Island, but, at that time, not on the air.

Some of the boys have been working a station signing *AC5CS,* and from preliminary reports it looks as though he might be O.K. Oh, yes, he is supposed to be in Bhutan . . . W9FKC has a card from *AG2AG* from Trieste. Thought maybe you might want to know that this guy sends cards . . . W6MX tells me that WØTND is at *HZ1AB,* and we're hoping that he will be QSL minded . . . WØFWW adds four, one of which is *ZD9AA* . . . *VP9P* is now stateside as W4OMI and will be glad to QSL any that he may have missed in the past . . . W8WWU worked *UA3DH/Ø* who gave his QTH as OST Siberian Expedition.

Don't Forget Call Letters

Hey, some of you guys are leaving your call letters off your letters to me. In most cases where you have been contributing to the column for some time, we can recognize your name, but some of you leave your last name off, and here again, we can usually match up handwriting or the address with something else from you which we might happen to have in our Honor Roll file. This, of course, takes additional time on the part of such high salaried men as W6ENV, W6DI and W6SA. We hate like heck to pay these fellows overtime, so please put your call letters on every piece of correspondence. Your address would also help should we find it necessary to drop you a line.

Results of the final standings of the DX marathon will be published in the May issue. We hope to have the Marathon certificates by the time the scores are published.

If you hear or work *TA3GVU* on 10 meters, or anywhere, for that matter, he is none other than old Fred Elser, W6GVU. That guy has had so many calls, and traveled so many places, it never is much of a surprise to me where he turns up . . . *FO8AC* is another one the boys have been working the past month without too much trouble. W3FYS had no sooner written me a couple of months ago about no CE6s getting on c.w., than, bingo, two of them pop up—*CE6AB* and *CE6AK*. Now I guess the phone boys will want them back on phone . . . W6LRU is still running 100 watts, and lacks only one card for W.A.Z. and that one is for Zone 21. His goal is W.A.Z. and 150 countries.

W2NSZ grabbed a good one in *YK1AF* on 28,064. For those who don't know, YK1 is the

(*Continued on page 48*)

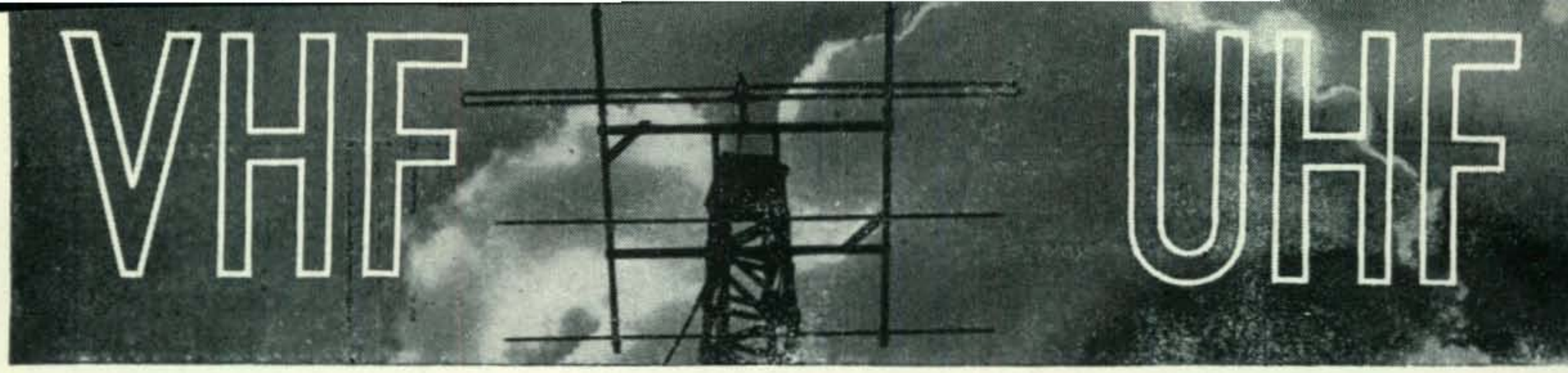
Send all contributions to Herb Becker, 1406 South Grand Ave., Los Angeles 15, Calif.

Tom Rothwell, JA3AA, ex-J2AAL, outstanding DX op.

W. A. Z. HONOR ROLL

C. W.-PHONE			C. W.-PHONE			C. W.-PHONE			C. W.-PHONE			PHONE ONLY		
W6VFR	40	216	W6TS	40	147	OK1CX	39	133	G4CP	37	117	W6VFR	39	146
W8HGW	40	210	W6AYZ	40	147	G5RV	39	132	VE1EA	37	116	W7HTB	39	143
W2BXA	40	209	W7DXZ	40	146	G2VD	39	132	WØAZT	37	112			
G2PL	40	207	W9NRB	40	146	W2GUR	39	132	W6CTL	37	111	W6DI	38	164
W3BES	40	206	W6MUC	40	145	G2FSR	39	130	G4AR	37	108	W4CYU	38	163
W6ENV	40	206	W6QD	40	145	W6DLY	39	129	W7EYS	37	107	W8BKP	38	145
W6EBG	40	205	W6LER	40	145	W8VLK	39	128	W8HSW	37	104	W1JCX	37	158
W6PFD	40	204	JA2KG	40	145	OK1AW	39	128	W2BLS	37	100	W2BXA	37	150
W6SN	40	202	I1IR	40	144	VR5PL	39	124	G5MR	37	100	W8BF	37	146
W6ITA	40	202	OK1LM	40	141	G5VU	39	124	G3AAE	37	99	G3DO	37	136
W3GHD	40	201	W6CEM	40	137	G3AAK	39	122	W2SGK	37	95	W1HKK	37	136
W6SAI	40	201	W6RDR	40	134	W6ID	39	120	W7BTH	37	95	G6LX	37	124
W6ADP	40	199	G3AZ	40	134	G5WM	39	120				G2AJ	37	121
G6ZO	40	199	W6YZU	40	129	G8RL	39	120	WØDU	36	138	VE7ZM	37	116
W4CYU	40	195	W7GBW	40	129	WØUOX	39	119	W2RGV	36	137	F8VC	37	115
W6GRL	40	194	W6MLY	40	129	WØOUH	39	119	W3WU	36	127	C1CH	37	83
W3LOE	40	194	G5BJ	40	126	G6BS	39	117	OA4AK	36	128			
W4BPD	40	193	PK6HA	40	124	W6NRZ	39	117	W3AYS	36	124	W1NWO	36	145
W6MEK	40	192	W6NRQ	40	123	W6RLQ	39	116	W4DIA	36	120	W8REU	36	144
WØYXO	40	192	W6LN	40	118	W7ETK	39	116	SV1RX	36	119	W1MCW	36	141
W3EVW	40	189	W6BIL	40	93	G3QD	39	116	MD5AK	36	118	W9RBI	36	136
ZL1HY	40	189				W6LGD	39	114	G2CNN	36	114	W2DYR	36	135
VE7ZM	40	187	W2PEO	39	202	G3TK	39	114	G2AKQ	36	112	W6PXH	36	131
W6MX	40	186	W2GWE	39	200	KH6PY	39	110	W2BF	36	108	W6WNH	36	128
W6TT	40	186	W2HHF	39	199	W6MUF	39	108	W2JA	36	102	W1FJN	36	128
W9KOK	40	186	W3KT	39	195	W7GXA	39	106	GM3CSM	36	102	G2PL	36	128
W6SA	40	186	W9IU	39	194	W6MI	39	106	W4BK	36	101	GM2UU	36	127
W6MJB	40	186	W2NSZ	39	193	KG6AL	39	104	G2AO	36	100	G6BW	36	127
W7GUI	40	185	W3JNN	39	191	W6LEV	39	103	WØRBA	36	99	W3JNN	36	126
W6FSJ	40	185	W2HZY	39	191	W7ENW	39	101	W5CD	36	97	W9HB	36	126
W2IOP	40	184	W3DPA	39	191	W6WJX	39	101	W3FYS	36	96	W4INL	36	122
W6NNV	40	182	W8BKP	39	190	W6AX	39	93	W6BUD	36	96	W4ESP	36	119
W6KRI	40	182	F8BS	39	189	G6PJ	39	76	G6WX	36	95	G5YV	36	106
W6DI	40	182	WØNUC	39	189				W7PK	36	91	G6WX	36	105
VK2DI	40	181	W8RDZ	39	188	W1JYH	38	178	GM2AAT	36	75	W3DHM	36	96
W6AM	40	180	W9ANT	39	185	VE3QD	38	172				W6SA	36	92
W6SC	40	180	W8NBK	39	183	W3EPV	38	172	W4DHZ	35	133	F8DC	36	57
W6RBQ	40	174	W2CWE	39	180	KP4KD	38	162	W4HA	35	131			
W6ZCY	40	180	W5ASG	39	180	W3IYE	38	161	W8ZMC	35	126	XE1AC	35	147
W7AMX	40	179	W3JTC	39	180	W3DKT	38	159	W4LVV	35	125	W6PCK	35	115
W7DL	40	178	W3DRD	39	177	W1ZL	38	158	W2GVZ	35	122	G3FU	35	115
W9VW	40	178	PY1DH	39	177	W8FJN	38	153	W9CKP	35	120	W6CHV	35	113
VE7HC	40	177	W9RBI	39	176	VO6EP	38	151	VE3AAZ	35	120	W9CKP	35	111
ZS2X	40	177	W1ENE	39	175	W4OM	38	149	W9WCE	35	119	W4OM	35	106
W6MVQ	40	175	W1BIH	39	174	W2PUD	38	149	VE3ACS	35	118	G8QX	35	100
W6PCS	40	175	VK2ACX	39	172	W8CVU	38	142	W8AVB	35	113	VE3BNQ	35	92
W6OMC	40	173	W1NMP	39	172	W3KDP	38	141	VE1PQ	35	112			
W6RM	40	172	W4INL	39	170	SM5WI	38	139	W2WC	35	110	W4HA	34	120
W6PKO	40	171	W2CYS	39	170	W4VE	38	137	W6ZZ	35	104	W8BIQ	34	111
W6WKU	40	170	W8LEC	39	169	TF3EA	38	134	G8VR	35	100	W2RGV	34	111
ON4JW	40	169	W4GG	39	164	W1KFV	38	134	W2HAZ	35	96	W8ZMC	34	110
VE4RO	40	169	W4DKA	39	164	W9FKH	38	132	G2AVP	35	89	W3PA	34	98
W5AFX	40	169	W6GDJ	39	164	W4FPK	38	132	W8JM	35	86	W6AM	34	93
W6BAM	40	167	CE3AG	39	164	G8IL	38	131	D4ANM	35	80	W8QBF	34	92
W7FZA	40	166	W4BRB	39	162	W3ZN	38	130	G8RC	35	78	W2NXZ	34	65
W6DUC	40	166	W9LM	39	161	G5CI	38	130	G3BDQ	35	74	W5ASG	33	118
W6AOA	40	165	I1KN	39	160	W2PQJ	38	130	W7FNK	35	72	W2ZW	33	115
W6AMA	40	165	G5DQ	39	160	VK4RC	38	129				W9BZB	33	114
W6PB	40	165	WØGKS	39	159	WØEYR	38	129	W4IYT	34	127	W5LWV	33	100
W6SRU	40	162	W6SYG	39	158	G6LX	38	126	W9FNR	34	109	W2PQJ	33	100
KH6IJ	40	161	WØAIW	39	157	W9FKC	38	126	W9LI	34	101	WØHX	33	95
W6DZZ	40	161	W9LNM	39	157	W9MZP	38	126	G8QX	34	99	W2GHV	33	93
WØNTA	40	161	G8KP	39	156	W9TB	38	124	G8KU	34	96	VE3ZM	33	81
W6IBD	40	161	W2RDK	39	154	GW3AX	38	123	WØFWW	34	93	W2DRH	33	60
W7BD	40	160	W8SDR	39	153	WØSQO	38	123	G6XX	34	89			
LA7Y	40	159	G6QB	39	152	W8WWU	38	122	W8PCS	34	80	W9RNX	32	113
W6RW	40	158	G5YV	39	151	GW4CX	38	120	W6WUD	34	68	W9MIR	32	99
G3DO	40	157	G2AJ	39	151	W8KPL	38	117	J4AAK	34	66	W9WCE	32	97
W6AVM	40	156	W2COK	39	150	W5CPI	38	113				WØAIW	32	93
G3AAM	40	156	W6EPZ	39	149	G3ZI	38	107	W4QN	33	104	W2HY	32	85
W7BE	40	156	W6EAK	39	148	G8IP	38	105	WØGBJ	33	89	W2SVK	32	84
W6PQT	40	155	G2WW	39	147	C1CH	38	84	WØFET	33	88	W9GZK	32	72
W6KUT	40	155	D2KW	39	147	G3BI	38	75	G2LC	33	85	W4LZM	31	88
W6BPD	40	154	W2MEL	39	145				W8QUS	33	85	W6UZX	31	85
W6FHE	40	152	W9YNB	39	143	CM2SW	37	161	G8VG	33	78			
W6PZ	40	151	W6OEG	39	143	W3JKO	37	154	G3BFC	33	77	OA4AK	30	86
W1AB	40	151	W6JZP	39	142	W3OCU	37	151				W2SVK	30	74
W6UCX	40	150	W9DUY	39	141	W2TJF	37	144	VE3AGC	32	108	W7JUO	30	70
OK1FF	40	150	G6BQ	39	140	W2EMW	37	141	W2OEC	32	105	WØJED	30	61
W6LEE	40	150	G3FJ	39	139	W3LVJ	37	138	W1BFB	32	94	W7GC	30	53
W6TI	40	149	W6IFW	39	138	W4ML	37	134	VE1NE	32	91			
W6UZX	40	149	W9VND	39	136	GM2UU	37	133				W6ZZ	28	60
ON4TA	40	148	W6RLN	39	135	W2CNT	37	126	VE5JV	31	89	W8SXU	28	59
W6ANN	40	148	W6LRU	39	134	W2BJ	37	118	W7BE/KH6	30	55	W2BF	27	52

VHF UHF



Conducted by VINCE DAWSON, JR., WØZJB*

ON FEBRUARY 22 at about EST W2BYM answered the CQ of HC2OT. Signals were S9 plus in both directions. At 1010 EST contact was made with Bill Coburn, W1AF, Cambridge, Mass. Bill then telephoned W1CLS and it is reported that Doc broke several cross-country records in jumping back fences to get into his shack. Glad to say he made it with a contact at 1045 EST. HC2OT says that both W1 signals then faded out, but W2BYM was audible for over another hour.

Those January 24-26 Openings

As we started to report last month in this column, the last week of January will long be remembered by many of the v-h-f gang. Blanketing type sporadic-E was liberally mixed with aurora and while the lower frequencies went dead, the 6 and 2-meter bands suddenly came to life. As to the storm itself, Miss Lincoln of the Upper Atmosphere Research Section of the CRPL says, ". . . the ionosphere storm of January 24-25-26, 1949, will go down in history as one of the 'very great' storms. The severe stage began about 1400 EST January 24 and continued to 0700 EST January 26. Our most recent ionosphere movie taken at Whippany, N. J., in the early morning hours of January 25, 1949, showed some most unusual nighttime E-region echoes. No doubt there was considerable Es during the storm."

6- Meter Heyday

Because of the peculiar nature of this storm we are listing as many as possible of the reports we received. This should give the old-timers an idea who was on, as well as helping some of the newcomers get an idea of what to look for.

WØKPQ, Robbinsdale, Minn., using 20 watts, a four-element beam and a VHF-152 worked W9ALU at 1900 CST on phone. Then heard or worked W9ZHB, W9ZHL, W3RUE, WØINI, WØRMS and WØCJS until 2000 CST . . . W8-NQD, Ashland, Ohio, worked W4RBK, W9UIA, W9QUV, WØCHI, W8APG and W9MBL from 1920 to 2240 EST, also hearing W3RUE, W4-FWH, W9ZHL and W9PK . . . W8UZ, Columbus, Ohio, got on late and was able to distinguish only W9ZHL through the bad flutter at 2230 EST. Several W4s were heard, but the calls on phone could not be read.

W1CGY, Enfield, Conn., using 400 watts into push-pull 4-65As, worked only VE3ANY on this opening at 2030 EST . . . W5HLD, Enid, Okla., says that at 2002 CST he worked W1PNB, Bristol, Conn., with a clean-cut phone signal. However, about twenty or more carriers were heard attempting to use phone, which if they had been on c.w. would have been perfect copy. WØINI peaked with a terrific, but badly garbled signal. 80, 40 and 20 were dead, while 10 was hot from W1 to W6 . . . W4LNG, Atlanta, Ga., worked W4MFI, W9-UIA, W3IZL, W9VPN, W4FQI and W9ZHL all on phone.

W7HEA, Toppenish, Wash., using 600 watts and his "seeing eye receiver," turned his beam northeast and worked W7BQX, W7IEE, W7FLQ, W7DYD, VE7EL, VE7AEZ and VE7CN. Most signals were only poor to fair, but says Bish, where did all the activity suddenly come from? WØQIN, Minneapolis, Minn., thinks that he was having every type of 6-meter propagation all at once. W9-AQQ, W8CMS, W4GMP, W9ALU, WØKYF and W4LNG were heard after 1920 CST. W9ZHL was worked at 1948 CST . . . WØINI, Pleasant Hill, Mo., heard WØCJS, W5CUH, WØKRZ, W8EP, W9PK, W7JRG and W5LF, while also working W5HTZ and W5LF.

W9ZHL, Terre Haute, Ind., appeared to have been in the middle of everything and worked this imposing list: W4CPZ, W8CEQ, W4HVT, W4-MKT, WØQIN, WØDZM, WØKQO, WØCJS, W4FWH, W4LNG, W4LNB, VE3ATB, W7JRG and WØUEL. While most of the signals were slightly garbled, the latter two were very clean and sounded like straight sporadic-E. A beam on a 90-foot Windcharger tower is being used . . . W7-JRG, located out at the KWYO transmitter site, Sheridan, Wyo., also had a pretty busy time. Starting at 1817 MST the following were heard: W9-ZHL, W9AQQ, W4MFI, W4FWH, W5LF, W5-DXB, W5NS, W5HLD, W5JME, WØINI, and W9QKM. Stations worked included WØKRZ, Topeka, Kan., WØUEL, Pueblo, Colo., W5LF, W5JME and W9ZHL. Conditions varied from

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

Bud Keller, W7QAP, the man who put Arizona on the (v-h-f) map.

clear signals with slight QSB to roaring flutters. Band closed after 2245 MST.

W2IDZ, Westfield, N. J., had his beam aimed north and picked up W1CGY, W1CLS, W2RLV, W1AEP, W8CMS and W1GJO . . . WØCJS, Bryant, So. Dak., had his beam aimed mostly to the east-northeast hearing or working W4FWH,

H. "Steve" Stevenson, HC2OT, ex-W5DNN, the first 6-meter South American contact for many of the boys in the States. Look for him on the very low end of the band.

W4GMP, W9ZHL, WØKYF, W5NYH, W9AQQ, W9PK, W9QUV, W9MBL, W9ZHB, W9BIQ, W4LNG, WØINI, WØHVW and W9OMR from 1911 to 2030 CST. Very brilliant aurora seen from 1845 to 1930 CST. Phones were readable with difficulty, but c.w. seemed to be mostly T9.

W9ALU, Metamora, Ill., worked W9QKM at 1858 CST, then W8WSE, W9QUV, WØKPQ, and WØQIN until 1940 CST when Hod switched down to 2 meters . . . VE1QZ, Halifax, N. S., worked W4GMP and W4CPZ from 2043 to 2100 EST on what appeared to normal sporadic-E. Later W1AEP and W1CLS were heard with auroral type fluttering . . . W9UIA, Evansville, Ind., heard W8NQD, W4MMI, W4LNG and WØCJS.

In general, the band opened shortly after local sunset with fair to good conditions similar to sporadic-E of the reflecting, or summertime type. Within one or two hours all beams were aimed to the north and the typical auroral flutter was noted, although not too severe. Visible aurora was reported and at least one station, VE5NC, was too far to the north to get in on these contacts.

January 25

In the eastern section of the country, the signal from HC2OT began breaking through around 1800 EST. W5NXM apparently was the first station to be worked, followed by W5KSW, W5JLY, W7FGG, W5VY, W5FFM and W5ZZF. Signal is last reported at 1910 EST by W7QAP. At 1825 EST, HC2OT was heard by WØKPQ calling WØQIN at which time Pete found the South American coming in strongest with the beam pointed to the north. HC2OT was heard by many others including W8UZ, W8NQD, W9QUV, W5-ML, etc.

During the same period that HC2OT was being heard, the aurora sporadic-E combination was again propagating 6 and 2-meter signals. WØINI reports hearing the following stations on 6 meters: W9QUV, W9ALU, W9NJT, W9LJP, WØHAQ, W9QKM, W9ZHB, W7JRG, and WØKQO . . . Before hearing HC2OT break through, W8NQD worked W8WZ, W4FBJ and W3RUE between 1610 and 1623 EST . . . W8UZ, Columbus, Ohio, heard W9WSE, W9QUV, W9ALU, W9QKM and W2RLV from 1630 to 2048 EST. All on aurora with the beam to the north.

WØKQO heard HC2OT and then W9QUV, W4FBJ, W8NQD and W8KQC. Later in the evening around 2230 CST, Pete heard VE7CN calling CQ, but badly . . . VE1QZ says the conditions were more typically aurora. Oscar worked W1PWW and heard W1LLL . . . W9ALU got a fairly early start with W4FBJ at 1445 CST. Hod then switched to 2 meters and contact with W4FBJ was made there. Back on 6, Hod then worked WØKYF, W9QKM, W9ZHL, and W9-VPN. Last signal at 1900 CST.

WØNFM, Solon, Iowa, using his 12-element beam and 900 watts, worked from 1926 CST W1-LLL, W8CMS, W8WSE, WØDZM, W8LHV and then heard between 1910 and 2200 CST: WØ-HVW, W8APG, W3OJU, WØKQO, WØKPQ,

(Continued on page 62)

50 MC HONOR ROLL

CALL	S.	C.	CALL	S.	C.	CALL	S.	C.	CALL	S.	C.	CALL	S.	C.
W9ZHB	**48**	**6**	**WØINI**	43	3	W9RQM	38	2	WØJHS	34	3	W5ESZ	28	2
WØZJB	**48**	**4**	**W9ALU**	42	5	W5FSC	37	8	W6AMD	34	3	W9MBL	28	2
WØNFM	47	5	W3CIR/1	42	5	W2RLV	37	6	W7JRG	27	2	W7ACD	27	2
W9QUV	47	4	WØKPQ	42	2	W5JTI	37	5	W1HDQ	33	6	W7JRG	27	2
W6UXN	47	3	WØLQW	42	2	W4EQR	37	4	W6PUZ	33	4	W5LBG	26	3
WØUSI	47	3	W5ML	41	3	W5VV	37	4	W4WMI/4	33	3	WØDNW	26	2
W6WNN	47	3	W7DYD	41	2	W1LSN	37	4	W4DRZ	33	3	WØYKX	26	2
W1CLS	46	6	W5JLY	40	11	W6IWS	37	3	W7KAD	33	3	W7BOC	26	2
W9ZHL	46	6	W8ZVY	40	7	W6OVK	37	3	W3MKL	33	2	WØUEL	26	2
W4GJO	46	4	W4QN	40	4	W9NJT	37	3	W1CLH	32	3	W6NAW	26	2
W9DWU	46	3	W1LLL	40	4	W9UNS	37	2	W5WX	32	3	G5BY	24	19
WØDZM	46	3	W4FBH	40	3	W9UIA	36	3	W6FPV	31	3	VE1QZ	24	6
WØBJV	46	3	WØSV	40	2	W7FDJ	36	3	W4HVV	30	2	W5LIU	24	3
WØQIN	46	3	W4GIY	40	2	W3OR	35	6	WØDER	30	2	XE1KE	23	6
W7BQX	45	4	W1CGY	39	6	W1GJZ	35	5	W1AF	29	6	W9AB	23	4
W9PK	45	3	W2IDZ	39	5	W6BPT	35	4	W8MVG	29	6	W8YLS	22	3
W8NSS	45	3	W6ANN	39	3	W1JLK	35	4	W4LNG	29	4	W7CTY	22	2
W7ERA	44	4	WØDKS	39	3	W9VZP	35	4	W7QLZ	29	4	W8LBH	21	2
W7FFE	44	4	WØYSJ	39	2	W5HF	35	3	W4FNR	29	3	W5HVP	20	3
W8QYD	44	4	W4GMP	39	2	W5HTZ	35	3	W5ELL	29	2	VE7NM	17	2
W5VY	43	11	W2AMJ	38	6	W5HJD	35	3	VE1QY	28	4	VE7CN	15	2
W5AJG	43	8	W5FRD	38	6	W7JPA	35	2	W9FKI	28	4	W8EP	14	2
W4EQM	43	3	W3OJU	38	5	W2BYM	34	4	W4FQL	28	3	KH6PP	5	7
W7HEA	43	3	W4FID	38	4	W3RUE	34	3	W1ATP	28	3			

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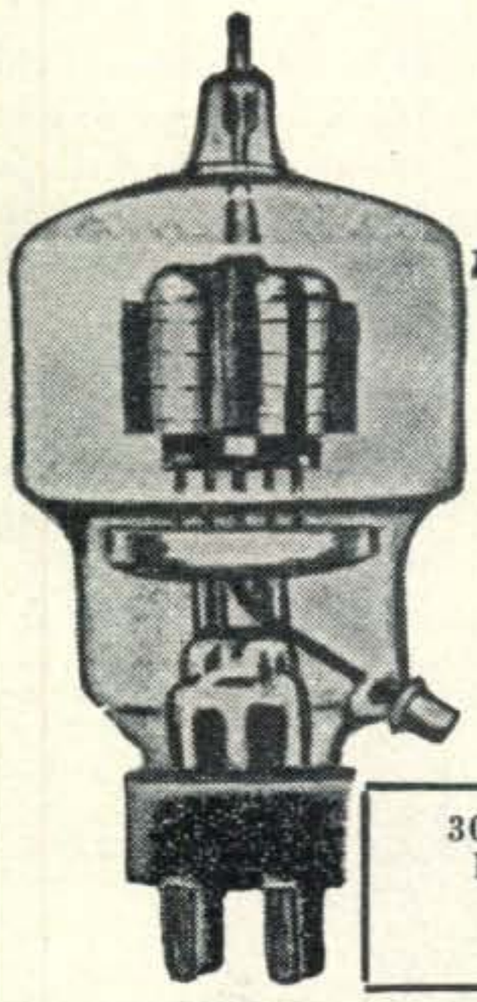

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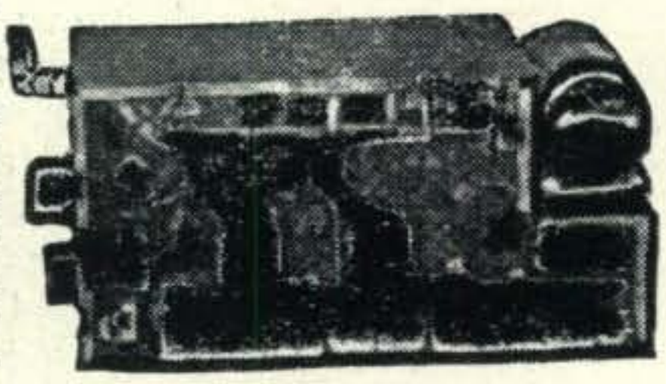

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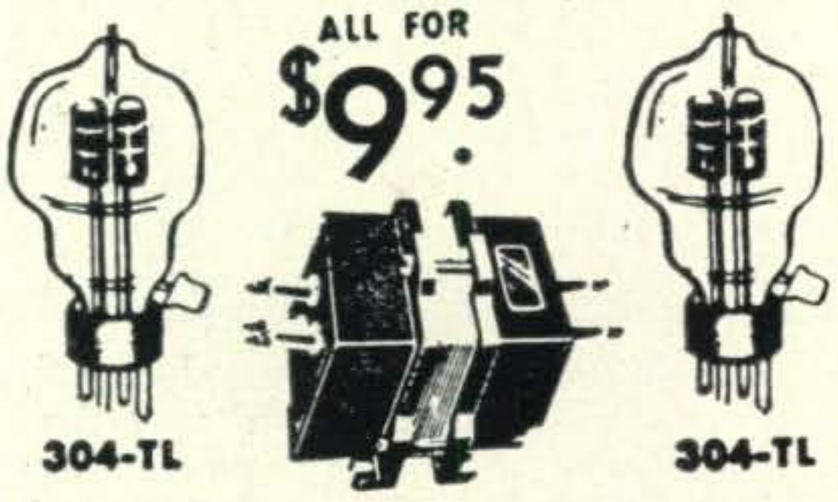

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Conducted by LOUISA DRESSER, W2OOH*

WE have heard of many father-and-son ham teams, but have you ever wondered how many *mother-and-daughter* hams there are? They aren't many, of course, but still there are a few such twosomes—or maybe we shouldn't limit it to twosomes, for usually the OM in the family is licensed, and provides the guiding spirit.

One family that includes *both* mother-and-daughter and father-and-son licensees is that of the Zelingers of Oklahoma City, Okla. Mary, the XYL, is W5PCH; Margie, aged 15, is W5PAD, while the OM, Fred, Sr., is W5HXJ, and Fred, Jr., aged 12, is W5PBO. While the OM has been licensed since 1938, it wasn't until a year ago that the rest of the family became deeply interested. It began during a bingo party! At this party, held by the Oklahoma City Radio Club, the club decided to sponsor courses in code. The non-ham Zelingers attended half a dozen classes, then continued studying at home, spurred on by the competition between Mary, Margie and "Freddie." It was during school vacation so Margie and Freddie could study during the daytime, and they all studied together during the evenings. A good system, for they all came up with their licenses by the end of September. Now W5PCH and W5PAD share an SX25 receiver and a 150-watt rig on 40 meters (7110 and 7120 are the favorite spots), with Margie usually getting on around 4 p.m. after school, and Mary (who works during the day) getting on the air in the evening. "For our other hobbies, Margie collects stamps," adds Mary, "and when I have time I like to crochet and sew. We both like boating and fishing. Another way we enjoy the evenings is musically—Margie plays the piano and I the violin." Truly a compatible mother-and-daughter team!

Any of you WAS/YL candidates looking for Idaho? Well, here's not just one YL in that elusive state, but two in the mother-and-daughter team of Betty and Frances Fine, W7GUQ and W7JFZ, respectively, of Boise, Idaho. They work both c.w. and phone, 20 and 75 being the favorite bands, with 600 watts on the latter. They have made WAC, and are always on the lookout for DX. Oh, yes, the OM is Francis, W7GQA.

Another "all ham" family boasting mother-and-daughter licensees is that of the Burnetts in Toronto, Canada. The XYL, Gwen Burnett, VE3-AYL, has been licensed since 1930. Writes the OM, Sid Burnett: "I believe she was one of the pioneer XYLs to receive her license in Ontario. The 'junior op,' Corinne, is 20 years old and obtained her license in December, 1948, just nineteen years to the day that her Dad, VE3GK, received his license. Corinne's call is VE3DYL. We are very proud of the fact that we are a real 'ham family' and you may be sure that ham radio plays a very important part in our family life." Running 400 watts input to a pair of HK354s in p.p. in the final and a 3-element rotary beam, the Burnetts operate mostly on 20-meter phone, their special interest being to get messages through to parents in Vancouver, B. C.

(*Continued on page 67*)

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

Right: Mother-and-daughter hams of Boise, Idaho, Betty Fine, W7-GUQ (right), and Frances, W7JFZ.
—Photo by W7CA.

◆

Below: Canadian YL Corinne Burnett, VE3-DYL, and her mother, Gwen, VE3AYL.

Left: Mary Eloise Rhein, W9FLU, 10-meter phone enthusiast, and her daughter, Clara Rose, W9FZX, who prefers 40 c.w.

◆

Below: Sharing the same rig are Mary Zelinger, W5PCH (right), and Margie, W5PAD.

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5/8"	$1.94
1"	$2.12
1 1/8"	$2.25
1-3/16"	$2.25
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1/4 watt bayonet base neons	20c
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CHOKES

SMOOTHING TYPE	Hy	SWINGING TYPE	Hy	PRICE EACH MA	Price
C-80	10	C-87	4—16	150	$3.09
C-81	10	C-88	4—16	200	$3.82
C-82	10	C-89	4—16	250	$5.29
C-83	8	C-90	3—14	300	$5.59

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Catalog No.	Output Cap. Watts	Net wgt. lbs.	Net Price
VR-6110	15	4	$15.00
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VR-6111	30	5	$17.00
VR-6112	60	8	$24.00
VR-6113	120	14	$31.00
VR-6114	250	25	$48.00
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Type No.	Sec. Rms. Volts	Sec. DC Volts	DC Sec. MA.	Dimensions H.	W.	D.	Price Each
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	550—550	400					
P 58	1080—1080	1000*	125	4 5/8	3 11/16	5	8.23
	500—500	400	150				
P 59	900—900	750	225	4 5/8	3 11/16	5 1/8	7.94
	800—800	600					
P 67	1450—1450	1200	300	5 3/4	6 1/8	4	19.84
	1175—1175	1000					
P 68	2100—2100	1750	300	5 3/4	6 1/8	4 1/4	24.99
	1800—1800	1500					

* For dual operation with simultaneous use of both sec ratings. † Has 40-volt bias tap.

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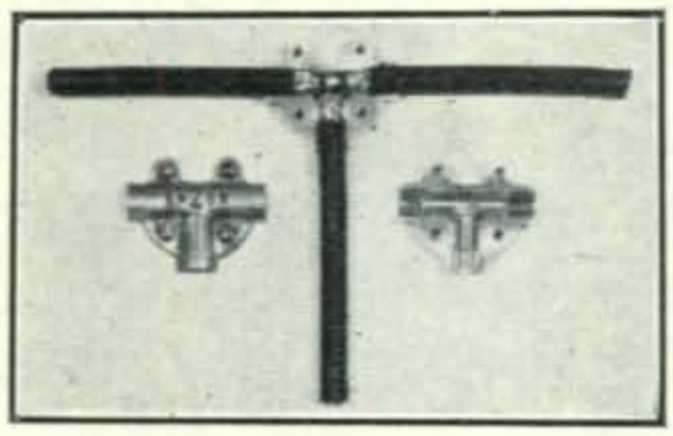
PARTS AND PRODUCTS REVIEW

Coaxial Cable Connector

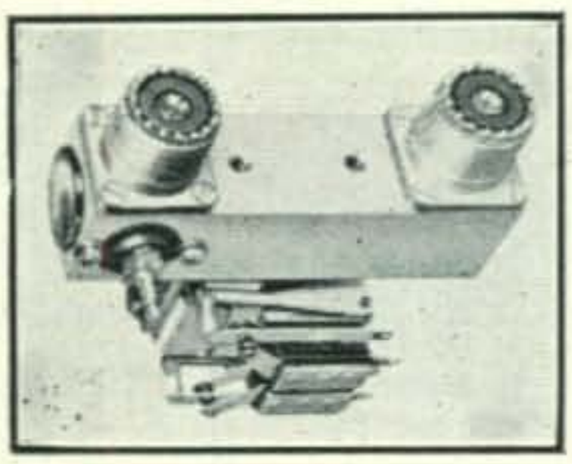
The EaZon coaxial cable connector is made of cast bronze, machined for a perfect fit to accommodate type RG-8/U and other types having the same outside diameter. Soldering of the outer shield braid of the cable is eliminated, thus preventing any deterioration of the inner insulation where joints are made. The inner serrated portion of the connector grips and holds the braid and at the same time makes a positive connection through the connector. An additional feature of this connector is that the through run of the inner conductor need not be cut.



The EaZon connector was designed to give practically no upset in the nominal impedance of the cable, yet at the same time giving a permanent, tight and by the addition of a small amount of sealing compound, a water tight connection. The EaZon connector is made in four styles; four way, three way, two way and a feed through bushing for running the cable through chassis or cabinets without the need for cutting the cable. These connectors are ideal for use as harmonic trap installations in your transmission lines. For details write: Dallas C. Akers, 33 Greenwood Ave., East Orange, N.J.

Small Coax Relays

Two new types of small coaxial relays have been added to the line of radio relays manufactured by the Advance Electric and Relay Co. of Los Angeles. These small coaxial units have proved ideal for mobile and other low power transmitters. Though small in size, with an overall length of only 2 1/8 inches, these relays are designed to maintain a voltage standing wave ratio ranging from 1.04: 1.00 at 80 mc to 1.40: 1.00 at 300 mc, with a maximum rating of 250 watts. They are built for use with 50-ohm RG cable. Terminal positions on the relays can be varied to meet special requirements.



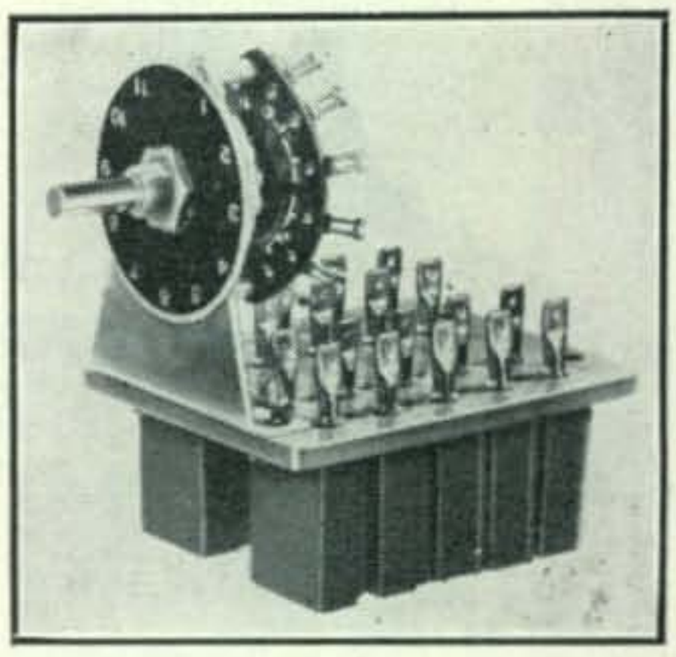
Advance Relay Co. also has their larger coaxial relays for maximum ratings to 880 watts. For a folder showing all Advance Relays, write to Advance Electric & Relay Co., 1260 West Second St., Los Angeles 26, Calif.

Small Parts Storage Cabinets

Something new is being offered for small parts storage. Individual drawers interlock with others at top, bottom and sides to form a rigid cabinet. Of all steel construction, easy to assemble, any number of units may be added as needed, building cabinets to fit size and shape of available space. Measuring 5" front to back, the drawer is 2¼" deep and 2⅞" wide. Finished in attractive, durable two-tone green each drawer has a holder for contents identification. Due to their compactness, versatility of arrangement and smooth free drawer operation, they are finding excellent reception in the home workshop, parts departments, or wherever a small parts storage problem exists. Manufactured by the Cincinnati Ventilating Co., Inc., Covington, Ky., they are available through retail outlets.

Multiple Crystal Selector

The Johnson instant crystal selector is sturdily constructed of quality components and permits instant selection of 10 frequencies. The unit is designed for all crystals with ½" spacing. With adaptors it can accommodate up to six of your upright ¾" spaced crystals, plus four with ½" spacing. There is an extra position on the switch for e.c.o.



The Johnson instant crystal selector comes complete, ready for mounting. Special bracket permits either vertical or horizontal mounting of crystals. Mounting board of high dielectric material is available separately for those who wish to build their own switching system. Size of mounting board is approximately 3" x 2½".

Soldering Iron Pencil

An improved soldering pencil iron that is said to assure tightness and guarantee contact has been announced by the Ungar Electric Tool Company, Los Angeles 54, Calif. Lightness (3.6 oz.) for hard-to-reach places and interchangeable tips (4) are also features of the new pencil iron which is 7" long.

A 65-strand, extra flexible cord is an integral part of the molded plastic handle. Coolness is claimed for the special plastic handle because both a cork insulator and cooling fins are used.

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.25 — 2500V — 95c	2 x 1MFD — 3000V — 3.95
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805 — 4.95	829 — 3.95	1626 — 59c
809 — 1.50	832 — 3.95	¼ WATT NEON 12c (with leads)

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SAVE UP TO 75%
Crystals Guaranteed!
In FT-243 Holders — you name the frequency — we will hit it or come darn close!

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3500 to 4000 KC 79c each
6700 to 7500 KC 79c each

20 METER CRYSTALS

12.514 to 13.1 MC 1.19 each
14.0 to 14.4 MC 1.19 each

FLASH! JUST RECEIVED! New 160 Meter Crystals in FT-243 Holders. All Frequencies **98c**

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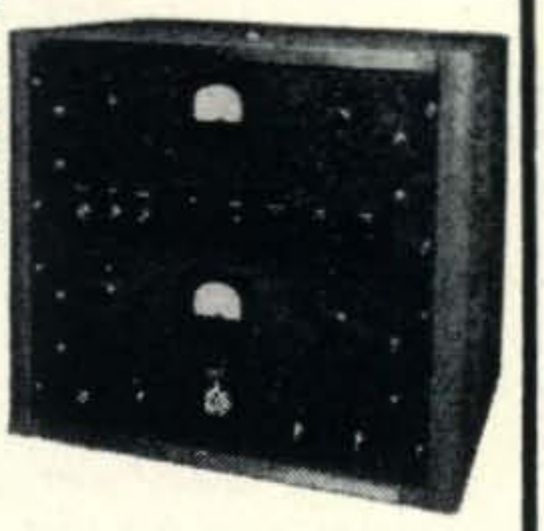

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DX

(*from page 38*)

new prefix for AR1. YK1AF has been rolling in on 20 c.w. also.

CE3AB is somewhat disturbed at what he thinks is a low percentage of QSL returns from W stations. Out of 640 QSOs, he has received 420 cards for an average of 66.71%. Being mathematically inclined, Luis says the percentage is higher from other countries, this being 79.13%. He has made up his mind, in the future, not to QSL until he gets a confirmation first.

XE1AC is all excited, as he should be, after working into VU land for the first time. This is on phone, of course, and here is what he worked: *VU7AF* who was supposed to be in Nepal, and who says his name is "Too-too." (Hey, Ripley!) Then, there was *VU2WR, VU2CU, YJ1AA,* and *YK1AA*. Al says that ham activties in Spain are progressing, and very soon there will be an EA6, as well as someone on the air in Ifni. This latter one sounds awfully good to me, and in case you start looking for Ifni, that's in Zone 33.

W9CKP writes, "Where, oh where, are Zones 17, 18, 19, 23, and 39," or, "This is my sad tale." Bob has worked 35 zones on 10 phone, and is anxious to work the other five, also on 10 phone.

We have a communique sent from Santander, Spain, which starts out something like this: "Tengo much gusto en comunicarlos que has sido, etc., etc." None of which, I am sorry to say, I understood until it was translated. Anyway, they inform us that the Mountain Association of Transmitting Radio Amateurs has been organized, and one of its aims is to exchange QSL cards which may be sent them by foreign amateurs. This note, signed by *EA1AB,* says they will take the responsibility of distributing the cards among the Spanish amateurs.

Poor old *PY1DH* apparently is having his troubles. He needs only Zone 23 for W.A.Z., and *PY1AHL* writes me to give a little dirt about 1DH. It seems that 1AHL heard LU7AZ working *C7FP/C8* and called 1DH on the land line. Ol' Ed was out honeymooning somewhere. Then later in the afternooon, *PY1AJ* telephoned Ed to say that he had just worked some rare DX. Ed said he was interested only in Zone 23, and when told that this was exactly the station PY1AJ had just worked, there was a dull thud heard on Ed's end of the line. Nobody seems to know what happened. . . . You can have three guesses!

GC2CNC says that a YL friend of his, *GC3-DVC,* is a regular subscriber to *CQ,* and they swap magazines each month. CNC has been doing a little QRP work lately, running about 3 watts, and has been doing fairly well working Ws and VEs with it. He normally runs 50 watts on c.w. and 40 on phone. The transmitter consists of an 807 into an 807. Every once in a while, he operates portable on 7 mc c.w., and during these sessions he signs *GC2-CNC/P*. Boy, what a mouthfull—or fistfull!

W8HGW is still piling them up. A few of the latest include *AR1OD, VU7AF,* and *FP8AB,* which we hope is on St. Pierre . . . W2SEI is back on the air after a long layoff. Before the war he was W8SEI . . . WØRBA wants to know if *PZ1L* works anyone, as he hears him calling CQ every

(*QSY to page 56*)

HENRY

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

Bob Henry
W⌀ARA

A FEW ITEMS IN STOCK ARE:

National NC-33	$ 57.50
National NC-57	89.50
National NC-173	189.50
National NC-183	268.00
National HRO-7	292.50
National HRO-7C	372.45
National HFS	142.00
Hallicrafters S38	49.95
Hallicrafters S53	89.50
Hallicrafters S40A	99.50
Hallicrafters SX43	189.50
Hallicrafters SX42	275.00
Hallicrafters SX62	269.50
Hallicrafters HT18	110.00
Hallicrafters HT19	359.50
RME HF-10-20	77.00
RME VHF-152A	86.60
RME DB22A	71.00
Hammarlund HQ-129X	177.30
Signal Shifter EX kit	49.75
Telvar T60-2	150.00
Harvey-Wells TBS-50	99.50
Harvey-Wells TBS-50A	121.25
Hunter 20A Cyclemaster	169.50
Subraco MT-15X	79.95

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Edited and printed by Techno-Graphic Publications. It contains 115 pages, size is 7" x 10½", printed on good paper stock, covers well bound. A partial list of contents includes complete information on the conversion of the following popular war surplus items: BC-221 Frequency meter, BC342, BC312, BC348, BC946B, SCR274N, SCR522, BC1068A receivers, BC412 cathode ray oscilloscope, BC645 transceiver for citizens' band, SCR274N transmitters, SCR522 transmitter, TBY transceiver, various dynamotors, and a cross-index on tube numbers, frequency allocation chart, electronic surplus index with listing of over 135 items and description or functions or frequencies or tube line-ups etc. of same. Circuit diagrams of original items, and of converted jobs, together with values of various component parts abound in the manual. The text is clear, concise and easy to read and follow. The price per copy is $1.25

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

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

The set consists of the detector head with antenna and reflector meter, a meter housing and lower section of exploring rod, amplifier assembly, exploring rod extension, bag designated to carry equipment while operating, and wooden case for storing or transporting the complete unit when not in use. This detector is not nearly as sensitive as the SCR-625 Mine detector. However, because of its price and its simplicity, you cannot go wrong on buying one for $14.95. Shipping weight, 125 lbs. Weight in operation only 22 lbs.

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

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CABLE CONNECTORS AND PLUGS
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Manufacturer	Type	Price Ea.
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Amphenol	AN3101-22-5S	.25
Amphenol	AN3102-22-15P	.25
Amphenol	AN3102-28-10P	.25
Amphenol	AN3102-32-5P	.25
Amphenol	AN3106-18-11S	.25
Amphenol	AN3106-18-18P	.25
Amphenol	AN3106-24-6S	.25
Amphenol	AN3106-24-7P	.25
Amphenol	AN3106-32-5S	.25
Harwood	AN3108-14S-*	.25
Aero	AN3108-14S-2S	.25
Cannon	AN3108-14S-2S	.25
Amphenol	AN3108-14S-2S	.25
Amphenol	AN3108-18-12P	.25
Amphenol	AN3108-22-5S	.25
Cannon	AN3108-22-5S	.25
Amphenol	AN3108-24-6P	.25
Amphenol	AN3108-24-16S	.25
Cannon	AN3108-24-16S	.25
Amphenol	AN3108-32-5P	.25
Amphenol	AN3108-28-10P	.25

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. Diagram for 110 V. AC furnished upon request for..... $1.00

PRICES: As follows—

Transmitter only	$12.50
Tuning units TU-6B, TU-7B, TU-8B, TU-9B, TU-10B, TU-26B, choice	2.50
Dynamotor PE-73C	4.95
Antenna tuning unit (BC-306A)	4.95

A TREMENDOUS BARGAIN
Quartz Crystals without Holders

Get an assortment of these and grind to your own frequencies or use them as they are. .5X.6" B-cut lapped on faces and squared on edges (Ready to use). We will give you an assortment of these from approximately 13 thousandths of an inch to 24 thousandths of an inch whereby you can grind to frequencies desired. These crystals are now ground to the approximate following frequencies:

3500	4300	5600	6300	7306
3700	4600	5800	6700	7400
3900	4900	6000	6800	7500
4100	5300	6200	6900	7800
				7900

Formula for converting thicknesses of B-cut crystals to frequency is as follows: F=98.4/T where F is frequency in kilocycles and T is thickness in inches. AN ASSORTMENT OF 20 DIFFERENT THICKNESSES..... $1.50

ESSE Radio Co
130 W. New York St.
Indianapolis 4, Ind.

Unless Otherwise Stated, All of This Equipment Is Sold As Used
CASH REQUIRED WITH ALL ORDERS
Orders Shipped F.O.B. Collect

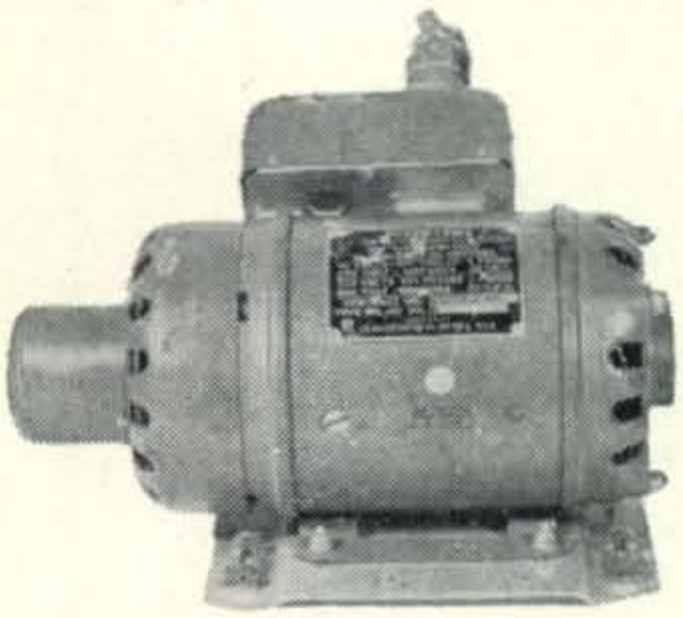
ESSE RADIO CO.

Esse's Special Offer

INDIANAPOLIS, INDIANA

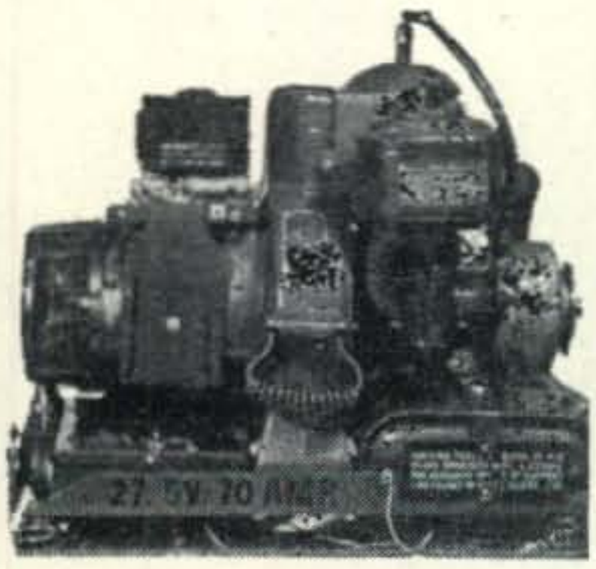
MG-149F INVERTER

(HOLTZER-CABOT ELECT. CO.)



Input 24 V. DC 36 amps. Output 115 V. 400 cy. AC, 500 V. A. Output at 90% P.F..... $5.95

(HRU) DC POWER SUPPLY



24-28 V. at 70 amp. 2000 watts gasoline engine generator with electric starter. Power supply which can be used to operate 24-28 V. equipment, start airplane engines, charge batteries, as a welding machine, lighting system, or for amateur radio station. 21½" 17½" x 24⅝". Wgt., 115 lbs.....$55.00

ATTENTION AIRLINES BC-348 COMMUNICATIONS RECEIVER

6 bands, 200-500 Kc. and 1.5-18 Mc. 2 stages RF, 3 stages IF, BFO, crystal filter, manual or AVC. Complete with tubes and 24 V. dynamotor. These receivers have been thoroughly checked in our work-shop and found in excellent condition.....$149.50

JACK BOX BC-1366 (OR SC-366)

Contains 2-pole 5-position switch, rheostat, two phone jacks, etc. In aluminum case 3¼"x4⅜"x2¼". Complete with headphone set adapter to match high to low impedance. Price, choice $1.00

ATTENTION! PROSPECTORS, MINERS, OIL COMPANIES, PLUMBERS, etc. Below is the finest metal detecting mine detector ever constructed.

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 factories.

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 $59.50

Batteries .....$4.00 extra

BATTERIES Battery type BA-38, 103.5 Volts, used in Handie-Talkie BC-625 mine detector, or for any purpose where low current drain is required. Size 1"x1"x11½" long. Outdated but tests okay. Unused.....**$3.00**

Battery BA-41, delivers 4½, 60, 25½ Volts. Used with BC-620 Transceiver, for bias supply, or portable equipment. Size 2"x2¼" x3½". Out-dated but tests okay. Unused.....**25c**

Battery BA-32. 144, 4½ and 3 Volts positive and 13½ Volts negative. Used with BC-222 Walkie-Talkie Transceiver. Size 5"x8"x7". Husky and has long life. Outdated but tests okay.

Each **$3.50**

Unused.....3 for **$9.95**

ALUMINUM BOX with lid. Size about 3"x3"x2½" with pointed end at top. Ideal for meter case, switch and fuse box, control box, for holding loose parts. Brand new .....Ea. **30c**

PHILLIPS SCREWDRIVER 6¾" overall length. Blades 3" long. Insulated non-slip handle ⅞" diameter. Brand new .....Ea. **15c**

PORTABLE TRANSMITTER Navy Department Model MI-2462 (made by RCA). Sound powered microphone transmitter with push-to-talk switch. Metal formed chestplate with adjustable strap for support about operator's neck. Pivot adjustment for placing of microphone. Has 7-wire color-coded rubber covered heavy duty cable, 20 ft. long. Units will work up to several thousands of feet apart, no batteries or external power supply needed. Several units may be connected together on same circuit. Indispensable for television antenna installation, electrical wiring work, plumbing contractors and other point to point work. Brand new.....Ea. **$7.50**

Headset not included

GLASS TELEPHONE-POLE INSULATORS Hemingway size 680. Fits ¾" wooden crossarm pin. Overall height 5", diameter 4". Will hold two single steel wires, or two pair of stranded wire cables. Brand new.....Ea. **40c**

ESSE RADIO CO.

Esse's Special Offer

INDIANAPOLIS, INDIANA

HONE and WHETSTONE

HUNTER'S and FISHERMAN'S SPECIAL! ALSO FOR HOME WORKSHOP and MACHINE SHOP

ORDER NOW

Fine quality, high-grade knife, fishhook, tool and hand-axe sharpener and polisher. U.S. Government surplus. Light weight (weight less than 1 ounce). Size ½ inch wide x 4 inches long. One-half of instrument is finest possible whetstone and other half is cork rust remover and polisher. Any trapper, hunter, fisherman, hobbyist or machinist cannot afford to pass up this bargain. Brand new.

15c EACH

$1.00 dozen

AIRCRAFT RADIO RANGE FILTER FL-8

For helpful reduction of QRM on crowded CW bands. When attached to output of any communications receiver:

1—Will pass signal of 1020 CPS, eliminating others.

2—Will pass voice frequencies and eliminate 1020 CPS code signal.

Compact, light weight, with switch. Size 2¾"x 2⅜"x3¾". Price ..... **$1.25** ea.

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. Price..... **$24.95**

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

Type 83-1R Receptacle, chassis type, low-loss Mica filled insert, very special..... **30c** each.

TURBO AMPLIFIERS

Used for parts or small phono-amplifier, shipped complete with the following tubes: 2—7C5's, 1—7Y4, 1—7F7. Our greatest bargain. See July 1947 "Radio Craft" for conversion data. Each **$1.25**

CO-AXIAL CABLE

For high frequency low-loss, trouble-free, weather proof, durable service. Fully shielded, cut to length. Brand New.

RGS/U-52 ohm (RG8/U)
Price—100 ft. for..... **$4.95**

CLOSED VIEW

OPEN VIEW

REMOTE CONTROLLED COIN INSERT AND SPEAKER BOX

- Made by Personal Music Corp., Newark, N. J.
- Model F
- 24 Volt operated, fused
- Weight 6½ lbs.
- Size 4¾ x 7½ x 5½" high
- 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 (lock furnished)
- Easily removable coin box, size 6" x 3½" x 1½"
- Requires 4 wires from power unit
- A beautiful piece of equipment that could be built to house coin operated radio.
- Worth several times our asking price. **$4.00**
- Price brand new.....

LS-3 LOUDSPEAKER

6" PM type, housed in heavy metal case. For use on BC-348 Receiver. Self-contained output transformer to match 400 ohm impedance. Used but guaranteed satisfactory. Price **$4.95**

ESSE RADIO CO.

CONCERT MASTER RADIO TUBES

INDIANAPOLIS, INDIANA

Newly Manufactured, Brand New Radio Tubes (Not Surplus)

Each tube is individually beautifully boxed. Standard radio tube guarantee, backed by the manufacturer and also by Esse Radio Company.

.50c each

0Z4	1L4	1U4	*5W4	*7C5
1A5GT	*1L4	1U5	5X4G	7E5
1A7GT	1Q5GT	1V	5Y3GT	*7F7
1C5GT	*1R4	5R4	5Y4	*7H7
1C6	1R5	5T4G	5Z3	*7K7
1G4GT	1S5	5U4G	5Z4	*7Q7
1H5GT	1T4	5V4G	7A7	*7Y4
1J6GT	1T5	5W4	7C4	*7Z4
1N5GT				

.60c each

2A3	6C8G	6SL7GT	12SN7GT	*50C5
*2A4G	6D6	6SN7GT	12SO7GT	50L6GT
2A5	*6D6	6SO7GT	12SR7	51
2A7	6D8	6SR7	14A7/12B7	53
3A4	6F5GT	6SS7	*14Q7	56
*3B7	6F6GT	6ST7	14X7GT	*56
*3D6	6F8G	6T7	19T8	57
3Q4	*6F8	6U6G	24A	58
3Q5GT	*6H6	6U6GT	25A6GT	70L7
3S4	*6H6GT/G	6U7	25A7GT	*70L7
3V4	6H6GT	6V6	25AC5GT	71A
6A3	6I5	6W7	25L6	75
6A6	6I6	6X4	25Z5	76
6A7	6I7	6X5GT	25Z6GT	77
6A8G	*6I6	6Y6G	10	78
6AC5GT	6I8G	*6Y7	26	80
6AC7	6K6GT	6ZY5	27	81
6AG5	6K7	*12A6	30	84/6Z4
*6AG5	*6K8	12A8GT	*30/VT67	85
*6AK5	6K8G	12AT6	31	89
6AL5	6L6G	12AU6	32L7	117L7GT
*6AL5	*6L7	*12AU7	35	*117N7
6AT6	6N7	12BA6	35B5	117P7
*6AT6	6P5GT	*12AV6	35L6GT	117Z3
6AU6	6Q6	12BE6	35W4	182B
*6AU6	6Q7	12C8	*35W4	183
*6AV6	*6R7	12F5GT	35Z5GT	482B
6AV6	6R7	12I5GT	36	483
6B4G	6S7	12I7GT	37	*717A
6BG6G	6S8GT	12K7GT	38	*955
6B8G	*6SA7	12K8	39/44	*956
*6BA6	6SA7GT	12Q7GT	40	*957
6BA6	6SC7	*12SA7	41	*1005
*6BE6	6SF5	12SA7GT	42	1629
6BE6	6SG7	12SF5GT	43	*1625
6BI6	6SH7	12SF7	46	2050
*6BF6	6SI7GT	12SH7	47	2051
6C4	6SK7GT	12SI7GT	50	*9003
6C5GT	*6SL7GT	12SK7GT	50B5	*VR150
6C6	6AG7	6AL7	35L7GT	

.05c off per tube if ordered in quantities of 50 or more

*All tubes marked * are not Concert Master radio tubes but are standard brand tubes in cartons and will be guaranteed by Esse to be perfect.

We will take your word—if these tubes don't suit your purpose or are found to be unsatisfactory, we will cheerfully refund. Satisfaction absolutely guaranteed.

ESSE RADIO CO.

Esse's Special Offer

INDIANAPOLIS, INDIANA

PILOT'S CONTROL BOX, TYPE CRV-23254

Used with CRV-46151 Receiver for remote control of volume, selection of any one of six frequency bands, has off/on switch or selection of C.W. and M.C.W. and M.V.C. or A.V.C. Black crackle finish. Size, 2"x2½"x5" high. Brand new.
Price ..... **$1.50** ea.

RECEIVER TUNING HEAD CRV-23253

Used with CRV-46151 Receiver for vernier tuning. Has beveled dial with hairline cursor. Bands are 200-560, 560-1600, 1600-4450, 4450-9050 Kcs. Each band spread over about 280 degrees of dial edge. Has provision for flexible tuning shaft or can be adapted for direct drive on any tuning shaft. Black crackle finish. Size 5"x3"x2" over-all. Brand new. Price..... **$1.50** ea.

ANTENNA KIT 2A-264-126

Consists of 1 canvas bag containing 20 ceramic insulators each 3" long, 1 covered wire 5' long, 1 covered wire 10' long, 1 covered wire 35' long, 2 covered wires 25' long each, 5 covered wires 20' long each (all wires included for ⅛" thimbles and 6" connecting leads at each end), wire 150' long, (all this is stranded copper wire, covered with weather-proofed insulations). Useful to any ham, serviceman or experimenter. Brand new overseas boxes..... **$4.50**

SN-7C/APQ-13

Sensational offer for television engineers. Contains 19 Mc. IF strip containing 5—WE 717A tubes, other HF strips containing 2—6AK5's, 3—6SL7GT's, 1—WE717A, 4—6SN7-GT's, 2—6N7's, 2—6L6's, 1—6H6, 3—6AC7's, 2—6AG7's, 1—6V6, a total of 26 tubes. Other parts such as DPDT relay, 7 pots, 12 Amphenol 831R chassis connectors, and numerous condensers, toggle switches, RF chokes, variable condensers and transformers. Wgt. approx. 25 lbs. Size 20" L. x 11½" W. x 7¾" H.
Price **$14.50**

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 5⅛"x 5¼"x3¼"). Price..... **$1.95**

BC-1033—contains 6SH7, 6SL7 and 12SN7 tubes, sensitive relay (size 5⅜"x5¼"x3¼"). Price..... **$2.25**

SCR 274N COMMAND SET OR BC -348 POWER SUPPLY

To convert the BC-348 receiver for 110 V. AC operation. Constructed especially for the Esse Radio Company by a leading transformer company.

These power supplies have gained great popularity due to quality, price and simplicity in conversion. Filament supply 24 V. Rectifier tube used: 6x5 (not included).
Price **$5.95**

R-89/ARN 5A GLIDE PATH RECEIVER

Formerly used for blind landing but adaptable to many other uses such as receiver for new police or citizens' band. Band of operation 326-335 mc. on any of three predetermined crystal controlled frequencies. Contains eleven tubes, 6 relays and other valuable parts. For 24 V. DC operation. Size 13¾"x5¼"x6⅜".
Price, complete..... **$9.00**

WILLARD LEAD ACID CELLS

(Brand new) 6 V. (dry-charged) **$2.00**

6 V. in metal carrying case (dry-charged) **$3.00**

(Add electrolyte specific gravity 1.265—any drugstore.)

BC-645 ULTRA HI-FREQUENCY TRANSMITTER-RECEIVER

You read about it recently in QST! Originally operated in the frequency band from 450 to 500 Mc. Can be converted to 420 Mc. amateur band. Consists of complete transmitter and modulator system, and receiver. Complete, brand new, with 15 tubes.
Price **$11.95**

T-39/APQ-9 RADAR XMITTER

Contains many excellent parts for the VHF experimenter such as a cavity oscillator using 2-RCA 8012 tubes rated at full output to 590 Mc. Tubes are forced air cooled by 24 V. DC motor, which is easily converted for 110 V. AC operation. Other valuable parts such as a pair of 807's, 2-6AC7, 1-931 and 1-6AG7 tubes; ceramic switch, potentiometers, gears, revolution counter, etc.
Price **$9.75**

CP-11/APS-15

Contains following tubes: 13-6SN7-GT's, 3-6SA7-GT's, 1-5Y3-GT. 1: 24 V. motor and blower (blower will operate on 110 V. 60 cy.), 4-one meg-ohm precision wire-wound resistors, 80-86 Kc. crystal, numerous other transformers, condensers, etc. Shipping weight approximately 25 lbs.
Price **$6.50**

ULTRA-VIOLET FLUORESCENT COCKPIT LIGHT ASSEMBLY

Air Corps type C-5, 28 V. DC operated. Black plastic case about 1½" dia. x 3" long. Has adjustable mounting flange, 3 foot two conductor shielded cord and plug. Includes bulb. Brand new. Each..... **$1.00**

OXYGEN TANKS 500 LB. PRESSURE

Aviator's oxygen breathing bottles. Non-shatterable. Ideal to use for air tank on air horns, paint sprayers, pneumatic tools. Excellent condition.
Price **$3.50**

PP-51/APQ-9 RECTIFIER POWER UNIT

400 cycle 115 V. Contains 4—5R4GY tubes, 2—4 Mfd. 1000 V. DC condensers, 2—1 Mfd. 1500 V. DC condensers, 400-2600 cycle transformer, power resistors, etc. Wgt. 38 lbs. Size 21" L. x 5⅛" W. x 7¾" H.
Price **$4.95**

BC-221 FREQUENCY METER

Covers 125-20,000 Kc. Battery or 110 V. AC or vibra-pack operated. A beautiful instrument. The finest we have ever had. Price..... **$69.50**

AIRCRAFT BATTERY AN-3152

Brand new, 12 volts, 24 amp hours. Dry packed and charged. Add battery acid Specific Gravity 1.265 (can be bought at any drugstore). Ideal for any amateur on 12 volt operations. Hard rubber case, size, 5¼" x10¼"x10¼" with bolt type connectors and with overflow. Weight 35 lbs.
Price **$12.95**

24 V.—600 Watt GRIMES Retractable Landing Lights. Excellent motor for model locomotives, etc. Wire 4 lights in series for powerful flood light operated from 110 V.AC or DC supply. Price..... **$6.50**

TUBE HEATERS

110V. AC or DC 100 Watt Heater. Ideal for many uses—such as line resistance, glue pot heater, baby bottle warmer, etc. Brand new—packed two per carton 2¾" diameter.
Price, per pair..... **75c**

ARB (CRV-46151) AIRCRAFT RADIO RECEIVER

6 tube. 4 band, superheterodyne receiver with built-in dynamotor. Designed for reception of MCW (tone or voice) or CW within the frequency range 195 Kc. to 9.05 Mc. We bought a carload of these in order to sell them at this price. Price **$24.50**

LEECE NEVILLE AIRCRAFT GENERATOR

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

I. F. TRANSFORMERS

RCA 455 Kc, Permeability Tuned. 1st I.F. tube 1R5, 90 Volts to 35 Volts, Size 1⅜"x 1⅜"x2½", aluminum can, Spade type mounting lugs—Brand new.
Price..... **50c** each, 10 for **4.00**

TRANSTAT

Made by American Transformer Co. Rated at 3.45 KVA output. Range 90 to 130 Volts, 50 to 60 cycle AC. Size 7¾"x7¼"x16½" long.

Can be mounted in any position—Handwheel adjustment for voltage adjustment.
Price **$45.00**

BEAM MOTOR

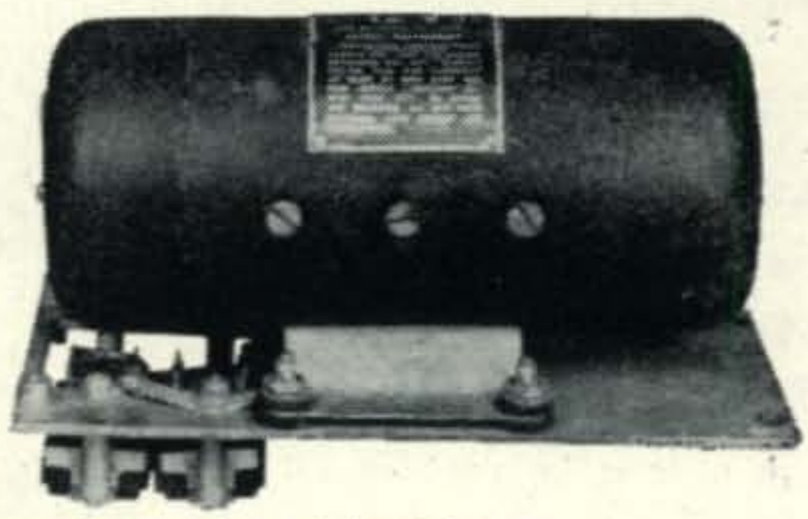
Brand new—export packed (Motor only) for large type propeller pitch changing mechanism, (less gear box). Will run 7000 RPM from 28 Volt 60 cycle AC source, or from 28 volt DC source—Full wiring instructions furnished. Size 6" diameter x 8" long. Shaft extends 2" from housing.
Price ..... **$7.50** each

A-5 AUTOMATIC PILOT SERVO M1

Made by Delco-Remy

Has ¼ horsepower shunt type DC motor, 27.5 V. 11 amps. input, speed 6000 rpm. Has hydraulic lift—(Intended use—Hydraulic lift actuates Ailerons on airplane). Overall length 16", width 12", height 11". Net weight 28 lbs. Shipping weight 35 lbs. Hardware for cable drum included. Brand new in original packing boxes. **$9.95**

DYNAMOTOR DM-35-D



Western Electric Model No. 5DY83AB7. Manufactured by G.E. for Signal Corps, U.S. Army.
Input 12.5 volts DC at 18.7 amps. Output 625 volts DC at .225 amps. Diameter 3½", length 7½", mounting rack 8½" long.
Ideal power supply for mobile installations. **$6.95**

Brand new in original boxes.....

AUTOMATIC DIRECTION FINDER RADIO COMPASS SCR-269-G

Brand new in original crates

Made by Bendix

Complete, a truly magnificent buy for airplane owners or boat owners..... **$179.50**

POWER SUPPLY FOR SCR-269-G RADIO COMPASS

A Holtzer Cabot Elec. Co. manufactured Inverter which changes a DC power source such as from the Aircraft battery to the required AC power source needed for operation of the SCR-269-G Radio Compass. Rated input 26 Volts at 400 cycles; 750 volt-amperes. Output 115 V. at 400 cycles; 500 volt-amperes. Approximate weight uncrated 25 Lbs..... **$12.95**

WESTINGHOUSE RECTIGON BATTERY CHARGER BULB

Style 289416, 6 ampere rating. For replacement in most chargers or for building power supply to use on D.C. operated equipment. Brand new. Price..... **$1.90** EA.

ARGON BULBS

2-watt, 110 V., Edison base. Ideal for R.F. indication, night light. Brand new. Box of ten. Price per box **$1.75**

day. Jim uses what he calls a lousy dipole with no hopes of a 14-mc. beam. He admits, however, the virtues of a beam, as WØPMQ now has one covering half a city block and is working VUs and VSs like crazy.

W6MEK was looking through his log, the other night, and ran across a pleasant surprise. The surprise was *F8NE*, Corsica, which he had worked last July, was overlooked, and failed to send it in until now. MEK, who lives in Oakland, lost everything in a big wind recently, which uprooted his tower and demolished much property. Others in that neck of the woods who also lost their antennas are W6PB, W6LDD, and W6RCC. You can't keep these guys down, and I'll bet they have new antennas up in the air already.

Just in case you haven't heard, *DU1GT* is ex-KA1ABT. ZL2GX is still waiting for Zone 17 for W.A.Z. Jock says he has worked more Russian stations than any other foreign country, and has received SWL cards, but the percentage is very low on returns from QSLs. In fact, the percentage is "zero" from Zone 17.

VK4RC couldn't raise *OQ5RA* by calling him, so he got mad and tossed out a CQ. Sure enough, back comes OQ5RA. Another good one for Bob was *C3EA* who generally specifies the frequency to use when you come back. 4RC relates that there is a new one on in Trucial Coast, Persian Gulf with a chirpy T8, signing *MP4BAC*. Also, *F18ZZ* tells him he still cannot QSL, and to make matters worse, *F18AL* is in the same boat.

MP4BAB, ex-VS9GT, is another "ex," since he has been moved to Egypt on the Suez. Frank says that if any of you fellows have not received your card from him, please drop him a line at his new QTH, which will be found in the regular section. He intends to QSL all contacts made during our World-Wide DX Contest in October.

WØYXO is moaning about having to make so many trips out of town, and this, of course, holds down his DX activities. You may recall that Ken lost his rotary some time ago, and did not seem to have enough ambition to put another one together. However, a little more serious consideration was given this situation, together with his competitors sneaking up on him, so up went another beam. As a matter of fact, he has had it up for two or three months.

ON4JW would like to have the boys know that he is on 3,500 and/or 7,000 kc around 1600 to 0700 GMT. Recently, he worked *VP2LA* on 3.5 for what is apparently the first VP2/ON contact on that band. Jules has salted away 67 countries on 40, and 23 on 80.

Another WØ is added to our fold; this one WØUOX. It sounds as though he is having a private battle with WØNUC. UOX needs only Zone 34, while NUC needs Zone 23.

It's good to see W7GC in the Honor Roll. It's good for several reasons, one of which is because the guy lives in Reno, Nevada, and a lot of the boys overseas, from what they tell me, want Nevada contacts. However, it looks as though you overseas boys are going to have to use phone to get him, as, thus far, W7GC has not done any key-punching. We're glad to hear from *VS1AY* in Singapore, and Stan claims he has high hopes of making W.A.Z. in 1949. If he does make it, he should deserve a great deal of credit, because conditions in Singapore are notoriously bad when it comes to reception and transmission. With the

STRICTLY HIGH POWER!

OUR POWER HOUSE "SPECIAL"!

100

7400 vct at 500 ma. HD transformer. Provides 3090 vdc at 500 ma., choke input. Nicely cased in two tone grey and black.....PRICE **$59.00**

THE 1KW "STANDARD"

5900 vct at 500 ma. Gives a perfect 2000 vdc at 500 ma., choke input. Similar to "SPECIAL" except for size. 6¼ H x 5¾ W x 11½ L.....ONLY **$39.50**

FILTER CHOKES

TYPE	RATING	INSUL.	EACH
 101	6 hy 350 ma 80 ohm	4500v	3.95
	8 hy 500 ma 80 "	5000v	8.50
	5-20 hy 500 ma 80 "	5000v	8.25
 101A	8 hy 700 ma 60 "	7500v	12.75
	5-20 hy 700 ma 60 "	7500v	12.50

Matches "SPECIAL" and "STANDARD" transformers

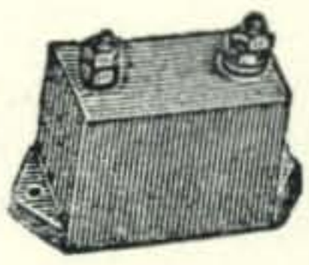
HV OIL CONDENSERS

TYPE	MFD	WVDC	EACH
 102	4	1000	1.45
	4	1500	2.25
	1	3600	2.75
	2	4000	3.95
	1	5000	3.75
	2	5500	5.95
	2	2000	1.85

FILAMENT TRANSFORMERS

TYPE	RATING	INSUL.	EACH
 103	2.5v at 10A	10,000v	3.75
	11.5v at 11.5A or 10.5v at 23A	2000v	3.50
	10v at 6A	2000v	2.75
	2.5v at 10A	7500v	4.95
 103A	10v at 3A 5v at 3A 5v at 3A 6.3v at 1A		

HV MICA CONDENSERS

TYPE	MFD	WVDC	EACH
 104	.005	7500	1.25
	.002	7500	1.25
	.0075	5000	.95
	.90375	5000	.95
	.00056	5000	.75
	.00011	5000	.85
	.0075	4500	.85
	.002	3500	.85
	.004	3000	.75
	.0001	3000	.65

1.5 KW ROCK CRUSHER!

1470 vct at 1.2A—Use bridge or doubler for higher voltages. A natural for a KW and 304TLs.

ONLY **$17.50**

TRANSMITTER VARIABLE CONDENSERS

Cardwell XE240XD, split stator, 120 mmf effective, .1" spacing 4000 v, polished plates..... **4.95**

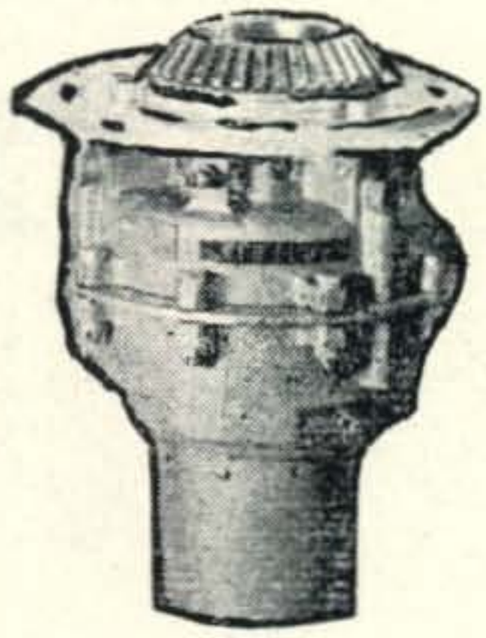
Cardwell MO180BD, split stator, 90 mmf effective, .05", 1600 v..... **2.25**

Cardwell MR260BD, split stator, 130 mmf effective, .03" 1200 v..... **1.50**

Cardwell single 80 mmf .08"..... **1.25**

Bud Jr. 250 mmf .05"..... **.89**

All variables Mycalex insulation



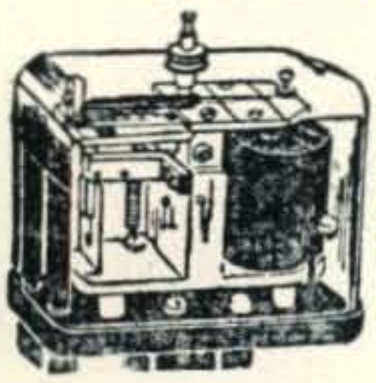
106

STILL AVAILABLE!

BEAM prop motor—28 to 35 vdc or ac, ¾ rpm

SAME PRICE **$12.95**

OVERCURRENT RELAY



108

GE glass cased, front panel reset, calibrated and adjustable 0.5 500 ma—1.5 amp.....**$7.95**

SURPLUS RADIO INC.

44-31 Douglaston Pkwy. Douglaston, L. I.

Phone: Flushing 7-9173

Minimum order $3.00

Send MO. or check, no COD

noise level being so high, only 14 to 28-mc bands are used. VS1AY has relatives in New York, as well as around Toronto, so you'll hear the guy trying to get into those spots more than any others. If any of you want to look for VS1AY, he is usually around 14,330, or 28,400 between 0030—0100 or 1400—1430 GMT on phone. GM3CSM would like to swing a deal which would get *TA3FAS* to work *in* the phone band instead of on 28,000 kc. With all W ops FAS should know better!

W2JA worked someone signing *EA7NF* who, apparently, is not in Spain proper. He told Dave to wait for his card, and patient Dave is still waiting . . . W6ID has worked his 40th zone, but sadly relates that he probably won't be able to claim W.A.Z. at the rate QSLs are coming in. Maybe it would help if we mentioned that W6ID is an FBI man.

VE7ZM passes along some phone info. Bill says there are any number of Russian stations who actually have phone, but will only contact you on phone after you first hook them on c.w. *UA9KOG* has an excellent phone signal; *UA1KEC* has phone, but his modulation lacks something; *UA3KAA* is on 14,185 phone only; *UG6BA,* 14,155, phone only; *UA1BE* another on phone who wanders all over the band; *UB5BG,* 14,300, phone only; and, *UB5KAG* is on 14,155. *UI8KAA* and *UA9DP* will go on phone after first being requested to do so by hooking on c.w. VE7ZM has been trying to get a phone QSO with *UAØSI* who is in Zone 18. *UAØFG,* in 19, can get on phone if requested to do so, after first hooking up on c.w. Bill actually has contacted all 40 zones on phone, but three of the QSOs were c.w. on the other end, which, of course, doesn't count for phone. Remember, you boys in the phone section, all contacts must be phone-to-phone.

WØOUH has moved to Minneapolis right in the middle of the home grounds of WØYXO, PNQ, and UOX.

LU8BF tells me that you can count on getting a card from *VP4TAN*. He is on 10 phone, running 500 watts into a BC-610 . . . W2EMW worked *VR5PL,* the other day, and Noel wanted word passed along that he is leaving Tonga to become a ZL1. From now on, send all your cards to him via N.Z.A.R.T. Apparently *VR5IP* and *VR5JA* will stay on Tonga, so that country will still be on the map. W2EMW worked *MO1A* who said he was ex-MD1A, with his present QTH being in Benghazi. EMW, after working 29 zones and 52 countries in the first ten days of this year, discovered, by reading CQ, there was no 1949 Marathon. Bob puts it, "I found out I was competing with myself."

From current reports, it looks as though *YQ5B* is located in Bucharest. Don't know yet whether YQ replaces YR or not.

VK2ACX has at last worked *TF3EA* for his 40th zone. It looks as though we will be shipping another W.A.Z. certificate down that way before long . . . *LX1AB,* who, as you know, handles the QSL Bureau in Luxembourg, gives the low down on LX calls as to which are *not* genuine, in other words—pirates. Here they are: LX1BW, LX1EN, LX1ER, LX1ES, LX1FR, LX1HW, LX1TS, LX1AX, LX1ST, LX2DN, LX2EF. It looks as though the pirates outnumber the genuine stations. LX1AB repeats that the only legitimate LX stations are those listed in the Call Book, and he says

NEW TRANSFORMERS and CHOKES by POWER CONVERSION CO.

TRANSFORMERS:

INPUT: 115/230 V.A.C. 50 or 60 cycles.
OUTPUT: 2500-0-2500 V.A.C. (2000 V.D.C. after choke input filter at 500 MA.) CH-102.....$39.75

ALL FOLLOWING TRANSFORMERS 115 V.A.C. 60 CYCLE INPUT:

OUTPUT: 750-0-750 V.A.C. (600 V.D.C. after choke input filter at 250 MA.) Includes 6.3 V.A.C. winding at 5 amps and 5.0 V.A.C. winding at 4 amps. CH-106.....$7.95
OUTPUT: 625-0-625 V.A.C. (500 V.D.C. after choke input filter at 250 MA.) Includes 6.3 V.A.C. winding at 5 amps and 5.0 V.A.C. winding at 4 amps. CH-107.....$7.35
OUTPUT: 600-0-600 V.A.C. at 250 MA. 12 V.A.C. at 3 amps; 12 V.A.C. at 3 amps; and 5 V.A.C. at 3 amps. Designed for Army surplus transmitters. CH-108.....$6.90
OUTPUT: 250-0-250 V.A.C. at 60 MA. 24 V.A.C. at .6 amps; 6.3 V.A.C. at .6 amps. Designed for Army surplus Receivers. CH-109.....$3.00
OUTPUT: 6.3 V.A.C. at 6 amps. CH-110.....$2.25
OUTPUT: 24 V.A.C. at 2 amps. CH-111.....$2.25
OUTPUT: 2.5 V.A.C. at 10 amps. Center tapped and shielded. Open frame mounting insulated for continuous operation at 5,000 Volts. CH-113.....$4.20

CHOKES:

CH-115—8 Henries at 500 MA. filter choke, 5,000 volt insulation.....$8.67
CH-116—5-20 Henries at 500 MA. swinging choke, 5,000 volts insulation.....$8.37
CH-117—8 Henries at 700 MA. filter choke, 7,500 volt insulation.....$12.90
CH-118—5-20 Henries at 700 MA. swinging choke, 7,500 volt insulation.....$12.45

All Above Items Are Brand New . . . Not Surplus!

TRANSFORMERS—110 VOLT 60 CYCLE PRIMARIES:

Sec. 14-14 or 28 Volt 7½ or 15 amp.....$4.95
Sec. 12 Volt 1 amp. 1.50
Sec. 24 Volt 1 amp. 1.95
Sec. 24 Volt .5 amp. 1.50
Sec. 36 V.A.C. 2.5 amp. 2.95

FL—8A FILTER—1200 CPS—Connects between receiver output and phones or speaker. Reduces interference and noise ratio. Price.....$1.95

COMMAND RECEIVERS:

BC-455—6 to 9.1 Mc.....USED: $6.95
MOBILE DYNAMOTOR—6 V. for Comm. Rec. No. USA/0151.....$1.95
TRANSFORMER—CH-109—for Command Rec.....$3.00

AC POWER SUPPLY AND SPEAKER:

Completely wired power supply and speaker with volume control C.W. and on & off switch, housed in metal cabinet. For command receivers with connections to plug into receiver and 110 Volt 60 cycle line. Voltage output: 250 V. 50 MA., 6.3 V. and 24 V.
Price: Completely wired.....$14.95
Price: Kit of Parts only..... 9.95

COMMAND TRANSMITTERS:

BC-457—4 to 5.3 Mc.....NEW: $9.95.....USED: 5.95
BC-458—5.3 to 7 Mc.....NEW: 8.95.....USED: 5.95
BC-456 MODULATOR—for Comm. Trans.....USED: 2.50
TRANSFORMER—CH-108—for Comm. Trans..... 6.90

COAXIAL CABLE U.H.F.

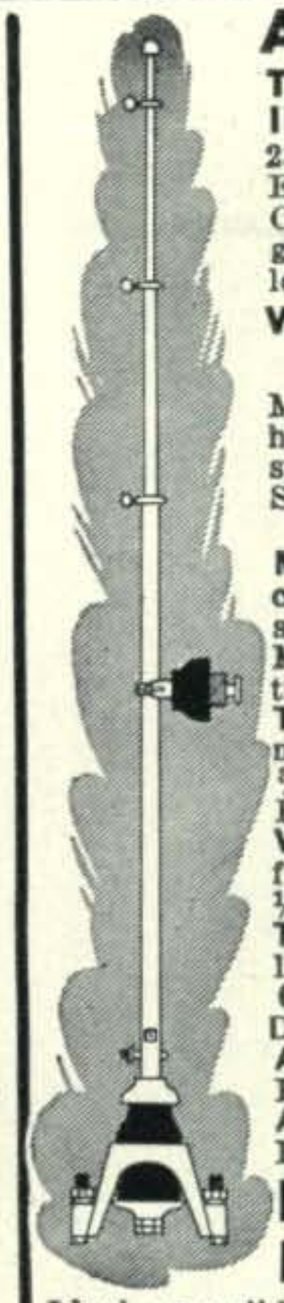
125 Ohm, Polystyrene beaded, cotton covered. Amph. 76-30. Price: 50 Ft. Roll.....$1.25 Two Rolls:.....$2.00
70 Ohm, Cable 8 ft. lengths w/conn. AN 3106-14-8ST; each end. Price:.....$.55 ea. Or Two for $1.00

MOTORS:

6 or 12 Volt AC-DC Heavy Duty reversible motor with 5/16" x 7/16" shaft. Price.....NEW: $2.95
6 Volt AC-DC Motor—Ideal for auto fans, models, etc. Shaft ¼" x ⅞". Used—Tested.....$1.50
Model Motor—12 Volt AC-DC ⅛" double end shaft. Size: 2½" L x 2½" W x 1½" H. Price.....$1.50
110 Volt 60 cycle, Ball Bearing, approx. 3500 RPM 1/25th HP. Shaft: 3/16" x ⅝". Motor size: 6½" L x 4" H. Converted type. Price.....$2.95
Hand Tool Motor—12 Volt AC-DC 5600 RPM. 3¾" L x 1¼" Diam. with splined shaft ¼" D x ½" L. Price.....$2.95

MISCELLANEOUS:

BC-647—IFF Receiver-Transmitter. High freq., complete with 8 tubes, dynamotor, gear box, etc.....$6.95
TU-17 or 25 for BC-223—Price: New.....$4.50
TU-5, 8, or 10 for BC-375 w/case—New..... 3.95
Cable for BC-223 w/PL-150 each end..... 1.75
Cable for BC-375 w/PL-61 each end..... 1.75
Cable for TCS EQ/65F7, 65F10, or 65F13..... 2.95
Vibrator Pack 6 Volt DC input, 220 V 50 MA output.... 4.95
Plug for I-82 Indicator PL-118 ..... 1.00
Plugs for LP-21 Loop, PL-112, or PL-108 ..... 1.00



ANTENNAS FOR ALL USES:

TELESCOPING ANTENNA WITH BASE INSULATOR: Four section, steel, extends 6'2" to 23'6". Diameter taper from 1-1/16" to ½". Each section fitted with adjustable locking clamp. Can be adjusted to length required for freq. Brown glazed base insulator and stand off. (Illustrated at left). Price.....$12.95

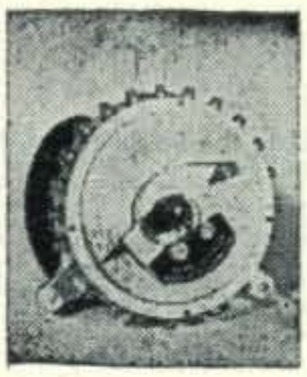
WHIP ANTENNA FOR MOBILE AND STATIONARY USE

MP-48 Mast Base Mounting with heavy vertical Coil Spring, insulated at top to receive Mast Section MS-53. Mast Base only $2.95

MAST SECTIONS: For above MP-48, tubular steel, copper coated, painted—in 3 foot sections. Bottom section MS-53 can be used to make any length. MS-52-51-50-49 for taper. Screw-in type. Any Section. Price: Each.....$ .50
TAPERED STEEL MAST—40 foot with hinged mounting plate. Eight sections tapered 2¼" to ¾". Isolating insulator in bottom section. Price.....$18.95
WHIP STEEL—24 ft. two piece. Bottom section 4 ft. long. Taper ¾" to ¼". Bottom Sec. threaded ½". Price.....$2.50
TELESCOPING STEEL ANTENNA—3 Sections, 94" long. Telescoped 40". Size: ¾" to ¼". Price.$1.75
GUYWIRE — Aircraft type, rust resistant. 3/32" Diam. 1,500 lb. test. Price per foot.....$ .02
A-27 PHANTOM ANTENNA—Used for loading BC-375, BC-191, and other transmitters. Price.$1.49
A-62 PHANTOM ANTENNA—Used for loading BC-604 Trans. around 10 meters. Price.....$1.49

NEW ANTENNA ROTATOR (Shown at right)

Ideal reversible motor for rotating all types of antennas at the top. Weighs only 4½ lbs. Size: 7½" L, less shaft. Gear box and Mtg.: 4⅝" x 3½". Motor size: 5" L. x 2¼" D. Shaft size: ⅜" x 1½" threaded. Operates from 24V. DC, 2 amps. 4.5 RPM or 36 V.A.C. Torque: 70 lbs. per inch. Price.....$8.95
TRANSFORMER (FOR ABOVE)—110 V. 60 cycle Primary; 36 V.A.C. Sec. Price.....$2.95



ANTENNA POSITION INDICATOR:

Ideal for indicating direction of antenna from a remote position. Units are same as illustrated and have 0-360 dial scales. Complete with two autosyns and 12 Volt 60 cycle Trans., and wiring instructions.
Price.....$6.95

SELSYN MOTORS:

115 Volt AC 60 cycle. Size V No. C-78248 3½" x 5½". Can be used to turn small antennas or for position indicator systems.
Price per Pair.....$5.95

SELSYN TYPE 2J1G1:

Can be used as position indicator for antennas; 110 Volt 60 Cycle, with instructions. Normally operates from 57.5 Volts 400 Cycle.
Price per Pair—Only.....$3.00

HIGH TORQUE MOTOR FOR ANTENNA ROTATION:

¾ RPM; operates on 110 Volt 60 Cycle with 10 MFD condenser; normally 110 Volt 400 Cycle, reversible clutch. Instructions included. Size: 4¾" x 4". Price $2.95; 10 MFD Cond. only $1.00 Reversing Switch at 35c.

DYNAMOTORS:

INPUT:	OUTPUT:	STOCK NO.	PRICE
9 V. DC	405 V. 95 MA	DM 635 X	$3.95
12 V. DC	220 V. 100 MA	D 402	3.95
12 V. DC	440 V. 200 MA	D 401	7.95
12/24 V. DC	440 V. 200 MA & 220 V. 100 MA	D-104	9.95
12/24 V. DC	F/No. 19 MARK II	P/S No. 3	9.50
13/26 V. DC	F/BC-645	PE 101	2.95
12/24 V. DC	500 V. 50 MA.	USA/0151	1.95
28 V. DC	F/Comm. Receivers	DM 32	1.95
14 V. DC	230 V. 100 MA	DM 20	3.95
9 V. DC	450 V. 60 MA/with Blower	D 9456	3.95
28 V. DC	400 Cycle Inverter (Reconditioned)	MG-149 F	12.95

ISOLATION TRANSFORMERS:

110 Volt AC to 110 Volt AC, 50 watts. Price.....$2.95
110 Volt AC to 110 Volt AC, 100 watts. Price.....$3.95
TRANSTAT VOLTAGE REGULATOR—No. 29144. Voltage range 103-126 V. 2.17 amps. Price.....$9.95

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even these are sometimes pirated. In addition to the stations shown in the Call Book, *LX1JW* should be added, as he is a new-comer . . . F8VC worked *VO6AL* on phone for his Zone 2.

W9BZB talked to *G6AJ*, the other day, who told him that after working about 30 Ws when operating portable in Pakistan last October, he gave a batch of QSL cards to a stewardess (you can't win here) on a Trans-Atlantic plane to be mailed in the States. Since BZB did not receive his, out of this batch, it is entirely possible the rest of you fellows who worked G6AJ might be in the same boat. Therefore, I am listing his QTH in the usual spot.

W6TI has been using an 80-meter doublet for years to work his DX, so, and I'll quote: "I'm getting tired of being a jerk and losing out on 50 countries in the past six months, so I am building a 3-element beam." This surprises me somewhat, because I figured Horace was going to be the sole survivor of a "last man club" using doublets.

The news is a little old, but *OQ5QF* is none other than ON4QF and is now operating in Elizabethville. I think you fellows would be interested to know that OQ5QF is, more or less, sacrificing his old African hobby of big game hunting for the sake of ham radio. Mick, that's OQ5QF, has known the scarcity of OQ5 contacts on c.w. and plans to use as much of his spare time as he can to give the c-w boys a contact. He does not plan to be there too long, and in order to have as many contacts as possible, he suggests:

A. Call him with very short calls *near* his frequency.
B. Make QSOs-short and avoid chatter such as: wx, name, description of gear, etc.

ON4QF photographed shortly before leaving for OQ5-land.

Mick will QSL every contact *after* he flies back to Belgium. Since his spare time will be limited, he prefers to use it actively on the air, rather than making out QSL cards. He *does* plan to send us, by airmail each month, lists of the stations worked with the date of QSO and time, for any who might want W.A.Z. credit. He is going to do the same thing for the A.R.R.L. Nice going, Mick. Maybe you've heard that *AC3GG* has been "discovered" by the proper authorities and has been tossed for a loss. Yep, he was in the States, they say.

ZL1HY, who digs up more stuff than ol' operative No. 1492, tells me that calls have been assigned to a couple of VKs for operating on two islands "down under." These islands, although not official countries, are Heard Island and Macquarie Island. The stations are *VK1FE* and *VK1VU*. They should be on the air by the time you read this. Remember I said they are not countries,

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304TL each 90c
Four for $3.00

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Complete with 5BP1 Scope Tube. Excellent Condition $12.95

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The ARB is a six tube, four band, superheterodyne Aircraft Radio Receiver with built-in dynamotor, designed for the reception of MCW (tone or voice) or CW within the frequency range 195 KC to 9.05 MC. USED .....

DYNAMOTORS & INVERTERS

BD-77—Dynamotor Unit 14v in, 100v, 350 ma out with relay fuse box and filters. FOB Chicago only $5.75

PE-101-C—Dynamotor unit; 12 or 24v in. outputs 800v, 20ma, 400v, 135ma. 9v, 1.1A 2.75

DM-32A—Each 95c. Three for 2.00

PE-55—Dynamotor unit: 12v in, 16 amp, 500v out. 200ma. FOB Chicago only 3.75

APN-1 RADIO ALTIMETER

Complete 420 mc transmitter-receiver unit, complete with all plugs, indicators. BRAND NEW. FOB Chicago only $34.50

ALTIMETER TRANSCEIVER RT-7/APN-1

Frequency 418-462 mc. FM with 14 tubes including 3- 12SJ7, 4- 12SH7, 2- 12H6, 1- VR150, 2- 955, 2- 9004. 24v Dynamotor, used, in working condition $7.95

VHF TRANSCEIVER

Ideal substitute for SCR-522, freq. range 140-144 mc, crystal controlled, 10 watts. The receiver section has two individual RF sections, feeding a common 3 stage 10mc IF amplifier. Both RF sections may be operated simultaneously, or either one individually. The receiver unit has 13 tubes. The transmitter is of straight forward design. Transmitter unit has 7 tubes, one #832 as final modulated by a pair of 6L6 and push-pull. Complete unit in case with tubes, crystals and diagram less dynamotor. EXCELLENT CONDITION $14.95

NEW PHANTOM ANTENNA for above unit:

3 lamps in parallel with sockets, complete for ..... 95¢

VHF DUMMY ANTENNA

Ideal unit for attachment for VHF transceiver while adjusting transmitter. 3 units hooked up in parallel will help tune up VHF transmitter. New Condition .....3 for 95c

SURPRISE PACKAGE

20 pounds assorted radio parts. A $25.00 value for only $1.95

BC-733-D

Localizer receiver of the blind landing system. Companion to the glide path receiver. Also contains 90 and 150 cycle band-pass filters. 108.3 to 110.3 mc by relay selection of crystals in the local oscillators. Wide pass-band on 6.9 mc. IF's ideal for FM. Has a wonderful AVC system using rectified output of an RF oscillator as power supply for 100v DC bias. With relays, crystals and 10 tubes: 3- 717A 2- 12SG7, 1- 12SQ7, 1- 12A6, 1- 12AH7, 2- 12SR7. Schematic furnished! Condition: used, excellent. FOB Chicago, only $3.95

New, FOB Chicago only $9.95

EE-8 ARMY FIELD TELEPHONE

Sturdy, highest quality telephone at less than price of a better-class toy. With ringer. Requires only two flashlight batteries for each phone and two wires between each phone. Excellent condition. Used. Each $7.95

GEARED TUNING DIAL

5 band, vernier. Freq. range from 3.2 to 32 mc. BRAND NEW. Ideal for many applications. An exceilent buy $1.39

APS-13 UHF ANTENNA

Suitable for 400 mc citizen band, ideal for UHF experimenters. With director and reflector elements mounted. BRAND NEW. 2 for $1.49

BC-659 TRANSMITTER-RECEIVER UNIT

FM transmitter-receiver, crystal controlled, two channels, freq. range 27-38.9 mc, 13 tubes 2 crystals. NEW $16.95

BC-620 TRANSMITTER-RECEIVER UNIT

FM transmitter-receiver, crystal controlled, two channels, freq. range 20-27.9 mc. 13 tubes, dual meter for testing filament and plate circuits. Used, good $9.95

MOBILE INSTALLATION KIT

For BC-659 or BC-620. Consists of TS-13; MP-48; 4 section whip antenna; insulators, 2 maintenance manuals; NEW $12.95

PE-117 UNIVERSAL POWER SUPPLY

6 or 12 v input; out. 145 v and 90 v. less, vibrator, voltage, regulator and rectifier tube; ideal mobile power supply unit; excellent condition. FOB Chicago, only. each $2.95

SMASH VALUES IN COMMAND EQUIPMENT

BC-453	EXC.	$12.95
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BC-456	NEW	2.95
BC-457	NEW	6.95
BC-458	NEW	7.95
BC-459	EXC.	9.95
BC-696	EXC.	14.95

CONDENSER

2 MFD, 4000V, Pyranol ..... ea. $2.95
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so please don't try claiming credit—not yet, anyway. Oh yes, it's the Australian Antarctic Expedition.

Now that the DX contest is over, I rather expect a large influx of additions to your zones and countries. If the phone boys had good conditions on both weekends, it might be possible for some of them to add the last two or three zones. Remember, I said, "Might!" Contest activity at W6QD was really at a high pitch. Actually, I was able to spend the whole sum of two or three hours on the air in the first weekend. It's a cruel world when you have to lay off contests to dash off this column, as well as hit the road for a little traveling. You all remember the traveling salesman and the farmer's . . . Hey, what am I saying??? Anyway, there wasn't a W9 in sight. 73

QTHs

AG2AG	**Trieste, c/o P.M. New York, New York**
CR7IZ	**Rutilio GRACA, Box 579, Beira Mocambique, PEA**
EZ5AA	**G. Loriot, Haut Commisariat, Direction Information, Sarrebruck (Sarre)**
EA4LA	**P. O. Box 220, Madrid, Spain**
FP8N	**Via W1JEL**
FO8AC	**c/o FZP, Papeete**
G6AJ	**H. W. Hamblin, May Cottage, Bosham, Sussex, England**
HL1BA	**T/Sgt. F. Soltis, 163rd AACS Sqdn., APO 712, c/o P.M. San Francisco, Calif.**
KC6EA	**Navy 3410, c/o FPO San Francisco, Calif.**
KH6VP	**Lt. Col. Wm. R. Shuler, Hqrs. U.S.A.R. P.A.L. APO 958 c/o P.M. S.F.**
KX6BB	**Navy 824, c/o FPO San Francisco, Calif.**
LZ1AA	**Box 271, Sofia**
MI3LZ	**APO 843, c/o P.M. New York, New York**
MO1A	**12/18 Royal Hussars, Benghazi**
MP2BH	**Via RSGB**
MP4BAB	**Cpl. Johnstone, 1238947, Signals, RAF, Shallufa, M.E.F.**
MT2FU	**B.O.A.C. Tripoli, North Africa**
TA3GVU	**c/o W2SN or A.R.R.L.**
VK1FE-VK/VU	**Via W.I.A.**
VP2KM	**P. O. Box 152, St. Kitts, B.W.I.**
VP4TBA	**5921 Group, APO 869, c/o P.M. Miami, Florida**
VU2CU	**P. O. Box 6666, Bombay, India**
VU2WR	**P. O. Box 5588, Bombay, India**
VU7AF	**Surjit Singh Majithia, c/o India Embassy, Kathmandu, Nepal**
VR3A	**Washington Island via Fanning Island**
W4LSW/KL7	**S/Sgt. Edgar Eno, 1929 AACS, Adak, Alaska, APO 980, c/o P.M. Seattle, Wash.**
W4OMI (ex-VP9P)	**Walter M. Olson, RFD No. 1, Kerrville, Tennessee**
YQ5B	**Box 326, Bucharest, Roumania**
YK1AA	**P. O. Box 35, Damacus, Syria**
YJ1AA	**Frank Palmer, Vila, New Hebrides, Oceania**
YS1ZG	**American Embassy, San Salvador**
ZD4AX	**Elmina Castle, Gold Coast, W.A.**

V.H.F. — U.H.F.

(from page 42)

W8ZUL, W9NJT, W9PK, W9LJP and WØQIN . . . W2IDZ, Westfield, N. J., spent considerable time listening and heard W1LLL, W1LSN, VE3-ANY, W1AEP, W1CLS, W8CMS, W3OR, W8-NQD, W1EIO, W1AW, W2RLV, W1CGX, WØ-NFM and W1GJO. All signals were of the aurora type, poor to fair readability.

W9PK got home from work at 1615 and at 1635 worked WØKYF. Then at 1650 CST worked W3RUE . . . W4LNG picked up W4FBJ on c.w.

before the Kentuckian switched down to 2 meters . . . W9ZHL worked W8APG, W9NJT, W9ALU, WØDZM and WØHEA . . . WØQIN reports contacts after 1730 CST with W8NQD, W4FBJ, W9NJT, WØCJS and WØHAQ . . . W7HEA found conditions similar to those of the night before, working W7BQX, W7FLQ, W7DYD, W7-IEE and VE7CN . . . W1CGY worked W8NBM at 2015 EST, heard WØNFM at 2040 EST, then at 2045 EST heard what sounded like a W7 call using phone . . . W7JRG heard WØCHI, Grand Junction, Iowa, W9QUV and worked WØHVW between 1805 and 1946 MST.

The opening on the 25th was more of the pure auroral type, although some of long-range work had the characteristics of unsteady sporadic-E. The following day HC2OT was again heard and worked. W8UZ got him at 1258 EST, W5VY at 1233 and W5ZZF at 1242 EST . . . W5ML, Oil City, La., during his usual valuable MUF watch heard it exceed 55 mc at 0830 CST towards the southeast. The MUF then remained around 50 mc until 1103 CST when W5JTI was worked via rebound scattering. HC2OT was heard at 1133 CST and then worked at 1143 and 1235 CST. This signal was one of the loudest ever heard on the 6-meter band. Probably at this time of the day it was regular high density F2-layer propagation.

February 3

During a moderate ionosphere storm aurora-type propagation again put in an appearance in the early evening. W8NQD reports working or hearing W2MEU, VE3YY, W9QKM, W9QUV and W1AEP . . . From 1950 to 2032 CST, WØINI heard W9QUV, WØQIN, W9PK, WØCJS, and WØNFM. Mostly very poor signals . . . W9ALU worked WØKPQ and W9IZQ . . . WØNFM worked W8NQD, W9AB, W9UCH and heard WØKPQ, W9PK, W9QKM, WØBJV, WØ-CJS, W2RLV, W8EP and WØQIN . . . WØQIN worked W9QUV and W9IZQ.

The V.H.F. - Hither, Thither and Yon

Six-meter activity is on the upswing in Oklahoma according to Merlin, W5HTZ. W5EHR has increased his power from 15 to 150 watts with good results. Ground wave from W5HTZ now includes W5LF, W5DFU, W5JME, W5MEY, W5GNQ and W5EHR. With W5AFX, W5LRY, W5EIO and W5HLD active it looks like this state will have a pretty fair representation next spring and summer . . . WØNFM has not been too active, spending most of his time installing a new furnace to fight off this past winter. During the lull, Clair has turned to photography and has a new Speed Graphic . . . Checking his log, W8-NQD reports 704 6-meter contacts during 1948. Did someone say something about nothing to work on 6?

W9DWU, who for a long time gave everyone a tough battle for the first WAS, has let his license expire: But, we're not worrying he'll be back—just you wait . . . WØQIN passes along the information that WØYSJ has moved east to Chicago . . . W1LSN wants everyone to know he is still alive and kicking. Jerry says that the New Hampshire gang have an emergency net on 6 meters which meets at 2100 EST each Wednesday night . . . WØCJS claims the aurora was so bright that he could turn off the filaments and still work the rig. Lumens—shmu-mens!

The *CQ* grapevine has it that Propagation Edi-

BUILDING ?

If you are constructing any gear described in any 1949 issue of QST or CQ, or the 1949 ARRL Handbook, send for our special listing of specified parts, and our guaranteed lowest prices.

Or — if you are building any other piece of gear, new or old, send us a list of parts you want and we'll be glad to quote a good price.

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25 WATTS: End link (160 MEL); Center link (MCL); or Variable link (MVL) Specify Type..... **$1.04**

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End Link—No Tap	160-BEL	**$3.44**
Center Link—Center Tapped	160-BCL	**3.44**
Variable Link—Center Tapped	160-BVL	**2.88**
Jack Bar (BEL, BCL) **85c**	BVL Base Ass'y	**3.44**

POWER UP TO 500 WATTS

Center Link—Center Tapped	160 TCL	**$3.93**
Variable Link—Center Tapped	160 TVL	**3.10**
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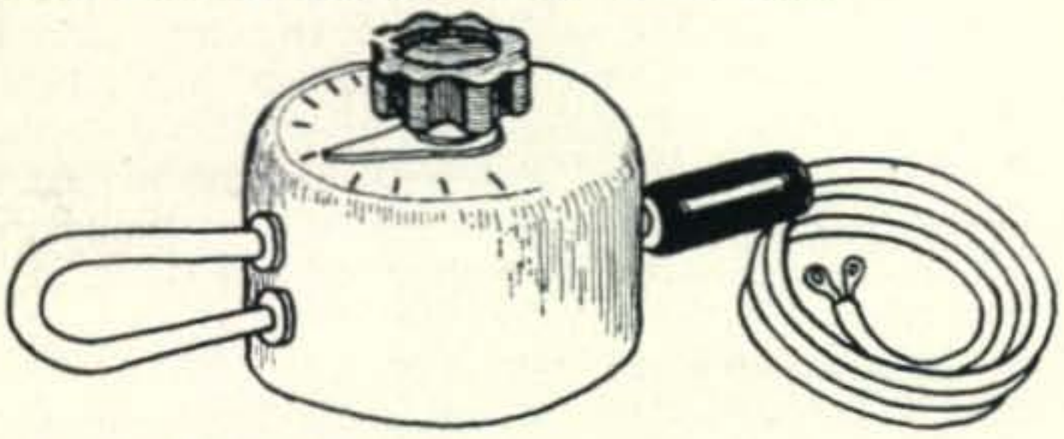
You'll need these to build up your tank capacity!

Stock No.	MMF	Gap	Price
PL 9700	25	.125	**$2.41**
PL 9701	50	.125	**3.44**
PL 9702	89	.125	**4.76**
PL 9703	100	.125	**5.61**
PL 9704	25	.250	**3.44**
PL 9706	50	.250	**4.76**
PL 9707	50	.350	**5.70**

"TIN CAN" WAVEMETER

Indispensable instrument described by John L. Reinartz, W3RB, in his "Ham Tips" TVI article.
Use for de-TVI'ing or for tracking down harmonics when building and adjusting. Many uses!



- Sensitive Wavemeter
- Field Strength Meter (Invaluable for tuning up beam)
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Everything needed to build it except the meter (even the can, meter jack and plug, grounding clip, reprint of article, etc.) Item TK-1 ..... **$4.98**

Same, completely wired and tested, ready to connect to your microammeter. Individually hand-calibrated, 50 to 150 MC. (Easily made plug-in coils cover lower frequencies) Item TE-1 ..... **$10.95**

SIMPSON MICROAMMETERS

3" Bakelite Case 0-100 microamperes..... **$12.50**

0-200 (Wavemeter twice as sensitive)..... **$15.00**

Model 374, Portable Lab. Microammeter. 0-50, 100, 200, 500, 1000, and "short" switch positions. With multiplier resistors, it makes an FB 20,000 ohms per volt multi-volt meter..... **$20.90**

The "GRID DIPPER" By MILLEN

A commercial version of W. Scherer's improved grid-dip oscillator described in Jan. and Feb. CQ. Drum dial calibrated 3 to 250 MC, sloping meter panel, compact size etc! 101 uses around the shack and shop. Made with Millen's traditional "Designed for Application" skill!
Send in your order NOW for first production delivery around April 20. Price, complete, about $40. to $45.
As usual — Harrison Has It! — FIRST

ANTENNA COUPLER

Will greatly reduce harmonic radiation and increase transfer efficiency to untuned feeders such as coaxial cable, ribbon, twisted pair or spaced line. Has series capacitor to tune out reactance of line. Perfectly couples balanced lines to transmitters with unbalanced output such as the 32V-1, etc.
Handles up to 500 Watts output, 6,000 Volt RF peak. Connect to xmitter with any coaxial cable. Dual output connections for coax and line. Plug-in coils with adjustable plug in taps simplify band changing. In compact, shielding metal cabinet, 7¼" x 10" x 8". Completely wired, with coax connectors, instructions, and coil for any one band. (Specify) Cat. AN-4 **$24.75**
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Additional coils, with plug-in taps **$4.95** each
Can be supplied finished in St. James Gray to match COLLINS equipment for $1.00 additional.

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Don't miss out on this tremendous transformer buy! 1500 Volts DC OUTPUT at 550 MA (ICAS). Rated 1750-0-1750 Volts AC at 400 MA., CCS. Completely shielded and potted, porcelain HV terminals—mounts upright or inverted. Rating clearly marked! (Not overrated surplus) BRAND NEW! 37 lbs—6¾" x 8" x 7¼" high. (See illus. March CQ ad) Item TP-17 (Add 85c for crating, if shipped)..... **$19.95**

866 Filament xformer—2½ Volts CT at 10 Amps. 7500 Volt Insulation! SPECIAL! Item TF-1..... **$2.39**

GOT BCI, TVI?

The Big TVI-BCI issue of the HARRISON HAM-A-LOG is still available! Packed with hints on interference reduction, material to do the job, Ham news and hundreds of FB bargains! Send us your name, address and call to receive this and future issues without obligation.

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Tell me what you have to trade, how much allowance you want, and what you wish to buy—or ask for my high offer. I guarantee the best trade-in deal! All material I ship is in original factory-sealed cartons (never opened). Another reason why it pays to get your equipment from me.

73, Bil, W2AVA

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144-Mc Honor Roll

	States	Dist.		States	Dist.
W8UKS	15	6	W8PYY	7	4
W8WJC	14	6	W9PK	7	4
W8WXV	13	5	W1CTW	7	2
WØNFM	12	4	WØBZE	6	3
W9TKL	12	6	WØGOK	6	3
W3KUX	12	5	W8DRZ	5	4
W1JFF	12	4	WØWG	5	4
W1IZY	12	4	WØHXY	4	2
W1PIV	12	4	WØJHS	4	2
W3RUE	11	5	WØRNC	4	2
W9BBU	11	5	WØKPQ	3	2
W3GKP	10	5	WØDDX	3	2
WØIFB	9	6	WØMZH	3	2
W9AB	9	5	W8YEG	3	2
W9ZHB	9	4	W4LNG	3	1
W2JPA	9	4	W9UIA	2	2
W1CTW	9	3	WØSV	2	1
W9LWE	8	5	W2RPZ	2	1
W9IPO	8	5	W5FSC	2	1
W3GV	8	5	WØZJB	1	2
W4FBJ	7	4			

tor Ferrell is going to shake some wigs loose with his analysis of antenna polarizations on the v.h.f. All the data comes from wartime research on which is better—vertical or horizontal. In overland tests, one type generally outperforms the other very very distinctly. Much of this information has just been de-classified.

A newcomer to 144 mc is W9EWO, Lebanon, Ind. Norm says that he wishes more of the new hams would realize the possibilities of 2 meters instead of attempting to crowd on 40 and 80 meters . . . Regarding 144-mc activity, WØJHS has acquired a hot new 144-mc pre-amp in a very shady deal with WØHXY. First crack out of the barrel, Phil worked WØGKO, Duluth, and heard WØBBN, Grand Marais. What kind of a gadget is that? WØTOZ is back on 144 mc in the Twin-city area, so look out, boys, when Doc is on, anything can happen . . . WØIZJ, Emporia, says that he and some of the locals are interested in looking for 144-mc DX next summer . . . Over in Junction, Kansas, WØCV, WØCJF and WØLQW are now consistently active with those ARC/5 units. WØLQW has an Elincor—horizontal, of course.

A group of above 50-mc enthusiasts has been formed in ustate New York, calling themselves the "Rochester VHF Group." It is affiliated with the Rochester Amateur Radio Association. At this time activity (about 25 stations) is confined to the 2-meter band. The frequency of 144.1 mc is used for calling with activity particularly on Monday, Wednesday and Friday nights. Anyone desiring more information on this organization should contact W2UTH.

Another interesting group is the Woody Island Television Club, Kodiak, Alaska. These boys, as their club implies, have banded together for the express purpose of constructing an amateur television transmitter. KL7QU and KL7KI have already started modifying BC-645 receivers for television reception. Floyd Overhauser, W6VAF, has been elected chairman of the club and Edwin C. Miller, P. O. Box 237, Kodiak, is the organization's secretary. They are very anxious to communicate with others who have attempted building television equipment.

W7QLZ reports working out to W7KJT, about 20 miles away on 420 mc. W7KJT is using a pair of 8012s and an APS/13 receiver into a ground plane antenna . . . Also on 420 mc, W2JND, Syosset, Long Island, has a WE316A running,

modulated with a single 6F6 at 28 watts input, 16-element beam and APS/13 receiver. W2JND has been heard several times at W2HWX, Little Silver, N. J., and by W2UCD, Belmar, N. J. A nightly schedule is held with W2BAV. W2JND generally runs a test transmission between 1900 and 2000 EST on 425 mc with automatic keying and voice break-in.

Postscripts

New England Division Convention

The annual N. E. Division Convention of the ARRL, sponsored by the Framingham Radio Club, will be held April 30, 1949, at the Nevins Memorial Hall, in the heart of downtown Framingham, Mass., with registration to begin at 1:00 p.m. Tickets will be $2.00; combination registration-banquet tickets will be $4.50. A special prize drawing will be held for all those having purchased tickets in advance, those ordered by mail postmarked not later than Saturday, April 16, 1949. To purchase tickets by mail, in advance, contact Ed Parsons, W1BWJ, 35 Pitts St., Natick, Mass.

Key Clicks

In the article "A Double Conversion Receiver for $30" by Allen Engleman, WØMYU, in the February issue of *CQ*, there is an error in the value of the resistance R3, in Fig. 2. Instead of 10 megohms as printed, the value should be 10,000 ohms.

Knickerbocker Amateur Radio Club

The Knickerbocker Amateur Radio Club of New York City, which was formed in 1937 and disbanded during the war, is about to reorganize. All Lower East Side Manhattan hams are cordially invited to make inquiry regarding membership. Full details may be obtained by writing the temporary recording secretary, Mack Santer, W2ZPW, 544 East 6th St., New York 9, N. Y. Other temporary officers are chairman, W2DRM; vice chairman, W2PJH, and treasurer, W2EFZ.

South Jersey Club Elects Officers

The South Jersey Radio Assn. has elected the following officers for 1949: President, W2UCV; vice president, W2ADA; treasurer, W2QKO; recording secretary, W2PFQ; corresponding secretary, W2PAU. New directors for the club are: W2OQN, W2ASG, W2AKI, W2SDO, W2PFT, W2REB and W2GQO.

YL's FREQUENCY

(from page 44)

But not all of the mother-and-daughter hams have a licensed OM in the family to help them along the way. One such instance is that of Mary Eloise and Clara Rose Rhein, W9FLU and W9FZX, respectively, of Carni, Illinois, who exclaim: "We sure have a time explaining why the OM isn't licensed! But he is very much interested so may have a call one day, too. It was through the encouragement of several friends of ours who are hams that we got our tickets." Mary received her license last October and operates W9FLU on 10 meters using 150 watts to a 3-element close-

spaced rotary. Clara Rose, who is 15½ years old, received her ticket on last December 24th (uum, nice Xmas present), and operates W9FZX on 40 c.w. running low power.

Are there other mother-daughter ham teams? If so, let's hear from you.

Storm Emergencies

With the rough winter experienced in the mid-west and west this year, many amateur emergency nets have had more than their fair share of practice. Irene Conklin, WØNXW, of Manilla, Iowa, the only YL member of the Iowa 75-meter Emergency Phone Net, comments: "We found out what it was to belong to a net of swell hams when our station was the only means of communication for several days."

One account of their work appeared in the Manilla *Times,* from which we quote: "For the fourth time since 'Conk' and Irene Conklin became interested in short-wave radio as a hobby they have been in the center of an emergency when all communication lines were down due to severe storms. The first time was when they lived in Madrid and this part of the country witnessed a severe blizzard. Claude (WØEFI) and Irene have been in two other such emergencies since moving to Manilla.

"Sunday's severe storm which brought a heavy blanket of ice throughout this part of the country cut off all lines of communication out of Manilla. During the emergency the Conklins operated as 'net control' and cleared train orders from points on the system, the majority of them being from Sioux City. They also handled several messages for the Illinois Central, and many personal messages. By 11 a.m. Tuesday only two telephone lines had been cleared out of Manilla . . ."

Explaining further, Irene adds: "The next week after this article was written we had another storm before the damage from the first one could be taken care of, so we went into it again for two days. We have an average of forty trains a day through here as our town is a junction on the Milwaukee Railroad, and no trains could have run through here had it not been for the hams who stood by to help us."

Well done! The Conklins run 500 watts on 75, with battery equipment on stand-by if the power should fail.

Personal Mention

Bea, W7HHH, tells of some interesting QSOs with Jeanne, KL7RN, who lives in Shungnak, Alaska, 50 miles north of Adak, where her OM, KL7IS, is with the CAA. Besides KL7IS and KL7RN there are only five other white people in the town: a man and wife who are the school teachers, their two children, and one other man. During a recent QSO Jeanne commented: "It wasn't so cold the other day—only 47 below zero." Ouch! Running 60 watts on 10 phone, Jeanne and her OM have many skeds with their families and friends in Oklahoma and Arkansas.

Recent visitors to Liz, W3CDQ, have been VE3-BTH, ex-G2JK, Capt. Ilott of the Canadian Army and his XYL and two jr. YLs, while on a month's leave visiting the U. S. A.

Latest from Eleanor, W6AWW, begins: "This is coming to you via my amphibious typewriter—

rain, rain—they say it never rains in southern California. We had one solid week of rain and now its starting all over. Guess I'll have to get the boots out again. Our ham shack is in the back yard so hamming and rubber boots go hand in hand in this weather!"

Rain or no, February 19th was a gala day for the YLs in San Diego. On that date members of the Los Angeles YL Club journeyed by bus and streamliner to be guests of the San Diego club at an informal social gathering. Guest speaker for the occasion was W6TBI, Dr. Frank Bornowski, a blind ham. His topic: what ham radio means to a blind operator—an inspiring talk we hear.

Remember our YL of the Month writeup about Lucille Sweet, W2SCI, back in the Oct., 1947, issue of *CQ*? Lucille, one of the few blind YL operators, has been on the air from Rochester, N. Y., for the last two years, signing her call "W2 Sweet Charming Irresistible." Must be more truth in it than in just her name and phoenetics for her call, for last autumn Lucille became Mrs. Dick Briemer. Dick is W2OTW, and to keep the wedding a "ham" affair they were married by Rev. John Healy, W2BLP, with whom they had become acquainted on 75 phone.

And speaking of YL marriages, Rheba, W2QJC, is now Mrs. J. Francis Gorski.

Good luck, YLs—or we should say, XYLs!

On the subject of handicapped persons, we hear from Maxine, W6UHA, about a couple of shut-in lads who are not just SWLs but are keen fans where the YL ops are concerned. One is Frank Halstead of Beverly Hills; the other is Charles Tooley of Sycamore, Ohio. Charles corresponds with quite a few YLs, among them W7KAE, Lily Mae, and Maxine, W6UHA. Frank, who has been in a wheelchair for the whole thirty years of his life with spastic paralysis, is an official observer for the Mission Trail Net. Recently the Net held a birthday party at Frank's home—the twelfth anniversary of the founding of the Mission Trail Net. One of the highlights of the evening, we hear, was the playing of Frank's prize possession—a very nice personal Xmas greeting in the form of a recording from Jackie, W9AYX, and her friend Mary Myer. Most YLs are not too busy to do really nice things like this, and we're sure Charles and Frank would both appreciate hearing from any of you YLs who will drop them a note.

No doubt many of you saw in your local papers the story "She Radios 16,000 Miles to Get in House." It seems Ed Beane, W9MO, and Walt Ashton, W9ONT, of Oak Park, Ill., were enjoying a three-way QSO with ZS6KD in Johannesburg, South Africa, late in January. While W9MO was operating his rig his daughter-in-law, Mrs. Rita Beane, stepped on to the front porch. A sudden gust of wind slammed the door and she found herself locked out. Headphones clamped over his ears, Beane did not hear her pounding on the door, nor the telephone ringing when she called him from a neighboring house. Then Mrs. Beane telephoned W9ONT, asking him to contact her father-in-law. W9ONT, continuing the QSO with ZS6KD, about 8,000 miles away, told him what had happened. W9MO soon was startled to hear ZS6KD say on his next transmission: "I say, Ed, OM, Mrs. Beane has been locked out and is freezing. Let her in."

Before I get locked out, 33 and CUL. Oh, by the way, any of you gals going up to 160 meters?

DX PREDICTIONS

(*from page 37*)

Midwest to Western Australia

40 meters: Signals come up out of the noise after 0200 CST. Peak conditions from 0400 to 0530 CST. Band should close around 0745 CST. *20 meters*: C.W. signals break through just after midnight. Phone after 0200 CST. Peak from 0300 to 0730 CST. Band closes just after 0900 CST. *10 meters*:

Very weak signals from 1545 to 1945 CST. No peak, conditions rather unsteady.

East Coast to Japan

40 meters: Daylight auroral zone conditions. Possibly a few very weak signals from 0400 to 0630 EST, but not likely to be readable. *20 meters*: C.W. around midnight until 0200 EST when band closes. Reopens suddenly about 0700 EST with phones readable. Closes down slowly between 0930 and 1100 EST. *10 meters*: No openings predictable. MUF should not exceed 24 mc.

East Coast to Middle East

40 meters: Poor opening from 1745 to 2215 EST. Only on ionospherically quiet days. *20 meters*: C.W. breaks through after 1330 EST. Phones come in after 1545 EST. Good signals until 2200 EST on quiet days. Band closes down suddenly just before midnight. *10 meters*: No openings predictable. MUF should not exceed 23 mc.

East Coast to South Africa

40 meters: Band opens between 1630 and 1900 EST depending on the intensity of the atmospheric noise. Fair to good strengths until midnight. *20 meters*: Very extensive opening this month with good signals regularly from about 1600 until 0200 EST the following morning. Phones readable during entire opening in both directions. *10 meters*: Another very extensive opening. Starts around 0615 EST with fair signals. Signals build up from 8 to 12 db during day until closing around 1630 EST.

East Coast to Australasia

40 meters: Fair to good signals, but high noise level, from about 0115 to 0630 EST. *20 meters*: Band opens just before midnight with fair signals. Band open all night with good signals. Closes down after 0900 EST. Peak conditions from 0300 to 0730 EST. *10 meters*: Weak signals from 1445 to about 1915 EST. Band closes erratically, may remain open until after 2030 EST on some dates.

East Coast to East Indies

40 meters: Path is now in daylight zones. No openings appear likely. *20 meters*: A few weak c-w signals may break through over the direct route between 0615 and 0815 EST. Not dependable. *10 meters*: No openings predictable. MUF should not exceed 23 mc.

East Coast to South America

40 meters: Good conditions from 1815 to 0445 EST the following morning. *20 meters*: Conditions slowly build up after 1615 EST. Good conditions from about 1830 to 0530 EST the following morning. Peak conditions 0100 to 0600 EST. *10 meters*: Extensive opening with good signals from 0715 to 1730 EST.

SCRATCHI

(*from page 8*)

of 15.75 kilocycles are just about aboves human audibilities, but trying to call home poor Rover with your silent dog whistle and see what are happening in houses what are having TV sets. You are not knowing if you are going to get Rover or three irate TV owners when whistle blows.

So what are ham to do? Practically every frequency he are transmitting on are finding its way into TV set like RF finding its way into micro-

phone when are having feedbacks trubble. Reducing power are being big waste of timce, as TV sets can raising 1/c crop of interference when only putting in a few microwhats.

Ha! you are thinking, Scratchi are having hard time working his way out of this dilemna. Ha! Ha! right back at you, Hon. Ed., but you are underestimating (excoose please, are using dictionary for that one) Scratchi's tecknical genius. Solution to hole affairs are simple when you are knowing how.

Scratchi are seeing quick-like that there are no easy way to preventing TVI, so Scratchi are deciding to go along with a gag and make TV listeners think they not being bothered by hams. To doing same, ham are merely having to build up TV transmitter with switching arrangement so it are covering all twelve channels. It are not even necessary to providing any audio. Input to TV transmitter should being from monoscope. Monoscope are being one which are transmitting this message: Due To Technical Difficulties the Pattern May be Disturbed From Time to Time During Next Hour or So.

Then, before ham go on air, he are turning on his TV transmitter and switching it to each channel. Each nearby TV set owner are seeing this message on toob screen, and he are not worrying when TV program being disrupted.

While this are red hots idea, Hon. Ed.. I are thinking that maybe it are slitely expensive. Also, I are not figuring out how to keep TV listener from heering ham on audio end of TV set. So, on second thoughts, please sending me a copy of your new booklet on TVI and its Causes and Cures and I will be working out new answer to problem.

Respectively yours,
Hashafisti Scratchi

RADIO CONTROL OF MODELS

(*from page 21*)

uous contact. When moved in one direction the rotor makes contact with the long segments, and in the other direction it makes contact with the short segments. The keying line is run from the steering switch through an off-on switch to the cathode of the tone oscillator.

The procedure is, first, to turn the off-on switch on. This starts the pulser motor and at the same time causes a tone to be sent out (the switch would have to be d.p.s.t. for this arrangement). This starts the boat motor. Now, if the steering switch is moved to the right, say, the boat goes right. Switching to neutral gives neutral, and left rudder causes the boat to go left. Result: You have radio control.

The pulser and selector can be tested easily before being placed in the model by running the leads from the pulser unit direct to the selector. Some adjustment of the relays may be necessary to cause the previously described action to take place; but once set, the operation is practically foolproof provided the batteries are kept up.

It should be noted in interpreting the circuit diagrams that the position of the relay contacts in relation to the movable arm is reversed; that is, energizing the relay will cause the arm to complete the circuit to the *top* contact in this particular set of circuit diagrams.

CONTEST DAY AT ZC8PM

(from page 17)

at 1500Z though suffering from echo. Higher than 14,120 kc the band is useless due to phone QRM. From 14,120 to the low end the phones are scattered but increasing in density every week. I have fears that 20 will soon become useless as a c-w band unless some action is taken to contain these wandering phones. Lately a large number of USSR phones have come on and it's the devil's own time finding a clear spot anywhere. Forty is even worse off from this angle. The best time for the east coast is 2200Z to 2300Z when the sun is setting over there, or better yet, from 0400 to 0530Z when the sun is rising here and Europe QRM is skipping. West coast and middle west signals are good for a half hour or so around 0500Z, and many W6 have been QSOd at 1430Z. The band usually is a mess of USSR and European phones except during the morning hours here. From about 7090 kc on up it's jammed with broadcast and shared services. All in all it's tough going on forty.

On eighty at any time you are plagued with shared services and they are knee deep from 3550 kc higher. However, it's not too bad from 1900Z to 0500Z. The USA can be heard quite well, when the band is open, from as early as 0200Z but they usually don't hear me until after 0300Z with a peak about 0430Z followed by a rapid fade out. Several W6 say they have heard me up there, but W5 has been the best heard from this end. As for activity on 3.5 mc in Europe, I think I can say

with a fair degree of assurance that there are no USSR, OH, SP, YR, I, EA, or CT stations on. Anyway, none have been heard. Rumor has it that a VS6, and AP2 and some VUs are on at times.

My apologies, too, to the gang for what seems to be such short QSOs, but I was trying to give you all a crack at ZC8PM.

Rogues Galley

For a moment I would like to take out my meat axe and wag it at some of the lids. As I do so I have a few mental reservations, such as the

knowledge that along with the best of you I, too, have at one time or another inadvertently fallen into some category in the rogues' gallery of lids I am about to describe. However, my experience as a "DX catch" has made me promise myself to be a model of decorum when I return to W2AIS.

Type One is the "Mad Hatter." He just hears someone sending your call and leaps to the switches and starts calling and breaking you. He is soon revealed when your break results in his continued calling. He can be heard four or five QSOs later still calling. He is probably the worst of lids benefiting no one but the local electric company. Type Two is a variation of Type One; he can hear you and keeps right on calling when you are QSOing someone else. He is silenced only by a call and a "QRT you twerp." He will still send a QSL because rebuffs mean nil. All this class are neatly listed and logged and will never receive a QSL from me.

Type Three is the "Muscle Flexer." I never knew his type existed until I got out here. He is usually a prominent ham with a well-designed rig that gets out. He, for some strange reason, is not satisfied with one QSO or a QSO every week or ten days. He will call you every time he hears you and his good signal just blankets the poor low-power joker who would be only too happy to have just one teensy weensy QSO. Type Three is easily rebuffed. You just explain that he is holding up the parade and keeping the QRP fellow from having a chance. When you tell him that a light goes on

somewhere and he never bothers you again. Type Four is "Friendly Egbert." The band is wide open, the wolf pack is howling, but he just calmly sits back and tells you all about himself, his rig and Aunt Nell's ingrown toenails. He never uses break-in so I just let him yak along and work two other guys while he does. Type Five is "The Flatterer." He comes on with a bang and sez "FB solid RST 579 OM." His bubble always bursts when I say "Gud QTC 5 QSP?" Last but not least is "The Coacher." He has QSOed you, natch, so he becomes "Lil Helpful" telling his friend, "GA call him now he signed." "Tell him RST 459." He never stops to realize that I usually hear all of this and cure it by asking the helpee some involved questions which can't be relayed. I then sadly log by his call "No QSL, coached."

My girl, Ann, has been acting as my QSL manager and she sends me typewritten transcripts of the comments on QSLs received. Some comments have been so ecstatic that I have come to the conclusion that there is another type who cannot be classed as a lid. He calls me and signs and I answer but never hear him again. I'm sure now that he just fainted from the shock.

You may ask me why I chose ZC8 for a call. Where Palestine used to be one country there are now two, Israel and Arab Palestine. Israel was ZC6 (it is now 4X4) so I used ZC8 to differentiate. Just read your local newspaper.

This job with the UN has its worries. I have had Arab irregulars stick rifles in my face. The Jewish MP always tenderly lays his homemade Sten gun in my lap as he asks with that (after 2000 years it's my turn) gleam in his eye. "Your pass, pleeze." Minefields are no joke, nor are stone throwing Arab refugees. But I think those first gray hairs I saw on my temples this morning are mainly from being a "DX catch."

HARMONIC CHASER

(*from page 25*)

regular receiver, it is still better to place the unit in some other room or even outdoors near the transmitting antenna. Since the recording meter is located on the receiver in the transmitter room, it may be observed, while tests are being made, no matter where the Harmonic Chaser is situated (within "cable" distance). An antenna no longer than six inches, connected to the unit, will generally provide plenty of pickup. If the pickup is too great, shorten the antenna or detune the detector circuit.

If the Harmonic Chaser is remotely located it will usually be impossible to observe the "S" meter on the receiver when first tuning in the harmonic. In this case, turn on the receiver b.f.o., turn up the a-f volume control, and listen for the beat while tuning the converter. It will be helpful to first set the detector control at the calibrated point for the harmonic reading desired. Then go to the receiver, turn off the b.f.o., and peak up the S-meter reading by retuning the receiver dial which has been set at 10 mc.

The stray field, or direct radiation from the transmitter components, is often as great a source of TVI as is radiation via the transmitting antenna. A comparision may be had between the two by placing the Harmonic Chaser outdoors either under the antenna or at a short distance away. Obtain a reading with the antenna connected as normally used. Then disconnect the antenna from the transmitter and substitute a dummy load. The reading then found will be that of the stray field and, unless the transmitter is well shielded with isolated power leads or unless a harmonic stray field cancellation method such as that recently described by Rheinartz[4] is attempted, the reading will often be unbelievably high.

Similar comparisons may be made near the TV receiver location, not only between antenna and stray field radiation, but also between these and the strength of the TV signals concerned.

If it is desired to use the Harmonic Chaser as a probe for checking r-f leakage in shields, power leads, etc., connect an antenna about one inch long to the unit. If the instrument has been modified to include its own power supply, it may be too cumbersome and heavy to handle as a probe. If so, it may be left stationary and a probe may be made of a convenient length of coax connnected to the input fitting. The free end of the coax should have about one inch of its inner conductor extending beyond the outer shield. This will perform nicely as a probe type antenna. When the coax is handled, it should be held a few inches from the end.

Readings obtained on the associated receiver S-meter during tests with one transmitter will demonstrate the usefulness of the Harmonic Chaser.

A six-foot antenna was connected to the instrument and it was placed, with the communications receiver, in another building 200 feet from the transmitter location.

The final stage of the transmitter consisted of a pair of push-pull 813s running at 400 watts input

4 RCA Ham Tips, Nov.-Dec., 1948; Jan.-Feb., 1949.

Dollars for Watts

on 28.5 mc and driven by an 807 amplifier. The entire transmitter was mounted in a standard rack type cabinet and all the stages, except the final, were in themselves completely shielded prior to installation in the cabinet. The final and the driver employed plate traps which had been previously adjusted when using the crystal diode meter. A harmonic shorting stub, cut approximately to length, was included in the antenna feeder.

Signal intensity of TV channel 2 ..... S8
Strength of 2nd harmonic at first reading .. S5
Rebalancing final screen currents S4.5
Retuning final plate traps 0,
but still slightly audible
Opening rear door of cabinet..... S8
Removal of harmonic stub (door closed) .. S9
Antenna connected directly to driver stage .. 0,
no trace of harmonic at all.

Incidentally, these readings, indicating the various degrees of harmonic interference under different conditions with this particular setup, are of special interest in demonstrating the importance of adequate shielding.

SINGLE SIDEBAND EXCITER

(from page 32)

Check the adjustment of the r-f phase control (C_{113}) and the gain equalizer by setting S_2 to the SSB position, keep the carrier control at zero, and apply 1000-cycle tone at *half* the level which corresponds to peak exciter output, the correct adjustment, of course, is that which removes all traces of envelope. This should be the case in either position of the sideband reversing switch S_1. With the test tone still at the same level, set S_2 to AM and observe the 'scope pattern. It should look like *Fig. 6*. Now advance the carrier level control until a pattern like *Fig. 8* is obtained. This will be recognized as 100% modulation. Change S_2 to the PM position without any other adjustment. Automatically, the same audio tone which gives 100% modulation for AM conditions produces phase modulation at a modulation index of 0.785 radians—just right for NBFM at the operating frequency. The appearance of a double frequency envelope under PM conditions where the peaks rise 41% above the unmodulated carrier level is illustrated in *Fig. 8*. The envelope may be removed by operating a stage following the exciter as a saturated amplifier (*Class C*) —but doing so will require return to linear conditions for AM or SSB use. Second-order sidebands characteristic of NBFM are produced when the envelope is "wiped off."

Operation

Assuming that the preliminary checks have been completed satisfactorily, everything is ready to go. Let's try our old acquaintance, AM. Choose the frequency you want, warm up the exciter for a few minutes and set the switch for AM. The v.f.o should run continuously, since S_3 in the standby position completely removes the output signal. Ready? Set S_3 to "transmit" and adjust

the carrier level control to give an output level equal to a little less than *half* the overload level. Speak! You are on the air with one of the sweetest AM signals ever heard. Adjust the a-f gain control as necessary to accommodate your operating habits.

Let's try NBFM (PM). Set the switch to PM and go ahead. Be certain that you are in the portion of the band allotted to NBFM. If desired, the r-f gain control can be advanced so that the 807 stage or following stages "wipe off" the envelope. This will give four times the carrier power possible under AM conditions.

Single-sideband? Certainly! Set S_2 to SSB, return the r-f gain control to the setting used with AM, set the carrier level so that the carrier is 5% of the peak amplitude and go ahead. You will find that without carrier you can talk 6 db louder than previously or can advance the audio gain control or the r-f gain control 6 db before the overload point is reached. The idea of sending a little pilot carrier along is to give the fellow who happens to have a single-sideband receiver enough carrier to lock his locally generated carrier to yours and get perfect results.

In case somebody asks which sideband you are using make this simple test: Tune in the signal with your receiver, a.v.c. off, r-f gain control (on the receiver) 'way down, audio gain wide open (use earphones), and set the b.f.o. to the point that gives perfect quality. Then tune the receiver just a little *lower* in frequency. If the speech pitch *rises*, you are transmitting the upper sideband. Conversely, if the pitch *lowers* you are transmitting lower sideband. Reversing the sideband switch will, of course, change sidebands without changing the carrier frequency.

Don't forget to reduce the exciter gain control when returning to AM operation. Also, don't forget to put the carrier back in. Never try to exceed the maximum peak output level—it isn't necessary with single-sideband, as your signal reports will show.

AN INDUCTIVE REACTOR

(*from page 34*)

This unit was coupled to the grid oscillator coil for the FM type of modulation.

In *Fig. 2B*, for anyone who might have a stock of 1N38s, is shown a full-wave bridge rectifier type of inductive reactor. The advantage of this unit is that twice as much audio voltage appears across the coupling loop for the same gain control position on the speech amplifier.

The additional gain was required because the unit was coupled to the plate oscillator coil which cut out one doubler stage in the transmitter. Also, the power needed in the plate circuit was greater in order to obtain the same frequency deviation. This modulation is used by the author on 10 and 20 meters with excellent results. For example, during the 1948 Sweepstakes contest, 300 stations and 69 sections were worked using this system.

ZERO BIAS

(*from page 11*)

(b) The provisions of (a), above shall be considered as temporary in the sense that they shall remain subject to cancellation or to revision, in whole or in part, by order of the Commission whenever the Commission shall deem such cancellation or revision to be necessary or desirable in the light of the priority within this band of the Loran system of radionavigation.

2. In any particular area the Loran system of radionavigation operates either on 1850 or 1950 kc, the band occupied being 1800-1900 or 1900-2000 kc.

IT IS FURTHER ORDERED That the frequency band 1800-2000 kc shall, as presently provided by Section 12.111 (a) (1) of Part 12 of the Commission's Rules Governing Amateur Radio Service, remain unavailable for use by the amateur service until such time as that Part 12 has been appropriately amended to reflect the conditions and limitations imposed upon the use of that band by the amateur service as provided by the service allocation herein set forth, and to insure that all possible precautions will be taken to observe and enforce those conditions and limitations and to prevent any harmful interference to the Loran system of radionavigation.

IT IS FURTHER ORDERED That, for the reasons hereinbefore set forth, this Order shall be effective immediately.

FEDERAL COMMUNICATIONS COMMISSION

Released: February 21, 1949

T. J. Slowie
Secretary

LETTERS

(*from page 6*)

sistance to progress on the part of the bulk of the amateurs is so great, how can there be any progress?

There is a familiar adage: "Progress or die." In the past radio amateurs have progressed—and have done so with the use of their own hands and minds and imaginations and the spur of creative technical accomplishment. They have progressed from coherer to galena to regenerators to three-circuit tuners to s.s. superhets, from spark coils to rotary gaps to high-*C* to crystal control to stablized v.f.o.'s. Pin dates to the terminal developments in those progressions; they won't be more recent than a decade or two ago. Does the sterile interim mean that, as a body, we have reached the limit of our ability to progress, that we have become stagnant and moribund technically and adamant against change? Then we must contemplate the only alternative: We die.

Admittedly, progress isn't easy; it never was. Admittedly, the new techniques being evolved in the battle of bandwidth are not simple to understand or apply. But we must in time learn to understand and apply them, or we will be increasingly at a competitive disadvantage in our struggle for spectrum space against other services employing ever more efficient practices. If we refuse to modernize, we will go the way of the horse, the kerosene lamp, and the dodo.

It isn't as though we were faced with an unsolved problem. We don't even have to find the answer ourselves, as we did in the old days. Others have already solved the problem, and the answer is being written out for us. All we have to do is use it.

Use it—or die.

Clinton B. DeSoto, W2IU

Classified Ads

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

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

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.

WANTED: Teletype 1/40th HP synchronous motor. W6ITH, Moraga, Calif.

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.

PERSONALIZED book matches . . . call letters or names and address . . . samples with prices. Miss Amanda Martin, Box 1123, Rochester 3, N. Y.

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.

TUNE IN to PRACTICAL WIRELESS, Britain's best radio monthly! Supplies enthusiastic "hams" with latest British-European radio-television developments. Exclusive articles by leading experts, special television features, newest transmitters and receivers fully analyzed, etc. Annual subscription (12 consecutive issues direct to your address from London) only $2.00 from George Newnes, Ltd., U. S. Subscription Office (P.W.28), 342 Madison Avenue, New York 17, N. Y. Two years $3.75.

FOR SALE: ART/13 unconverted. Frank Curtis, Jr., Virgil, So. Dakota.

USED OPEN FRAME relay racks, W.E. drilled, 6 ft. high, 100 lb. shipping weight, $8.50 f.o.b. Boston. Also, NC101X in excellent condition—$60. W1IBY, 12 Sunnyside Ave., Wellesley, Mass.

MUST SELL: Harvey-Wells TBS-50, brand new, never used, shipped postpaid first money order for $80.00. Also Philco CR-2 auto radio used for 10 hours, shipped postpaid first money order for $20.00. W6TGO, 6040 Beeman Ave., North Hollywood, Calif.

QSLs? SWLs? "America's finest!" Samples free! Sackers, W8DED, Holland, Michigan.

SCOTT marine radio model SLRM for sale. Write P. H. Parker, Box 414, West Point, Georgia.

QSLs—SWLs. Free samples. W1HJI QSL shop, Box 32, Manchester, N. H.

NEED MONEY: Brand new Harvey-Wells TBS-50 transmitter used only on one FD. Save $10—first $90 offer takes all. Will throw in three xtals and mike. All letters answered. W4IMQ, James Schliestett, P. O. Box 28, Cedartown, Georgia.

FOR SALE: 500 watts phone-c.w., 4 stage 10-20 meters transmitter and HRO—$450.00 for all. W9GVJ, Crawfordsville, Ind.

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; signal shifter $29.00; Abbott TR-4 $24.50; HT-9 $295.00; MB-611 $49.00; Silver 701, 800, 801, 802 $29.50 ea.; NC-173, SX-28 $149.00 ea.; NC-240C, HQ-129X, HRO $139.00 ea.; RME-45, SX-25 $99.50 ea.; RME-9D $39.50; SX-24 $75.00; BC-348, S-40 $65.00 ea.; S-20R, DB-22A $49.00 ea.; NC-44, S-38 $35.00 ea.; S-41 $25.00; 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.

QSLs varicolor cards. New designs, all A-1. Samples free. Varicolor Press, Box 265, Dover, Ohio.

COLLINS 75A receiver. 60 watt tabletop transmitter with Meissner signal shifter. Must sacrifice. W2TWK, 61 Hart St., Brooklyn, N. Y.

SELL: HQ129X with speaker; excellent condition. $125. Fred Weimann, 28 Center Drive, Franklin Sq., L.I., N.Y.

FOR SALE: HRO-W. Like new. Matching speaker and power supply, with general coverage coils, 500-30,000 kc. —$200.00. J. H. Dunagan, W4MRW, 226½ New Street, New Bern, N. C.

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.

BARGAINS: VHF-152A, DB-22A, HF 10-20. (All very slightly used). W8QJC, P. O. Box 218, Holland, Michigan.

COLORTONE QSLs! "Nuff sed"! Big variety. Beautiful samples free! Colortone Press, Tupelo, Mississippi.

BARGAINS: New and reconditioned Collins, National, Hallicrafters, Hammarlund RME, Millen, Sonar, Meissner, Meck, etc. Reconditioned S38 $35.00, S40 $59.00, SX42 $199.00, HQ129X $129.00, VHF152 $59.00, RME45 $99.00, NC57 $69.00, NC173 $149.00, NC183 $199.00, MB611 $29.00, VFX680 $39.00, NC46, HRO, SX25, SX43, SX28A, HT18, HT9, SP400SX, SP400X, BC610, other receivers, transmitters, VFOs, etc. Shipped on trial. Easy terms. List free. Henry Radio, Butler, Missouri.

QSLs, SWLs, quality cards. W5FAY Press, 6118 Goliad, Dallas, Texas.

FOR SALE: Meissner 150B converted for all band operation and including all spares and tubes. Cost $300—first check over $250 takes it. Also HQ129X, new for $160. W2FQR/Ø, Francis Umina, 847 10th St. S.W., Cedar Rapids, Iowa.

ARR-5 RECEIVER converted for a.c. supply, P.P. 6V6 audio stage added. New, excellent condition, $75.00. W6-VWA, 10306 Otis St., So. Gate, Calif.

ALUMINUM TUBING, angles, channels and pipe. Write for list. Willard Radcliff, Fostoria, Ohio.

BC348's complete with tubes and dynamotors. Excellent condition. $100.00 each. Write A. L. McMulen, 533 N. 8th St., Weatherford, Oklahoma.

WANTED: January 1946 issue of "CQ". Must be in good condition. For sale: misc. transmitting equipment, Millen R9'er, 75 watt multi-match mod. transf. Send for list. A. Martinka, 1253 Grace St., Chicago.

SILVER MICA CONDENSERS .006, .005 mfd. 300 volts @ 50c each. W8OYP.

FOR SALE: HRO-7 complete, plus NFM-07 adapter, original packing cases, used 30 hours—$270. New Sonar XE-10 NBFM exciter $24. Crystals, all frequencies, $1.00. Six new 814's—$3.00 each. Write for general list. D. B. Whittemore, Masterton Road, Bronxville 8, New York.

PATTERSON PR10. Pick it up for $15. W2ETD, Ed Dunn, 4031 Park Ave., Bronx, N. Y. Telephone LU 3-2265.

WANTED: Hammarlund 4-11 from local. W2ETD.

TRADE IN your used receivers for new or better units at Northern New England's foremost amateur radio supply house. Evans Radio, Concord, N. H.

FOR SALE: Stancor ST-203-A transmitter, with meter and tubes, $55. Simpson 260 VOM with carrying case, $32. BC-1068A receiver less front end, partly converted, $30. PP-813 10 meter final, see GE Ham News, May 1946, new with tubes less meters, $45. Power supply, 2800 volt, 750 ma., with relay control, in 36 inch cabinet, new, $140. W9EKU, 3435 N. 47 St., Milwaukee 10, Wisc.

SUPERHET MODEL SLR-F. RF stage. 4 bands 80-560, 1900-24,000 kc. Sell $65, trade. Want LM or BC-221 frequency meter with calibration and modulation. W2CUD, F. R. MaDan, Irvington, N. Y.

NEW HQ-129X—$145. Write for details on complete 150 watt phone xmtr with extras, $100. Donald R. Abetz, 187 Nevada, Dubuque, Iowa.

WILL TRADE: ART-13 transmitter, good, with tubes and crystal, for BC-312, BC-342, BC-224, or BC-348. Also have two ASB-7 receivers and four command transmitters 5.3-7 mc for trade. W7KKB, 647 S. Clark Street, Butte, Montana.

2 handy-talkies, Sperti 2-meter, like new, $20.00 each. W8KKE, Joseph Rapien, 5907 E. Woodmont Ave., Cincinnati 13, Ohio.

SELL: BC-654 in serviceable case, complete with PE-103, PE-104-A, CD-501 and T-17 mike. $37.50. Loren Greiner, WØGTW, Pawnee City, Nebraska.

QSLs: Enamel finish cards, price reasonable. Samples return mail. Rainbow Press, 816 Maple Ave., New Philadelphia, Ohio.

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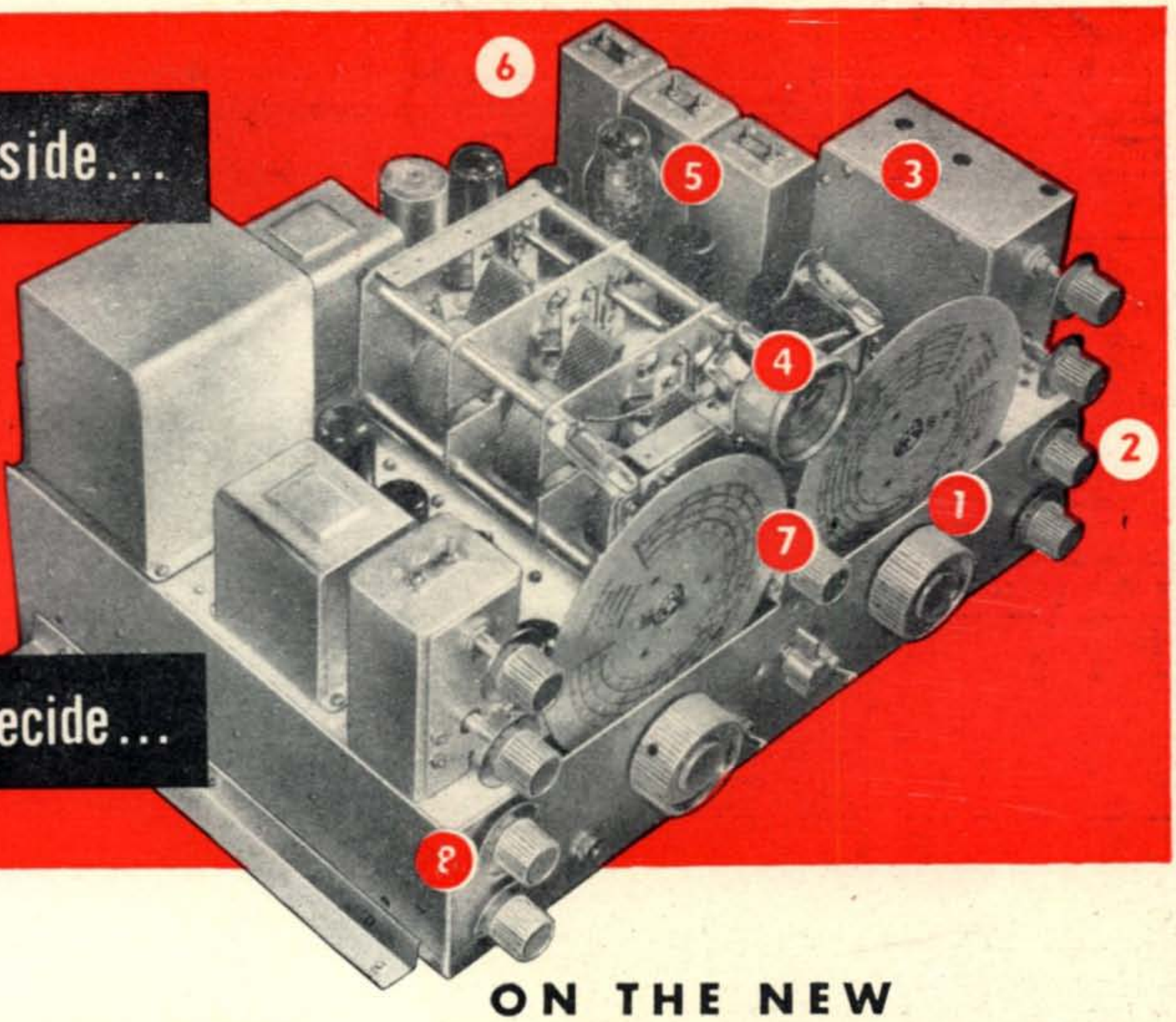
see inside...



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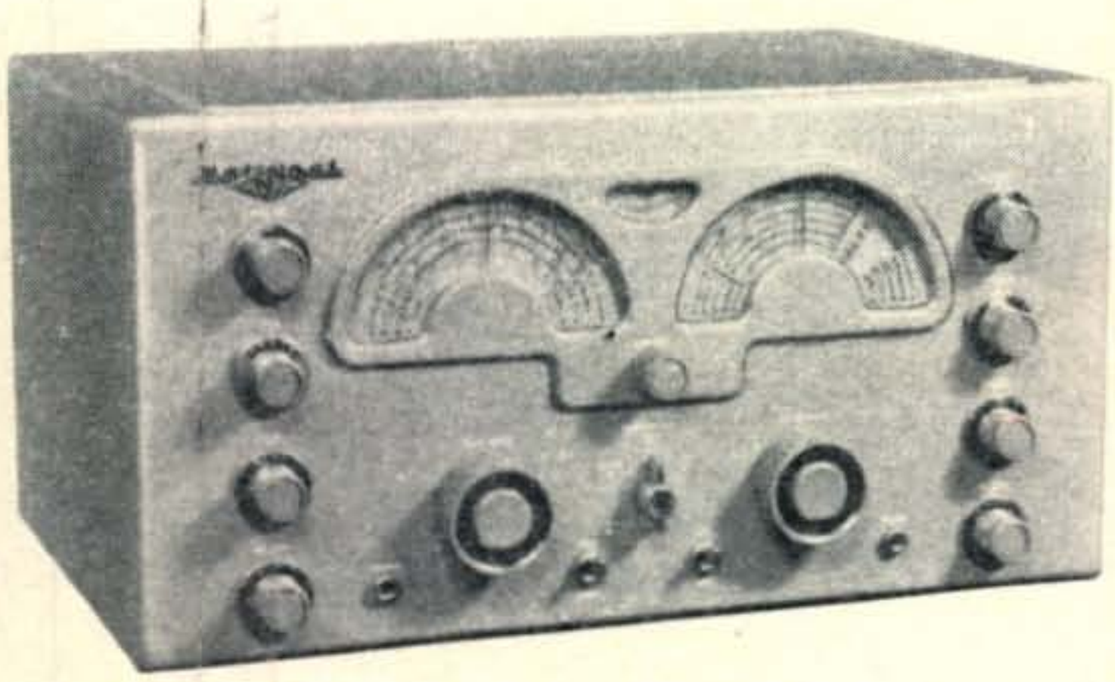

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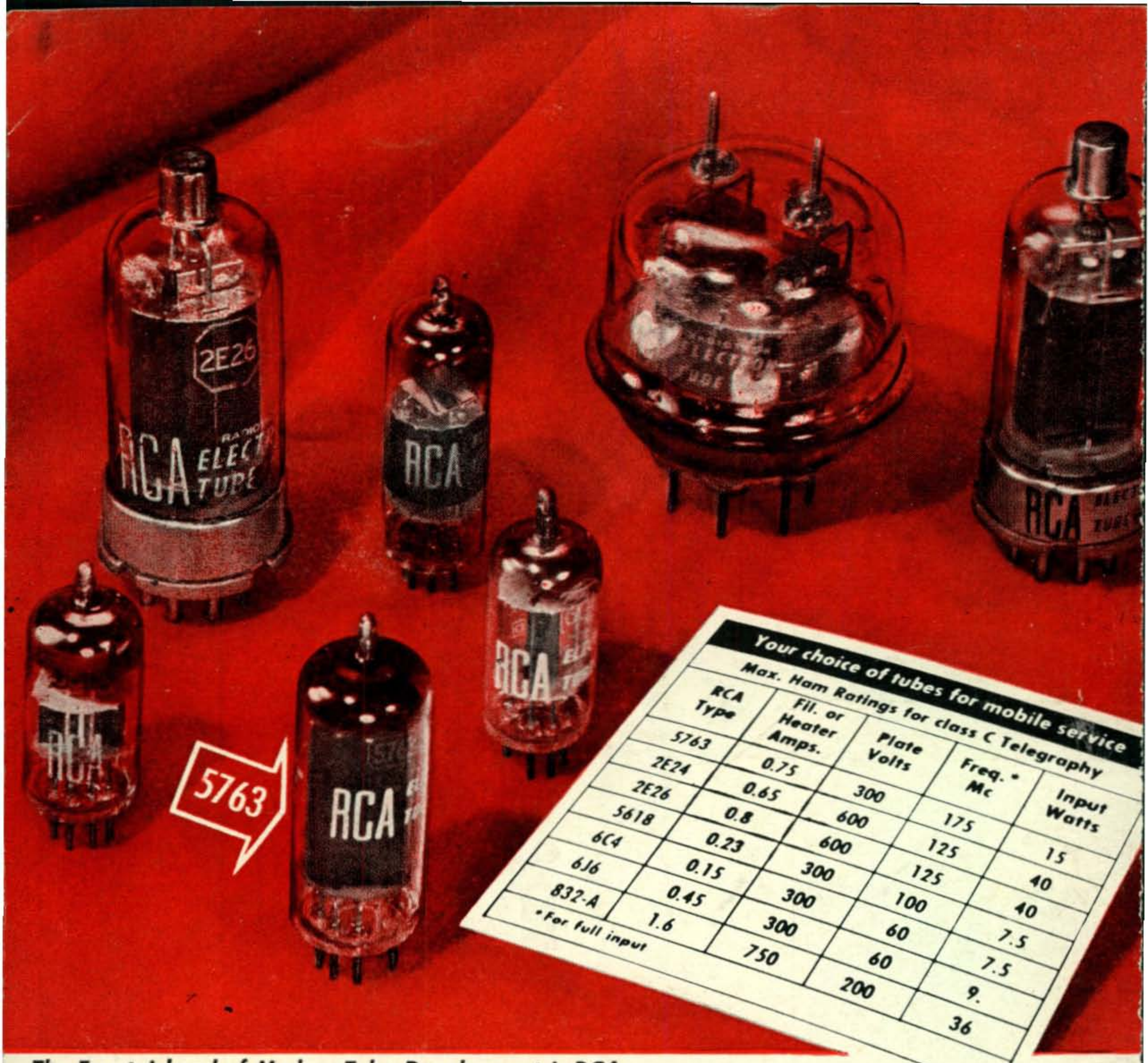

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