CQ

DEC., 1950

The Radio Amateurs' Journal

35¢

Features

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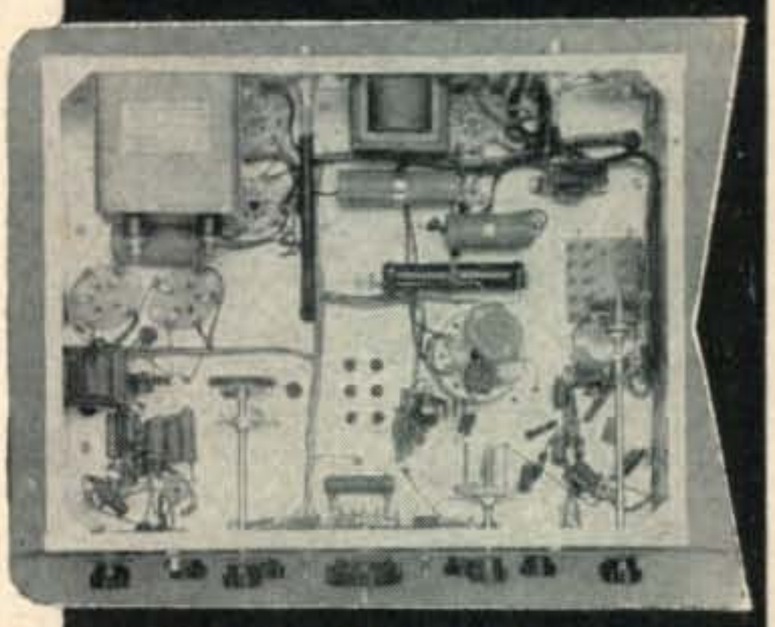
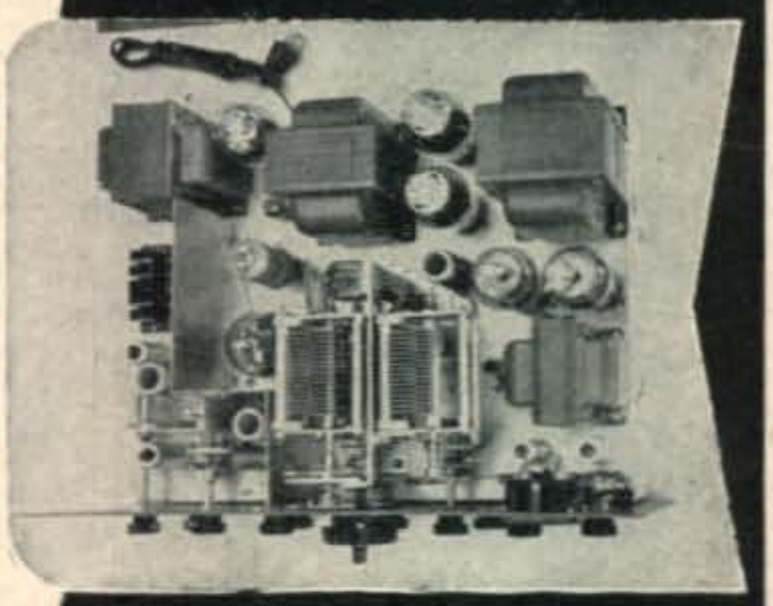


Wiring the VIKING 1 is made easy by following the complete step-by-step instructions.



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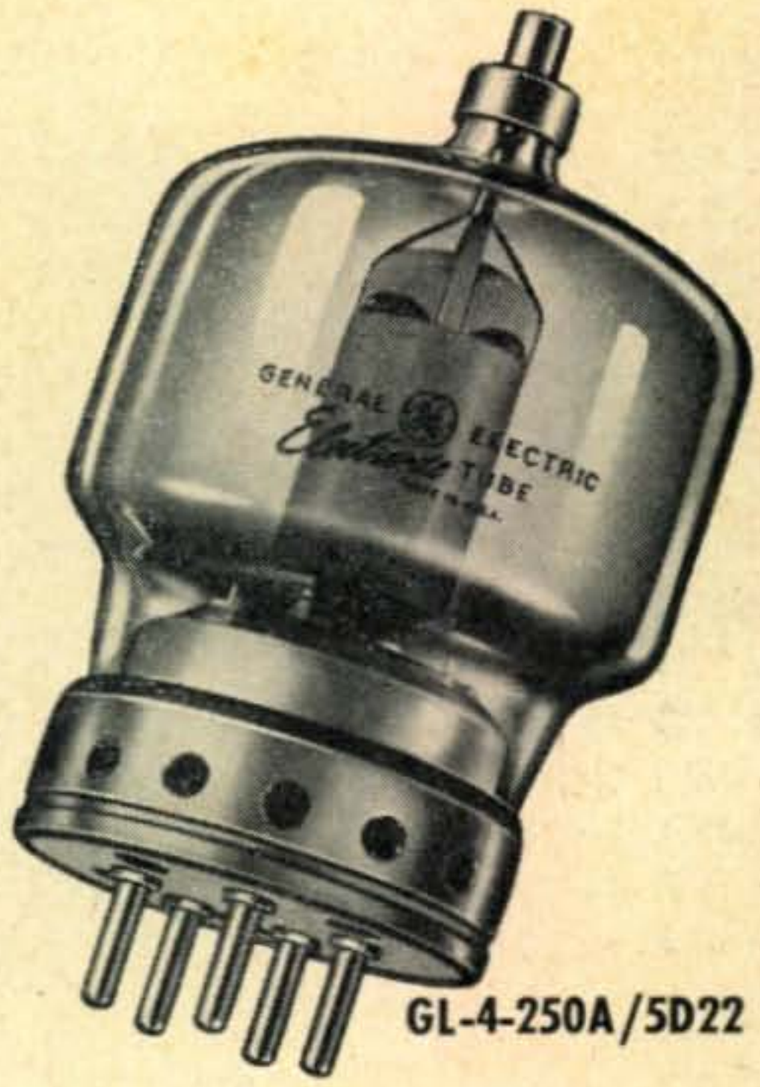
Of course, merely increasing power from 700 or 800 w to a kilowatt, hardly would be worth your effort in QSO's gained. But the extra 10 db you can get by going, say, from 100 w to 1,000 w, not only is apt to give you more QSO's per call, but may let you contact that elusive VK9 you've been chasing the past couple of months.

Backed by General Electric, both tetrodes can be relied on to give full-rating performance. Extensive quality-control tests mean the G-E tube *you* put in your rig will be a top-value, long-lived product. See your G-E tube distributor! He'll be glad to help you with prices and complete information. *Electronics Department, General Electric Company, Schenectady 5, New York.*

GL-4D21/4-125A



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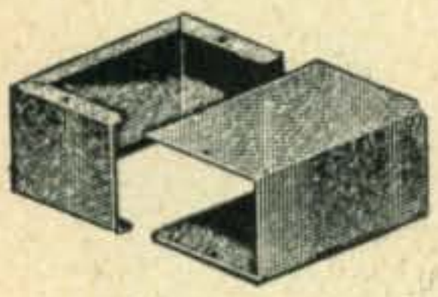

There are thousands of uses in the fields of radio and electronics for these new boxes. They are made from heavy gauge aluminum. The design of the box permits installation of more components than would be possible in the conventionally designed box of the same size. It is of two piece construction, each half forming three sides. The flange type construction assures adequate shielding. Available in etched aluminum finish and gray hammerloid finish.

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Gray	Etched	Length	Width	Height	Gray	Etched
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CU-2101	CU-3001	3¼"	2⅛"	1 5/8"	.63	.57
CU-2102	CU-3002	4"	2⅛"	1 5/8"	.66	.60
CU-2103	CU-3003	4"	2¼"	2 1/4"	.87	.78
CU-2104	CU-3004	5"	2¼"	2 1/4"	.90	.84
CU-2105	CU-3005	5"	4"	3"	.99	.93
CU-2106	CU-3006	5¼"	3"	2 1/8"	.96	.90
CU-2107	CU-3007	6"	5"	4"	1.23	1.14
CU-2108	CU-3008	7"	5"	3"	1.38	1.26
CU-2109	CU-3009	8"	6"	3 1/2"	2.01	1.89
CU-2110	CU-3010	10"	6"	3 1/2"	2.49	2.02
CU-2111	CU-3011	12"	7"	4"	2.94	2.64
CU-2112	CU-3012	17"	5"	4"	3.45	3.05
CU-2113	CU-3013	10"	2"	1 5/8"	.99	.93
CU-2114	CU-3014	12"	2½"	2 1/4"	1.35	1.17
CU-2115	CU-3015	4"	2"	2 3/4"	.84	.78
CU-2116	CU-3016	4¼"	2¼"	1 1/2"	.87	.81

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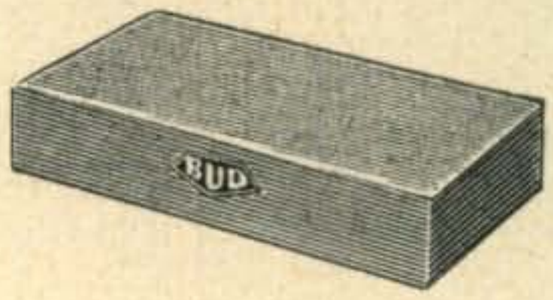

The construction and design of these chassis is exactly the same as our steel chassis. The aluminum chassis are welded on government approved spot welders that are the same as used in the welding of aluminum airplane parts. The gauges in table below are aluminum gauges. As a result, you can depend on BUD Aluminum Chassis to do a perfect job. Etched Aluminum finish.

Catalog. No.	Depth	Width	Height	Gauge	Dealer Cost
AC-430	4"	6"	3"	18	$1.02
AC-431	4"	6"	2"	18	1.02
AC-432	4"	17"	3"	16	1.83
AC-402	5"	7"	2"	18	.84
AC-429	5"	7"	3"	18	1.05
AC-403	5"	9½"	2"	18	.94
AC-421	5"	9½"	3"	18	1.17
AC-404	5"	10"	3"	18	1.20
AC-422	5"	13"	3"	18	1.26
AC-433	6"	17"	3"	16	1.89
AC-405	7"	7"	2"	18	.99
AC-406	7"	9"	2"	18	1.08
AC-407	7"	11"	2"	18	1.20
AC-408	7"	12"	3"	18	1.41
AC-409	7"	13"	2"	18	1.26
AC-411	7"	15"	3"	16	2.04
AC-423	7"	17"	2"	16	1.83
AC-424	8"	12"	3"	16	1.71
AC-425	8"	17"	2"	16	1.89
AC-412	8"	17"	3"	16	2.22
AC-413	10"	12"	3"	16	1.89
AC-414	10"	14"	3"	16	2.40
AC-415	10"	17"	2"	16	2.28
AC-416	10"	17"	3"	16	2.58
AC-426	11"	17"	2"	14	2.37
AC-417	11"	17"	3"	14	3.00
AC-418	12"	17"	3"	14	3.18
AC-419	13"	17"	2"	14	2.82
AC-420	13"	17"	3"	14	3.36
AC-427	10"	17"	4"	14	2.97
AC-428	13"	17"	4"	14	3.84

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CQ

VOL. 6, NO. 12 DEC. 1950

CONTENTS

OUR COVER

The dedication of the new MARS Headquarters station, K4AF/K4USA, (See page 30), is a tribute to the position amateur radio holds in the emergency communications picture. This view of the control console and part of the transmitter bay at K4AF is representative of the complete installation. This shot shows Brig. Gen. Ivan L. Farman, ex-W6MG, Air Force Deputy Director of Communications, at the operating position.

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Feenix, Ariz.

Deer Hon. Ed:

Scratchi are still having nightmares. As you recalling last time I writing you I telling how I have been having all sorts of weird dreams about being big-shots see-w man on Block Island, and how FCC are giving me new call, KB1AA, which are making me much-sought-after DX. Now instead of having same old dream all the time, are having new dream.

Old nightmare are ending where I are discovering that I can't work any of my old friends on account now everyone on band coming on like mad and calling me. Present Scratchi nightmare are a continuation of this story.

In dream I deciding that things are come to pretty pass when good old lovable me can't even get on air for ragchew or traffic session because of new call, so are writing FCC and complaining. It are a nice letter, very polite and very proper. I are getting nice letter in return, very polite and very proper. Only trubble is that letter say that as long as DX Committee, and other DX men deciding that Block Island are new country, that FCC are requiring that my prefix be KB1. FCC are being most happy to changing call to any letters I want, as long as prefix are staying KB1. They are even being so nice to pointing out that if I not liking KB1 prefix, I knowing where I can go, that is. back to continental USA where they be happy to giving me old W1 call back again.

Well, old KB1AA is made of sterner stuff than this, so with a bit of "chin-up" and all that sort of stuff as practiced by the Gs, I are looking about for another solution to this nasty problem. (Hon. Ed., it are funny thing, but in this nightmare Scratchi are not even talking like Scratchi—I hope you are understanding it ok.)

After many hard thinking are deciding to try several subterfuges to getting QSOs. First are getting on air and sending a long seek-you but not signing call until at very end, then slipping in one fast sign. This idea are going over like proverbial lead-filled balloon. Are finding so many Ws calling me that some are slipping outside band they are crowded so.

Another bright idea are to using high speed, so cupple hours later are getting on at about 45 words per and calling seek-you and signing in usual form, all at high speeds. This also working nots so fine business, as evidentally the DX mens are all red hot see-w men, on acct. hole band are again calling me.

Still not discouraged (stern stuff we DX men) I are setting alarm clock for 4 ayem in the morning, and when time coming I firing up rig and sending out three seek-yous and one call sign. Hon. Ed., don't these DX men ever sleep? I are not only having a band full of Ws calling me, but are having

(Continued on page 46)

Happy Christmas

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TVI Help Wanted

207 Bishop Ave., Oil City, Penna.

Editor, *CQ:*

I own an ART-13, and it is causing me a lot of TVI. I wonder how many ART-13 owners have found the solution to the TVI problem. I would very much appreciate hearing from anyone who has solved it. Will somebody give me some suggestions, please.

Joe Szabat, W3LST

SCR-274N Conversion

1838 Winona Blvd., Hollywood 27, Calif.

Editor, *CQ:*

In reference to W2BFB's very fine article on 274N transmitter modifications, I would like to point out one thing which the author has apparently overlooked. Mr. Whitaker refers to relay K_{53} as the "original keying system." Others, too, think this is a keying relay.

Actually, in the original SCR-274N setup, there were two or three transmitters associated with a single power supply, modulator, and control unit. Relay K_{53} was used merely as an "on-off" switch for the oscillator B supply, and an activation switch for the 1625 stage when the transmitter under consideration was selected by the switch in the control unit. The actual keying of the transmitter was done, from the control unit, in the high-voltage supply to both the oscillator and the final. The relay K_{53} was used only as a control element, and was thus operated but once during each sequence of transmissions.

Many of the gang have used this relay for keying, but it is both noisy, and a factor in the cause of microphonic modulation of the output signal in many cases.

Edward F. Munsell, W6PCP

High vs. Low Power, Again

125 West Main, Ardmore, Okla.

Editor, *CQ:*

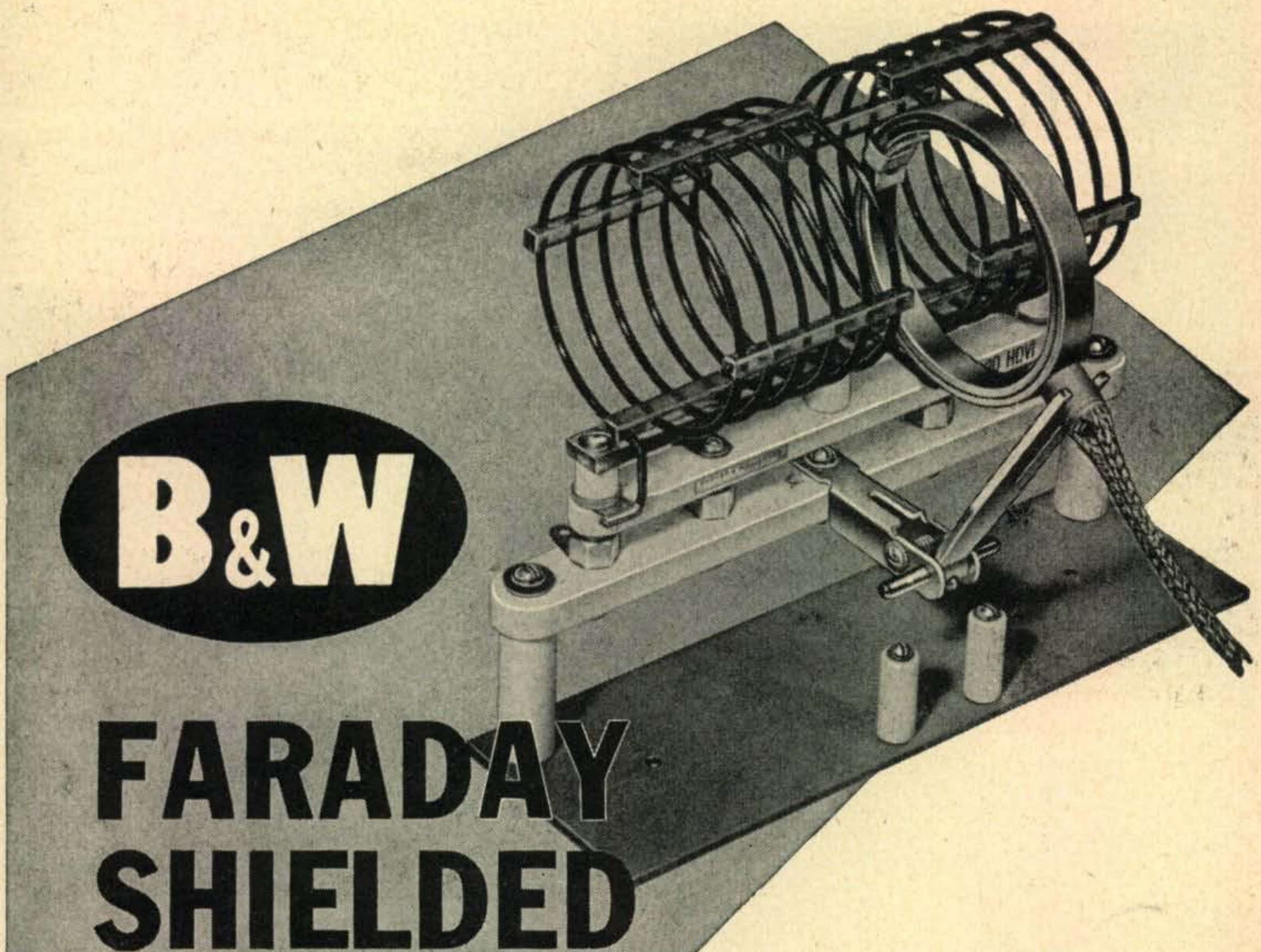
Why pick on kws? He is learning the hard way that a "full gallon" is not necessary. Despite all the recent publicity to the contrary, the station who runs a full gallon is not the station that is filling our bands with chirps, clicks, and T5 notes. Those stations which are always S9 are also nearly always T9X.

The ham who builds a kw rig, and most of us have that ambition at one time or another, spends from six months to two years building and debugging it. He is forced to do it right. His mistakes show up quickly in blue smoke.

What does the kw station operator get out of it? The S9 is all on the other end, and he still has to dig the other half of the QSO out of the QRM.

So, why pick on the kw? Why not forget the S9 and work on the T9X. We could use it.

R. M. Reavis, W5OWG



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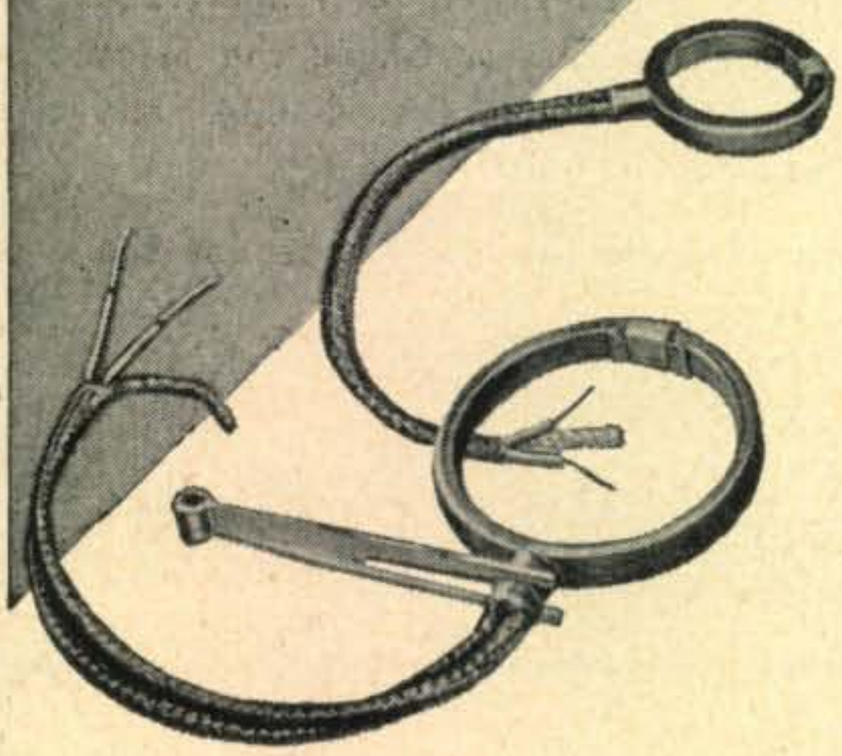

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EDITORIAL

HOW LONG ARE THE TV RECEIVER manufacturers going to continue to produce sets which QRN amateur and commercial traffic circuits? We know many hams in the New York City area who have been forced to curtail their operations during TV hours because of the hash which covers the low-frequency ham bands as the result of radiation from the sweep circuits of the majority of present-day TV receivers.

We amateurs have more than done our part in the matter of the reduction of interference to the TV viewer. Countless hams have attained harmonic attenuation figures which industry regarded as impossible only five short years ago. We have devoted hours of effort and many dollars of our own toward the improvement of our neighbors' TV sets when they came from the manufacturer with insufficient front end selectivity to reject fundamental low-frequency ham signals. Let's see how the shoe fits on the other foot at the moment.

These radiating television receivers cause harmful interference to interstate radio communications, and thus, it appears to us, are definitely not in the public interest. The manufacturers of the offending sets are contributing to the disruption of interstate radio communications. Where is the FCC in this matter? The Commission has stated that we are licensed in the public interest—these television receivers are not licensed. When are we going to be freed of this nuisance?

In Retrospect

As we "button up" the December issue of *CQ* we find it almost impossible to keep from looking back and observing the progress amateur radio has made during the past twelve months. The reduction of TVI by ham rigs has been successful to such an extent that the ham who is off the air on this account is the exception at the local club meeting, rather than the rule. New devices, such as the Antennascope and the Low-Frequency Discone have added a lot to the pleasure of being a ham for many of us. Our famous text on the subject of the design and use of pi-network tank circuits has become a standard in many development labs, as well as in most ham shacks. We've finally gotten most of the surplus gear under control, and our bands sound a lot cleaner these days than they did only a year ago. The "X" in signal reports is coming back into popular usage, and we're the better for it.

But all of our progress during 1950 has not been confined to the technical side of things. It's hard to believe it, but the life-and-death battle over Docket 9295, "direction," and other catch-words was at its height only a year ago. It has all been talked out by all interested parties now, and we are once again a united, solid, friendly ham radio. Time was, not so long ago, that one had to express one's political affiliations before one was welcomed into a ham group. Now, happily, all of us are unhyphenated hams again.

If the future can be judged by the past it seems to us that 1951 will be the greatest year yet for amateur radio. We'll see plenty of technical progress, and a continuation of the union of amateur radio which has always been our greatest asset. The next year should bring new records in all phases of amateur operating, from 160-meter WAS to new records on 144 mc. We'll figure how to get more watts out of smaller tubes, and our antennas will put bigger signals into better receivers at the other end of the circuit. Yes, 1951 looks like a banner year for all of amateur radio.

We here at *CQ* will continue to do our very best to bring amateur radio the finest publication ever. The present high standards of our departments will be maintained and our technical articles will continue to be the tops in the field. We recognize the fact that our present leadership in the world of technical communications could not be without the support of you, our readers. Thanks a million, and a Merry Christmas to you all.

Doc, W2BYF
Herb, W6QD
Lou, W5RZJ
Brownie, W2PAU
Andy, W3NL
Frank, W2TNE

Despite rumors

COLLINS IS NOT GOING OUT OF THE AMATEUR EQUIPMENT BUSINESS

The grapevine is wrong. Here are the facts:

Production lines are rolling now for a large run of 75A-2 amateur receivers. These new receivers, engineered specifically for amateur use, will be in full distribution by February of next year.

Our factory is going ahead full steam for the production of the new Collins 1 KW transmitter. Deliveries will begin early next spring.

Meanwhile, production of the Collins 32V-2 continues steadily, and has been stepped up for a substantial increase in the number of units scheduled for delivery.

It is true that Collins has taken on a tremendous additional load for the Department of Defense. To accomplish this and to continue to serve you, it is still expanding its facilities in every reasonable way.

The first products of this company were for amateurs, and it still considers amateur equipment one of its most important products.

No — COLLINS IS NOT GOING OUT OF THE AMATEUR BUSINESS.

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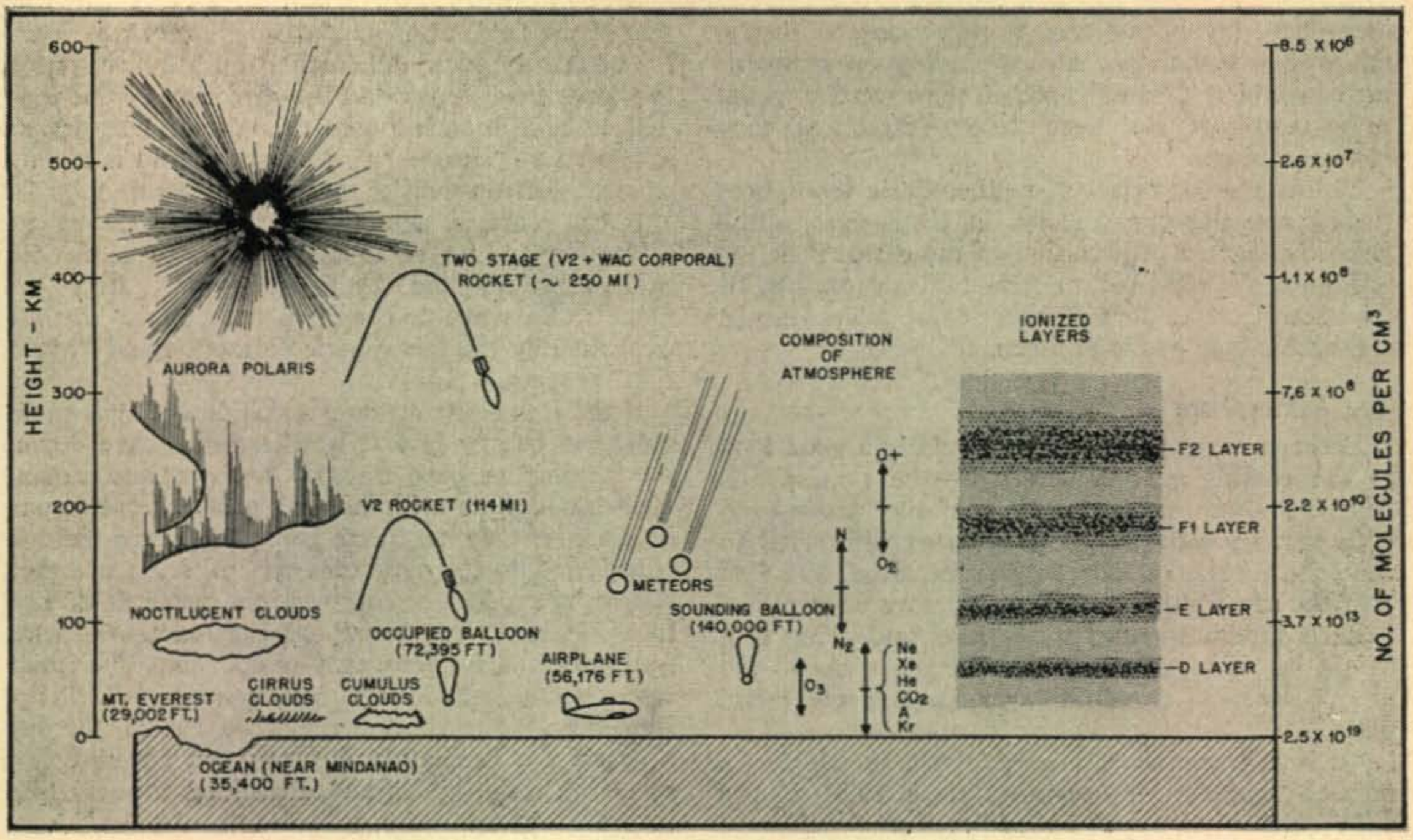


RADIO WAVE PROPAGATION

CHESTER R. UNDERHILL, W2YT*

Part one of a three-part article giving the authoritative low-down on why our high frequencies act as they do.

THE TYPE OF DX WORKED BY AMATEURS on their v.h.f. and u.h.f. bands can hardly be explained in terms of conventional ionospheric and tropospheric theory. In this article, an attempt is made to explain various modes of propagation of v.h.f. signals, and to outline the ionospheric and meteorological conditions which may result in extended-range transmissions.

The Propagation Problem

Considerable information exists in our literature on the propagation of v.h.f. and u.h.f. radio waves via the troposphere, or "weather-sphere," to use plain English.

Unfortunately, much of this information is contained in scientific journals not readily available to the radio hobbyist. Also a "trace language" has come into usage by the research physicists in which propagation phenomena are discussed. Many expressions from this scientific language have found their way into the vocabulary of the radio amateurs. Such terms as *temperature inversions, ducts, sporadic E, reflection, refraction, M-units, MUF and aurora scattering* are only a few of them. Many of us hobbyists, not having the scientific literature at our disposal or not wishing to delve into it, have been prone to set up our own somewhat vague definitions for these expressions. One result has been the pseudo-scientific QSOs that we have all indulged in from time to time—speaking learnedly about propagation conditions, meanwhile scheming for some excuse to pull the switch before betraying our abysmal ignorance of the subject.

Those of us who have engaged in DX work on the low frequency bands (below 40 mc) over a period of years have brought to the v.h.f. bands a pretty fair understanding of propagation via the ionosphere, while many of the ex-service boys have brought to the amateur ranks a knowledge of u.h.f. technique involving propagation via "radio line of sight," diffraction and by means of inversion ducts, at frequencies above 200 mc.

When these two amateur groups meet on two meters and try to explain DX in terms of their own familiar terminology, we are prone to hear the ionosphere boys talking learnedly of Sporadic E,

* *Senior Engineer, Radio Propagation Laboratory, The Pennsylvania State College, State College, Pa. On special leave from RCA Service Co., Inc., Camden, N. J.*

ionosphere layers and aurora reflections, while the microwave technicians discourse ably on temperature inversion "ducts," and, if they were exposed to meteorology, the term "super-refraction" may receive a plug.

Unfortunately, however, neither basic ionosphere theory nor the duct theory, in themselves, satisfactorily explain propagation of radio waves of the order of 150 mc over abnormal distances. Let us face the fact then that much remains to be learned and take a look at the problem.

The Atmosphere

Perhaps we may best start by taking a good look at the earth's gaseous envelope—the atmosphere. *Figure 1* shows a cross-section of the atmosphere, with various well-known phenomena illustrated to demonstrate the relative heights involved. We find that the atmosphere contains a number of stratified gaseous layers, starting at sea level and rising to a height of some hundreds of kilometers above the earth's surface. The first layer, nearest the earth, we call the troposphere, or weather-sphere. This layer is approximately 6 miles thick, in which the normal temperature decreases some 19.5° F per mile with increasing altitude from a sea level value of 60° F, to a minimum value of −58° F at the upper limit. Meteorological changes in this "weather-sphere" are responsible for the variable v.h.f. propagation conditions with which we are familiar.

Above the weather-sphere is the stratosphere, which is characterized by an approximate constant temperature of −58° F and in which water clouds never form. The stratosphere is positioned approximately from 6 to 50 miles above the earth's surface and is thought to have little effect upon radio propagation.

The ionosphere, or ion sphere, as its name implies, may be considered in terms of stratified layers of ionized gases of varying density and thickness, positioned in the upper atmosphere from 50 to 190 miles above the earth's surface. Ultra violet radiation from the sun is the principal ionizing agent. When this radiation impinges on the gas molecules of the air, electrons are knocked off some of the gas atoms changing them to positive ions. As the air is very thin in the upper atmosphere, a large number of these free electrons may wander at random for considerable distances before being trapped by an ion and recombining into an atom; thus the ion density of the upper regions of the atmosphere is high. In the lower atmosphere, however, where the air is much denser, an electron may be trapped almost immediately, resulting in a much lower ion density due to the higher recombination rate.

When the electromagnetic field of a radio wave enters such an ionized region it exerts force on the free electrons causing them to move at the frequency of the passing wave. As a moving electron constitutes current, it might be expected to effect the propagation of the wave, which is exactly what it does. As the electron reradiates due to its acquired kinetic energy, slightly out of phase due to time delay, it causes a small change in the direction of the field. The cumulative effect of this transfer of energy back and forth from the electrons to the wave field may cause the direction of the wave field to be bent back towards the earth. This process is known as "ionospheric refraction" and is a function of electron density and wave frequency.

If the wave is actually bent sufficiently by the refraction process so that it returns to earth it is said to be "reflected" by the ionosphere. Long distance radio wave propagation around the earth is explained by the ionospheric refraction and "reflection" process.

If the free electrons do not collide with gas molecules, no energy is lost by the radio wave during the bending process. Should, however, the moving electrons collide with neutral gas molecules, part of their energy acquired from the wave field is transferred to the molecules and part is reradiated, causing a net loss of energy in the wave field. This loss is called "absorption," and is a function of wave frequency and the frequency of collision. The rapidity of these collisions is known as the "collision frequency." The shorter the wave length, the less distance the oscillating electron can travel before reversing its direction and, therefore, the less likelihood to collide with a molecule. At the longer wave lengths, the electron's excursion becomes so great that the probability of collision is greatly enhanced. In the relatively dense air of the E region, the lower frequencies may suffer serious absorption losses in the refraction process.

From the nature of ionospheric absorption it follows that this loss may be minimized by utilizing the highest possible frequency at which the refraction process can occur, for the particular angle of incidence that will yield the required skip distance. When this frequency is exceeded, reflection ceases, as the waves are not bent sufficiently in the ionized layer to be returned to earth. This frequency is defined as the "oblique incidence critical penetration frequency," (F_{max}) and the frequency just below this, at which signals are reflected, is known as the "maximum useable frequency," (MUF) for a given distance. The MUF varies with the Sun's zenith angle, and therefore varies daily, as well as seasonally.

The Central Radio Propagation Laboratory of the National Bureau of Standards publishes monthly very useful predictions for three months in advance, giving the MUF plotted against time for communicating over various distances around the earth. For practical communications purposes "Optimum Working Frequencies" (OWF) are chosen which are some 15% below the MUF to allow for day-to-day variations in critical frequency and height of the layer.

The Earth's magnetic field extends throughout the ionosphere, and exerts an influence on free electrons in this region. Moving electrons will tend to rotate in a magnetic field. The period of rotation depends on the strength of the field, so in this case the period is dependent on the latitude. In temperate latitudes the natural period of rotation is such that at a driving frequency of about 1.4 megacycles maximum absorption occurs. Pioneer experimenters on the "short wave" bands noted this absorption

effect, but these workers jumped to the conclusion that absorption effects increased with increasing frequency. As a result, these frequencies were generously turned over to the hams! Further information on this absorption, or "Gyro Frequency" effect can be found in Terman's *Radio Engineers Handbook.*

The "E" layer, nearest the earth, is roughly positioned from 50 to 80 miles above the earth, depending upon the season and the latitude, with a diurnal variation in height of approximately 10 miles. The F_1 layer is at an altitude of 70 to 125 miles, and is noted as a separate layer only during the summer months. The F_2 layer extends on up to approximately 190 miles. These two layers coalesce during the winter months. Relative intensity of ionization increases with altitude, the E layer being the least ionized and the F_2 layer having the highest ionic density.

affect two-meter communication. This fact may readily be demonstrated by an examination of the relationship between the oblique incidence critical frequency, f_{max}, the vertical incidence critical penetration frequency, f_c, and the angle of incidence, i_o, that the ray makes at the refecting medium with a vertical line h dropped to the earth. This relationship is known as Martyn's Theorem and has been shown to be $f_{max} = \frac{f_c}{\cos i_o}$. (Mitra, *The Upper Atmosphere,* pp. 236–253). The ratio f_{max}/f_c is known as the MUF factor and represents the figure that f_c must be multiplied by to arrive at f_{max}. Appleton and Beyton[1] have prepared curves giving the MUF factor for angles of propagation from 0 to 5° for distances up to 1250 miles for a parabolic thin reflection layer 60 miles high. According to these curves, reflection from a layer of infinite thinness, 60 miles high, at an elevation of 1°, shown an MUF

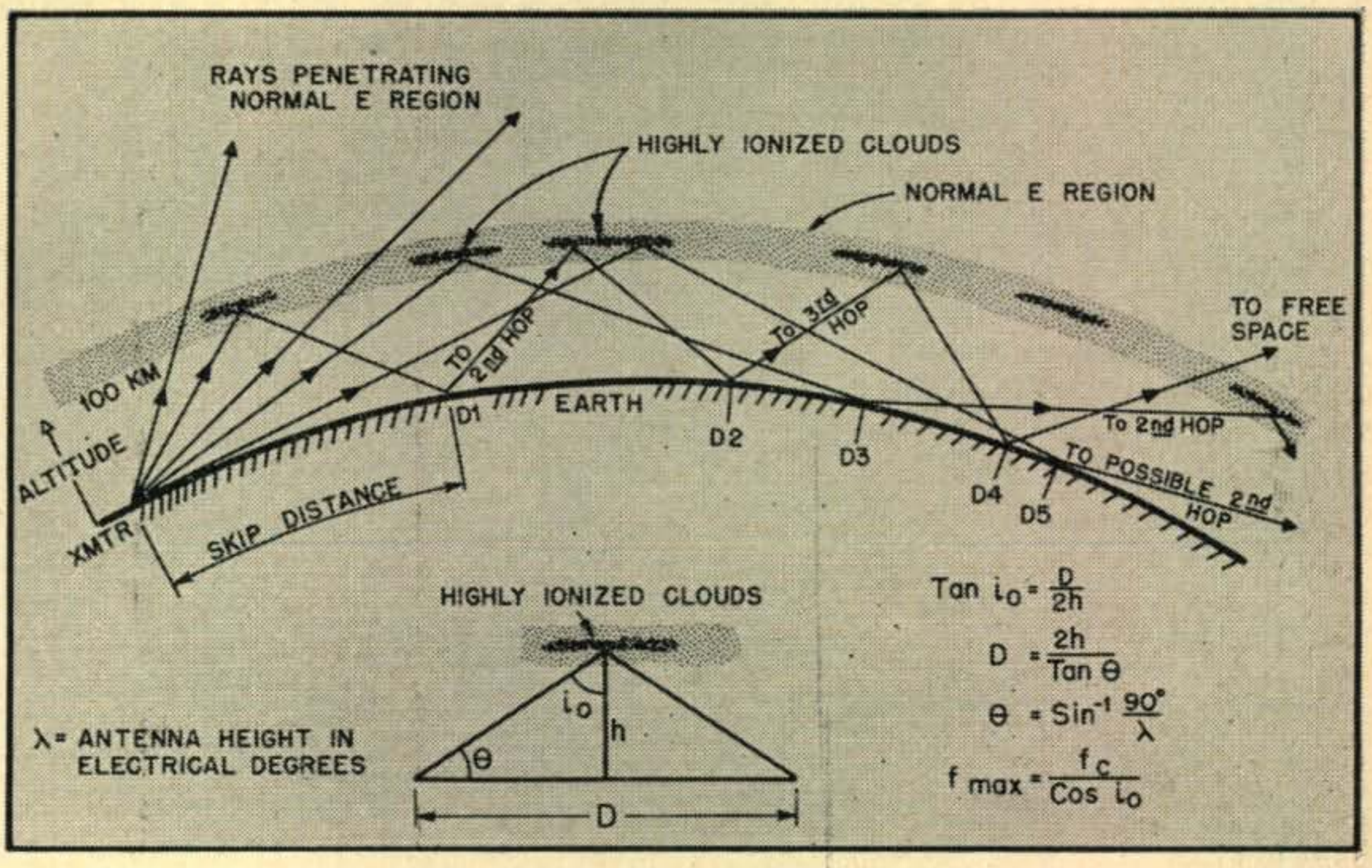


Fig. The mechanism of sporadic-E propagation of v.h.f. waves. The highly-ionized clouds in the normal E region are responsible for the unexpected reflections.

The F_1 and F_2 layers play the most important part in long distance communication on the amateur bands below 30 mc. The normal E region reflects long radio waves (below 2 or 3 mc) but usually has little effect, other than absorption, at most amateur frequencies.

Recent studies indicate that the E region is the most complex of the various stratified layers of the ionosphere. Positioned at random in this region are thin "clouds" apparently composed of highly ionized gases, stationary at times, while moving at high velocity at others. This phenomenon is known as "Sporadic E" and the cause is unknown. These sporadic-E clouds, most prevalent in the summer months, vary greatly in ionic density, their presence being manifested by a sudden abnormal increase in the maximum usuable frequency (MUF). They are thus responsible for some of the unusual propagation conditions on the ten and six meter bands. (See *Fig. 2.*) It is unlikely, however, that they often

[1] The Application of Ionospheric Data to Radio Communication, *Proceedings of the Physical Society,* Vol. 59, p. 58, 1947.

factor of 5.65, which requires an f_c of 26.6 mc for an f_{max} of 144 mc. This constitutes, of course, the best possible condition and represents a skip distance of 1200 miles, which would be most unusual.

There have been occasional reports of abnormal DX reception on our 144-mc band. In almost every case, the distance covered by the signals was within a few percent of 1200 miles. Recently a two-way QSO was accomplished by W5VY and W8WXV over the 1196-mile path between San Antonio, Texas, and Shiloh, Ohio. These incidents seem to support the assumption that occasionally, although very rarely, sporadic-E ionization becomes sufficiently intense to reflect signals back to earth—even at frequencies as high as 144 mc.

We have neglected to mention the D layer of the ionosphere, because there is some doubt as to its existence. Its adherents claim it to be located at an altitude of 25 to 40 miles. At any rate, its possible ionic density would be far too slight to yield a refractive index effective at any amateur frequency.

(Continued on page 54)

Here is a simple Q5er which will not alter the stability and calibration of your receiver.

A XTAL CONTROLLED

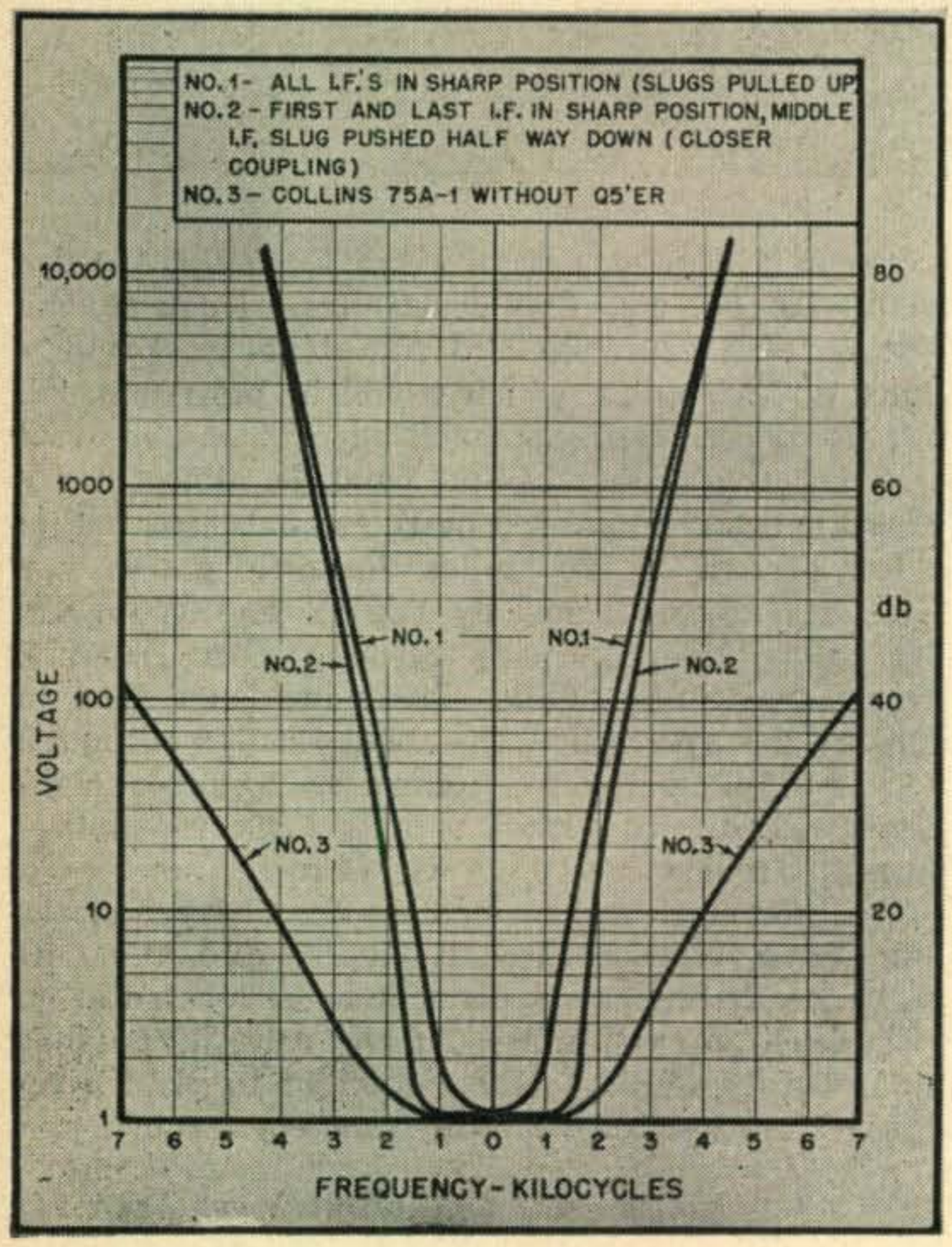
THE WRITER HAS FOLLOWED PREVIOUS ARTICLES on this subject by Rand, Goodman, and others. Shortly after Goodman's article "The Lazy Man's Q5er" I purchased a BC-453. However, before putting it to use I paid a visit to a ham who was using it.

I was very much impressed with the selectivity of the unit but the audio quality was very disappointing and also the noise limiter in the receiver could not be utilized, so nothing was done on the Q5er until I read the article in the 1948 September issue of *QST* entitled "Triple Conversion for the Communications Receiver."

In this article a complete unit was constructed on a small chassis using the 85-kc i.f.s from the Q5er, which included a crystal detector and a crystal noise limiter. After reading this article I could not see why the second detector and noise limiter in the receiver could not be used, eliminating the construction of the additional circuits. A haywire adapter was constructed for the second detector of my 75A-1 and the i.f. output of the receiver was connected to the grid of the mixer in the BC-453. The output of the last i.f. in the 453 was connected to the second detector of the 75-A. To say the least, the results were more than gratifying as we had the audio quality of the receiver and the use of the noise limiter. However, all of the phone signals were bassy, of course, due to the extremely sharp nose of the i.f. response in the 453. We thought the Q5er was FB but if we could only broaden the nose of the response curve and still maintain the skirt selectivity, we would have something approaching the ideal response curve.

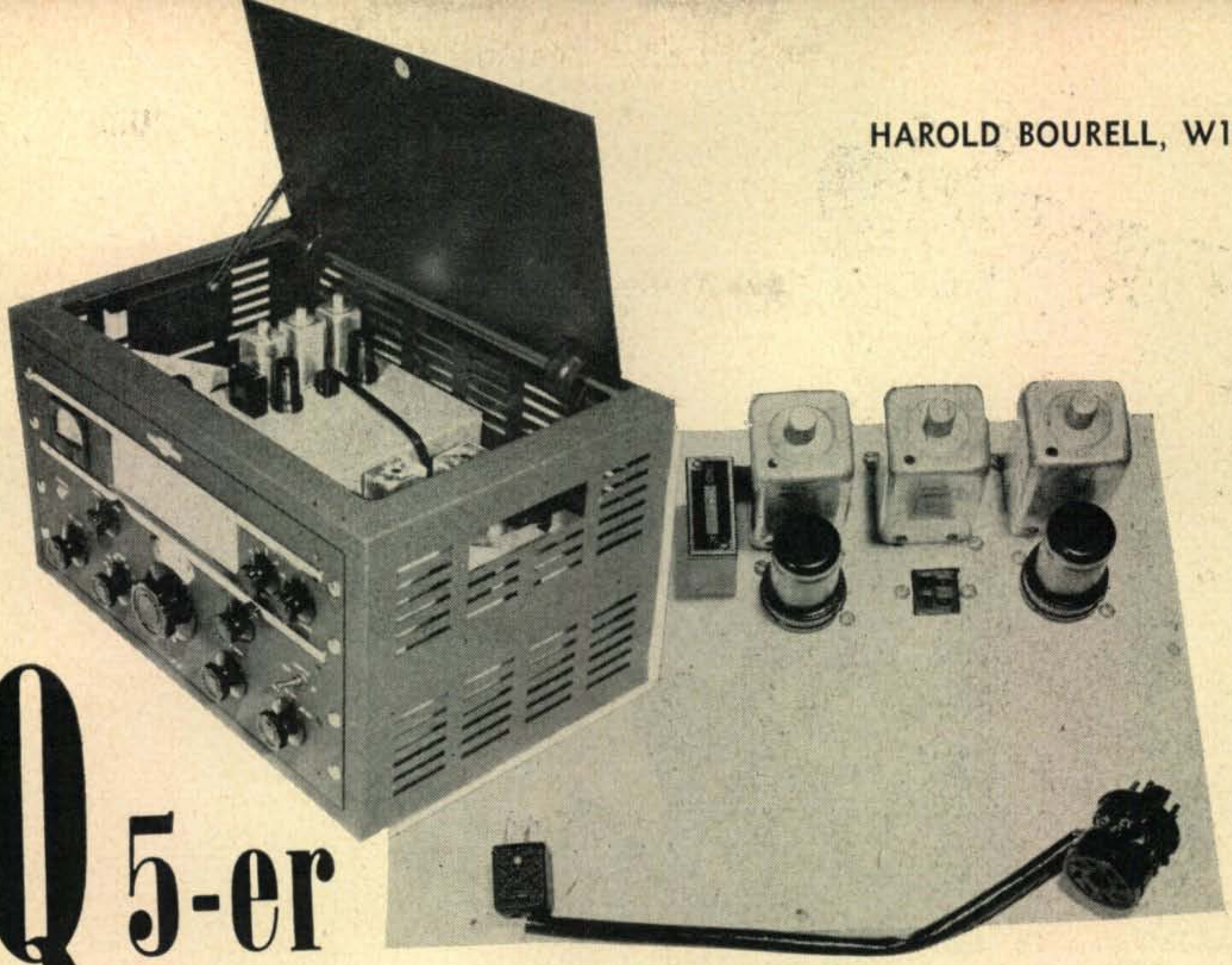
All of the i.f.s had been placed in the sharp position (slugs pulled up) and then aligned. We then decided to see what would happen if we overcoupled the middle i.f., so the slug was pushed down. Lo and behold, the phone signals sounded almost normal, so then we wondered what had happened to the overall selectivity of the unit. A few quick checks were made at 3 and 4 kc off resonance which showed the skirt selectivity to be the same as before. After several checks were made with the coupling of the middle i.f. in various positions it was found that the phone signals appeared very near normal with the slug pushed half way down, so the unit was used in this position. An important point to remember in obtaining the curve shown is that the i.f.s are first all placed in the sharp position (slugs up) and then carefully aligned, then the middle slug is pushed half way down without realigning the circuits. If the i.f.s are realigned after pushing the middle slug down you will not obtain the broad nose shown on the curve.

Needless to say we were now more sold on the Q5er and plans to incorporate it in the receiver were immediately begun. The first consideration was to maintain the frequency stability and calibration of the 75A-1, so it was decided to crystal control the unit. Considerable time was spent in building up several Pierce oscillator-mixer stages before the one shown was decided on. Only one i.f. tube is necessary and then the gain of this stage is held down with a high value of cathode resistor. Another point in designing this unit was to get sufficient gain with the least amount of current drain as it was planned to power the unit from the receiver power supply.



The secret of improved phone reception with this unit is the adjustment of the coupling of the second i.f. transformer.

HAROLD BOURELL, W1QVC



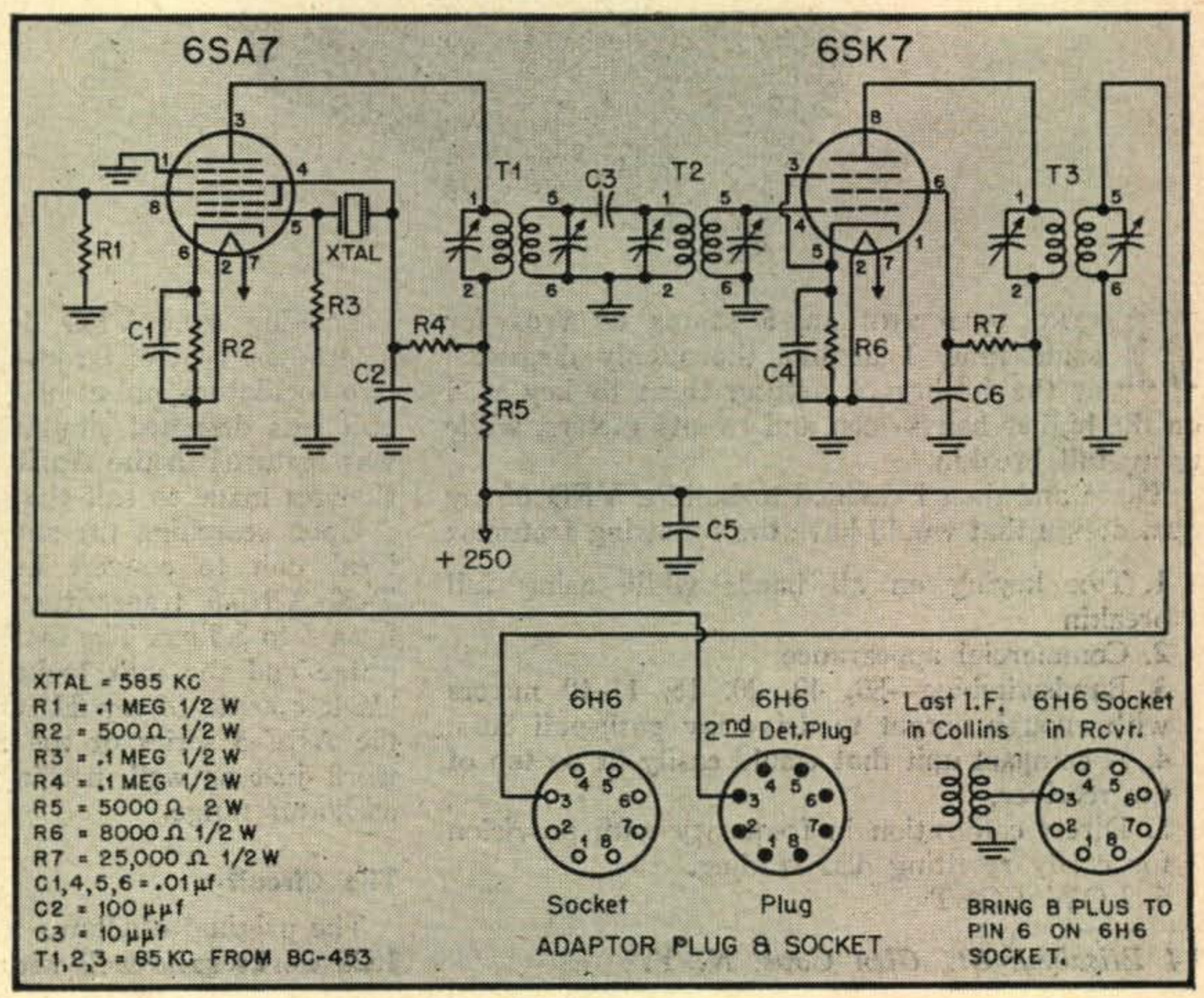
Q 5-er

The total current drain of the final unit constructed is only 5.6 ma with 250 volts.

Being rather fond of our pride and joy (the 75-A) we decided to steal some of the plate current drain from the 6V6 output stage. The current of this stage was checked and found to be 38 ma, the cathode resistor was increased from 330 ohms to 560, resulting in a current drain of only 27 ma while the audio output was only decreased slightly. (Most receivers have more audio than necessary), so now we were all set to put the unit in the receiver. After studying the inside of the receiver for a short time we decided to utilize the space on top of the dust

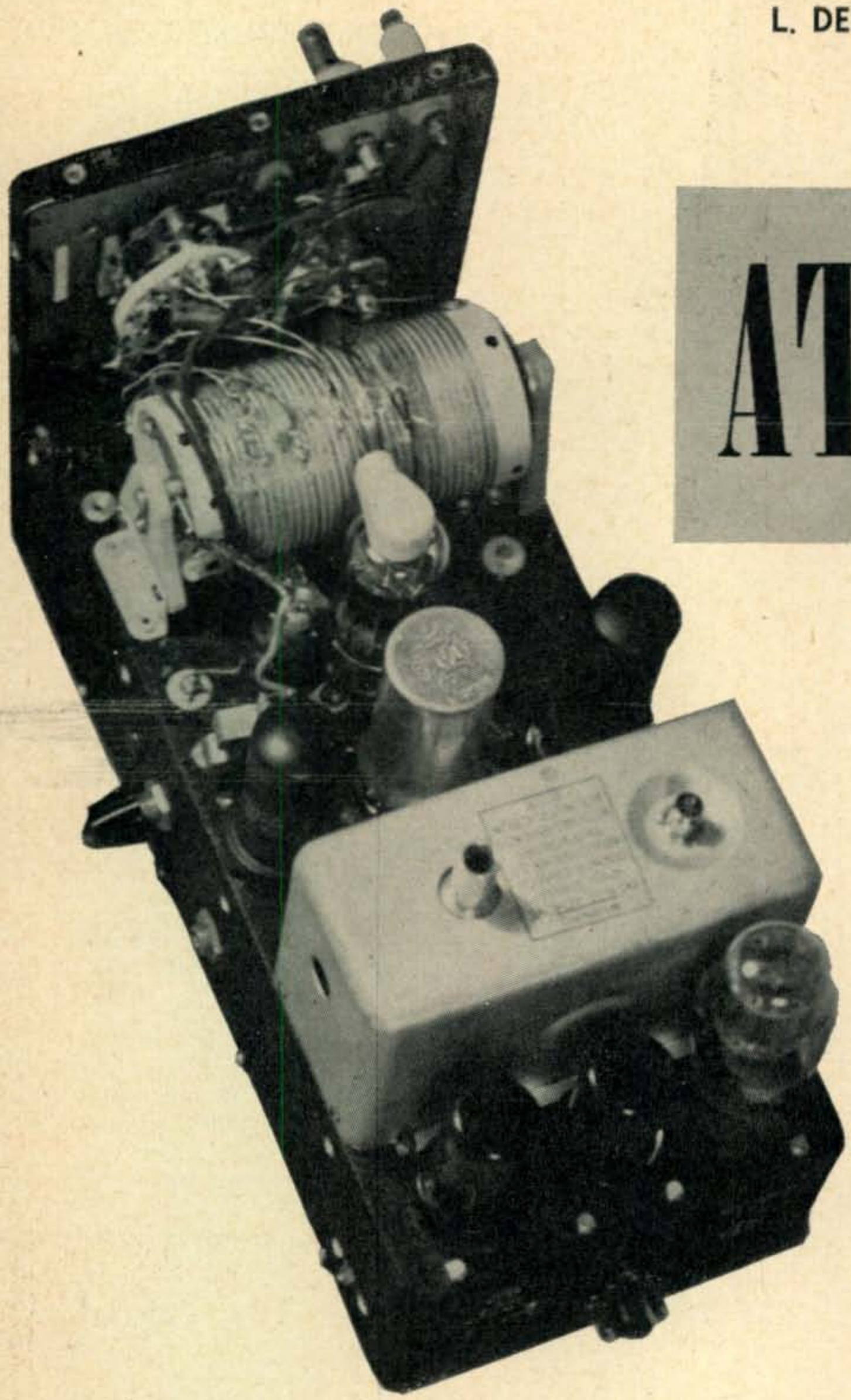
(Continued on page 56)

The crystal-controlled Q5-er is considerably simpler, circuit-wise, than most units. The 6SA7 acts as crystal-controlled local oscillator and mixer, while the 6SK7 provides sufficient i.f. amplification, at 85 kc, to cancel losses. The 8K cathode resistor for the 6SK7 keeps the overall gain down and contributes to the stability of the system. It is the coupling adjustment of T2 which provides the desired broad nose on the selectivity curve.



L. DENNIS SHAPIRO, W2URX*

AT LAST



HAVING USED THE ARC-5 SERIES OF VFOS for some time, I became thoroughly disgusted at the futility of getting them to key well on the higher bands—ten and twenty meters, while using full breakin.

There and then I decided to build a VFO of my own design that would have the following features:

1. T9x keying on all bands while using full breakin
2. Commercial appearance
3. Bandswitching—80, 40, 20, 15, 11–10 meters with enough output to drive my push-pull 807s.
4. A compact unit that would easily fit on top of the receiver.
5. Direct calibration in frequency with provision for easily resetting dial reading.
6. LOW COST

*4 Elizabeth St., Glen Cove, N. Y.

Looking over VFO designs, I found that the heterodyne type of frequency generator, which uses two oscillators and a mixer, was the best bet. This unit was designed similarly to the "T9-er" which was featured in the April, 1948, issue of *CQ*, with changes made to suit the particular application.

Upon searching the surplus market, I found the ideal unit to convert into this exciter. It is a T-20/ARC-5 transmitter which has a range of from 4 to 5.3 mc. The oscillator covered the desired range and the unit looked neat and matched the black crackle of my HRO receiver. Any other of the ARC-5 series or the SCR-274N series should work just as well, needing only a revision of the oscillator range.

The Circuit

The original oscillator is used as the VFO. The 1626 works quite well with six volts on the heater,

A PRACTICAL ALL-BAND HETERODYNE V. F. O.

and eliminates the expense of a six-volt tube. The oscillator covers a range of from 4765 to 4290 kc, which, after being mixed with the crystal oscillator, beats to give output from 3375 to 3850 kc.

The fixed oscillator is crystal controlled on 8140 kc. A 6J5 works quite well in the conventional Pierce circuit. Using this range of frequencies no trouble should be experienced due to beat notes on the conventional communications receiver with an i.f. at or near 456 kc.

The two oscillator signals are fed into a 6SA7 mixer which extracts the difference frequency and sends it to the next stage. The 6SA7 is not used as an oscillator in itself so does not cause any chirp when it is keyed.

A 6AG7 is used as a buffer in the next stage. It is keyed along with the 6SA7 so as to keep the signal leakage at a minimum.

The next stage, a 6AG7, is used as either a quadrupler or a tripler, raising the frequency to either 10.5 or 14 mc. This stage may be switched either in or out by a switch on the side of the chassis, so as to allow excitation to the PA on 3.5 mc, whenever 80- or 40-meter output is desired.

A 2E26 is used either straight-through or as a doubler in the final stage. Considering the cost of turrets and the space available, I decided to use the ARC-5 antenna coil as my final coil. Although it may not be as efficient as a turret, the output is more than enough on all bands and the extra cost of a turret did not warrant its use. The silver plated wire makes it more efficient than it would seem.

Two band switches are used, one switching the final coil and the link, and the other switching the quadrupler in and out.

Special attention is called to the link output circuit. In order to get good output, a small link was needed for the higher bands and a big link for the lower bands. A two-turn link is used for 10-11, 15, and 20 meters, and one wire from that link plus one wire of a four turn link half way up the coil gives good output on 80 and 40 meters. The circuit is unorthodox but it works very well.

The 500-ohm resistors on the wire from the link of the VFO coil to the 6SA7 are used to cut down signal leakage with key up so as to be able to work full breakin. They also serve to keep a constant load on the oscillator which cuts down chirp.

Small size coax should be used in the wire from the link to the grid of the 6SA7 to insure against signal leakage.

A tune-up switch has been incorporated in the exciter since the pictures were taken. It is inserted in the hole in the front panel which originally housed the link control. It allows swishless zero beating and the VFO puts out a weak signal which does not overload the receiver. The switch cuts off screen voltage from the quadrupler-tripler and the 2E26.

Construction

There are a lot of parts that are unused in the ARC-5 that must be removed. Remove all tubes. Remove the 1625 sockets by slipping a screwdriver around the rim and prying the iip up. Disconnect the wires from these sockets and put them aside. Remove the neutralizing condenser and all parts of the amplifier and antenna coils and the tuning assembly for the antenna coil. Leave the mounting bracket on the antenna coil and put it aside for later use. Remove the r.f.c. and all the knobs on the front panel except the tuning knob and lock. Use a Bristol screwdriver for this purpose. If one is not available, take a six-inch screwdriver with a ¼ inch blade and file the blade on the edges so as to fit into the Bristol screw heads. Then jam it into the screws, with a hammer if necessary, and it will unscrew easily. This screwdriver will be of much use later on. Make sure to use a 6-inch one, for you will need the length.

Remove the p.a. padding condenser. Remove both relays and the plug in back of the unit. Cut the wires at the connection points to the parts, for they will be used to carry filament and plate voltages later on.

Remove the crystal and resonance indicator tube assembly and all connected parts. Remove all parts on tube sockets except the group on both #1 pins and the filament connection on the #2 pin of the resonance indicator socket. Follow the diagrams and make the necessary changes. Use as many parts from the original transmitter circuit as possible in wiring the new circuit.

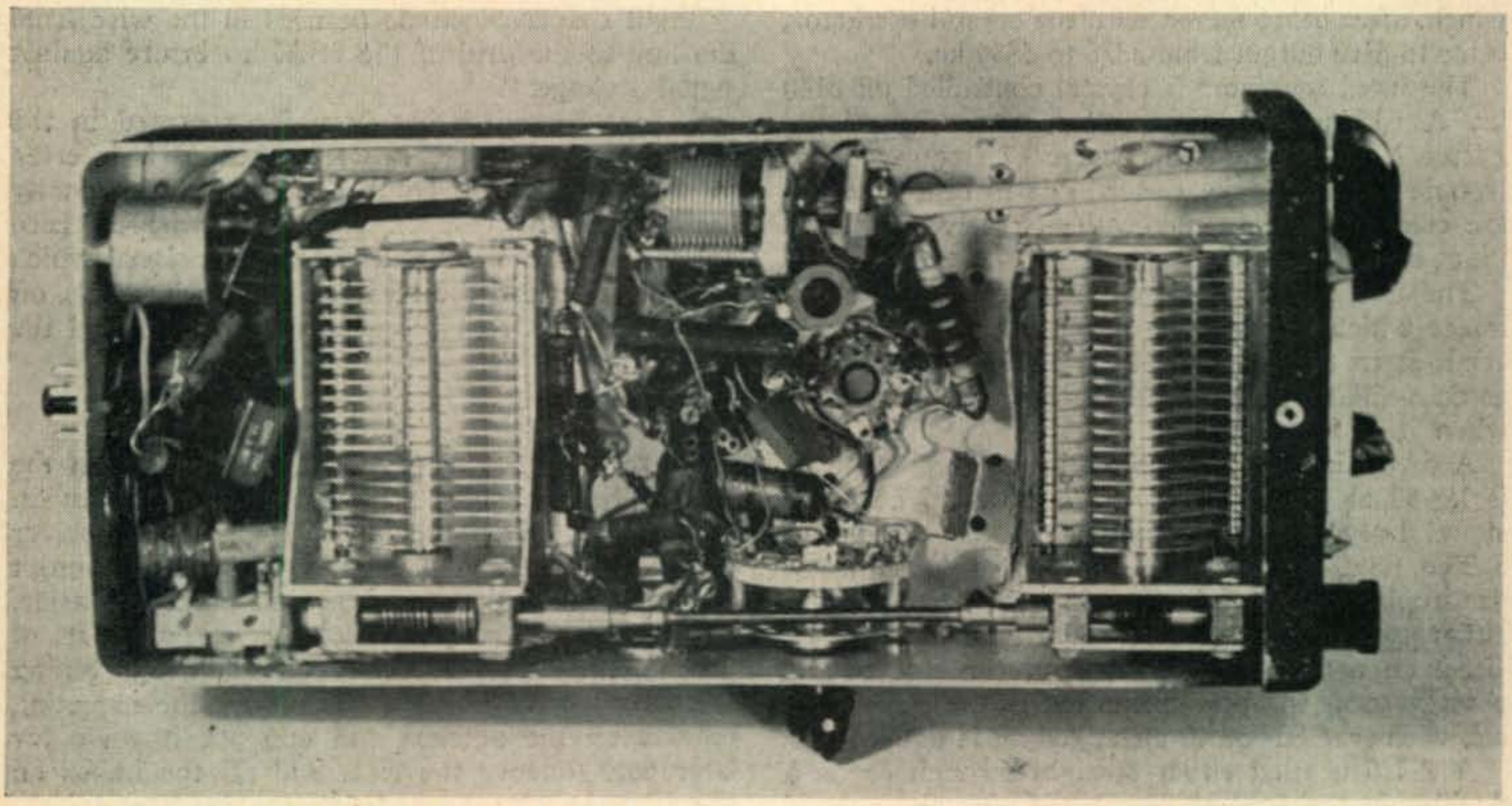
You should now have a clean chassis between the oscillator coil shield on top of the chassis and the front of the cabinet with the exception of the feed-through insulator. On the underside, all should be clean between the oscillator tuning condenser and the amplifier tuning condenser except for the relay wires which will be used for power wires later on.

The connector on the back is an 8-pin male plug. It may be bought commercially but it is very simple to make. Take a metal octal tube that has gone west and remove the octal plug from the bottom. Remove the wires from the plug and clean out the pins. File out the hole in the back of the chassis with a rattail file until the plug fits snugly. Then file two pips in the hole on the top and bottom. Place the plug in the hole and fasten it with two small screws through the pips. It makes an inexpensive substitute that works very well. If a commercial plug is used, the lock ring or screws should be put into place in the usual way.

Before assembling any parts on the chassis, the filaments should be wired. Use the original filament wires whenever possible. Remember, do not wire filament voltage to the coil socket! Allow these wires to go around the edge of the chassis so as not to interfere with the r.f. wiring.

The wiring should be done starting from the oscillators and finishing with the 2E26 stage.

The wiring is very crowded in the oscillator and mixer compartment. The 3×.05 condenser should be unscrewed and left hanging over the side to gain access to the sockets. The 6SA7 transformer should be installed last. The easiest way to assemble the crystal oscillator is to connect all the parts to be connected to the crystal socket first without soldering them. Solder the socket to pins #4 and #6 of the 6J5 socket after connecting pin #4 to pin #5 and the necessary connections to pin #6. If this is followed it will greatly simplify the job of assembly. The other wiring of the unit is routine stuff. The



Bottom view of the finished unit. The placement of major components should follow this model rather closely. The switch mounted on the side is the "multiplier in-out" control, SW_1.

The tube sockets should be punched next. The three sockets in the rear are ideal for the two oscillators and the mixer. The other sockets must be punched. The removal of the 1625 tube sockets leaves a problem because of the wide holes in the chassis. The 6AG7 sockets are mounted on the outer edge of these holes. They are made the right curve at the edge with a socket punch and the sockets are held by one screw which seems to be sufficient, for tube changing does not come often. The 6AG7 buffer coil socket is mounted in a hole punched exactly between the 1625 socket holes. Two screws should be used in this case.

The 2E26 socket is placed in the center of the chassis, being careful that the 2E26 tube, when inserted, will not interfere with its coil assembly. Follow the pictures in laying out the chassis as closely as possible.

3×.05 μf condenser is used as the 6SA7 cathode bypass, and the 105-volt bypass, and the 6SA7 screen bypass condenser.

The mixer plate transformer is made from a 456-kc cartwheel i.f. transformer that was lying idle in the junk box. This transformer may be easily obtained at any radio establishment. Both of the coils are removed and the transformer is built on one of the forms. The windings are wound with maximum coupling to get the widest bandpass without resorting to much resistor loading. Any small gauge cotton-covered, stranded, or solid wire may be used. The type that I used was stranded cotton-covered wire from an old i.f. coil of about a 34 gauge. The transformer consists of about 25 turns, closewound, on one of the forms. A piece of scotch tape should be inserted between the two windings of the transformer to take care of the difference in

potential. The windings don't have to be wound in an orderly fashion and the specifications are not critical, for the wide range of the trimmers take care of any slight variations.

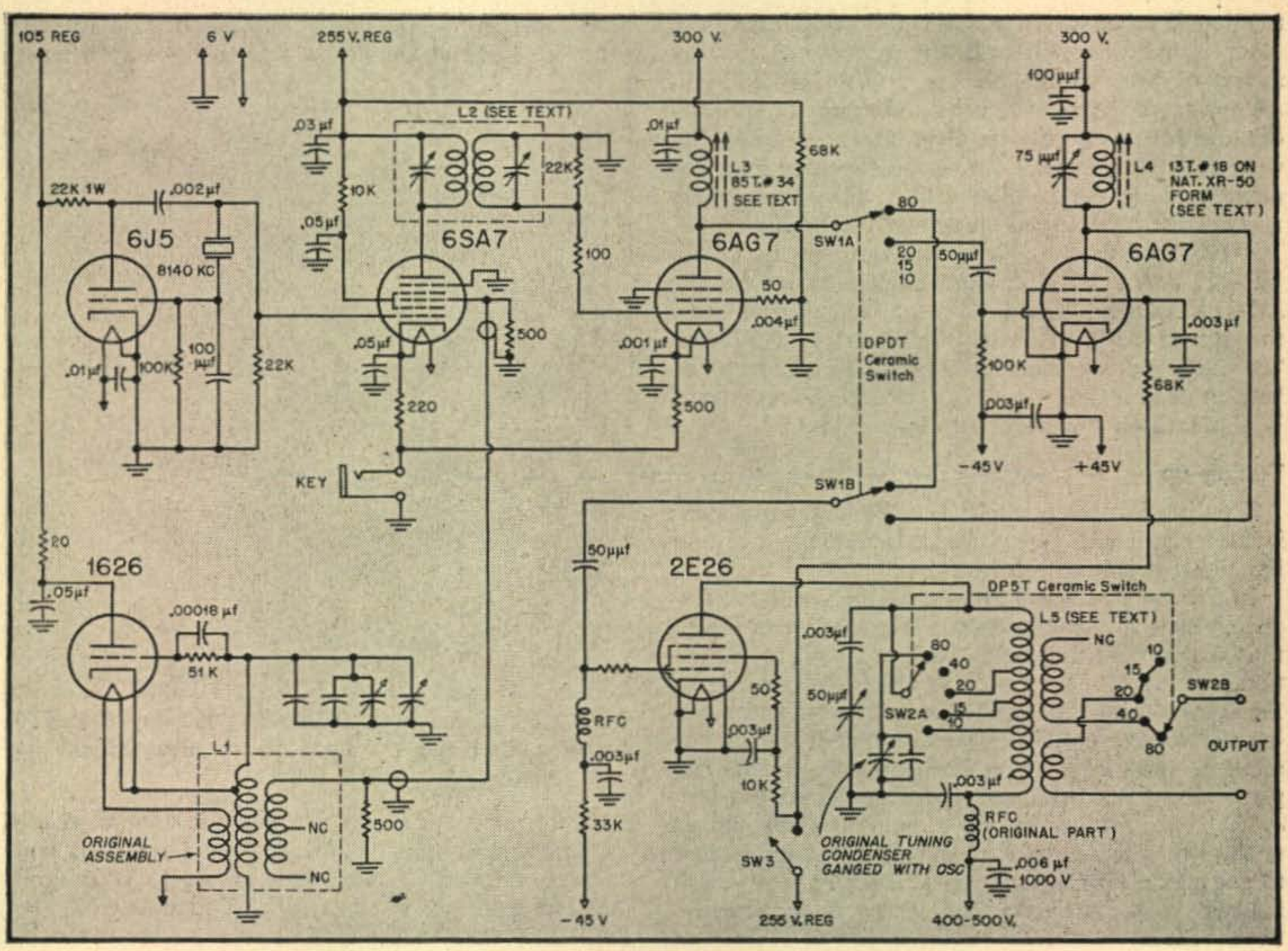
The transformer is mounted right below the 6SA7 tube on the right side of the cabinet. Two holes should be drilled in the side of the chassis to allow screwdriver adjustment of the trimmers.

The "quadrupler in-out" switch is located in the larger hole on the right side of the chassis. The cover for this hole and for the smaller hole is used to cover up the holes in front left by the removal of the knobs. The key jack is right next to the switch further back on the chassis.

The quadrupler plate coil is located midway between the 6AG7 quadrupler and the 2E26. It is

The buffer coil consists of about 80 turns, close wound, of #30 or smaller wire. Any wire from an old r.f. or i.f. coil would work fine. The coil should be about ¾ inches long, starting ½ inch down from the top of the form. Slight variations may be necessary in different coils. The turns can be easily removed, so I suggest that you start with about 85 or 90 turns and prune it down to size.

The 2E26 band switch and tuning condenser are placed on the front plastic window in holes drilled to fit. Make sure that your condenser is the right size and will not interfere with the coil directly behind it. The coil is the original antenna coil tapped for the different bands. It is screwed to the top of the chassis using the original brackets. The holes in the brackets are tapped so the screws, inserted from



The circuit of the v.f.o. exciter. The original ARC-5 parts should be used wherever possible.

made up of 13 turns of 22 gauge enamelled wire spaced over the length of the XR-50 coil form. The 75 µµf variable condenser is mounted on a bracket made of copper sheeting. A lip is bent in the copper to allow it to be bolted to the side of the chassis and extend out at right angles.

Four holes should be drilled in the copper plate; one to hold it to the side of the chassis; two to hold the condenser to the plate; one for the rotor control that is large enough to prevent it from shorting to ground. The rotor is connected through a ¼" insulated flexible coupling to a ¼" rod extending through a bearing out the front of the cabinet to a knob. This circuit tunes either to 14.0 or 10.5 mc.

the bottom, need no nuts. The entire coil is used for 80 and 40 meters. It is tapped between the 15th and 16th turn for 20 meters, between the 10th and 11th turn for 15 meters, and between the 6th and 7th for 10–11 meters. The counting of the turns should be done from the high-voltage end of the coil. The taps are made by laying the tapping wire between the two turns and soldering them. These connections should not be made permanent until the unit is operating efficiently, for a bit of cut and try may be necessary to find the correct points for maximum output on the higher frequency bands.

The original p.a. condenser which is ganged with the oscillator condenser is used to provide a good

degree of gang tuning on 80 meters. A copper shield should be placed between this condenser and the 2E26 to insure stability. It is placed right over the side of the condenser, as seen in the pictures.

The parts layout in the pictures should be followed closely in order that all components be fitted into such a small space. The tolerances of the components are not close, and any makeshift parts will work, such as parallel or series resistors to reach a certain value.

Power Supply

Four plate voltages are necessary to operate the unit besides the six-volt filaments. You need 105 volts regulated, 255 volts regulated, 300 volts and 400–500 volts. Two supplies were used in our installation. One supply had an output of 105 volts, regulated, at about 30 ma for the oscillators. The other supply supplied all the other voltages by means of taps on the bleeder resistor. A 500-volt 200-ma transformer was used and seems to be bearing the load very nicely. Separate power supplies were necessary to take out the slight chirp that was introduced by the voltage shift if the same supply was used for the keyed stage and the oscillators. A VR-105 was used for the 105-volt supply and a VR-150 and a VR-105 were used in series for the 255-volt supply. Good filtering should be used throughout to insure a good clean note. A 45-volt "B" battery is used to supply bias. The one here has been in use for over 6 months and still going strong. It is placed on the power supply chassis.

Tuning up

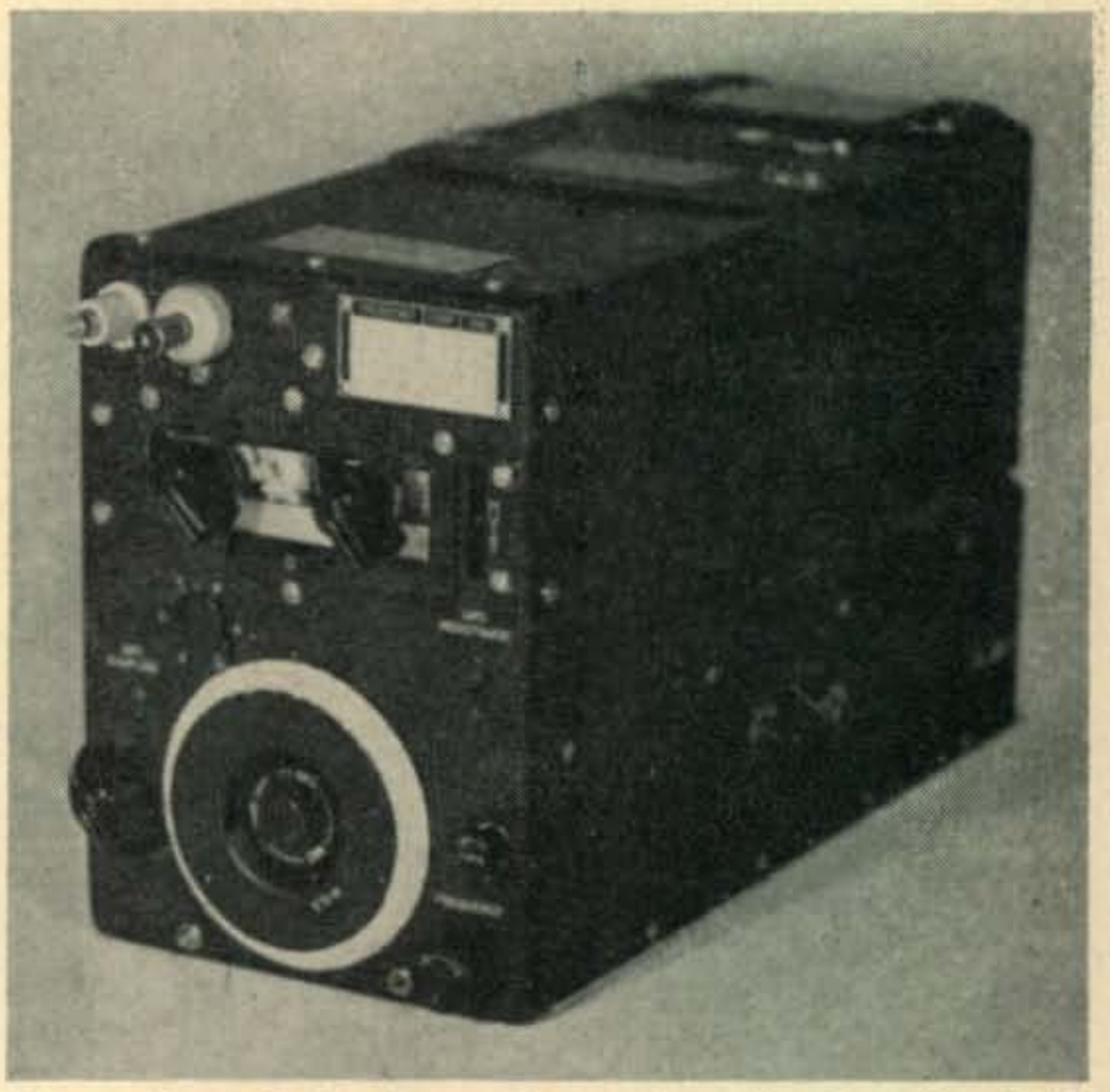
This job forms the nucleus of the unit, for if done incorrectly, it will give no end of trouble, but if done the right way, it will do wonders.

In this type of VFO circuit, as the oscillator frequency gets higher the output frequency gets lower, thus making the dial read "backwards." This condition was rectified by loosening the bristol screws on the rotor shaft of the oscillator condenser and rotating the condenser 180 degrees so that it moves into mesh as the dial reading is increased. Remove ten plates from this condenser, starting from the rear of the shaft, leaving the six remaining plates closest to the worm drive mechanism in place. This is done to get maximum bandspread. Make sure that you do not disturb the drive mechanism for it might introduce some backlash.

Remove the two 6AG7s and the 2E26 tubes and apply voltage to the unit. Tune your receiver to 3.6 mc. Adjust the oscillator tuning condenser so that it is a little less than half mesh, by turning the knob on the front panel. Short the key terminals and adjust the oscillator padder located in the shield on top of the chassis until you get a signal from the oscillator on the receiver. Make sure that you don't pick up an image instead of the fundamental. The oscillator padder is adjusted by unscrewing the locking screw through the hole on the side of the shield and pushing the adjusting arm toward the right with a screwdriver. The shield does not have to be removed for the arm only has to be moved about ½ inch. Move it slowly for it is very critical and a hair this way or that will get you off frequency. When you get the signal near 3.6 mc it may be adjusted by turning the top blue screw in or out, as the case may be. The original oscillator adjusting screw is used to reset calibration in this unit. It should be set at about half scale and all the fine adjusting should be done with the blue screw on the top during the original tuning up process.

Put a pencil mark on the dial at the 3.6 point for easy reference. Check the range of the unit by turning the VFO dial from one extreme to the other. It should cover from 3.375 to 3.85 mc. If this range cannot be covered, adjust the cut end plate on the condenser so that a lower frequency will be produced when it is out of mesh, and a higher frequency will be produced when it is in mesh. It should just cover the desired range.

Adjust the 6SA7 transformer to peak at 3.6 mc and insert the 6AG7 buffer. Adjust its coil for 3.6 peak. The output should be able to light up a neon



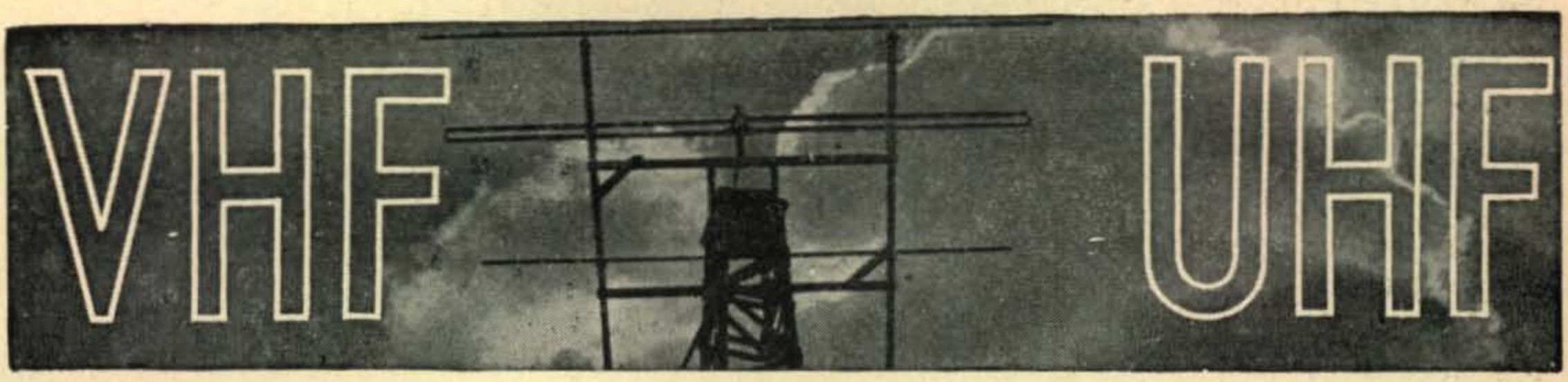
Front view of the heterodyne v.f.o., showing the 2E26 tuning control and the band switch mounted on the plastic window.

bulb. Those of you who are anxious to get on the air might want to put a link around this coil and connect it to an 80-meter antenna or to your final grids, if using 807s or the like. You will really be thrilled by its performance.

Insert the 2E26 and, making sure that the band switches are in order, tune it to 3.6 mc with the tuning condenser. In order to obtain gang tuning over the 80-meter band, the original p.a. condenser is used to tune the 2E26. It was found that the range of the condenser was too much for the coil and padder combination to allow it to track perfectly over the range so the ganged condenser should be set at half mesh at 3.5 mc. This is an unorthodox condition but the front condenser dial only has to be touched three or four times during the whole range on 80 meters.

The 80-meter band should be set first before going to the higher frequency bands. The easiest way to tune the unit for uniform output over the

(Continued on page 52)



Conducted by E. M. BROWN, W2PAU*

THUS FAR, THE MONTH OF OCTOBER, 1950, seems to have been pretty much a repeat of the month of September, as far as conditions on the v.h.f. bands are concerned. Frequent tropospheric openings have occurred on the two-meter band, and although no new assaults on the DX record have been reported, conditions have been good enough to permit some of the DX artists to pick up new states here and there. Scattered aurora displays have given the boys on six and two meters samples of c.w. DX. None of these aurora sessions were up to the expectations of those who remembered the extent of some of the early season openings, but they provided a taste of what might be in store. In some sections of the country, six meters has been pretty quiet for the past month or so, but between the aurora and an occasional sporadic-E opening, there is good cause to keep an eye on this band. We are approaching the season when F-layer DX may be experienced on 50 mc—remember those extensive 3000-mile skip sessions of last year?

We take this opportunity to report, belatedly, a new European two-meter DX record, which was established on September 13 by G2BMZ and DL4XS/DL3KE (a jointly-operated station). Reports of S7 were exchanged over the 540-mile path between Weisbaden and the South Coast of England. DL4XS/3KE reported working 19 Gs, minimum distance 365 miles, with all signals S7 or better. East Coast Ws take note: DL4XS/3KE operates on 144.45 mc! Although the band was also open from DL to HB, I, and OK, the contact reported above seems to have been the best DX.

W2BAV has been continuing in his efforts to put Claryville, New York, on the two-meter map. As reported in this column last month, Bill has been doing an outstanding job from his DX factory, located in a 65-foot tower atop the 3,000 foot summit of Red Hill, near Claryville. On the evening of October 3rd, a "quickie" opening gave Bill an opportunity to work several W9s, and also W4JDN, at 11:22 for his first Kentucky contact. On the 16th of October, good conditions again developed over about the same area, and with the assistance of W8WXV, Bill lined up W8EP, of Terra Alta, West Virginia, for his first two-meter contact with that state. While these contacts as such were not especially sensational after the near-record contacts of September 6th, they did serve to place W2BAV on the top of the list of States Worked on Two Meters with a grand total of 21 states, all worked during 1950, all on phone, and all without assistance from the ionosphere! W8WJC and W8BFQ, both with 20 states to their credit, and the numerous runners-up at 18 and 19, are sparing no efforts to overtake the leader. If W3ASD, (Delaware's most substantial representative on two meters), had a phone listed in his name at his Smyrna estate, he would have had no sleep during the night of October 16th, but W8WXV, W3QKI, W8EP and others might have had a new state!

** Associate Editor, CQ. Send contributions to E. M. Brown, 88 Emerald Avenue, Westmont, Collingswood 7 N. J.*

More on Amateur TV

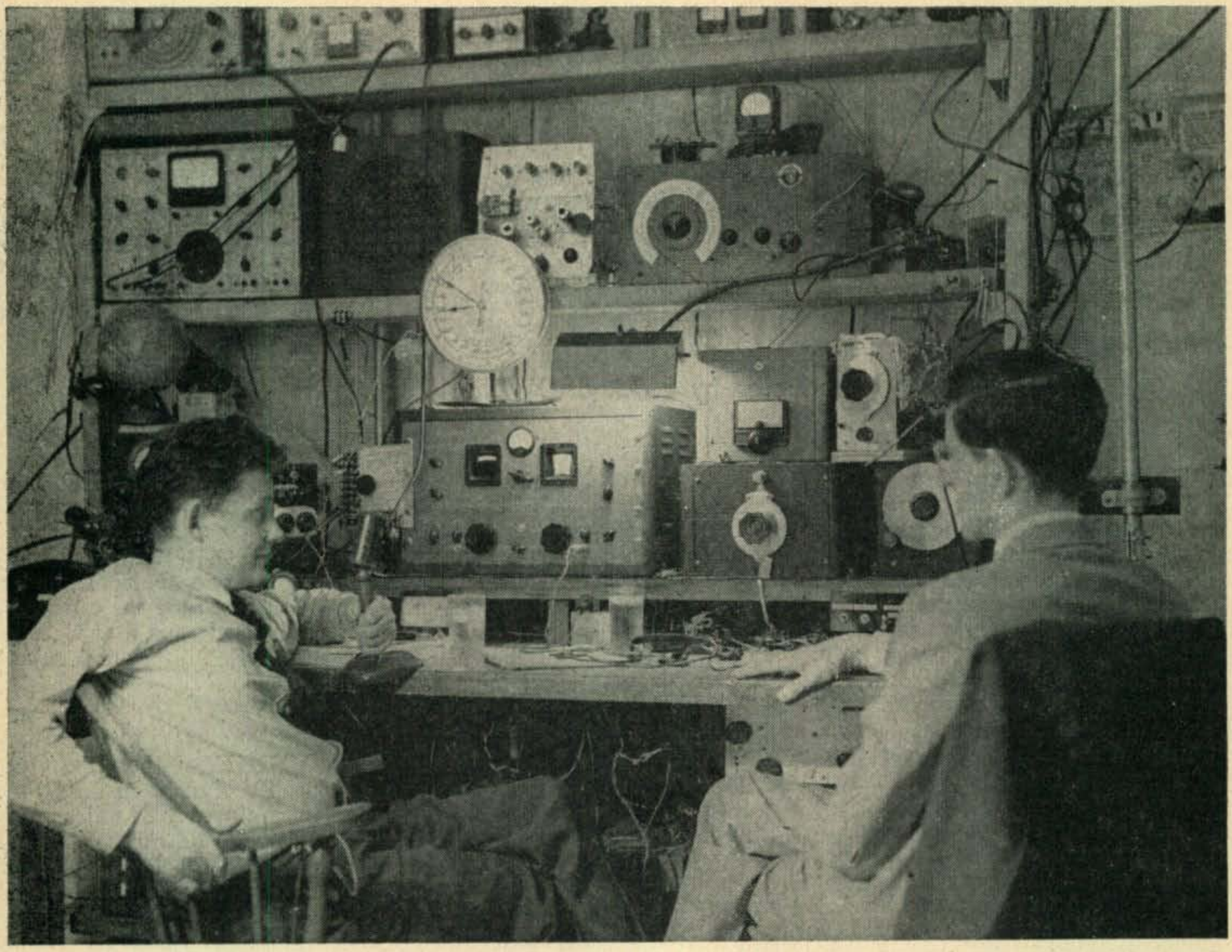
Since September 1st, VE2HE, of Iberville, Quebec, has been transmitting TV signals on the 50-mc amateur band. Located approximately 28 miles north of the United States border and 32 miles from the city of Montreal, Mr. John D. Woodlock, VE2HE, had been receiving broadcast TV signals from various stations in the United States consistently during the past three years. Using the relatively simple ham TV system devised by J. R. Popkin-Clurman, W2NLP, (described briefly in our column in April, 1950, *CQ*, in *QST* for June 1950, and in greater detail in *Radio News* for May, June and July 1950) VE2HE succeeded in putting a TV transmitter on the air to provide test signals for other interested experimenters in his area, and to aid in propagation tests.

The picture carrier frequency was selected as 53.51 mc, which made possible the use of standard broadcast TV receivers for the field tests. (The receivers could be adapted for six-meter reception by shifting the oscillator frequency down slightly from channel #2.) A power output of about 25 watts peak was employed, and the four-stacked eight-element antenna array boosted the effective radiated power to about 250 watts peak. Apparently the regulations permit this type of signal to be employed, but since the rules do not permit radiation of two carriers from a ham transmitter at the same time, the test patterns to date have not been accompanied by sound.

Strong signals have been received from VE2HE by VE2AMO, 21 miles distant, and in several places in the city of Montreal, 32 miles away. The blanking bars could be seen at Lavaltrie, Quebec, at the

VE2HE

It is with deep regret that we announce the untimely passing of J. B. Woodlock, VE2HE, on October 31, 1950.



Editor W2BYF brought his camera along when he and Perry Ferrell visited W2PAU. This shot of the receiving position shows Brownie gripping the mike and Perry watching the fun.

location of VE2SV, a distance of 51 miles. Others participating in the tests were VE2WF, VE2AEZ, VE2SG, VE2RC, VE2AG, VE2IQ, C. M. Berry and O. Fontaine. It was reported that the resolution of the pictures was better than 325 lines.

VE2HE expects to be on the air again soon, using higher power. He hopes to try transmission of 16 mm films in the near future.

There has been considerable interest in amateur TV in evidence on this side of the border. VE2HE's experiments call to mind a plea made almost a year ago by Hod, W9ALU, who suggested that since the top 3 mc of the six-meter band is virtually dead anyway, we should approach the FCC with the idea of permitting TV operation in this section of the band. Hod argues that this is the only band available where we would stand a chance of getting DX TV contacts, via sporadic-E and F-layer reflections. Any comments?

Another ham with ideas on TV operations is W4MS/W4RE of Pensacola, Florida. Eddie prefers a system in which the entire modulating signal is produced locally, (as opposed to the system proposed by W2NLP in which the synch and blanking signals are "borrowed" from a local TV broadcaster), and he suggests that some uniform standards be adopted. He proposes the system used by W6VSV, which employs 262 lines and a frame rate of 60 per second. This system will lock the sweep circuits of most standard TV receivers, so all that is required to adapt these receivers to ham TV work is a suitable r.f. converter for the front end. Eddie's plans for TV operation are well along, and he hopes to be able eventually to push a signal into Mobile, Alabama, on 430 mc, strong enough to produce a good picture. Incidentally—for the two-meter hams —W4MS/W4RE will be on 144 mc soon with some first class equipment and hopes that there will be someone available for him to work when he fires up. Cheer up, Ed, it won't be much quieter than six meters has been lately! (And a Florida outpost on two meters will be welcomed by everyone within 1000 miles!)

Low Power—an Answer to the Activity Problem

We have, of late, heard of more and more stations going over to "flea power" for two-meter operations —especially during the early evening hours. This strikes us as being one of the best answers to the problems of lagging activity around our metropolitan areas.

Let's face it—TVI is a problem. The knowledge that TVI can exist even though the emissions of the transmitter are perfectly clean is sufficient threat to keep many of the gang off the air during TV hours. The near-complete shutdown of the v.h.f. bands that occurs around 7:30 or 8:00 p.m. local time and the revival of activity after the big-time programs go off the TV channels can hardly be ascribed to anything except fear of TVI. The argument that the gang are going QRT to watch TV doesn't explain things either—is the mentality of the average ham that low?

The only answer to the TVI problem in many cases, probably the only answer that will satisfy both you and your neighbors, is to use less power—only the bare minimum required to establish and maintain communications. (After all, that's all the law allows!) In addition to easing the neighbor-relations problem, the use of low power adds a certain spice to operations on the v.h.f. bands which many of us may have lost. It provides a better measure of performance for the other guy's receiver. It serves to demonstrate the virtues of the high-gain antennas which most of the v.h.f. hams now have. And a little flea-powered station which is readily portable may be a useful addition to the inventory of emergency gear available in your area.

W2NGA set the pace on this power-reduction fad over a year ago. Situated in a forest of TV antennas in a New York apartment house, Doc simply was not able to get away with using high power. He cut the input down to five watts, and was then able to operate at any time without trouble.

W3NXT is well-known in the Philadelphia area for his "Suitcase Susie"—a complete flea-power station, including a good superhet receiver, housed in a standard suitcase. In addition to providing Buck with a good pipeline to the local two-meter gang in the various towns he visits on his frequent road trips, "Suitcase Susie" can usually be found on hand whenever communications must be set up on short notice.

W2DPB has been heard frequently at our location over a distance of nearly 100 miles using his only surviving two-meter transmitting gear—a lusty 1-watt rock crusher!

W1JKC seems to be spending a good part of his on-the-air time using less than 1 watt input, and is doing well. W3TF, at the last reckoning, was down to about .07 watts input to his "cheese-box" special, and still cutting down! These examples may illustrate a trend. . . .

While on the subject of flea power, a word of warning may be in order. It does not necessarily follow that because the power level of the final amplifier is low, the TVI produced by the rig will be low in proportion. In fact, some of the worst TVI-producing rigs we have seen were low-powered mobile stations! The common-sense precautions which must be observed in every transmitter to minimize radiation of spurious signals which may fall within the local TV channels must be observed in the design of the flea-powered jobs as well.

We certainly do not propose that the high-powered rigs which have been so painstakingly developed by most of the serious workers on the bands should be scrapped. The first few hours of operation of a midget rig will drive home the point that power *does* make a big difference. But a good antenna, clever work with a VFO dial and a knowledge of who to call, when, will compensate to a great extent for the lack of power. And after a little experience with a flea-powered rig on the regular station antenna you'll probably do as we do, and rely on that rig for most of your routine operations. You can then save the big job for DX schedules, band openings, and QRM elimination!

Aurora Observed by Radar

It is generally assumed by the hams that v.h.f. signals can be propagated over great distances by reflection (or scattering) from the glowing streamers of the Aurora Borealis. At any rate, the experimenters on our v.h.f. bands long ago discovered that by pointing their beam antennas north during aurora displays they could receive signals from stations far beyond the normal ground-wave range. The signals were strangely garbled, to be sure, but they were audible above the noise, and could be copied by using c.w. techniques. Strangely enough, this discovery was not given much recognition in the lofty scientific circles most concerned with ionospheric research. In fact, until very recently, research workers on one of the outstanding aurora-investigation projects in the United States had never heard aurora-propagated signals!

In 1947, a group of British scientists noted peculiar scattering effects at 46 mc during aurora displays. Further research followed, the results of which have been published in the April, 1950, issue of *Journal of the British Astronomical Association.* The British workers employed radar techniques to analyze the effects of aurora. Using a radar transmitter operating on 72 mc with a peak output of about 5 kw, a pulse length of 8 microseconds, and a pulse repetition rate of 150 pulses per second, echoes were obtained from aurora sufficiently clearly to permit photographic analysis of the receiver oscillographic display.

Two general types of return pulses were noted. The most persistent type were labelled "Diffuse Echoes". They appeared at ranges of 350 to 500 miles, and were generally approximately 1½ to 2 times the background noise level. These echoes appeared during the early stages of an ionosphere storm. So-called "Discrete Echoes" were noted generally at the climax of the aurora display. They showed up at ranges of 250 to 600 miles, and were often more than twice as strong as the diffused echoes. The discrete echoes were short-lived, lasting for an average of only 100 seconds.

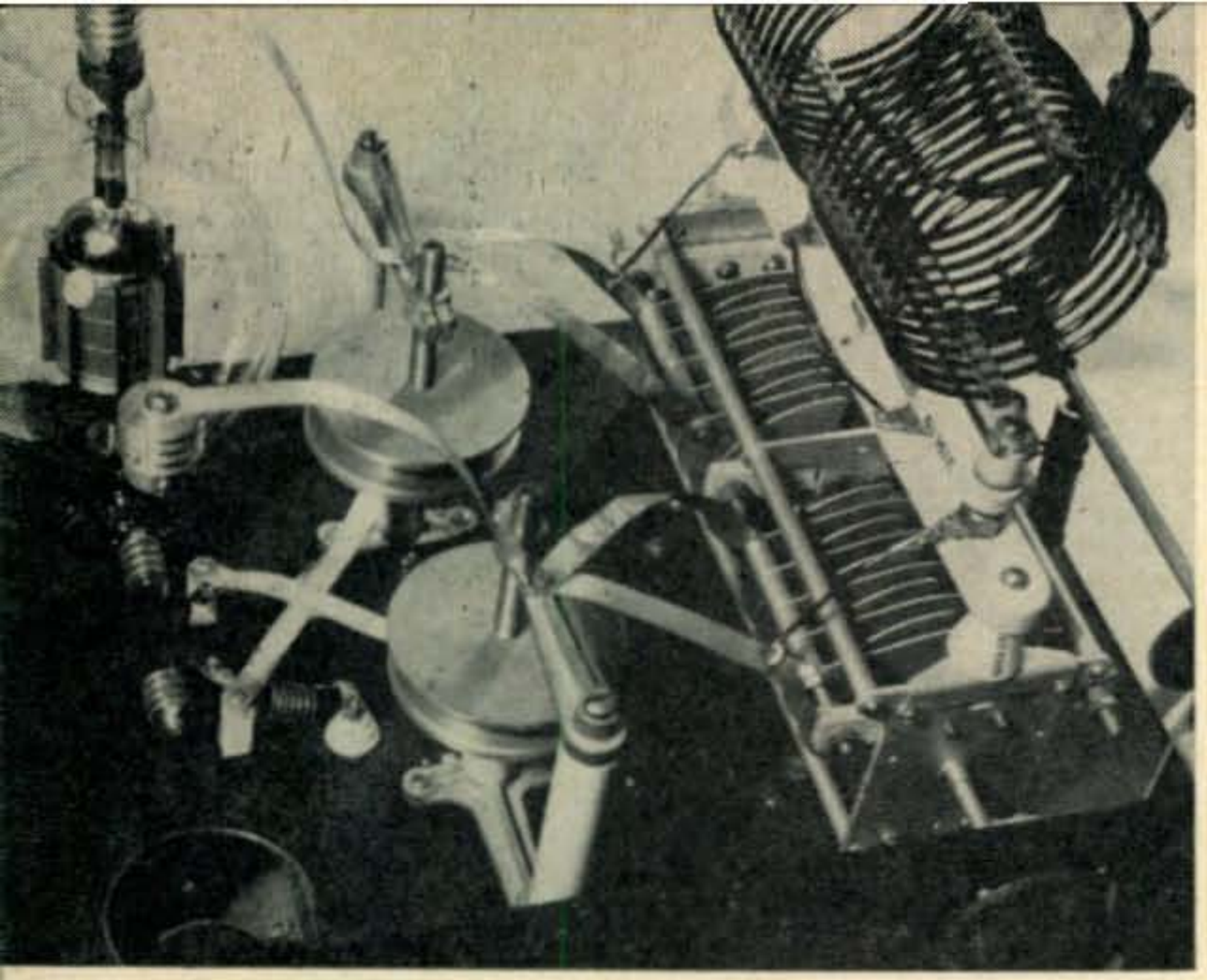
The echoes seemed to move rapidly at a random rate. They were clocked moving toward and away from the transmitter at speeds in the order of 55 miles per second. At times, peak velocities as high as 105 miles per second were observed. Although the mechanism of this apparent motion is not yet understood, it is quite probable that Doppeler Effect frequency shifts might occur at rapid and random rates as a result of the motion of the reflecting medium. This possibly explains the peculiar garbling of aurora-reflected signals noted by the hams.

We will attempt to obtain more information on this series of experiments as soon as possible. Meanwhile, Perry Ferrell is preparing a more detailed analysis of the published results with an aim toward correlating the radar data with ham observations of aurora effects. He expects to publish his findings in forthcoming issues of the RASO *Newsletter.*

Mountainous Path from Southern to Central California Spanned on Two Meters

The rugged terrain of Central California is not conducive to long-range ground-wave working on the v.h.f. bands. Despite the continuous high level of activity which has been maintained by the California v.h.f. enthusiasts, the reports of DX tropospheric contacts from this section of the country have been few and far between. In addition to the shielding effect of the mountain ranges which divide the state into "mountain-locked" v.h.f. communities, the perpetually-disturbed weather conditions around the mountain peaks effectively prevent the formation of refracting layers in the atmosphere which might produce record-range DX contacts. The

(Continued on page 42)



A close-up view of Bill's new parasitic-free final. By following in his footsteps you can duplicate his success, at any power level.

The PURSUIT &

WILLIAM I. ORR, W6SAI*

ONE OF THE NOBLEST DIVERSIONS in the whole field of amateur radio is the pursuit and elimination of parasitics. I have spent many an hour, when I should have been combing the low end of 7 and 14 mc, out in the garage work-room, neon bulb and grid-dip meter in hand, chasing parasitics through the various stages of my rig.

"Do other hams have to do this," I wondered, "or am I the only ham whose transmitters have built-in parasitics?"

My DXing pal W6WWQ drove up in the driveway with a rush and a squeal of brakes and ruffled my temper by remarking, "Well, Bub, if you built your finals like *mine* you wouldn't have any trouble with little birdies in your attic."

"Oh yeah?" said I, "What about that 20,000-ohm resistor you have hung between the grids of your final? *That* isn't there just to dissipate extra drive!"

"A mere protection," he assured me as he gyrated around the driveway and headed towards the exit. "I'll leave you to your fun. Why don't you junk that pile of stuff and retire?"

"You've sold your soul to the devil to get rid of your clicks," I shouted after the receding speck. "Come back here, coward, and assist me!"

Well, as you can gather, things were at a pretty low ebb. Here was my new final (an offspring of many a final amplifier) sitting in the garage instead of the radio shack. Why?? Parasitics. It worked fine as long as excitation and bias in copious amounts was fed to it. Drop one or the other a slight amount and a click would show up on the signal. Detuning the grid circuit would also bring a click on the signal. If I ran the plate voltage much above 2200 volts the amplifier would oscillate when the excitation was cut off.

This was *very* annoying. The amplifier was just an ordinary push-pull job; nothing unusual about it. Look on page xxx of any handbook, and there it is with 811s, 250THs, or perhaps only a pair of 35Ts. Why was the published amplifier always a clean, parasitic-free design, while mine was always full of birdies? (Or did the handbook amplifier have parasitics that were merely not mentioned???) Was there a magic formula for laying out the physical components of an amplifier to prevent oscillation at some unknown high frequency? Should the plate *coil* or the plate *condenser* be next to the tubes? Should the grid coil be above or below the chassis? Are parasitic chokes necessary? Should they be in the grid or plate leads? Every authority used a different circuit layout. Who was right?

I realized the hour of decision had arrived. I struck the workbench a resounding blow. "I hereby resolve not to go back on the air until I find out the answer to this parasitic problem, and get my final working—free of parasitics!! So help me!" The thunder of applause smote my ears. I bowed to the invisible cheering audience before me. "It is nothing. Nothing at all, " I murmured.

"Stop bowing to yourself like a jerk," said the little woman who had arrived upon the scene un-

* *555 Crestline Dr., Los Angeles 49, Calif.*

announced. "What will the neighbors think? Come inside and help me wax the kitchen floor!"

The purpose of this paper is to describe a successful clean up job on a high-powered push-pull amplifier. The ideas and procedures described herewith will apply to finals of any power level—3C24s to 450s.

The various final amplifiers constructed over the last years had followed no specific layout plan. Perhaps a layout in a magazine was followed, or a copy was made of an existing final owned by another amateur. The observation of "short leads" was piously adhered to, but in every case there was some evidence of instability. Discussions of these observed instabilities with other hams and tests on their finals led to this inescapable conclusion: EVERY R. F. STAGE IN A TRANSMITTER

ELIMINATION of PARASITICS

WILL HAVE PARASITICS IN IT UNLESS SPECIFIC STEPS ARE TAKEN TO PREVENT THEM! It is next to impossible to build a parasitic-free stage unless you have taken certain very important precautions to be discussed here at length. The parasitics may not be evident unless the excitation is removed or the plate voltage is boosted to above normal value. They are there, nevertheless, ready to fuzz up your signal when they are excited by keying impulses or modulation.

Test for Parasitics on Existing Amplifiers

The following experiment should be tried to ascertain the stability of your amplifier:

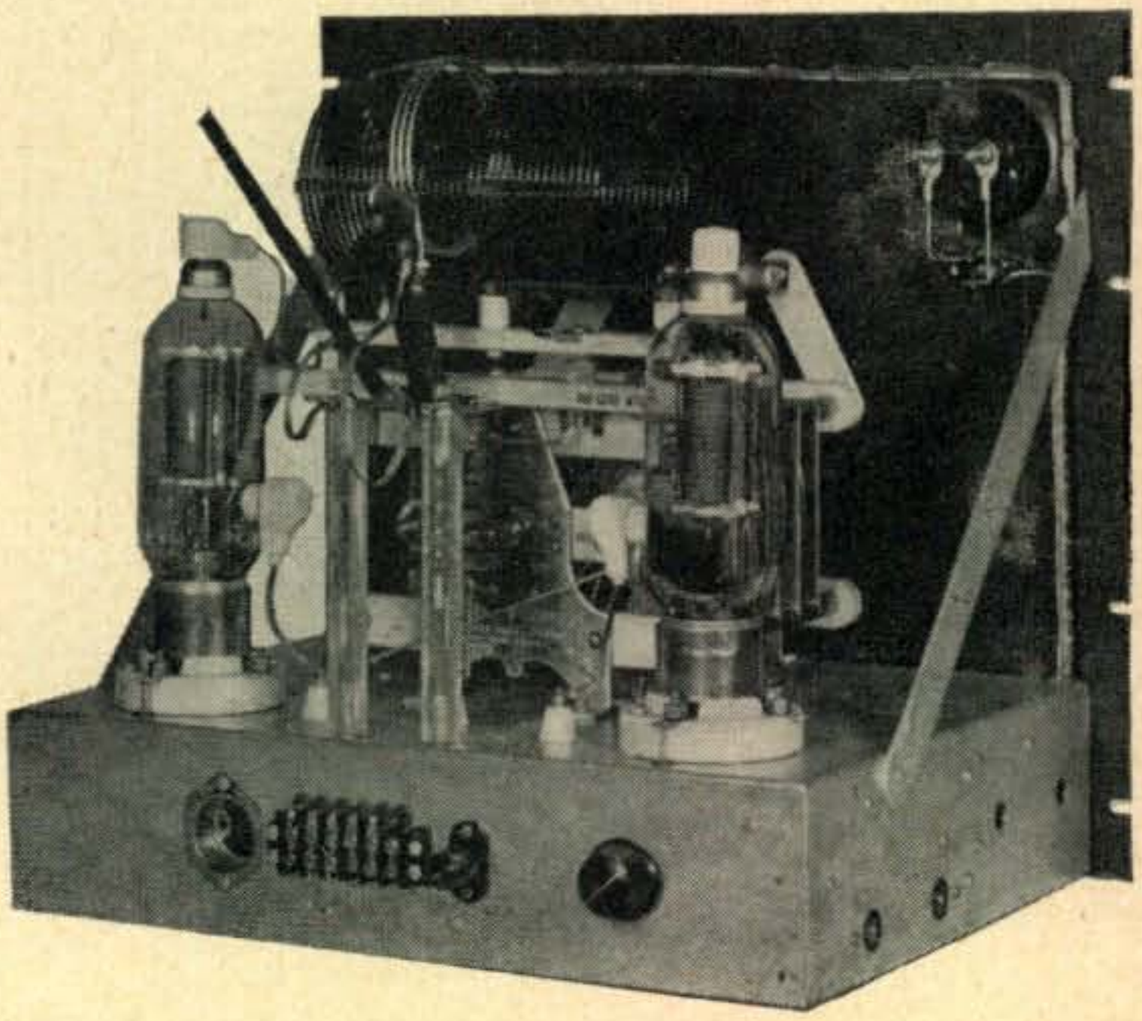
1. The auxiliary circuits should be so arranged that it is possible to remove the r. f. excitation from the stage. The d. c. operating bias should also be removable, preferable by means of a switch in the 117-v. supply to the bias pack. The plate voltage supply should be run through some kind of auto transformer to permit the plate voltage to be varied from zero volts to approximately twice normal operating voltage. (A typical set up is shown in *Fig. 1.*) A cut-out relay is a necessity for this experiment. It should be set to cut out at about 50% of normal operating plate current of the amplifier. You should now run the following tests:

2. Apply excitation and bias to the amplifier. Neutralize it, and apply about 500 volts of plate voltage. Tune both plate and grid circuits to resonance and record the settings of plate, grid, and neutralizing condensers. Advance the plate voltage, 500 volts at a time. After each advance, while the plate voltage is on, remove the excitation and tune the grid and plate tank condensers through their full ranges. If no indication of spurious plate or grid current is evident, this process should be carried out through 150% of normal plate voltage.

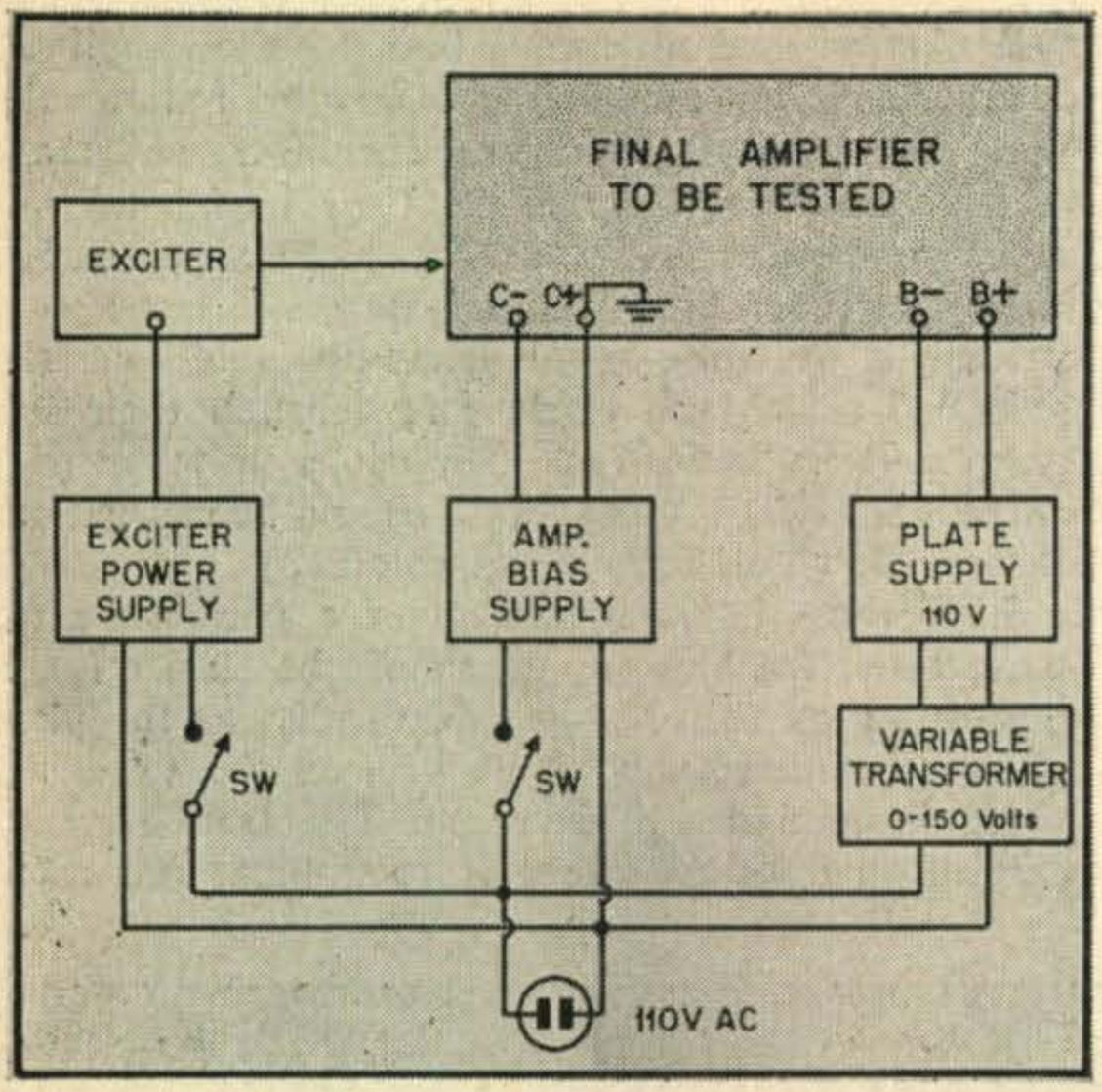
3. If there is no indication of a parasitic after these tests, the bias supply should be shut off and the tests repeated as above. Naturally, as the plate voltage is increased with no bias on the tubes the plate dissipation will increase. The tests may be carried on until each tube is running at full rated plate dissipation. Care must be taken at this stage of the game and the plate supply circuit breaker must be carefully set to prevent any serious overload on the tubes. The instant a parasitic starts, the tubes will draw an alarming amount of plate current when operating under these circumstances.

When evidences of parasitics are found, the plate voltage should be reduced slightly and the tank condensers adjusted for strongest oscillations. The plate voltage may now be dropped to a value that will just maintain oscillation. The value of this voltage will depend upon the bias voltage and also the efficiency of the parasitic circuit. Many times, with no bias, an amplifier designed to operate with 3000 volts on it will oscillate merrily along with only 500 plate volts!

When the operating parameters have been adjusted so the amplifier will oscillate without "blow-



This typical 1-kw final layout is typical of those that started Bill wondering. Note the long grid leads and short, heavy plate leads—good design, again!
(Courtesy Tube Divisions, G. E. Company)



ing up" under overload, the frequency of oscillations should be measured with a wavemeter or grid dip meter. The auxiliary equipment may now be disconnected. We have proven the existence of the parasitic, and we know its frequency—the rest is easy!

The Cure

In order to illustrate "the cure," let me take you through a typical test—the one I did on my own final amplifier. The circuit of this amplifier is shown in *Fig. 2.* The physical layout of the amplifier was very common—nothing at all unusual about it; the two tubes at one end of the chassis, grid circuit beneath, neutralizing condensers between the tubes. Plate condenser in the middle of the chassis, and plate coil at the extreme right end of the chassis. All leads were reasonably short and direct. However, it would oscillate violently in the range of 100–130 mc, the frequency of oscillation being dependent upon the setting of the tank condensers. If we (I can say "we" now, you are in this as deeply as I am!)

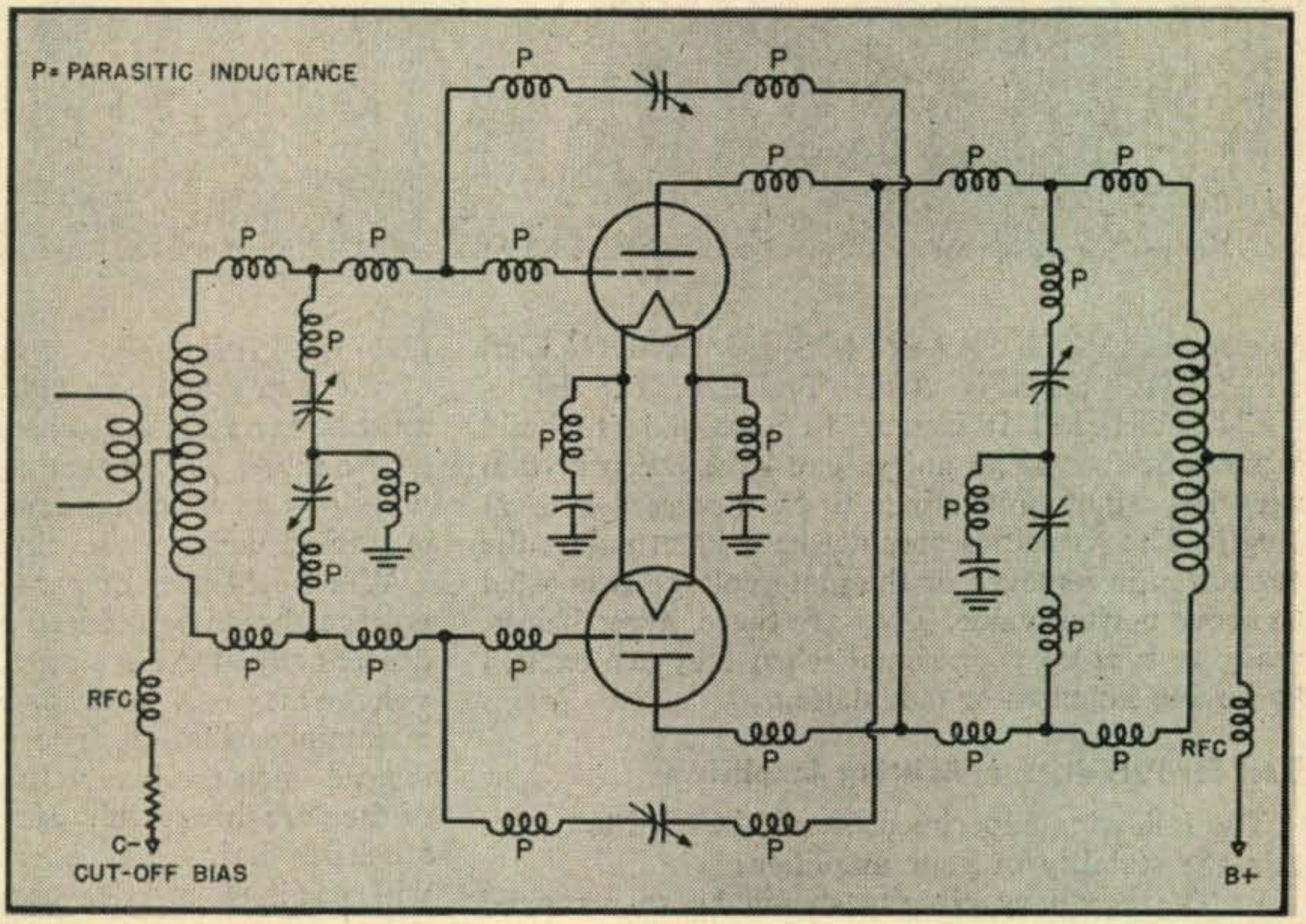
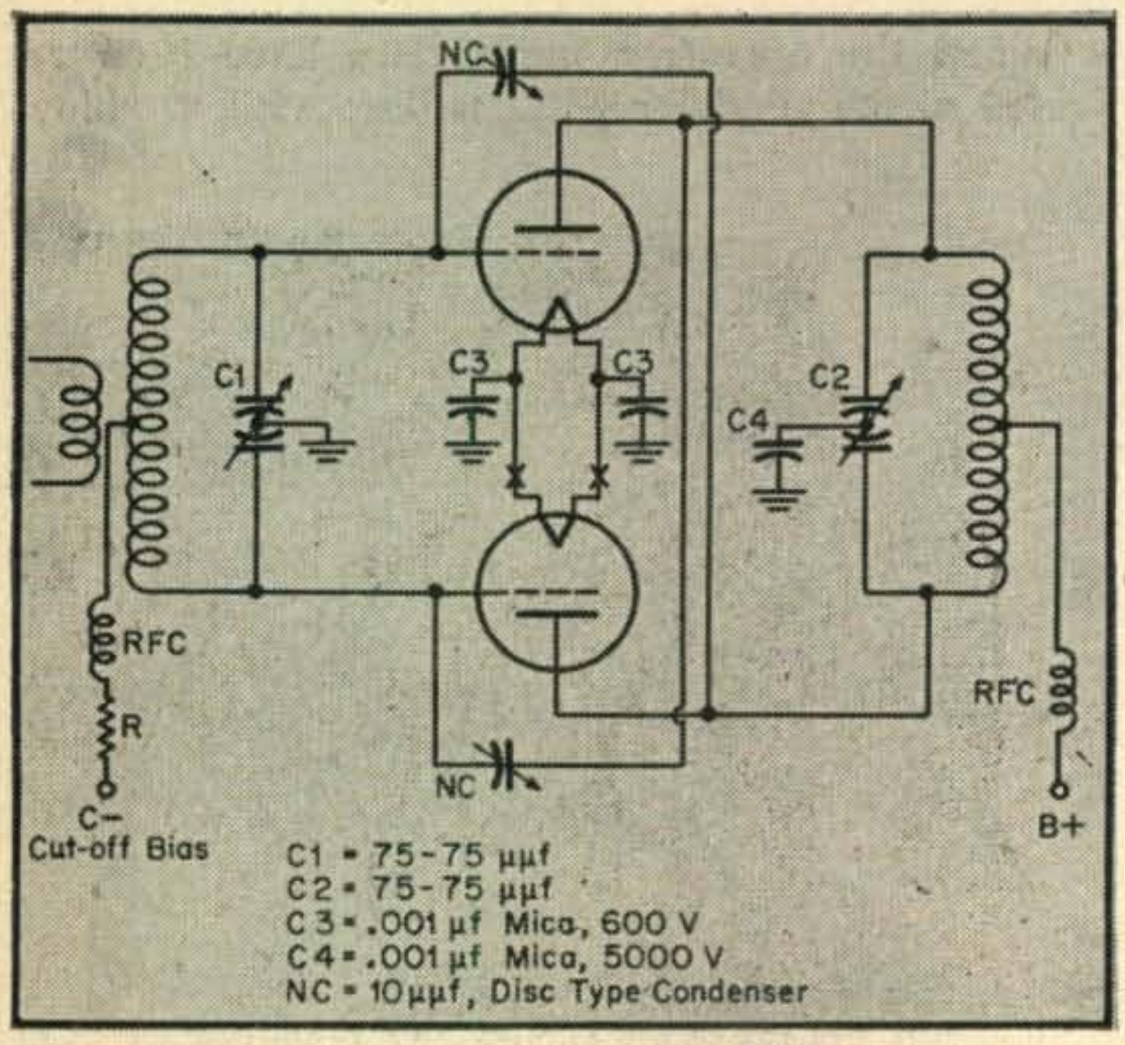


Fig. 1, above, is the test circuit for finding parasitics in your amplifier. Fig. 2, below, is Bill's original straight-forward final—familiar, isn't it? Fig. 3, right, is a more complete diagram of the same amplifier. Those Ps are all there!



take into account the inductance of the various leads and parts in the circuit, the true diagram ceases to look like *Fig. 2,* and looks more like nightmarish *Fig. 3.* Horrible isn't it? But this is the actual circuit! Every piece of wire, every condenser used has inherent inductance. This inductance is as real as the wire is; it may be measured on a bridge, and you can't ignore it for one moment! The plate tuning condenser, by virtue of its size, has considerable inductance. This inductance is built in, and you are stuck with it! However the inductance of the leads is at your mercy, and it is here that you can break the back of the parasitic.

Grid-dipping the plate circuit of my final amplifier produced a multitude of resonance indications, as listed in *Fig. 4.* The grid dipper was next applied to the grid circuit of the amplifier and the results tabulated in *Fig. 4.* Disconnecting the neutralizing leads, and touching the opposite grid and plate caps together to form a closed loop made things worse.

With this rich collection of resonances no wonder the amplifier took off like a scared rabbit!

It can be seen from a quick comparison of the lists that resonances appear in the region of 100–130 mc in all three circuits: grid, plate, and neutralizing. Obviously, the combination of these results in the parasitic oscillations. There are now two basic things to be done to effect a cure:

1. Make the loop resonance of the neutralizing leads as high in frequency as possible. This will assure that the amplifier will remain neutralized over the greatest possible range. (If the amplifier was neutralized at 100 mc, for instance, it wouldn't break into parasitic oscillations at that frequency).
2. Since we cannot make the parasitic inductance of either the grid circuit or plate circuit zero, the next best thing to do is to make sure that the grid resonances and the plate resonances do not fall into the same frequency range. I remember, back in the "good old days" a friend of mine had a super-station: A pair of UX-852s in t.p.t.g. running with SIX HUNDRED watts input. Fantastic! I can remember him saying to me, "Yep, keep the grid leads long and the plate leads short. Only way to get a PDC note on twenty meters!" A trip to the bookcase with this in mind and a quick search through my old *QSTs* gave me the answer to the problem.[1] The old boys weren't so dumb!

And now to work! To accomplish Item 1, this is what I did:

1. I relocated the neutralizing condensers to place them as near to the tubes as practical. The #12 wire leads were removed and replaced with .01"×¼" copper strip. (Cut from shim stock.)

A quick run on the grid dip meter now showed the neutralizing circuit resonant frequency to be 146 mc. As an experiment, the strap leads were removed and wire leads of the same length substituted. The resonant frequency went down to 132 mc! See what I mean by lead inductance?? Better use strap leads.

The following steps were taken to accomplish the cure for Item 2:

1. All mica condensers in the filament circuit were removed and replaced with non-inductive high frequency condensers.
2. Parallel strap leads are run from the neutralizing condensers to each end of the stators of the plate tank condenser. Strap plate leads are used. Yes, this helped immensely. Many of the plate lead resonances disappeared, and the resonance was moved up to 118 mc, with a small indication of a resonance at 180 mc. Incidentally, the smaller, physically, the amplifier tubes are, the higher will be the resonant frequency of the parasitic circuit. The VT-127A tube is a natural for a set up like this as it is small and the neutralizing leads can be made very short.

As an added precaution, the plate tuning condenser, instead of being insulated from ground and bypassed thereto, is directly grounded to the chassis. This move obviates the necessity of having to use a high voltage blocking condenser in the return circuit of the split stator tuning condenser. If the plate condenser has the correct spacing consistent with the applied plate voltage, there is no danger

(*Continued on page 57*)

Plate Circuit Parasitic Resonant Frequencies (mc)	Grid Circuit Parasitic Resonant Frequencies (mc)	Neutralizing Circuit Parasitic Resonant Frequencies (mc)
23.5	19.5	118.5
70.0	30.0	
72.0	105.5	
90.0	125.0	
102.0	180.0	
106.5		
115.5		
123.0		
133.5		
140.0		
170.0		
183.0		
260.0		
292.5		

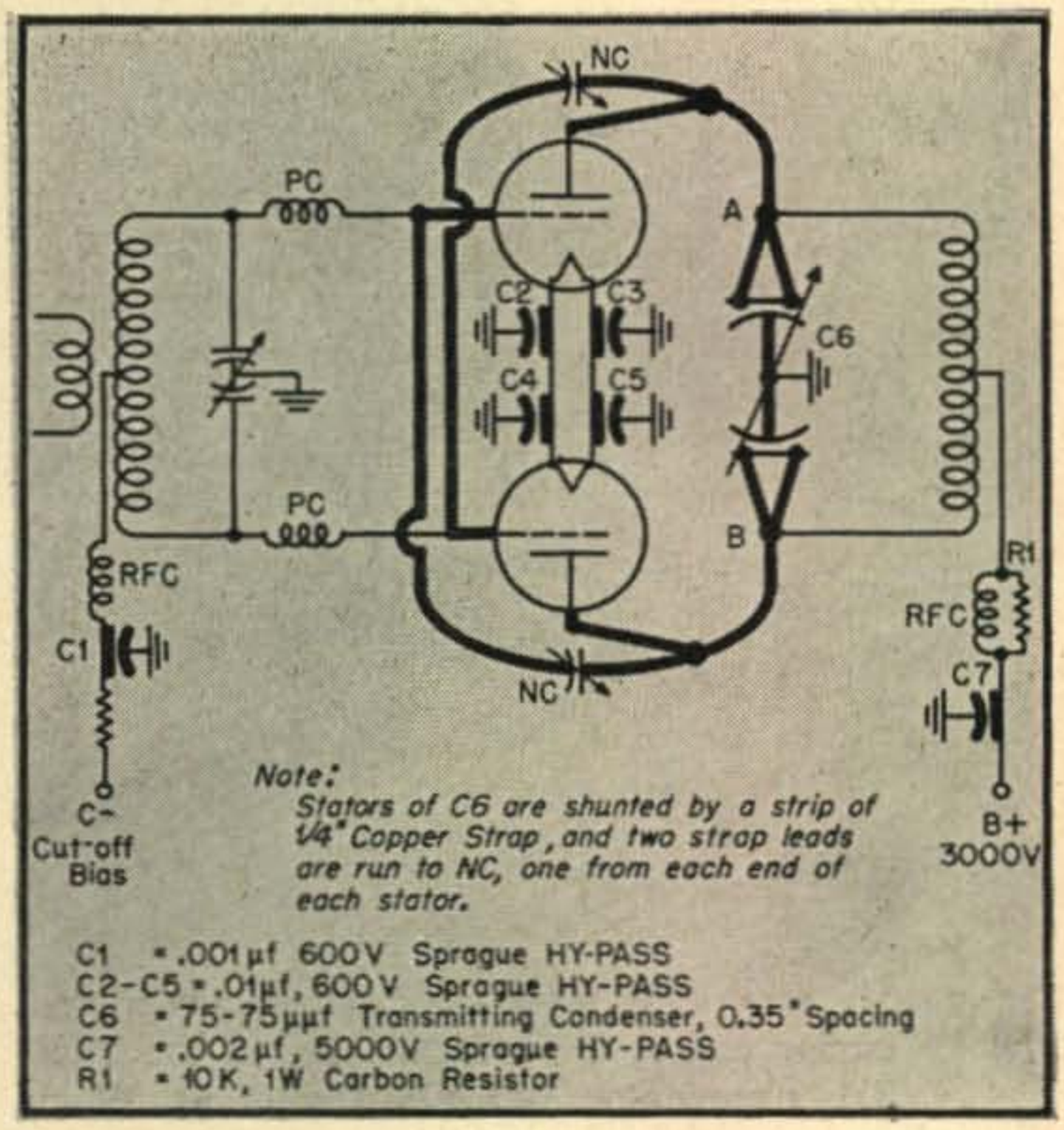
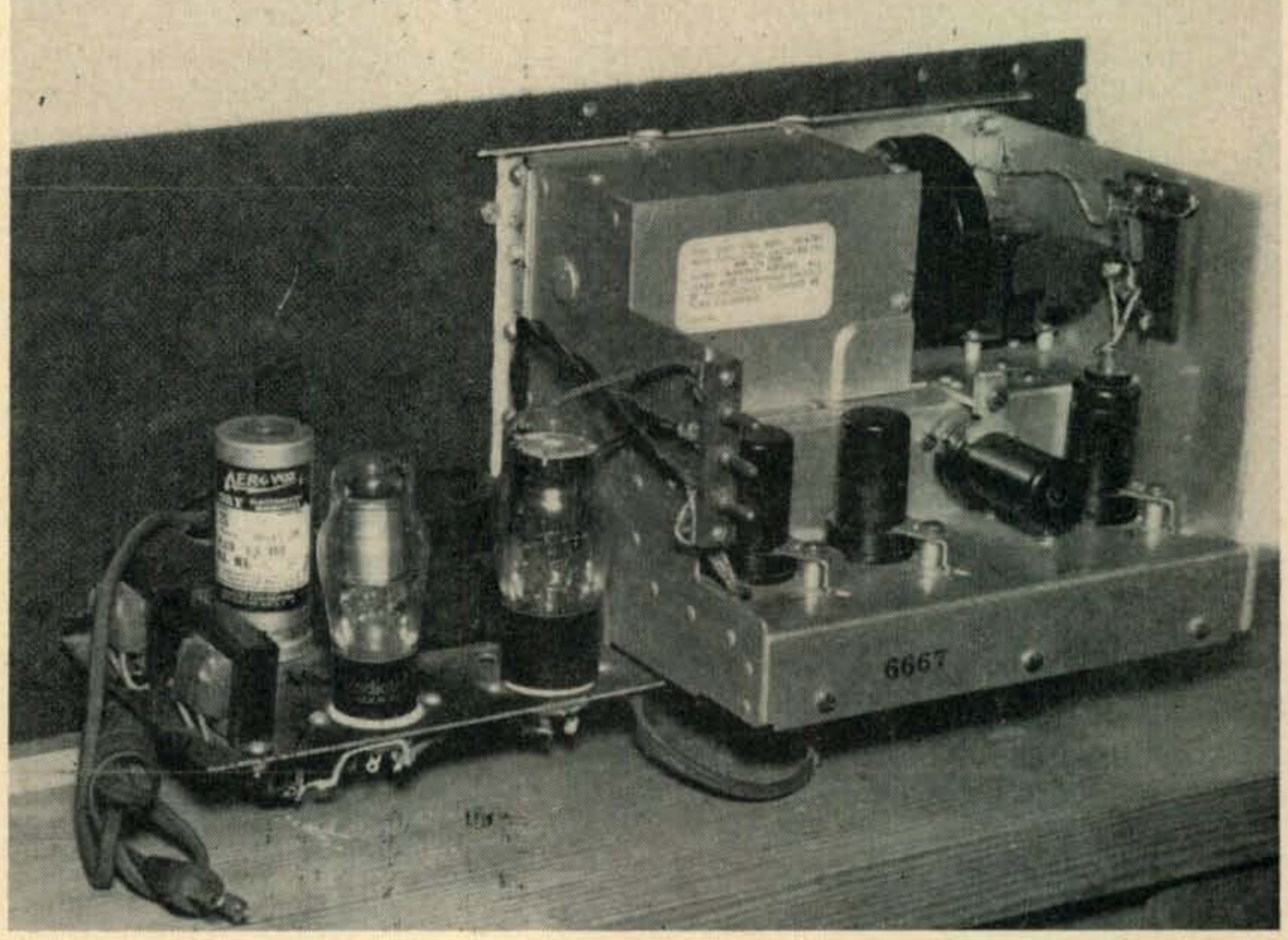


Fig. 4, left, listing the parasitic resonances detected in the original amplifier, and, Fig. 5, right, the parasitic-free final version.

[1] "Advanced Transmitter Design," *QST*, June, 1930.

DEMOTHBALLING the BC-221

RICHARD E. NEBEL
W2DBQ*



The rear view of the BC-221 with its attendant power supply.

MANY AMATEURS HAVE BEEN FORTUNATE in procuring one of the several types of the SCR-211 Frequency Meter available as World War II surplus. This unit is a wonderful and important addition to any ham station. The mechanical precision and electrical stability inherent in this instrument are such that it would be extremely difficult if not impossible to duplicate by amateur construction.

The nomenclature SCR-211 refers to the complete assembly: frequency meter chassis, batteries, earphones and calibration book contained in its cabinet. When the chassis is referred to alone it is known as the BC-221 and is followed by a letter or letters indicating the model and manufacturer. BC, incidentally, stands for Basic Component, therefore BC-221 is a basic component of the SCR-211.

It is believed that to date twenty five different models of this unit have been manufactured, each containing one or more minor or major improvements over the earlier models. It would thus be quite impractical to show schematics and details. Circuit diagrams will be found in the War Department Technical Manual TM 11-300, July 1944.

The most versatile model is the BC-221-AK made by Philco. This is the only type having a six position switch including "Warm-up" and "MODULATOR" positions. It is not known how many were available over the entire country but in the New York Metropolitan area approximately 800 hams made fortunate acquisitions. These units were packed in factory cartons and it is believed represented "contract termination" material. There were of course no cabinets or calibration books; the units had never been calibrated. All had been treated with fungicidal lacquer and dated.

Power Supply

The problem of power supply is one that must be solved according to the manner in which the instrument is to be used. If it is to be portable, batteries are of course the answer. Those who purchased only the BC chassis may obtain cabinets to fit from various radio dealers. Care must be taken to find the cabinet made for your particular model. Batteries

1104 Lincoln Pl., Brooklyn 13, N. Y.

are of course available. 135 volts of "B" and 6 volts of "A" are required.

In the writers own case, just the BC-221-AK chassis was purchased and was mounted on a rack panel together with a voltage regulated power supply as illustrated. A lighting fixture is mounted over the unit for convenience in a crystal-calibrating installation.

The power supply is of conventional design employing a VR-105 voltage regulator. It was found that 105 volts was sufficient to permit normal operation and this tube was used in preference to a VR-150 on the basis of "cooler operation, better stability". The power supply constants are shown in *Fig. 1.* Take note that if a higher voltage transformer is used the dropping resistor R_1 must be changed accordingly in order to prevent excess current through the VR-105.

The filament supply presented a bit of a problem but was solved by merely applying a.c. and putting up with the resulting hum in the earphones. If the instrument is to be used for long periods at a time the hum might prove to be annoying (depending upon the individual) but for short periods of use the incorporation of a rectifier and filter was deemed unnecessary. For those who would like d.c. on their filaments there are available as surplus small full-wave selenium rectifiers. There is absolutely no hum on the signal when tuned in on a communications receiver, using a.c.

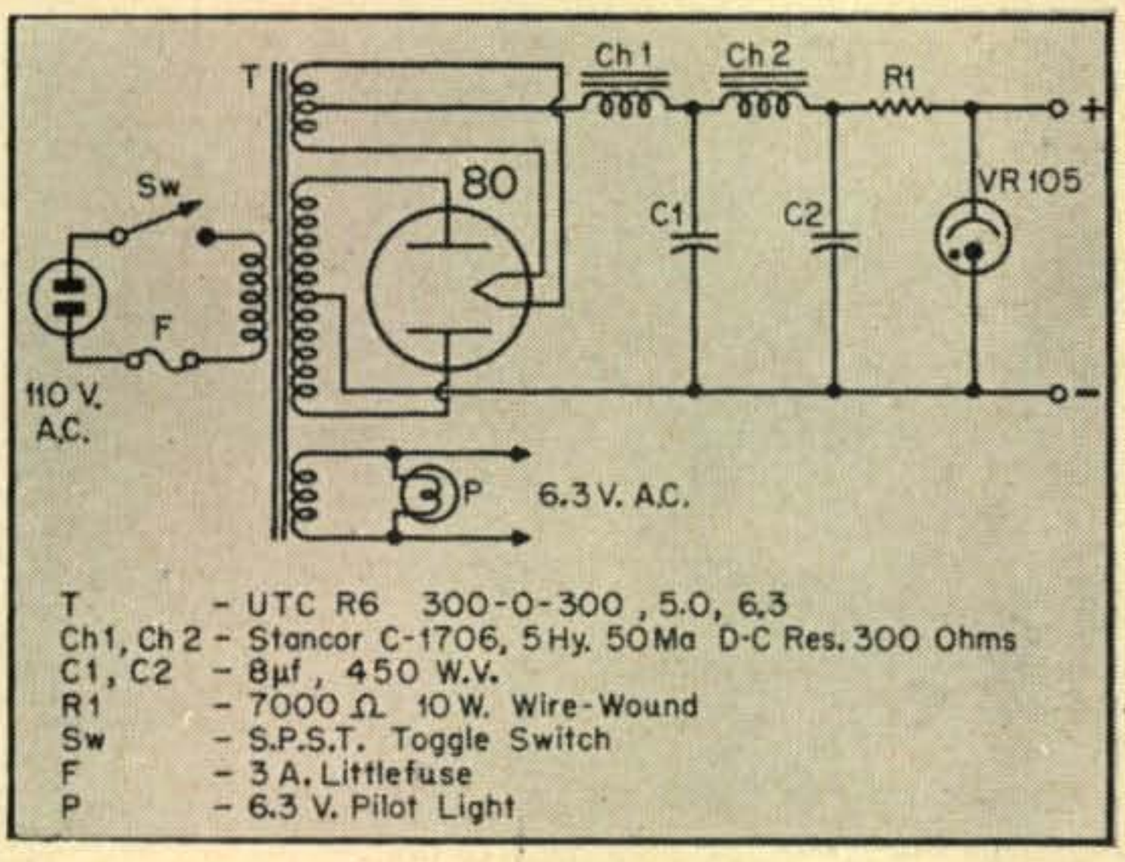


Fig. 1, the simple power supply for a.c. operation of the 221.

Calibration

Calibration presents the greatest problem to those who have purchased these instruments less calibration books. This was no stumbling block to the writer, however, who would have preferred to do his own calibrating in any case for greater overall accuracy.

Some users of this frequency meter were able to obtain blank calibration books but their utility is somewhat doubtful due to the small type that is used in the "frequency" columns. This makes it necessary to possess artistic ability to enter the dial readings neatly, perhaps we should say to enter them at all! We made our own book.

Perhaps it should have been stated earlier that an

(Continued on page 50)

MEASURING FREQUENCY with the BC-221

MORRIS DORSEY, W4KXX*

ALL OWNERS of the BC-221 frequency meters can benefit greatly by followly the procedure outlined herein. You can determine, almost instantly, the exact frequency of a given reading of your frequency meter—without the usual interpolations.

Here's how it works, using my BC-221-J meter as an example. On the 75-meter band the calibration book states that there are "2.5 dial divisions per kc." Since I can read the 221 dial to within 0.1 dial divisions, I break that "2.5 divisions" down into tenths of a division, as follows:

Dial Divisions	Cycles	Dial Divisions	Cycles
.1	40	1.4	560
.2	80	1.5	600
.3	120	1.6	640
.4	160	1.7	680
.5	200	1.8	720
.6	240	1.9	760
.7	280	2.0	800
.8	320	2.1	840
.9	360	2.2	880
1.0	400	2.3	920
1.1	440	2.4	960
1.2	480	2.5	1000
1.3	520		

Now here's how you use this table. Say that the 221 frequency dial setting is 4099.1 for the frequency you are checking. Assume the calibration book value nearest that setting is 4098.5, and that this

(Continued on page 64)

* *442 Cherokee Av., S. E., Atlanta, Ga.*

MARS DEDICATES NEW

ALBERT E. HAYES, JR., W2BYF*

Super ham station set up in Pentagon Building.

IF ANY OF US HAVE HAD THE IMPRESSION that amateur radio was of no interest to the officials of the military establishment, a rundown on the guest list at the recent dedication of the MARS Headquarters Station, K4AF/K4USA, at the Pentagon, should clear things up. The following military and civilian dignitaries were among those present: For the Air Force: Gen. N. L. Twining, Secretary of the Air Force Thomas K. Finletter, Maj. Gen. F. L. Ankenbrandt, Brig. Gen. Edmund C. Lynch, Brig. Gen. Ivan L. Farman, Col. G. A. Westphal, Air Vice Marshall G. M. Attison, Group Capt. Benjamin Ball, Maj. Gen. H. M. McClelland, Admiral Forrest P. Sherman, and Commander E. L. Battey. For the Army: Maj. Gen. S. B. Akin, Maj. Gen. K. B. Lawton, Mr. Frank Pace, Jr., Secretary of the Army, Brig. Gen. V. A. Conrad, Brig. Gen. Wesley Guest, Col. Tittle, Gen. Hatcher, Maj. Griff Davis. Others included: George Bailey, of ARRL, Allan Richter of the Red Cross, Col. Dixon, of AFCA, Mr. Hammarlund, Mr. Bill Halligan, Jr., Mr. Kahn, Comissioner Sterling, of FCC, G. A. Rollins, Mr. Loucks and your Editor.

The new MARS Headquarters Station is a true

---

* *Editor, CQ.*

HQ for all of ham radio. It is not strictly a MARS setup but may be used by any ham who visits the Pentagon Building. All that is necessary to keep your traffic sked when in Washington is to show that ham ticket to the WAC at the desk, and a control position will be assigned to you and your choice of frequencies will be made available by the operator at the master control position. A Collins 75A receiver, a Panadaptor, a Vibroplex and a mike are available at each of the four operating positions. The hard work of changing the frequency of the transmitter is taken care of by the MARS operator on duty.

The new MARS station, then, is not but a headquarters station to be visited and admired, but is to be used by all of ham radio. Of course a few hours a day will not be available for general operations, due to the necessity for keeping MARS schedules, but, in general, K4AF/K4USA is open for *your* use, whether or not you are a MARS member.

And don't worry about whether you'll be able to "get out" or not—a pair of 833As in the final of each of the two transmitters takes care of that side of things. For those who are so inclined another pair of 833As can be found in the modulator sockets. The radiating situation is handled capably by a maze of antennas which reminds us of Rocky Point. Yes, the MARS Headquarters Station is second to none in amateur radio today.

The shack that houses K4AF/K4USA is located at the end of the Concourse, on the first floor of the Pentagon, just where it will be most available. Due to the noise and QRN situation, the entire 8-room shack is shielded bonded, and grounded. Coax leads to the various antennas and filters in all incoming leads keep noise to a minimum. Individual control rooms house the four operating positions, and this tends to minimize audio interference. The Concourse is a busy place in more ways than one, but the operators of the MARS Headquarters Station don't have to worry about that.

The two big transmitters are custom built Temco jobs, while the receivers are standard Collins, Hammarlund, and Hallicrafter units. There is nothing strange or "non-amateur" about any of the operating gear, and thus each of us will feel at home when operating K4AF or K4USA.

If you can't get to Washington to handle the controls at this dream station, why not do the next best thing—look for K4AF or K4USA on your favorite band and give the boys a call. This is the station which the military built to demonstrate their faith in the importance and usefulness of amateur radio, and we think amateur radio owes the MARS gang a vote of thanks and our continued support.

HEADQUARTERS STATION

The wheels look on while a pretty WAC pounds brass at K4USA. Standing, l. to r., General Ankenbrandt, Secretary Finletter, Secretary Pace, and general Akin. Corporal Mary Lafler, a licensed ham is doing the keying.

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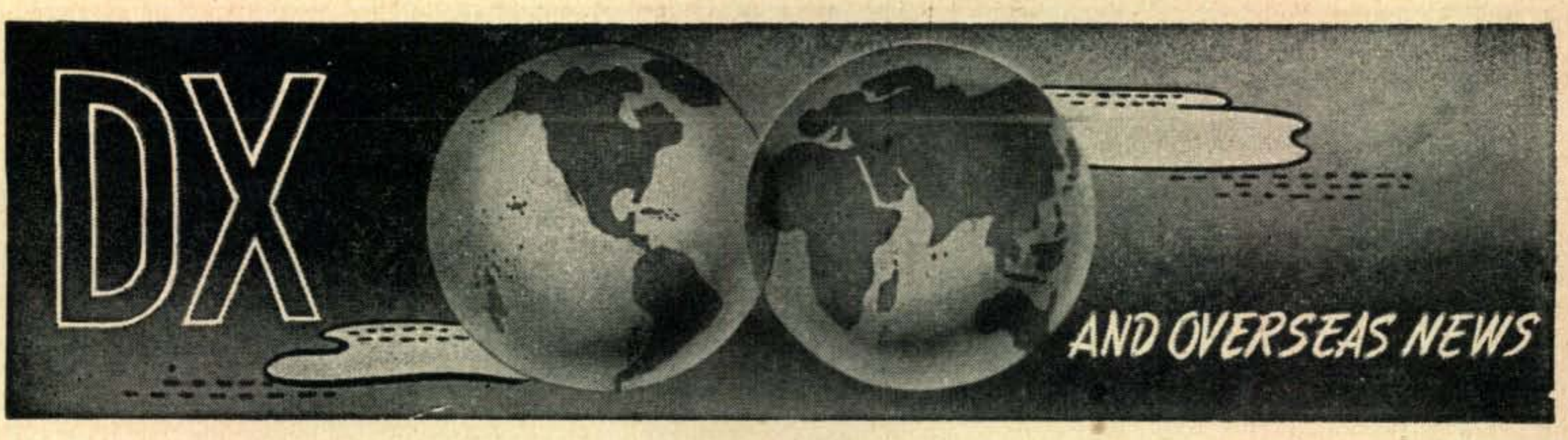

Conducted by HERB BECKER, W6QD*

CONGRATULATIONS TO VK5KO on achieving WAZ. His certificate has been awarded as follows:

232 VK5KO Jack de Cure 40–155

Jack's cards were the only ones received and passed this month.

Judging from the DX news this month, it is still low tide. However, the last week or so has seen a little improvement in conditions. Let's hope it keeps up. I suppose I could fill the column with a lot of "soap box" oratory, but not having anything to spout off about, let's dig into the mail and see what happens.

I hope that most of you will be interested to know that: W3BES worked FB8ZZ for number 226. . . . ZM6AK at 14,040 told W6AM during the QSO that a small size lizard was on his key getting a free ride. . . . W2BJ outside of logging MS4FM and FP8AC, has been pretty much QRT due to rebuilding a final which will use a 4-125A. . . .

G6ZO is still sad about not getting a QSL card out of KJ6AH and YN1FTB. (You don't suppose Jim is by any chance hinting for an assist, do you?) G6ZO also grabbed a new one, HR1AT, on 20 c.w., and reports ZD6EF active on 14,050.

W4RBQ feels that life is worthwhile after receiving cards giving him 38 confirmed out of 39 worked. Buck took a flyer on 20 phone, which was his first crack at it since 1934. A few of his recent 14 mc c.w. countries are CR5AC, VQ8CB, and OY3G. . . .

FB8ZZ is also new for W6SYG. . . . KP4KD adds ET9X, also crabbing about the tussle he had in working ZS6AAM on 40. Apparently, some of the Ws don't operate the way Ev wants them to. . . . W9EGQ thinks that the W9 gang, at least some of them, are going nuts on account of HS1ES coming through on 14,220 phone. . . .

W2GVZ takes a minute to write saying that he really didn't die—it is just that he hasn't worked any new stuff since March. He did work CR5AC recently, however. . . . It was good to hear from VE3QD, and, although he worked 5 new ones, he tells me that it could have been better except TVI limited his operating. . . . W6AM brings his phone country list up to date by adding such things as ZM6AK, PJ5FN, CT1CB, CR6AQ, EA8BC, VP1NW, PK6LN, and EA9AQ. W6AM also says he worked PI1LS, who was a Dutch weather ship somewhere in the Atlantic. The operator happened to be PAØHI. He thought possibly some of you may wonder who this station was, and of course we all know that ships are not countable as countries.

Those of you who have been keeping a watchful eye on Madagascar may be interested to know that the licensing of amateurs there seems to be moving in the right direction, although very slowly. Through our good friend, ZS2X, we are informed that the Madagascar government started to accept applications for licenses last spring, and designated the following six months as a period in which applications should be made. A number of prospective FB8s have since applied, although with one exception, all are v.h.f. enthusiasts! The exception of course is Paul Bour, exFB8AB. We understand that Paul has a transmitter all set to go when some xtals and a license are obtained. We think that the xtals are now on the way. Unfortunately, it does not appear to be definite that licenses will be issued to those eligible applicants at the end of the six months period, and yet this would seem to be a reasonable assumption according to their official government bulletin. Guess we can wait a little longer, can't we?

We hope there is no significance to the fact that the most recent EAØAB, on c.w., gives a different box number than the original one on phone, who does QSL. W2SN states that he does not know who is operating YA2B, but has a number of cards waiting for him, and figures that he must be someone from the W2 area operating undercover. This could be, but our faith is a little low at the moment, hence we are not crediting YA2B as yet. The LP2J, supposedly on Jan Mayen, seemingly disappeared rather suddenly which doesn't particularly enhance his appearance. Topping them all, however, is VQ9AA on the low end of 28 mc on c.w. This lad claims to be at the Naval Signals Base on Seychelles, but his signals come straight across the USA, which is very nearly 90 degress off his true path from the West Coast. Don't bother to sent him in until you get his card, if ever. Even then he wouldn't look good. Sounds like ZD7AA!

From the "Tri-State Sparks" I see where W2CKD worked W9JTU while driving through town on his way to Owensboro. For your information, W2CKD is Tex Beneke, the leader of that great band, and I don't mean the 10-meter band. . . .

W5QMI, who does his work on 10 phone, thinks the band must be opening a little on account of VS9AH and GC4LI telling him he was their first W this season. . . . New stuff for W8WWU includes ZB1AR, PK5AA, and CE7ZJ.

I received a letter from Jack Thorn, who operated HL1AL in Seoul until around June 25th. Due to the hurried evacuation, he lost his complete sta-

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

W. A. Z. HONOR ROLL

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W6LER	145
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W6ONZ	139
W7KWC	139
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W6TEU	133
W6RDR	133
W6OBD	131
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W6IDZ	130
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G5BJ	126
PK6HA	124
G5VU	124
W6BIL	124
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VK6SA	103
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W3KT	219
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W1JYH	208
W3OCU	208
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W5LVD	203
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VE3QD	201
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KL7GG	114
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W6FBC	110
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W6LEV	103
W7LEE	91

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W2WC	136
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36 Zones

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F8TM	124
W9LI	124
SV1RX	119
W2BF	115
4X4BX	112
OE1FF	111
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EA1AB	103
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W6ZZ	120
W9RQM	119
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W9FNR	114
W8AVB	113
W2HAZ	109
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W3MZE	126
W5FXN	121
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PHONE ONLY

39 Zones

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36 Zones

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W8ZMC	122
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W5LWV	108
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W3PA	105

34 Zones

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WØANF	115
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W8UIG	100
W4IWO	100
W8QBF	92
WØBFB	70
W2NXZ	65

33 Zones

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W2ZW	115
W8BFQ	114
I1VS	114
W8SDR	113
W8NSS	112
VE3BQP	108
W2PQJ	100

tion , not to mention QSL cards, logs, and etc. Jack wants all of the boys who have worked him since January of this year to send duplicate QSL cards. As President of the American Amateur Club of Korea, he would like very much to extend a belated "thanks" to those who cooperated with the club station, HL1US, during the early days of the emergency. For his QTH, please look at the end of the column.

CE3AG, as well as a few other South American stations, has received a QSL card from EAØAB, and his QTH checks with that shown in October *CQ*. For some time, CE3AG has been having difficulty getting a card out of EP1AC, EP1AL, and EP2B. He wonders if someone might have the right combination. . . .

W5FXN wanted to get yanked out of the cellar, so he ups and works VQ8AF for his 34th Zone. For new countries, he has VR2BW, FO8AC, and VPA8I.

An interesting letter from W2BXS gives us a slightly different slant on this good old subject of DX. For example, Jack, although reading the column for some years, claims he has been a DX man by proxy only. One reason for this was that he was running 40 watts on 40 meters, and as he put it, after reading the juicy DX that other fellows worked, he felt "like a small boy standing outside the baseball park watching the players, but unable to take an active part in his favorite sport." Things are a little different now, since he has purchased a transmitter that will get him on 20 meters. He is still using the same old voltage-fed single wire, and thus far has startled some of the European countries, when he tells them that he is only running 35 or 40 watts. It appears that some of these overseas stations were of the opinion that QRP stations were non-existent over here. Keep up the good work, Jack.

G8IG is still getting them. This time he pops up with HE1JJ, UL7AB, UA9CQ, HV1A, and UG6W on phone, while on c.w. there is MD9AA, and ZD6EF. . . . W9RNX is anxious to see how it feels to once again receive a QSL card. He says it has been a long, long time. . . . W6TI, after a long dry spell, has added number 191, who was none other than FF8JC. . . . W9HB found September 14th hot for Asia on 20, and worked JA2BT, JA2CW, XZ2SY, XZ2KN, FN8AD, and HS1SS. W9HB was the second W9 phone for FN8AD . . . and don't forget, HB uses NBFM.

W5ASG had one of those dreams come true. Bill had worked all the Russian countries except UM8, so the dream had him calling "CQ UM8." This being a good dream, naturally it came true, and back came UM8KAA to W5ASG. It just so happened that the UM8 was looking for Arkansas. Another good one for Bill was CR5AC.

W9LNM got himself married the same week that FP8AC came through, so he lost out—on the FP8, that is. Apparently, he is back in business now, and a few of his post-marriage QSOs were with CR5AC, CS3AA, and UM8KAA. Congratulations, Art. I mean both on your wedded bliss, and also DX. (May they always agree.)

G6RH hasn't been so inactive that he couldn't work FP8A, VQ8AS, and HV1A. . . . It appears that SV5UN has left Rhodes, so those islands are out of circulation for the time being. If it happens that you don't know where IT1AQS is located, it is on the island of Sicily. No, 'taint a separate country. . . . Currently, everybody is going slightly

(Continued on page 48)

Corrections: 1949 DX Contest Scores

ALBERT E. HAYES, JR., W2BYF

MISTAKES are bound to creep into any operation as large as compiling the results of *CQ*'s Second Annual World Wide DX Contest, which appeared in July and August, 1950, *CQ*, so here is the final dope:

W6LWC, with a score of 32-20-11, 388, is the 28-mc single-operator c.w. winner for W6, replacing W6WJX in that spot. **W4DQH** takes home the all-band single-op phone award for W4 with a score of 76-47-53, 382. **W2FBA** wins the 28-mc single-band multiple-op award for W2. **VE7KC** wins the All-band single-op award for VE7. **W5FNA** was not winner on 7 mc, but takes the 14-mc single-op award for W5. **W5LVD** was erroneously listed as a single-op station, whereas he should have been listed as the all-band multiple-op c.w. winner for W5. **W1CJK** is the winner of the 14-mc single-op phone award. **VE2BW's** score is invalid since our printer apparently invented him. His score should have been credited to **VE2NI. VE7MS** was listed as a c.w. entrant while he turns out to be the 28-mc single-op phone winner for VE7. **WØANF,** the 14-mc single-op phone winner for WØ, was accidentally listed as **WØIINF** in the published results—sorry, OM, guess our bug slipped.

We'll try to come a bit closer to perfection in next year's scoring, gang. *73 de W2BYF.*

Conducted by LOUISA B. SANDO, W5RZJ, ex-W700H*

CONVENTIONS GALORE! In August the ARRL Convention at San Antonio drew these YLs: W5PTW, Peggy; KQG, Fran; OQT, Sue; MJU, Pauline; DRA, "Teev"; PFU, Johnny; OTU, Anne; JAD, Ethel; PKL, Billie; PTR, Min; QXR, Margaret; PTI, Rene, and DQF, Madie. Peggy tells of fun at a pre-convention party held the evening before at the Mexican Village—plenty of free beer and later a Mexican supper and dancing. On Saturday, Aug. 19th, they had a YLRL luncheon, in the afternoon lectures and in the evening a dance, with W5PTR, PTI and PTW all sitting at the same table. Sunday morning more talks and the banquet at noon.

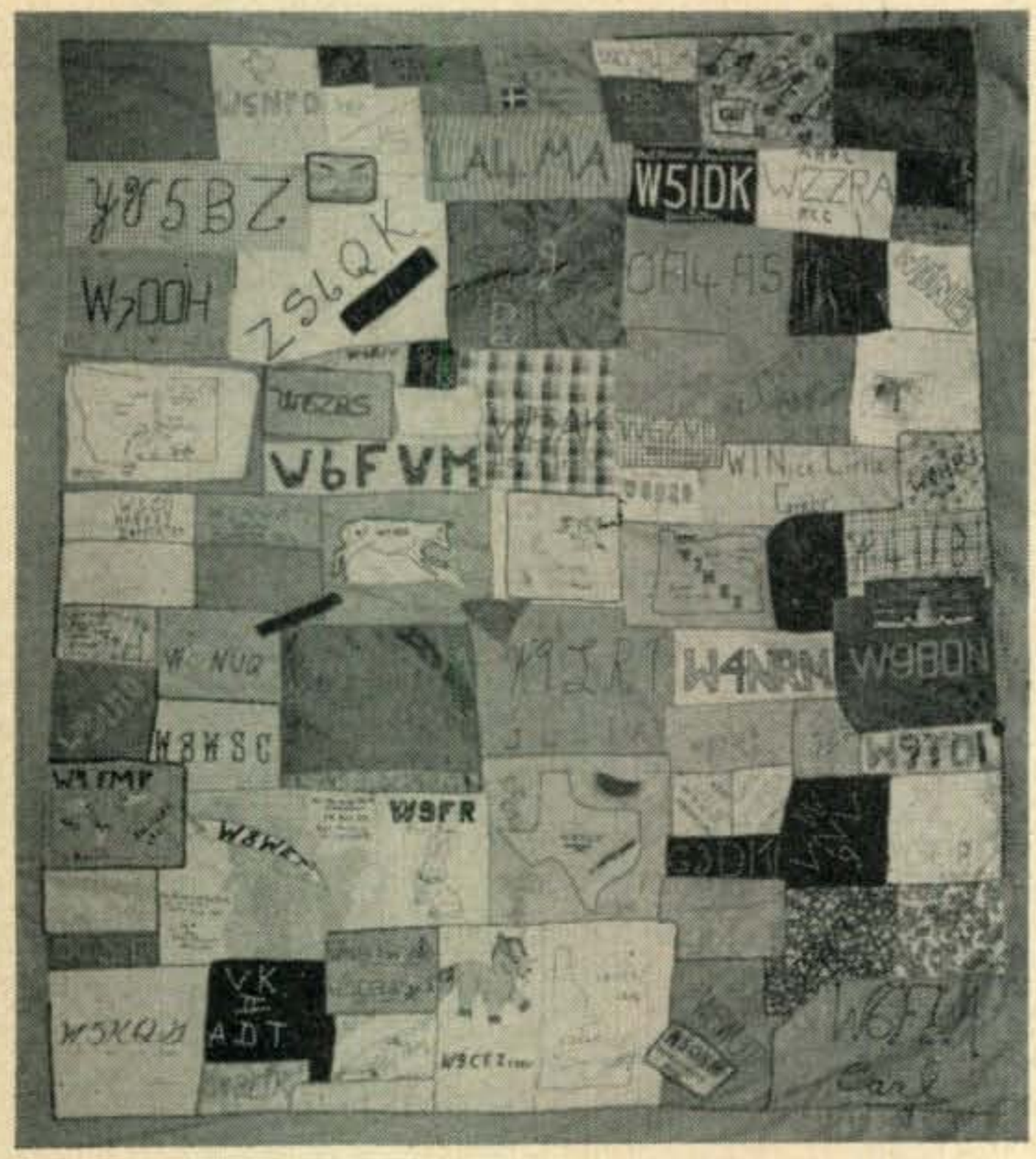
Peggy, by the way, decided not to remain in Texas and has returned to her mother's home in Indiana. So she is now W5PTW/9, though she hopes to have a place of her own soon plus a new call. Since she is not staying in the 5th district she has given up as YLRL D/C. Taking over for the remainder of the year is W5DRA, so send your news to "Teev" at P. O. Box 548, State College, N. Mex.

On Sept. 9th the Southwestern Division Convention was held at Santa Barbara. We haven't been able to dig up too many details, though we hear there was a YL luncheon with about 25 attending, and a good time was had by all, especially at the barbecue held that night. Though she couldn't go, W6ZYD tells us San Diego was represented by W6IGP, Carole; JKE, Ruth; AWW, Eleanor; YXI, Neva; and YYM, Ellen.

The New England Division YL Convention (in conjunction with the New Hampshire State Convention) September 17th proved most successful. Instigator W1FTJ reports 15 licensed YLs at the meeting and another showed up later. YLs present included: W1HIH, MCW, JME, MWI, NUO, PIG, QJX, QJY, QON, RYJ, SAJ, SCS, SVN, SYL, FTJ, and W9JXF/1. "We had a YL QSL card contest," adds Dot, "which was won by W1NUO, if I recall correctly. She received a nice plate decorated in blue with New Hampshire activities and places of interest. Four YLs received honorable mention in the QSL contest and they each received a pair of candlesticks resembling birch trees. All licensed YLs at the meeting were presented with small ashtrays decorated in the manner of the large plate, N.H. being the theme." (Another C of C worker—hi!) The meeting was directed by W1QON, Eleanor Wilson, who is Publicity Chairman for YLRY. She has a new QTH, by the way—318 Fisher St., Walpole, Mass.

Present at both the San Antonio affair and the New Hampshire one was W9LRT's patch-work quilt made up of patches of every color, size and material sent to Julie by various YLs and XYLs, with calls, designs, etc. (see picture). W1FTJ says: "It caused quite a sensation at Concord. So nice I want to start one, so please send me a patch with your call." Guess that goes for the rest of you YLs, too.

* *Box 21, Jemez Pueblo, New Mexico.*



W9LRT's patch-work quilt of ham calls displayed at San Antonio, Tex., and Concord, N. H., conventions.

Silent Key

Again we have sad news—another YL has become a Silent Key. On September 15th W2PMA, Lillian Ruocco, passed away. Lil's had been an uphill fight for many years. A victim of double pneumonia as a child, she was hospitalized for a long time and had to have several ribs removed. Despite being handicapped she was very active, even to taking dancing lessons. During World War II Lil became interested in ham radio through AWVS. and after winning her own ticket taught code classes for others. D/C for YLRL and very active in the New York City Club, Lil was ever cheerful, courageous and doing for others. On the air W2PMA was well known on 10 meters, and she really loved ham radio, especially since she was confined to her home so much of the time in recent years, though at times she did not even have strength

(Continued on page 40)

The Monitoring Post

gleaned by THE BRASSPOUNDER

IT DID HAPPEN! Contrary to the oft-repeated phrase, "It can't happen here," the group comprising the Muskingum Amateur Radio Assn. at Zanesville, Ohio, was startled into the realization that while the report of flood conditions at Roseville, only 15 miles south of Zanesville, where a light summer rain was being welcomed by the local residents, seemed impossible, that it did happen. **W8DVH** aroused **W8LQB**, prexy of the Muskingum club, from a deep slumber soon after midnight reporting that "high water" was reported at Roseville. The latter, with thoughts of returning to pleasant sleep, remarked: "Somebody is unduly excited. Nothing ever happens here. What would happen if we get the gang out of bed to find that at Roseville the creek had no more than overflowed its banks?"

It was decided to go back to bed, and as LQB enjoyed a short smoke before retiring a second time the telephone demanded his attention again, with DVH on the line. The parents of DVH live in Roseville, and he decided to reassure himself of their safety before getting back to bed and made a call to them. The reported flood conditions were absolutely correct. DVH and LQB began organizing the local mobiles and soon were on their way, to be turned away by the State Police when Roseville was reached. However, DVH, having been brought up there, knew all the back roads, and soon was at the water's edge observing conditions beyond the imagination of Zanesville residents. **W8ZYW** was alerted, as was **W8AZR** when the first mobile left Zanesville carrying DVH, LQB, AZR's XYL and AZR in the latter's car. **W8INS**, also at Zanesville, was pressed into service with his fixed rig. Conditions were not a bit favorable for QSOs between the two towns, and an attempt to telephone INS indicated dead telephone circuits. Another try brought the same result, which meant that INS would also be without power as the light circuits went out in Roseville, so the 1,500-watt generator in the car had to be carried back. On reaching the scene of high water on their second arrival at Roseville, the home of DVH's parents, earlier found to be high and dry, was not so an hour later. It was impossible to get within several blocks of the house. LQB headed for his parents' home, waist deep in water, and was soon lost to view and not heard from again until daybreak.

A newspaper reporter asked for communications to Zanesville, and being assured of this directed the mobile to a Red Cross emergency first aid and canteen station on the main highway. W8ZYW appeared on the scene two hours after the first mobile, but had to repair and install the rig in the car at home before starting for the flood area. Traffic from Red Cross, telephone and gas companies were soon pouring into the mobile stations—messages directed to main offices at Zanesville, for by then ham radio was the only means of communications. W8AZR with his XYL drove to the top of a 100-foot hill to maintain consistent QSO with INS at Zanesville, with the XYL copying traffic in shorthand and rewriting the messages for the OM to transmit to INS. INS was requested to get some of the Zanesville boys on the air, but was kept too busy answering telephone queries from newspapers, telephone and gas companies, in addition to copying and delivering incoming traffic. It was impossible to get the telephone to himself long enough to alert the gang, to send additional help requested by LQB and DVH.

The plea, had it been satisfied, would have gone for naught as main roads between the two towns were by then inundated. DVH, with his knowledge of the country and back roads, hitchhiked his way back to Zanesville to get his own car to bring a small portable station to the scene as batteries in the mobiles were taking a beating. Then **W8YOM** was aroused with a request to get to Crooksville, five miles south of Roseville, and report to Red Cross the conditions there. It was learned later that Crooksville was affected far worse than Roseville,

(Continued on page 46)

W8AZR, in car, with his XYL, hands a message to a reporter during the flood, while assistant EC W8LQB watches. W8AZR and XYL were on duty for eleven hours without relief.

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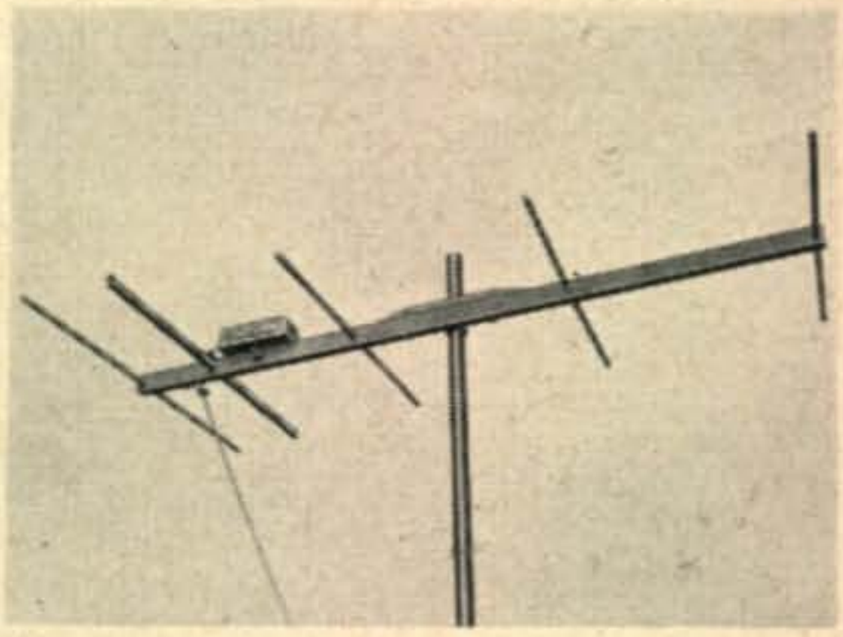

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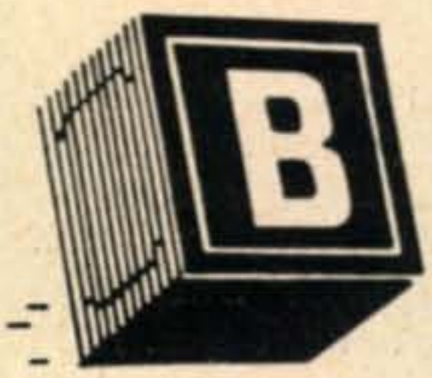

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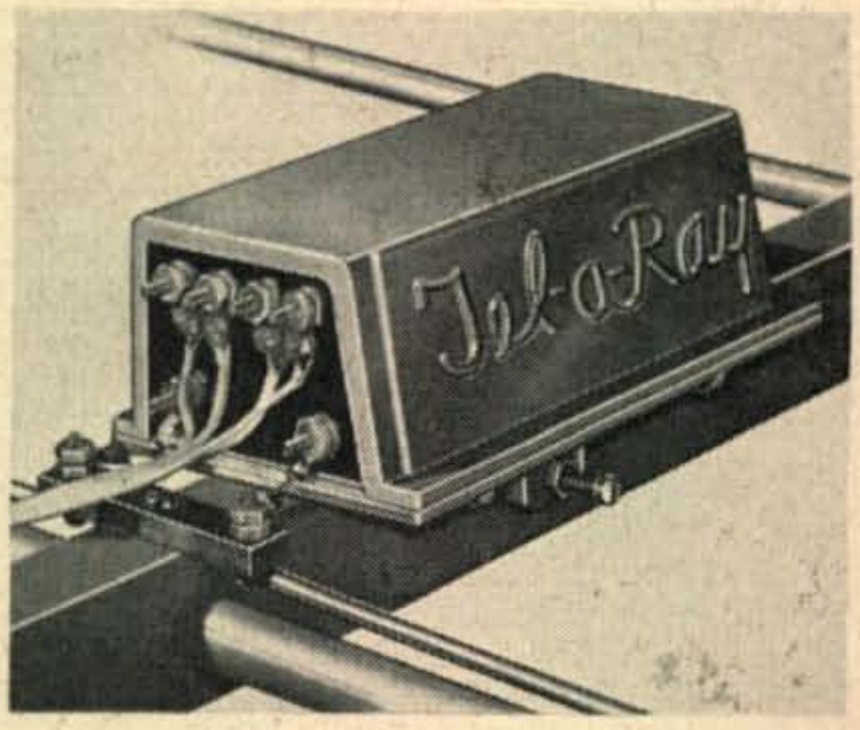

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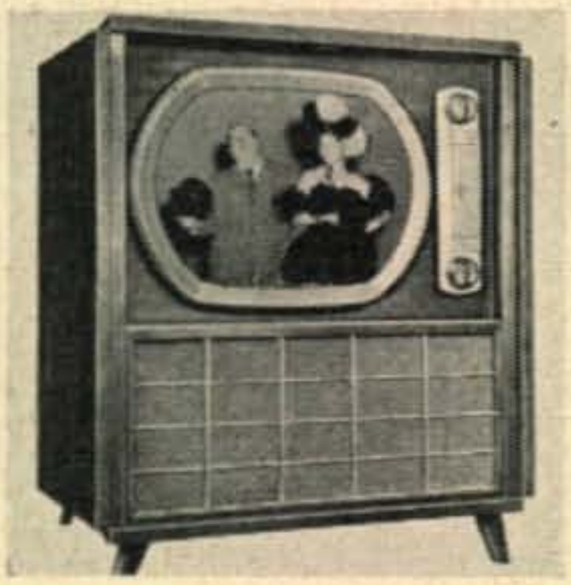

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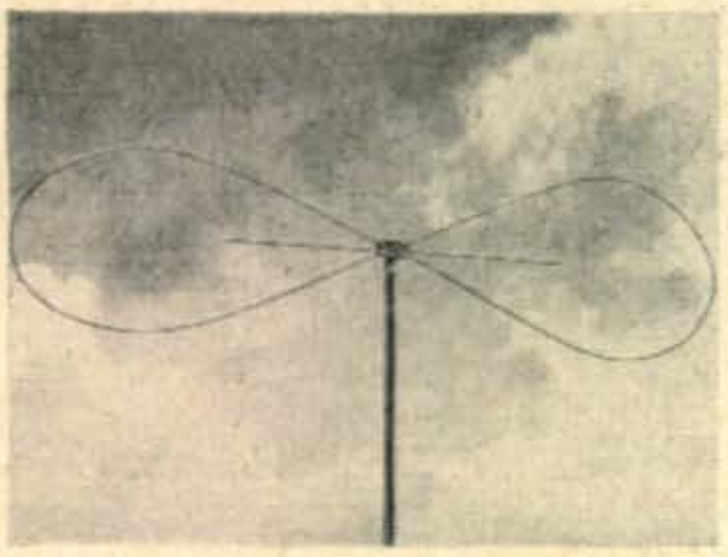

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YL'S FREQUENCY

(from page 36)

enough to pull the switches or talk over the mike. Though her OM, Abbey, was not licensed, he did all he could to help her in her hobby. To all who knew her personally, on the air, or by correspondence, W2PMA will be sorely missed.

Wrong Credit

A note from W1RTB: "Sorry I can't claim the publicity given to me in September *CQ*—I'm sure it was meant for Eleanor Wilson, W1QON, as she gave birth to a jr. op. in May." Sorry, Nell! It was indeed meant for W1QON, as reported in the October issue.

YLRL Anniversary Party Contest— Dec. 9-10, 16-17

This contest is open to *all* licensed YL operators throughout the world. Since this year, for the first time, there is a cup for the c.w. girls as well as for phone, there will be a weekend devoted to each type of operation. The phone contest will begin 6 p.m. EST Dec. 9th and end 12 midnight Dec. 10th. Any or all phone bands may be used, including cross-band operation. The c.w. contest will begin 6 p.m. EST Dec. 16th and end 12 midnight Dec. 17th. Any or all c.w. bands may be used, including cross-band operation. YLs may try for either or both tropnies.

Correct procedure and exchange between YL stations worked: Call "CQ YLRL" and exchange: call, number, report, QTH, time, and whether you are YLRL member or non-member.

Score sheets will be found in *Harmonics,* or write W8UDA, 3513 Fleming Rd., Flint 5, Mich. In scoring: (a) count ten points for each YLRL *member* worked; (b) five points for each licensed YL non-YLRL member worked; (c) same number of points may be counted for repeat contacts between YLs on different bands; (d) total number of points and multiply by the number of states, possessions or countries worked; (e) confirmation of all contacts by submission of logs by all YLs worked not necessary; (f) send your log and score to W8UDA.

Other YLRL Activities

New Editor for YLRL *Harmonics* is W1SCS, Ruthe Ferguson, 112 Rockview St., Jamaica Plain 30, Mass. Good luck, Ruthe, and we'll be looking for that Sept.-Oct. issue.

YLRL QSO Nets: Since we have more complete details this month, we'll repeat here the nets now set up.

20-meter c.w.: Monday 7 p.m. EST 14,360 kc., no NCS, open for volunteers.

10-meter phone: Tuesday 10 a.m. EST, NCS W9LRT 29,080 kc., and W7HHH 29,000 kc.

40-meter c.w.: Wednesday 10 p.m. EST 7220 kc., NCS W3CUL.

80-meter c.w.: Thursday 10:30 p.m. EST 3610 kc., NCS W1QJY.

75-meter phone: Friday 6 a.m. EST 3900 kc., NCS W8ATB.

V.H.F.—U.H.F.

(from page 23)

bulging coastline intervenes between the major cities, to break up the coastal route.

As a result, several of the W6s have planned elaborate "expedition" stations, designed for mountain-top operation. We have a report on the activities of one such station, manned by W6MVK, (President of the Two Meter and Down Club of Los Angeles), and W6ZUX, Warren Seeley, during the v.h.f. contest weekend of September 23rd and 24th.

Equipped with a 750-watt gasoline driven motor generator, rigs for all bands up to and including 435 mc, a Gonset 10-6-2 converter into a BC-348 and an electric rotator for their various antenna arrays, the boys traveled to the top of Mount Pinos, a lofty 8842-foot peak located in the range of mountains that separates Southern California from Central and Northern California. This peak is about 35 miles SW of Bakersfield.

The two-meter rig, running about 40 watts to a modified 522, accounted for most of the excitement. Shortly after the station was put on the air, W6GTZ, in Chula Vista, near the Lower California border, over 200 miles away was worked. The signals into and out of the Los Angeles area were strictly local in strength. W6SRX of Fresno, over 100 miles away, broke in off the back of the beam, and called attention to the long waiting list of Fresno stations waiting for a contact. W6ERE of Turlock, about 200 miles to the north, was worked next, with S7 signals.

After a busy early evening session, the gang began to realize that they must have hit a pretty good band opening. Around midnight, W6VLS of Fresno suggested that the time might be right for him to try working into Los Angeles direct. W6NLZ reported on deck from L. A., and after a little preliminary jockeying the contact was established. W6NLS was solid on phone to W6VLS, but on occasions W6VLS was forced to resort to c.w. W6EJL of Manhattan Beach was next to work W6VLS, thus definitely proving that the mountainous 200-mile path could be spanned by two-meter signals.

The following evening, through the efforts of the mobile crew, W6YYG, of Redondo Beach, was hooked up with W6GGM for the first Los Angeles to Santa Cruz two-meter contact, close to 300 miles, over about the most rugged terrain imaginable.

Not content with having thus broken down the "barrier" between their sections, these boys are taking positive action to insure that it will remain broken down. A conference was held in Turlock on October 9 with delegates from the entire area from L. A. to San Jose in attendance. Recordings were made of the proceedings of this conference for distribution to local groups. It was voted to clear the first 200 kc of the band for the use of the northern gang in DX experiments.

(In case the u.h.f. enthusiasts are wondering how W6MVK made out with his 420-mc gear during his contest expedition—after a few futile attempts to work into L. A. on this band, it was decided that something was sour in the setup so further experi-

ments were postponed in favor of the 144-mc activity!)

Congratulations, fellows, on a fine achievement. Maybe we'll see the DX record move West yet, if you keep this up.

The Month in Review

We do not seem to have left much space to report on band conditions this month. It's just as well, we haven't a heck of a lot to report!

Our last column carried the news of the extensive openings of October 2nd and 3rd along the northeastern seaboard. W2BAV's report of contacts with several W9s and with W4JDN seems to indicate that the band was also open considerably inland. We also note that VE3AET worked W1CGY via aurora on six meters during the evening of the 3rd.

October 5–11: Although no reports of unusual band conditions in the United States during this period have been received to date, we cannot afford to overlook the exceptional six-meter DX conditions which prevailed in South America during this period. We still have no explanation for this type of DX—the band opens shortly after sundown for 1000-mile plus skip contacts. The extent of these openings, and the number of stations worked during this period, is almost unbelievable. We could certainly use a few samples of these "mystery" openings in the northern hemisphere, judging from all we've hear on six meters lately!

October 14: Reports of six-meter aurora reception of VY6R have been reecived from VE3AET.

October 15: A sporadic-E opening brought the six-meter band to life in the Southwest. W6OB worked several W7s in the Washington and Oregon section. W6IWS worked WØELL at 2142 EST and also reported W5LKP, W5NJD, W7ACD and W7QLZ. W7HEA was in there pitching, and got WØELL, W5IKP and several W6s.

October 17–18: Good conditions developed on the two-meter band over the inland northeast section of the country. Among those worked from W2PAU during the evening of the 17th were W8WXV, W8WJC, W8EP, W8ZUR, W3QKI and VE3BOW. W4OXC was reported active from Louisville, Kentucky. The good conditions held over during the early evening hours of the 18th, with W8EP of Terra Alta giving several of the W2s and W1s their first crack at West Virginia.

October 19th: Radio silence was lifted on the six-meter band for the first time in months according to WØINI. He and WØZJB were heard working W4CVQ, W4OJU, W4LVA and W4HVV. Activity was at a fairly low level, perhaps due to the coincidences of this opening with some of the big-time Friday night TV programs!

October 21–22: During this entire weekend, excellent conditions prevailed for long-range two-meter work up and down the northeast coast. Although this opening was not as solid as some of those earlier in the month, it tempted quite a bit of activity out of hiding, and two meters was a fairly busy band for a while. We noted with great consternation that many of the local sufferers from TVI couldn't be induced to fire up during the early hours of Saturday and Sunday evenings despite the temptations of a first-class band opening. Gosh, fellows, what does it take these days to get you on the air?

That's about all for this month. Thanks to those who were kind enough to send us new items—they are *very* much appreciated. *73, Brownie.*

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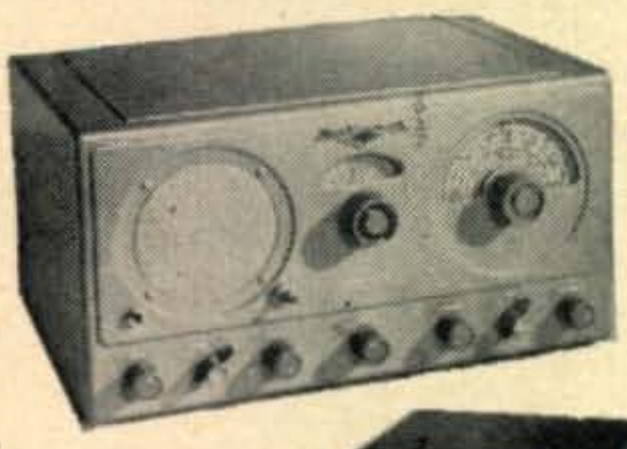

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MONITORING POST

(from page 38)

which was not known until YOM reached there at 9 A.M., by routes other than highways, with his mobile rig.

By 1 P.M., 12 hours after the arrival of the first ham gear in Roseville, conditions began to return to normal. A record of every message delivered and an answer returned within minutes, over the 12-hour communications emergency, is a record that the Muskingum ARA can be proud of in their first real test.

Other hams in Zanesville, learning of the situation during the morning, sat down to their rigs to help relieve the load of traffic. Among these were **W8CAB, BNB,** and **BGK.** The final report of the emergency shows: ". . . we could not make ourselves believe 'it could happen here' and didn't want to get the gang out of bed. When it was realized that a great deal of help was needed, it was too late, for our home station was too busy handling traffic and the roads were covered, cutting off access to the scene."

Local Red Cross and newspapers were generous in their praise of ham radio and henceforth will depend upon the ham for emergency communications. A permanent station is offered by the Muskingum ARA to the local chapter of Red Cross as a result of this flood work.

SCRATCHI

(from page 4)

the choicest assortment of reel DX calling, VQ8s, PK4s—even some AC4 are practically zero beat on my frequency giving me snappy call.

At this point, in my dream, I are deciding that no sensible traffic man having a DX call like KB1AA can handling any traffic, or even, for that matter, can be having any QSOs without the wolf pack rounding up and baying for QSL cards. So, are deciding to take a rest for a few days, and maybe the excitement about me are dying down. This are big mistake, as I finding out shortly.

First inkling I having of same are the time the postman are delivering to me a brand new callbook, and a note from the amateur sending it. He are saying he are getting extra one by mistake and thought I'd be liking the spare one, and by the way how about a sked one of these days?

Are also getting parcel containing 500 QSL cards. all made out prettily in three colors, for KB1AA. This fellow are telling me he owning a printing shop and one evening he trying out new printing press and had nothing else to doing on it so running off a few QSL cards for me and by the way, how about a sked one of these days?

This are only the beginning. All sorts of packages arriving. Getting magazine subscriptions, radio handbooks, slightly used toobs, new toobs, more handbooks, more QSL cards, tie clip with call letters on (good old King Baker One Able Able), lapel pins

HERE IT IS AGAIN!

Sun Radio's Annual Warehouse Inventory Clearance Sale

CRYSTALS Low Freq.

FT-241 A holder ½" pin spacing, for ham and general use, XTAL control, Signal Generator, marked Army Mc. harmonic frequencies—Directions for deriving fundamental frequencies enclosed. Listed below by fundamental frequency, fractions omitted.

412 426 442 475 493 504 516
413 427 443 477 494 506 518
414 429 444 479 495 507 519
415 431 445 481 496 508 522
416 433 446 483 497 509
418 434 447 484 498 511
419 435 448 485 503 515
420 436 462 487
422 437 468 488
423 438 472 490
424 440 473 491
425 441 474 492

each **49¢**
10 for $4.50

372 381
374 383
375 384
376 386
377 387
379 388
380

each **39¢**

390 401
391 402
392 403
393 404
394 405
395 408
396 409
397 411
400

each **79¢**

450 465.277 531.944
452.777 526.388 533.333
461.111 529.166 536.111
464.815 530.555 537.500
538.888

Each **99¢**

Special 200 kc. Xtals without holders 21-32" space x 23-32"
69¢ each
3 for $2.00

HAM CRYSTALS

FT-243 holders—½" pin spacing, for ham and experimental use, fractions omitted.

4190 6173 7806
5030 6206 7840
5485 7873
6006 6773 7906
6040 6840
6073 6873 7973
6075 6906
6100 6973 8273
6106 7740 8306
6140 7773

each **49c**
10 for $4.50

3735 5850 6425 6806 7573
5305 5873 6440 7306 7640
5677 5875 6450 7340 7673
5900 6473 7373 7706
5706 5906 6475 7406 7806
5740 5925 6506 7440
5750 5940 6540 7473 8340
5760 5973 6573 7506
5773 5975 6606 7540
5775 6273 6640
5806 6340 6673
5825 6373 6705 each **99c**
5840 6406 6740 10 for $9.00

SCR-522 XTALS

5910 6610 7580
6370 6750 7810
6450 7480 7930
6470
6407.9
6522.9
6547.9

each **$1.29**

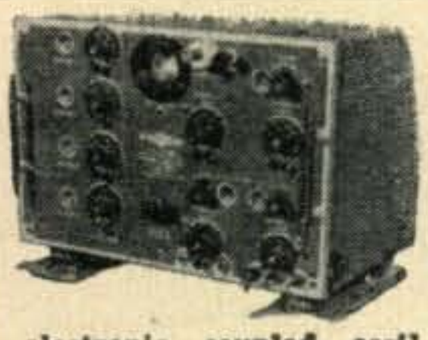
BC-610 XTALS

2 Banana Plugs ¾" spc.

2045 2260 2415 3215 3570
2105 2282 2435 3237 3580
2125 2300 2442 3250 3945
2145 2305 2532 3322 3955
2155 2320 2545 3510 3995
2220 2360 2557 3520 each
2258 2390 3202 3550 **$1.29**

Payments must accompany order. Enclose 20¢ for postage and handling. Minimum order $2.00 plus postage. Crystals shipped packed in cloth bags inasmuch as they are shock mounted. All shipments guaranteed.

BENDIX 100 WATT TRANSMITTER



Four separate electronic coupled oscillators: These can be easily converted to 20-40-80 meters. Crystal required for 10 meters. Each electronic coupled oscillator dial has 3000 divisions enabling quick precision shifting. This transmitter was constructed of the highest quality of precision parts, with laboratory precision. Four separate output tanks; one 4-position selector channel switch having seven sections which changes the ECO, IPA and output tanks simultaneously. All the controls are mounted on the front panel. The housing is cast aluminum; shields and case are sheet aluminum. Dimensions 11 x 12 x 15 inches, weighing 35½ lbs. Complete, simple instructions for conversion furnished. Uses three 807, four 12SK7 tubes; one 2-inch 5 amp. R.F. meter. A complete coverage transmitter, for the new or experienced amateur. A TRUE HAM VALUE—complete with tubes.

ORIGINALLY $49.95—NOW ONLY

LIKE NEW **$29.95** | USED **$19.95**

High Voltage Triplet DC. Voltmeters—125 Ohms per Volt—With External Multiplier—Brand New!

VOLTS	2" PRICE	3" PRICE
600	$2.95	$3.95
1000	3.49	4.49
1500	3.49	4.49
2000	....	4.49

Famous Make Butterfly Condensers All New—At 1/3 off Regular Net Prices. Not Many Left.

.500 GAP		.375 GAP		.250 GAP	
87	20.65	11	$ 8.15	111	16.80
96	22.15	106	20.15	127	18.25
115	25.20	130	21.60	143	19.85
124	26.65	141	24.50	159	21.00
		153	25.95	175	22.50
				192	23.95
				208	25.95

Note: figure in left column is max. cap. per section

Nationally Known Famous Make Heavy Duty Single & Double Stator Transmitting Condensers.

MAX. CAP.	GAP	PRICE	MAX. CAP.	GAP	PRICE
300	.077	$ 5.32	200-200	.077	$ 6.58
230	.171	5.57	100-100	.219	14.11
500	.219	17.22			
250	.219	12.85			
75	.344	8.96	100-100	.344	15.64
245	.344	14.11	60- 60	.469	14.11
			30- 30	.719	12.99
50	.469	7.05			
100	.469	11.62			
150	.469	12.95			
75	.719	12.85			

Ham Transformers New Boxed Peerless Hi-Quality—Not Surplus at 60% Off List Prices.

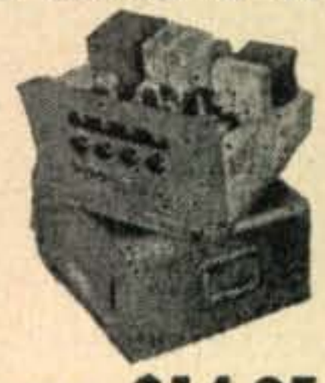
Modulation Trans., 300 Watt Universal, Model M-2107T, List $70.00, Reduced to $28.00.

Driver Trans., 15 Watt Universal—70MA Primary, Model A4237Q, List $10.75, Reduced to $4.30.

Plate Trans., 2428V-CT 300 MA, Model P5196A, List $45.00, Reduced to $18.00.

RADAR RECEIVER BC-1068A

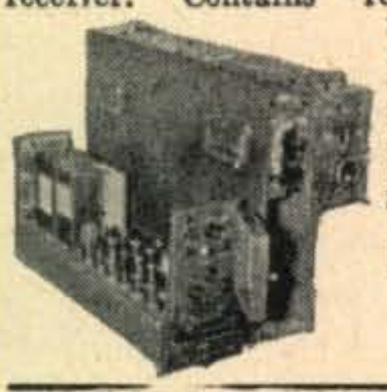
Used. Good Conaition. Covers 150-210 MC. Can be converted to TV Receiver or a Hot 2 Meter ham receiver. Has 2 RF stages, detector & oscillator. Each individually tuned, 5-10 MC. I.F. Stages, 2nd Detector & Video AMP with 110 V AC 60 Cycle Power Supply.



LESS TUBES **$14.95**

WAVEMETER BC-1073A

Used. Good Condition. Covers 150-210 MC. Companion to BC 1068A receiver. Contains resonant cavity wavemeter, oscillator, heterodyne amplifier, tuning eye, 110V-AC 60 Cycle Power Supply.



LESS TUBES **4.95**

RADAR TRANSMITTER BC-1072A

Used. Good condition. Covers 150-210 mc. Contains many parts, such as 110V AC Blower, Gen. Radio—1 AMP variac, kilovolt meter, circuit breaker, 110 volt HI & LO voltage power supply, tubes, oil condensers, and many others. Companion to 1073A. Operates from 110 V AC 60 Cycles. **$19.95**

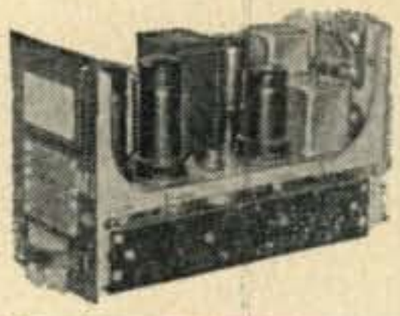
Special Package
1—BC 1068A
1—BC 1073A
1—BC 1072A

Less Tubes **9.95**
All 3 for **24.95**

BC-645UHF RECEIVER TRANSMITTER

$14.95

"The Citizen's Radio" covers 420-450 mc. Consists of complete transmitter, modulator system and receiver, 15 tubes, and simple complete conversion instructions for Citizen band operation. Brand New!



SPERRY AMPLIFIER

Brand new servo amplifier containing two beam power output tubes (1632) two twin triodes (1632 and 1634) two mica condensers, dozens of color coded half watt resistors, two dual and four section bathtub condensers, three transformers, two wafer switches, one volume control, four octal sockets. With schematic **$3.95**

BC-746 Tuning Units, contains antenna, oscillator coils, 140 mmf midget tuning condenser, double crystal socket, less xtals ..... **$.39**
With 2 crystals ..... **$.99**
With 2 crystals, one in 80 meter band **$1.29**
CATHODE RAY 5BP4, New **$3.89**

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Handle here is "Pick" . . . call or write me for anything you need in ham gear or parts—Will be happy to expedite your order with best quality merchandise. 73's

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OF WASHINGTON, D. C.

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TERMS: All items F.O.B Washington, D. C. All orders $30.00 or less, cash with order. Above $30.00, 25 percent with order, balance C.O.D. Foreign orders cash with orders, plus exchange rate.

ditto, forty-meter xtals, eighty-meter xtals—each with note attached, ending up, and by the way, OB, how about a sked one of these days?

One big wooden box are arriving from DX Committee. It are containing modern sooper-dooper all-band chromium-plated multi-knobbed transmitter and brand new all-band receiver. Maybe they are figuring that I being off the air because my rig are going on the blink. Transmitters, receivers, VFOs, boxes. cartons, packages, piling up at the front door, piled high in the living room, in the shack, coming in the window—HELP!!! I'm being buried alive with radio equipment—at this point, Hon. Ed., Scratchi are waking up in cold sweating.

Well, I not knowing what causing these nightmares, but Brother Itchi keep telling me that my mattress are lumpy, so are going to changing it pronto. Of course, if Scratchi not dreaming any more, not finding out end to the story. I wonder what happening to KB1AA? Are he becoming DX man, or becoming stamp collector, or moving back to good old W1 land? What saying, Hon. Ed., should I keeping my lumpy mattress until finding out what happening to good old solid citizen King Baker One Able Able?

Respectively yours,
Hashafisti Scratchi

DX and OVERSEAS

(from page 35)

batty working 3A2AB in Monaco, one of the ops being DL4FS. He has been working the low edge of 20. . . .

It looks like we have some more dirt from W6AM. Both he and W6OEG visited the Northern California DX Club which accepted the challenge from the Southern California DX Club to a 7-mc DX contest. . . . W6MVQ has a new 10 and 20 rotary going, and it looks as though he might be high man out this way in the VK/ZL contest. . . . W6DYP is putting up a new tower and rotary and W6CIS is still working DX with 50 watts. W6WB is now TV happy, thus accounting for no DX. I can imagine Bud watching a Hop-a-long every evening, on his flicker-box.

It is good to hear from W2BXA after many months. His latest are EAØAB, and TI9EQ—the latter being on Cocos. On phone he also grabbed off two, FP8AC and FO8AB. . . . W9HUZ also worked EAØAB as well as FP8AJ and ZK1AB. . . . Two new ones for W4VE are VK9MR and VP8AK. . . . W6GDJ and W6EFM, both of Sacramento, worked VP5BE on Cayman. . . . W6BYB, also of the same town, was having some sort of a vacation in the Caribbean and South America.

W8DFQ reports that VK1HV will be on Heard Island until March of next year. He operates on 14,130 and runs about 25 watts. Due to a large amount of traffic, however, his operating time is somewhat restricted. W8DFQ runs about 100 watts into an 811 on 20 meters. He uses a 3-element beam, while on 10, and he has a 4-element rotary.

HC2JR reports that HC8GI, who is in the Galapagos, was having trouble with his transmitter, and may not get it on the air until he returns there from Panama early in January. . . . VK4EL is now located 800 miles north of Brisbane, and has his station at the same location of the broadcast station

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We are Especially Interested in Large Quantities

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BC-221 Frequency Meters
SCR-522 Transmitters & Receivers
Hallicrafters BC-610 Transmitters
Any factory built transmitters and receivers such as Hallicrafters, National, Temco, Collins, RCA, RME, Hammerlund, Millen, Meck, Harvey-Wells, Meissner, Sonar, McMurdo-Silver, Gonset, Stancor, Bud, etc.
Amateur or commercial sets
Large stocks of tubes
Large stocks of transformers
Large stocks of condensers
Large stocks of resistors
Large stocks of speakers
BC-224 Receivers
BC-342 Receivers
Police type VHF transmitters and receivers for mobile application
Collins ART-13 Transmitters
APS-13's
SCR-269F or G Fairchild or Bendix ADF's
Headphones in quantity lots
Microphones in quantity lots
Field telephones
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We are especially interested in any factories, dealers or other outlets giving us a list of surplus electronic equipment that is for sale so that we may submit our bid.

We are particularly in the market for large stocks of tubes and commercial communications receivers.

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where he works. Since he has plenty of space to play around with antennas, he has done a great deal of experimenting, and he likes the lazy "H" better than any that he has tried. Eric says the location is really good, and in three months' time he has worked 355 Europeans.

This is being written just prior to the DX Contest, and it appears that conditions have been a wee bit better than they have been for several months. Let's hope that you all enjoyed still better conditions during the two contest weekends. Don't forget to send in your logs immediately, and we will do our very best to publish the results much sooner than we did this year's contest. You can send the logs directly to me or to the New York office.

Most of you will be getting this issue a little before the Holiday Season begins. I hope good old Saint Nicholas will be good to you, and along with restoring good DX conditions, let's hope he can bring everybody a present of better international conditions. We don't like to think of it, but it looks as though some of the DX gang will be going into the service, and those who do, please drop us a line once in a while. I am sure the rest of the boys would like to hear from you.

Before signing off, I would like to ask all of you that are in the Honor Roll to take time out and see if your country totals have been brought up-to-date recently. I'm sure there are many of you in it that have not attempted to revise your totals for many months.

And now, even if I don't see you on the low end, I do want to wish you a very Merry Christmas.

QTH COLUMN

EA8AT P.O. Box 215, Tenerife, Canary Island.
EA9BB Adolfo Perez Real, Carretera De Alfonso XIII, Chalet, Melilla Marruecos, Espanol Norte Africa.
HE1JJ Same as HB9JJ.
HL1AL Jack Thorn, ECA Mission to Korea (Tokyo) GHQ, FEC, APO 500, c/o PM, San Francisco, Calif.
OQ5EB American Presbyterian Congo Mission, Luebo, Belgian Congo.
PJ1UF (STRICTLY UNDERCOVER. Don't mention Radio or call letters on your envelope.) John, Box 80, St. Nicholas, Aruba, N.W.I.
PK6XG W. Willemse, Borssenburgplein g-1 Amsterdam-Zuid, Holland.
VP7NH Box 1280, Nassau, Bahama Island.
ZK1AB Box 41, Rarotonga, Cook Islands.
ZM6AK Box 177, Apia, Western Samoa.
3V8BB Vasco Mazzanti, 23 Bis Rue de Marseille, Tunis, Tunisia.

DEMOTHBALLING

(from page 29)

unlimited supply of patience is required to complete this job but it always has been felt that ham radio is the original source of all patience! This is a task that must be spread over a considerable period of time, perhaps weeks, if an hour or two per day can only be spared.

The SCR-211 frequency meter has two ranges marked LOW and HIGH. These positions cover fundamental frequency ranges of 125–250 kc and 2000–4000 kc, respectively. All other frequencies are covered by harmonics of these ranges, the unit being capable of producing a strong signal at 30 mc, the highest frequency at which checks could be made on the available communications receiver.

It has been taken for granted that a crystal-controlled secondary frequency standard is available in the shack or may be borrowed. 100 and 10-kilocycle points are necessary. After permitting the instrument to warm up for about 20 minutes (the earphone plug must be inserted to close the filament circuits) the frequency standard is coupled to the antenna post. The frequency standard should be adjusted to zero beat with WWV on a communications receiver. Then the frequency standard is turned off and the SCR-211 turned to CRYSTAL or XTAL ONLY position and that crystal zero-beat with WWV. This is done by means of a small adjustment screw on the back of the chassis right next to the 1000-kc crystal. Now the CORRECTOR knob on the 211 is set at exactly center scale.

With the frequency meter in operation the dial is set to exactly 4700.0. This is the recommended setting for 4000 kc (2000 kcs. will be in the 200s on the dial). It now remains to zero beat 4000 kc to this dial setting. Most of the instruments are set close to this setting at the factory and a strong beat note should be heard in the phones. This signal should be brought to zero beat by means of a trimmer adjustment found on the rear underside of the chassis. There are two of these trimmers, one for the HIGH band and one for the LOW (125-250 kcs.). If they are not marked (they are in the later models) it must be determined which is which.

If no beat note is heard in the phones (the crystal must be oscillating) 4000 kc must be beyond audible beat with the dial set at 4700.0. In this case it would be well to tune in the frequency meter on a receiver and set it close to 4000 kc by means of the trimmer. The final adjustment should be made as described in the previous paragraph.

After the frequency meter has been warmed up the dial settings for the checkpoints are located and recorded. Every ten or fifteen minutes during this process it is well to tune back to 4700.0 on the dial and zero beat by means of the CORRECTOR. This compensates for a slight amount of drift during calibration and in the long run provides that n^{th} degree of precision. It will be necessary to use the communications receiver and frequency standard in order to make certain that the right check points are being recorded. As mentioned above, other unused check points are present and might prove confusing.

The next step is to set the frequency standard to 100-kc intervals and, with the latter coupled to the frequency meter, record the dial reading for every 100 kc throughout the range. When this is completed the frequency standard is set to 10-kc intervals and all the readings filled in between the 100-kc points. This phase of the calibration is carried out with the SCR-211 crystal in a non-oscillating condition. This crystal is now only used as a reference against which to zero beat checkpoints. It is always off when measuring frequencies.

As the calibration proceeds across the dial the CORRECTOR should be zero beat to the nearest checkpoint, previously calibrated.

Now the 1-kc points are filled in between the 10-kc calibrations. This is accomplished by means of interpolation. It is done by mentally dividing the number of vernier dial divisions between the 10-kc

points into ten parts and adding this amount progressively to each 1-kc calibration. For example, 3500 kc might be 3647.2 on the dial and 3510 kc might be 3667.4. Thus 10 kc covers 20.2 divisions on the dial and each 1 kc advances the dial 2.02 divisions. It will be noted that the dial cannot be read to hundredths as this would indicate so progressive compensation must be employed, the calibration appearing as follows:

FREQ.	*DIAL*
3500	3647.2
3501	3649.2
3502	3651.2
3503	3653.2
3504	3655.2
3505	3657.3
3506	3659.3
3507	3661.3
3508	3663.3
3509	3665.3
3510	3667.4

At first this might appear quite complicated but it is surprising how fast it really is done. After a while the calculations come automatically and the time required depends upon how fast one can write down the numbers.

HETERODYNE V.F.O.

(from page 20)

range is to connect the output link to the grid circuit of the next stage in your rig and tune for uniform output, or grid current. The 6AG7 coil should be left at 3.6 mc and the 6SA7 transformer should be stagger-tuned until the correct range is covered. A little adjustment of the 6AG7 coil may be necessary in some installations. There will be more drive in the middle of the band, but that is to be expected from circuits not using elaborate loading resistors and the like. Your main consideration is getting enough excitation over the range, and if you get more than enough at some frequencies it will do no harm. Adjust this from 3.5 to 3.85. Do not worry about 3.4–3.5 output for this is not necessary on 80 meters.

Once you have it working on 80 meters the other bands are quite simple to get going except ten meters. You will find that you will get good output on 40, 20, and 15 meters with no trouble at all.

The 6AG7 quadrupler should work fb from the start. A wavemeter would come in quite handy to make sure that you have the right harmonics but you can get along ok without it. With the constants shown, the circuit should only tune the third and fourth harmonics of the 80-meter input. The circuit works quite efficiently on both tripling and quadrupling.

Ten meters may give you a bit of trouble in getting good output from the doubling 2E26. As the frequency gets higher, the taps on the 2E26 coil get more critical so that on ten meters you may have to adjust the tap a bit on the coil to get maximum output. The link should be coupled loosely to the coil to obtain good output. Experimentation with your particular application is the best condition under which to adjust the unit. Once the unit is adjusted correctly it will work with no trouble for a long period of time. The 2E26 tube plate should not get red under any condition if the unit is operating properly. Short overloads are permissable in tuning up, however.

The 6SA7 transformer may need a little adjustment when you are initially tuning for good output on the 11-meter band. By tuning it a little, a happy medium can be struck that will be good for both 80 and 11.

Calibration

To calibrate this unit so that it will be accurate in frequency readings, all that is necessary is a 100-c crystal oscillator and a receiver. If your particular installation does not require accurate calibration, you may calibrate it with the receiver alone if your receiver calibration is fairly accurate.

Since the original dial readings are discarded, a mask made from stiff paper was cut out to fit over the dial. Tune the receiver to 3.5 mc and tune the VFO to this spot. Make a mark on the new VFO dial at this spot. Now put the receiver on ten meters and find the harmonic on 28.0 mc. Keep the VFO tuned to 80 or 40 meters so as to get a weak harmonic to beat with the weak 100-kc harmonic at that frequency. Adjust the VFO trimmer to set the 3.5-mc point exactly at 28 mc, for any bit you were off on the adjustment on 3.5 mc will be multiplied 8 times on this band. After this is set, make a mark at every 100-kc point from 27 to 30 mc.

This procedure will make your unit a pretty good frequency meter, but remember, when using it near band edges, join it with a 100-kc crystal oscillator to make an unbeatable team. In time, the VFO will tend to get off calibration. An adjustment of the original oscillator trimmer will put it right on the beam.

Results

I have been using this exciter to drive pp 807s on all bands for about a year now and have found nothing lacking in its capability of T9x c.w. I have never gotten a report below T9.

Because I can now use breakin on the higher

bands and still retain a good note, my scores in the DX and CD contests have been vastly improved.

I find that this exciter retains its calibration over long periods of time and is quite accurate as to band edges.

Although I spent quite some time taking the bugs out of this unit, it is repaid a millionfold when I can say during a QSO, "Exciter hr OM is a *homemade* bandswitching job and I am using Bk in," after receiving a T9x report.

PROPAGATION

(from page 13)

The Aurora

V.h.f. amateurs have noted for some time that it was possible under certain conditions to establish contact with a distant station when both stations had their directive antennas pointed north, but were unable to hear each other when their beams were oriented on a great circle course between the two stations. This phenomena is now known to be caused by the aurora, and is characterized by signals fluttering so badly as to make phone QSOs practically impossible, although interesting QSOs have been maintained by use of c.w. telegraphy.

Here again is a field wide open to scientific research. We know very little about the aurora other than what we can see. Where we have light we must have ionization, so we know that the aurora is a highly ionized area, positioned 50 to 500 miles above the earth, changing rapidly in density, as evidenced by the pulsating, fluctuating visible displays of the northern lights. These rapid changes of refractive indices cause the familiar fluttering effect noted on echoes from the aurora region. The ionizing agent is unknown and, although no data exists to confirm correlations between Sporadic E manifestations and the aurora, it may well be that they have a common ionizing agent. Cosmic ray radiation and the impact of high speed charged particles emanating from the sun during solar magnetic storms have been mentioned as possible sources of this abnormal ionization.

Meteor Trails

It is known that meteors passing through our atmosphere at high speed release sufficient energy while being consumed to ionize that area of the atmosphere through which they pass.

Reflection echoes from these meteor trails are characterized by a sudden burst of signal strength rarely lasting more than a few seconds. While useless for communication purposes, they are of considerable scientific interest.

(Readers who are interested in further ionosphere study are referred to *The Upper Atmosphere* by S. K. Mitra, published by the Royal Asiatic Society of Bengal, 1 Park St., Calcutta, India. This book is by a recognized authority on the subject.)

The Standard Atmosphere

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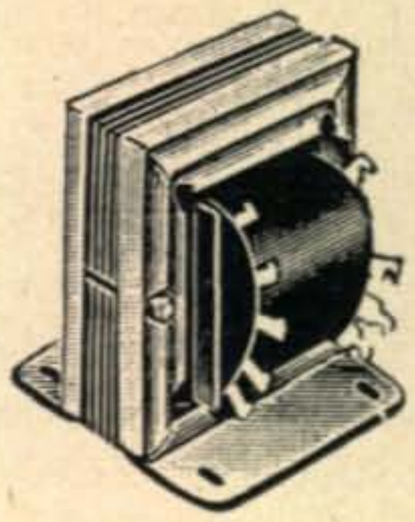
Outstanding POWER CONVERSION UNITS

for any Voltage and Amperage Rating

R. P. S. POWER CONVERSION UNITS

Specially designed to convert any d-c receiver, transmitter, etc., into a-c use. No rewiring necessary—simple, easy, quick installation. No tubes! Instant Warm-up! Cool operation! No maintenance! Low cost!

These units are available for any current and voltage rating—applicable to all d-c operated equipment. These units are designed especially for radio amateurs and will operate efficiently on all dynamotors. When inquiring about other power conversion units than those listed, please give full particulars as to input and output voltage and amperage rating of dynamotor. Special units are available—prices and delivery dates quoted at time of inquiry.



INSTALLATION DATA

Select proper rectifier and transformer from table for your specific application. After proper selection has been made proceed as follows: Connect secondary terminals of transformer to yellow lugs of rectifier selected, connect black lugs to NEGATIVE input terminal of dynamotor, connect red lugs to POSITIVE input terminals of dynamotor. No changes in switching circuit of dynamotor are necessary if cables are included or cable are to be used with unit. Provide "on and off" switch in primary of supply transformer. Rectifier output can be connected to any dynamotor giving good regulation.

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8889	32	6	36.7, 35, 31	12	6.75
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view" of the atmosphere, we are in a better position to focus our attention on that part of it that has the greatest effect on v.h.f. propagation. With the abnormal effects of Sporadic E and aurora exceptions, useful propagation of radio waves at frequencies above 100 mc occurs entirely in the troposphere and is affected by such factors as radio line of sight, reflection, refraction (bending), super-refraction and diffraction. These factors are controlled by atmospheric temperature, pressure, water-vapor content and the topography along the ray path.

(This completes part one of a series of articles on VHF Radio Wave Propagation by Mr. Underhill. Part 2 will deal with the influence of the troposphere on v.h.f. band conditions.)

Q5er

(from page 15)

cover. It was soon found that sufficient space was available. In order to save the original dust cover (for resale purposes) a new cover was cut from 16 gauge aluminum and the unit built along the left rear side of the cover, keeping the components 1½ inches from the rear and $\frac{5}{8}$ inch from the left side.

The adapter is made from an octal plug and an octal socket, with the socket mounted directly on the plug and all connections parallel except *pin No. 3* which is used for the in and out connections of the unit. *Pin No. 6* in the 6H6 detector socket on the 75-A is used as a tie point for two connections. These connections were removed from this *pin No. 6.* Another tie point was installed for the two wires removed from *pin No. 6.* A small four-prong Jones socket and plug are used for connection between the adapter and the Q5er. The unit adds approximately 6 db gain which is all that is advisable to maintain a good signal to noise ratio.

It can be seen from the curves that this unit is an approach to the ideal i.f. curve, and more than doubles the selectivity of the receiver. This crystal-controlled unit is easily adapted to any other receiver and the only two values of components that would have to be changed would be the grid-to-ground resistor on the mixer and the cathode resistor of the 6SK7, to adjust the gain of the unit to your particular receiver. It is suggested that if the unit is built for other than the 75-A that the two resistors mentioned be made variable and adjusted for the best performance of the unit, then the value could be measured and fixed values installed to save space.

No provision has been made in this unit for switching it in and out as the 75-A is strictly an amateur receiver. This feature might be desirable if you have a general coverage receiver and desire to listen to the broadcast band.

The crystal used in this unit is 585 kc which is on the high frequency side of the Collins i.f. of 500 kc, however several crystals have been used in this unit either 415 kc or 585 kc and the performance is the same whether the crystal is on the low or

high side. 415 kc crystals are available on the surplus market for approximately one dollar.

If it is desired to obtain a higher frequency response in the audio after the Q5er has been installed this can be accomplished by removing the .002 condenser from the volume control to ground. Also the slight loss in audio volume caused by changing the cathode resistor from 330 to 560 ohms in the 6V6 output stage can be recovered by installing a 10-μf 50-volt bypass condenser from the 6V6 cathode to ground. Incidentally this cathode condenser will eliminate the sharp click in the speaker when the standby switch is turned on and off.

This unit has been in use for over six months and needless to say we are more than pleased with the results, a greater number of 100-percent contacts have been made since its installation and many more would have been 100-percent had the fellow on the other end been using a Q5er.

It is only recently that receiver manufacturers have given much thought towards greater i.f. selectivity and if more amateurs would take advantage of this feature as well as turn down the gain a little on their speech amplifiers, certainly more pleasure could be derived from phone operation.

PARASITICS

(from page 27)

of flash-over. The plate tuning condenser in itself has so much inductance, it is best not to tempt fate by adding an ordinary inductive mica condenser to the circuit. Ground the condenser and play safe!

3. Now, if the parasitic resonant frequency of the grid circuit is remote in frequency from that of the plate circuit, oscillation will be impossible. We wish to keep the plate leads short to keep resonances in the TV channels at a minimum, so why not make the grid leads long? Of course all the advice is to make "all leads as short as possible." This is a gallant thought, but it results in squeezing the natural parasitic resonances of both the plate and grid circuit into a small range of frequencies! Let us be bold and buck popular opinion and rewire the grid circuit as shown in *Fig. 5*. This will lower the parasitic frequency as shown on the grid dipper to about 90 mc. As an extra precaution, small inductances were added to each grid lead to lengthen them further, bringing the resonant frequency down to about 55 mc.

A check under operating conditions shows that the amplifier is stable over the whole operating range. As a last, final, check the plate voltage was run up to the risky value of 4500 volts. At this voltage an odd, buzzing noise came from the plate tank coil. A corona discharge had appeared on the wire running from the plate r. f. choke to the center tap of the plate coil! It was a nasty looking thing, standing upright and buzzing with a vicious sound! ("Aha,"

QSY to page 60

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. Phone orders not accepted. 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.

MUST SELL: Transmitter, 20 meter c.w., 400 watts. Meissner signal shifter, 813 final and power supply. Complete, $65.00 f.o.b. W6FXL, 1452 Coolidge Ave., Pasadena, Calif.

SELLING OUT: Hammarlund HQ-129X receiver and speaker, $150.00. Grid Dipper, $20.00. "Vomax" V.T.V.M. $45.00. Cascade home recorder, radio and phonograph combination with accessories, $75.00. All practically new with instruction books. Home made c.w. xmtr, exciter unit, power supplies, rack panel, using 457A VFO with V.T. Keyer, TZ-20 final, $30.00. All prices f.o.b. Rawlins, Wyoming or make offer. Les Kolsen, W7FCX, Box 309, Rawlins, Wyoming.

SELLING OUT W1RVR: Millen exciter $35, power supply $75, scope $35, R.F. amplifier $80, cabinet $10. Or complete xmtr for $225. Brand new. IFF scope unit w/5CP1 and all tubes, 110 v. 60 cy $50. 30 Mc. I.F. strip, $5.00, with 9/6AK5's. RAK-7 receiver and 110 v. 60 cy supply, $60. Also large number of small parts, tubes, and units. Send post card for further information to Alfred E. Cybulski, W1RVR, Box 272, Worcester, Mass.

WANTED: Panadaptor. Must be excellent condition and bargain. Drop post card with proposition to "Tex" Price, Drawer O, Greensboro, North Carolina.

BC-610D, complete, perfect. Custom dual-diversity receiver. BC-342N. Make immediate offers. SX25, SX71, RAK6, Collins 310B1, BC221, BC453, BC454, BC459A, 7" Hallicrafters TV, Pilotuner (FM). Hundreds of parts, books, magazines, etc. Write needs. No list. Baker, 4419A Olive, St. Louis 8, Mo.

SPECIALIZED QSLs, SWLs! Samples! Ace print, 2705 So. 7th, Council Bluffs, Iowa.

FOR SALE: (NYC and Long Island). Moving, name your price! Panadaptor. Telrad frequency standard. National 1-10 receiver. Hallicrafters S-36 (surplus). Kw power transformer. 400-watt AM transmitter. Webster wire recorder with hi fi amplifier. Triplett modulation meter. W2NLF. WOrth 4-0770.

FOR SALE: BC-348Q, built-in 117-volt a.c. power supply, $45.00. VHF-152, $50.00. Both items in excellent condition. WØJJT, 105th St. & Center Rd., Omaha, Nebraska.

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QSLs, HIGH QUALITY, fair prices. Samples? W7GPP, 1380 F, The Dalles, Oregon.

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CONVENTION! ARRL National Convention in Seattle July 27, 28 and 29, 1951. Plan your vacation in the evergreen playground during Seattle centennial year. The event of a lifetime! General Chairman: W7RT.

L. A. HAMS: For sale: ART-13 Collins Autotune transmitter complete with power supply ready to go, $150. BC-348 with power supply, $50. ARR5 27-144 mc. AM-FM receiver with power supply, $50. Al Cuesta, 4518 Simpson Ave., North Hollywood. Phone SU 3-0259.

QSL—SWL cards. Samples. W1HJI, Box 32B, Manchester, N. H.

NORTHWEST HAMS: 400-watt transmitter, new, heavy-duty UTC components, phone-c.w., relay-controlled, VFO, $200. RME 152A $50. S-40, $50. W7ALH, Naches, Washington.

SELLING OUT: All-band push-pull 813 c.w. rig with Millen 90800 exciter, 2000-volt supply, all standard parts in 82-inch steel cabinet with room for modulator. Write for information. $275.00 or offer. BC-348Q with built-in AC supply, noise limiter, separated AF, RF controls, $65.00. BC-221J frequency meter, good shape, $60.00. Lysco Transmaster TV-600, brand new, $87.50. 3 BC-459, black finish, new, $12.00 each. Two cased pole transformers, mica insulated, one good for 1000 to 1400 volts dc at 750 ma., $15.00; other good for 1800 to 2200 volts dc at 1 amp. $20.00. Sil Thompson, W5BUF, 6460 Vicksburg St., New Orleans, La.

SELL: Collins 310-C2, excellent condition. Used only 6 hours. First $75.00 gets it. Harold Danforth, 154 Baldwin, Oshkosh, Wisc. W9QEJ.

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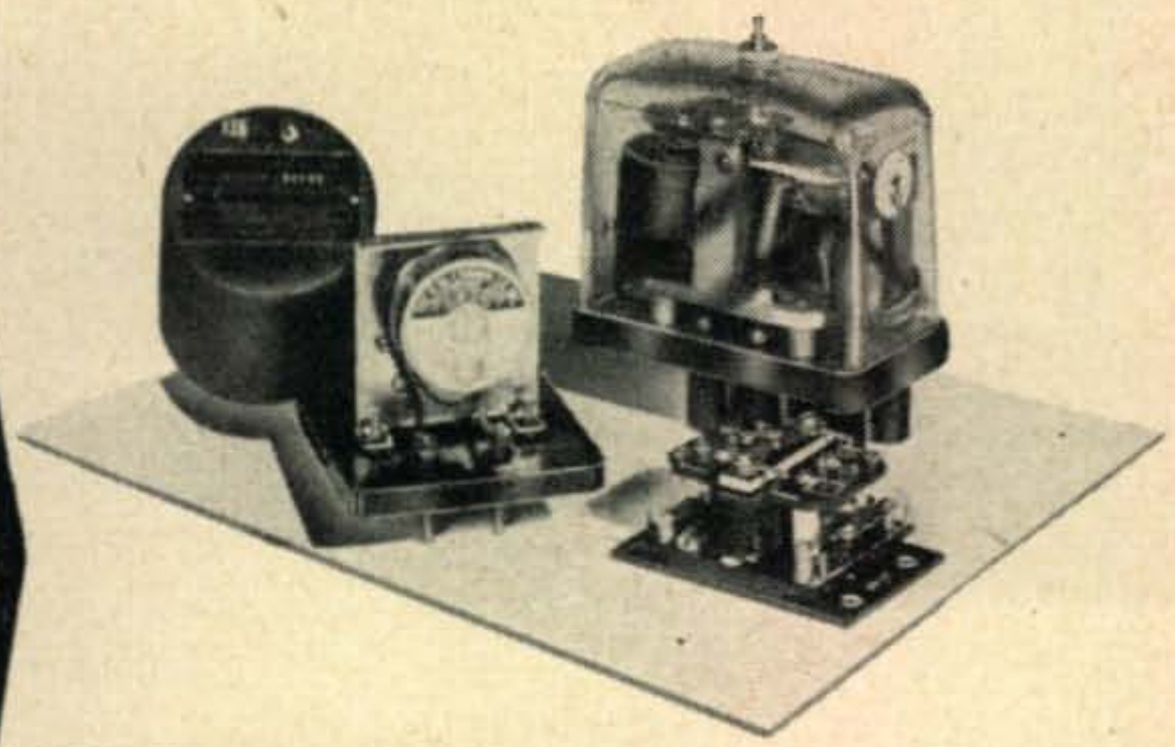

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R-579	220 VAC.	...	1B
R-294	27.5 VDC.	200	1B
R-686	115 VAC.	...	2C
R-246	115 VAC.	...	1B
R-246A	115 VAC.	...	1A
R-611	24 VAC.	...	1A/30 Amps.
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R-614	18/24 VDC.	60	1A/15 Amps.
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R-841	115 VDC.	1200	4A
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R-843	115 VDC.	1200	3A
R-844	115 VDC.	1200	3A, 1B
R-845	220 VAC.	Intermit	3A
R-831	7.5/29 VDC.	6.5	1A/250A, 1000A Surge
R-837	110 VAC.	...	2A/30 Amps.
R-835	24 VDC.	2800	1A Dble. Brk./10 Amps.
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said I, "a low frequency parasitic caused by resonances in the grid and plate r. f. chokes"). No, for with a carbon resistor substituted for the grid choke the corona continues. A sudden hunch caused me to grid dip the plate r. f. choke and—what do you think!—it had a resonance point right around 60 mc! The natural grid circuit resonance of 55 mc is resonanting with a spurious resonance of the plate r. f. choke. This all stops when the plate r. f. choke is shorted with a 10,000-ohm, one-watt carbon resistor.

The final is now complete! It is completely stable up to 4500 volts plate voltage at any frequency in the amateur range, regardless of tank condenser settings. There is no flash on the plates of the tubes as the key is lifted. It acts like any normal, self-respecting final is supposed to do. But it doesn't look like the final amplifier in the handbook any more!

Here is a summary of important modifications to a "standard" push-pull amplifier that are required to stabilize it:

1. Lower the resonant frequency of the grid circuit many megacycles below the resonant frequency of the plate circuit. At the same time, raise the natural resonant frequency of the plate circuit as high as possible to provide shortest possible ground returns for harmonics.
2. Make the neutralizing leads as short and as heavy as possible.
3. Bolt the plate tuning condenser directly to the chassis and eliminate the plate blocking condenser from the plate loop.
4. Use non-inductive condensers in the filament return circuit.
5. Use a wire wound resistor in the grid return lead instead of an r. f. choke. (Don't forget to include the value of this resistor in your bias calculations. I used a 400-ohm 25-watt resistor. It has a satisfactorily low Q).
6. If you use a high-Q r. f. choke, such as a solenoid-wound one in your plate circuit, shunt it with a 100,000-ohm one-watt carbon resistor to dampen parasitic resonances.
7. Bypass the "cold" end of this choke with a good non-inductive high voltage condenser. This will keep harmonics out of the power wiring that may slip through the plate choke at one of its resonance points.
8. Use parallel leads from the neutralizing condensers to the plate tuning condenser if the condenser is any distance from the tubes and neutralizing circuit.

Final note: Be very careful when conducting any tests such as these on your equipment. The high voltage must be applied at times so keep away from it when you are conducting the tests. Parasitics increase the danger to you and the equipment from accidental flashovers so be sure to have a cut-out relay. It is also a good idea to have a second person nearby—just in case. . . .

Where to get all this voltage? Well, you could wire your plate transformer up in a bridge circuit, or use condenser input temporarily. Just watch yourself! One slip, and you are "kaput." A word to the wise. . . . *73*

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INDEX TO CQ

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MEASURING FREQUENCY

(from page 29)

value indicates 3909 kc on the frequency meter. Subtract 4098.5 from 4099.1, and you should get .6. Refer to the chart and you will see that .6 represents 240 cycles, so the exact frequency being read is 3909.240 kc.

Thus this method makes is an easy matter to make frequency checks by a simple subtraction. The chart above is, of course, only good for my particular model 221, but the system can be applied to any model.

The making of charts for other amateur bands is simplicity itself, requiring only the multiplication of the chart values by 2 for use in the 7-mc band; by 4 for the 14-mc band, and by 8 for the 28-mc band.

By making a chart for each ham band you'll be able to give anyone a frequency check in less than ten seconds which will be as accurate as is possible to get with the BC-221.

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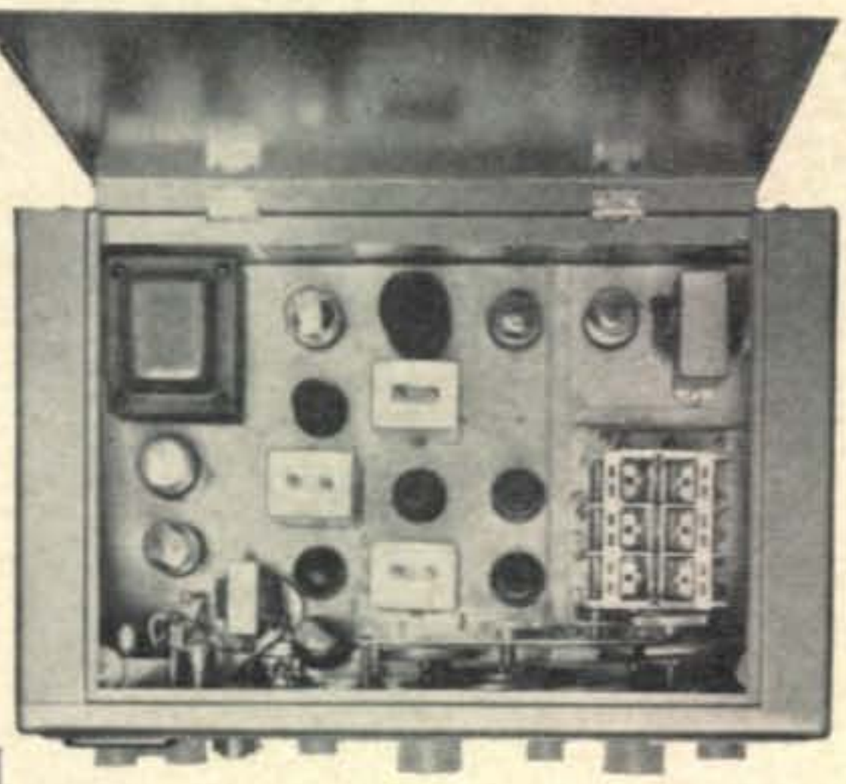

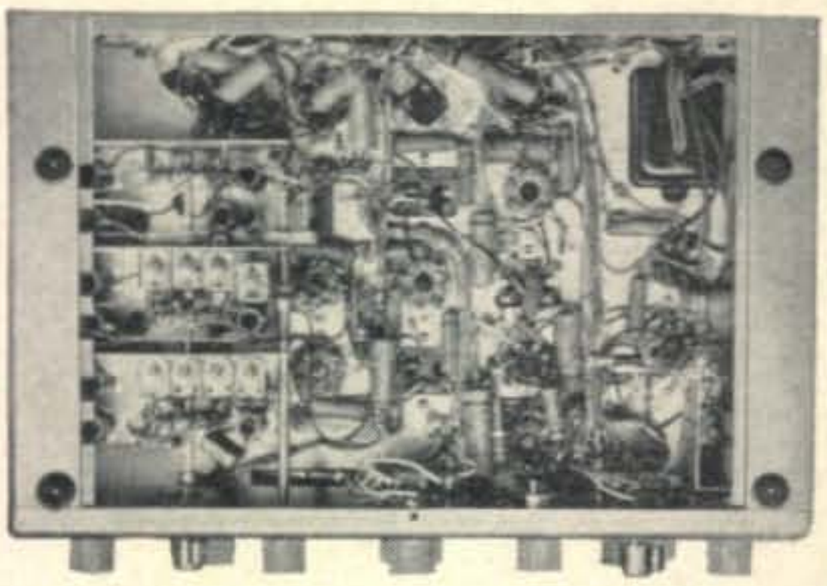

Lift the cover of the new NC-125. Look at the sturdy chassis, the quality of the National-made precision-wound coils, the solid construction of the tuning condenser, the dependability of the gear drive. Then remove the bottom plate and examine the cleanness of the cabled wiring. Especially in such a moderate-priced receiver, who but National builds like *this*?

NC-125	**$149.50***
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MALDEN, MASSACHUSETTS

THE RCA TUBE DEPARTMENT YULE LOG

CALL	NAME	CALL	NAME	REMARKS
W1OFS/9	Wally Pond	W2ZPD	Frank Neuner	
K2AH	George Rose	W2ZXI/9	George Flenner	
W2ADY	Bob Lord	W3CHV	LeRoy Wenger	
W2AYY	Horace Hanthorn	W3EJN	Charles Cramer	
W2BRP	Joe Evon	W3EOB	Fred Koeng	
W2CBL	George Jones	W3EWR	Dick Wenger	
W2CDP	Ken Bucklin	W3FEI	George Shenberger	
W2DGN	Russ Huntington	W3GJA	Art Jenkins	
W2FTW	Jim Owens	W3JRR	D. McKee	
W2FZV	Ed Smith	W3KBZ	Andy Rau	
W2GGV	Norm MacKenzie	W3KKX	Ted Schreiber	
W2GQK	John Sterner	W3KXA	A. D. Gordon	
W2HDW	E. Bartels	W3LIL	Andy Nekut	
W2HEA	A. G. Petrasek	W3MNX	Harry Pully	
W2IAR	Charles Poskonka	W3MZJ	Don Neighler	
W2IOP	Larry LeKashman	W3NFF	Hideo Takeuchi	
W2IYG	Clarence West	W3NOI	Bob Carvell	
W2JSX	Mattie Bell	W3NOK	Charles Nesslage	
W2KCN	Joe Pastor	W3OXG	Merrald Shrader	
W2LHP	Bob Cohen	W3PAX	Jim Weaver	
W2MDZ	J. P. Livingood	W3PGL	Gene Duckworth	
W2OWA	J. Row	W3PSK	Henry Kazanowski	
W2PUD	Dick Talpey	W3PTD	Dave Ballard	
W2QJV	Larry Freeman	W3QFQ	Norm Graham	
W2QLB	Syl Walczak	W3TLH	Merle Hoover	
W2RBO	Don Power	W3VAM	G. H. Urban	
W2RHB	R. L. Holtzheimer	W3VRR	Paul Klinko	
W2RVV	Tony Sariti	W3WSH	Bill Shaw	
W2RYI	Mack Seybold	KL7BV/W3	Frank Arams	
W2TQS	Herb McCord	W4AYT	Randy Frisbee	
W2UIJ	Dave Koch	W4MUR	Bill Jackson	
W2WCT	Hal Stamm	W8BPD	John Driver	
W2WDR	Jack Wasserman	W9EHF	M. Copan	
W2YM	George Hanchett	W9GZE	Steve Johnson	
W2YXL	Bob Klein	W9HYF	John Spooner	
W2ZGT	E. Coughlan	W9ZEE	Bob Stevens	
W2ZJU	P. Barna	WØPJO	Bill Benner	

Merry Christmas!
Happy New Year!
73 and good DX in 1951 — the gang

RADIO CORPORATION of AMERICA
ELECTRON TUBES HARRISON, N.J.