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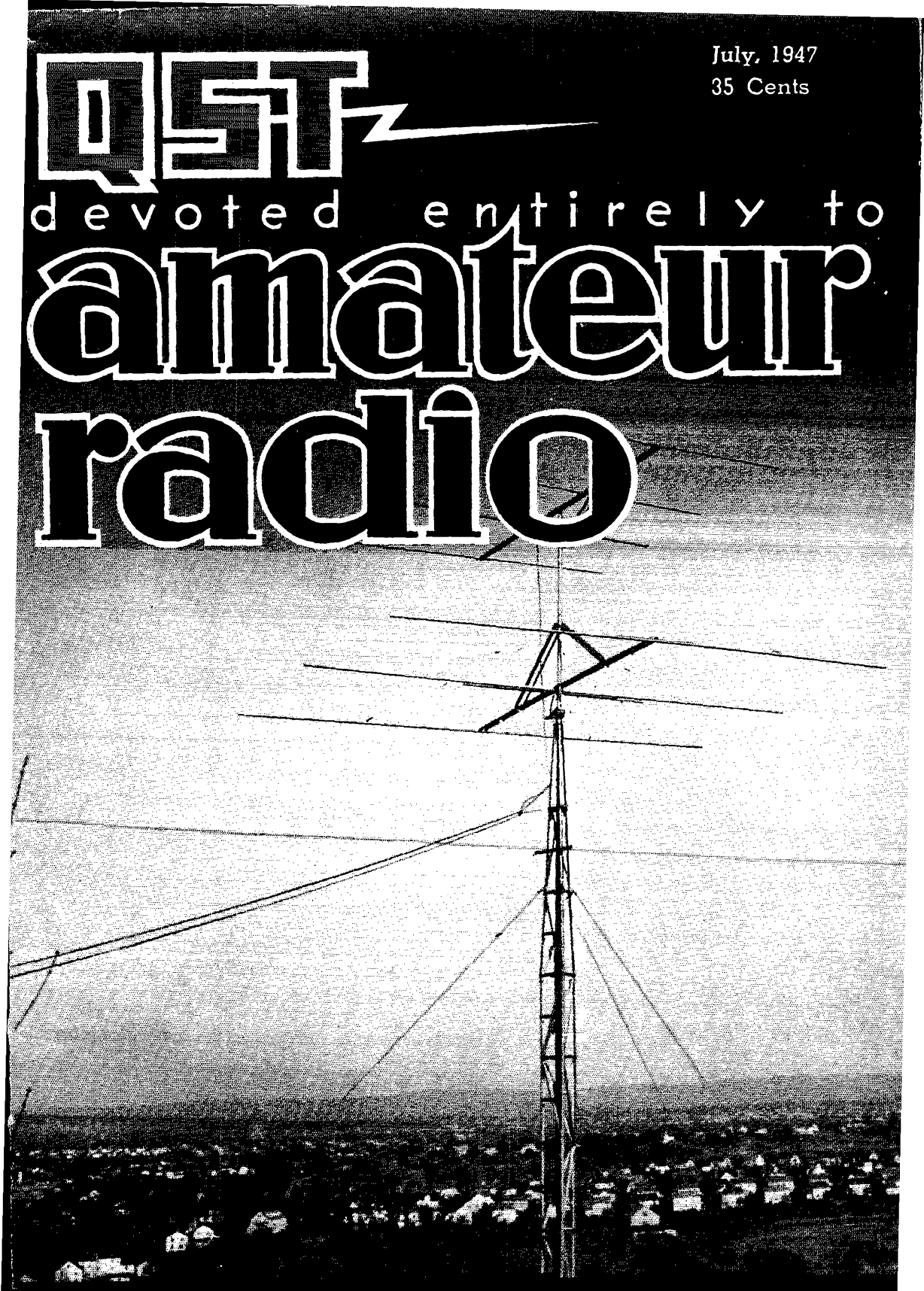

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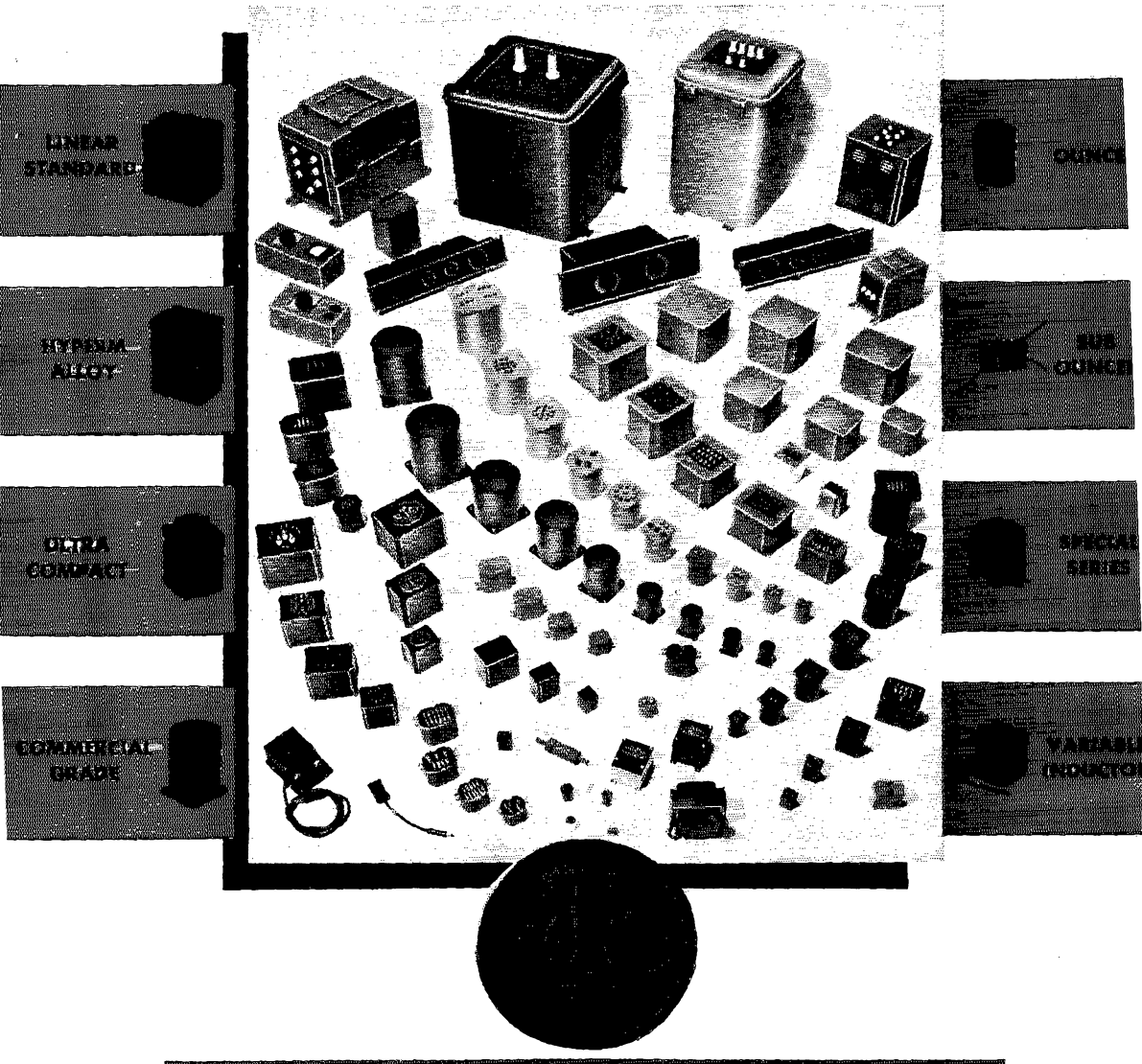

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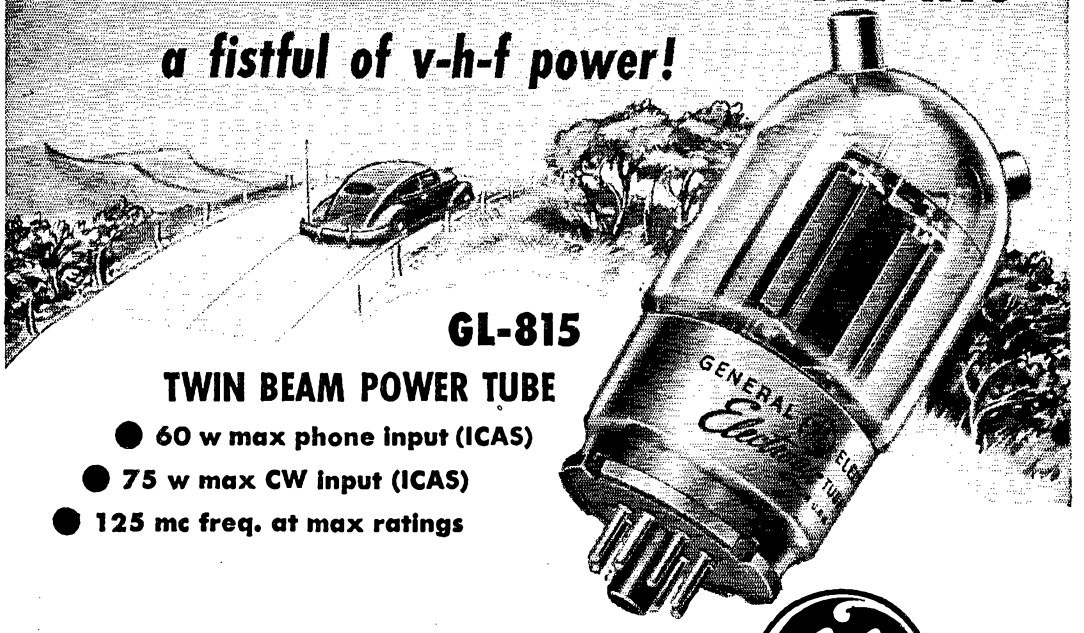
FOR YOUR PORTABLE-MOBILE RIG

a fistful of v-h-f power!



GL-815

TWIN BEAM POWER TUBE

- **60 w max phone input (ICAS)**
- **75 w max CW input (ICAS)**
- **125 mc freq. at max ratings**

THAT portable-mobile or portable rig you're building . . . chances are you've already "pegged" the GL-815 as the v-h-f power tube you want. Compact, modern—*two tubes in one*—Type GL-815 is your push-pull final wrapped up in a single efficient package.

Either half of the tube can be used separately, but common practice is to employ one GL-815 in push-pull as a final-stage amplifier . . . or, if you wish, as a Class B modulator tube with first-rate qualities.

For r-f use, input is sufficient to give your medium-power portable rig all the punch you need for "roving" work. And the tube's drive is extremely low (less than 0.2 w at max input), meaning slight additional drain on your battery power supply.

Design? . . . All that up-to-the-minute tube engineering implies! Clean, compact structure with short internal leads, excellent internal shielding, close electrode spacing—plus beam power efficiency! Also, Type GL-815 is *sturdily built* for hard service.

PRICE? . . . See your nearby G-E tube distributor, and be pleasantly surprised at the big dollar-value offered by the GL-815! Or write direct to *Electronics Department, General Electric Company, Schenectady 5, N. Y.*

ELECTRICAL CHARACTERISTICS

Cathode (indirectly heated)

	Series	Parallel
Filament voltage	12.6 v	6.3 v
Filament current	0.8 amp	1.6 amp

Avg interelectrode capacitances, each of two units:

Grid-plate (with external shielding)	0.2 mmfd
Input	14 mmfd
Output	8.5 mmfd

Tube Ratings for Typical Operation, Phone (ICAS)

Plate voltage	400 v
Screen voltage	175 v
Plate current	150 ma
Power output	45 w

ELECTRONIC TUBES OF ALL TYPES FOR THE RADIO AMATEUR

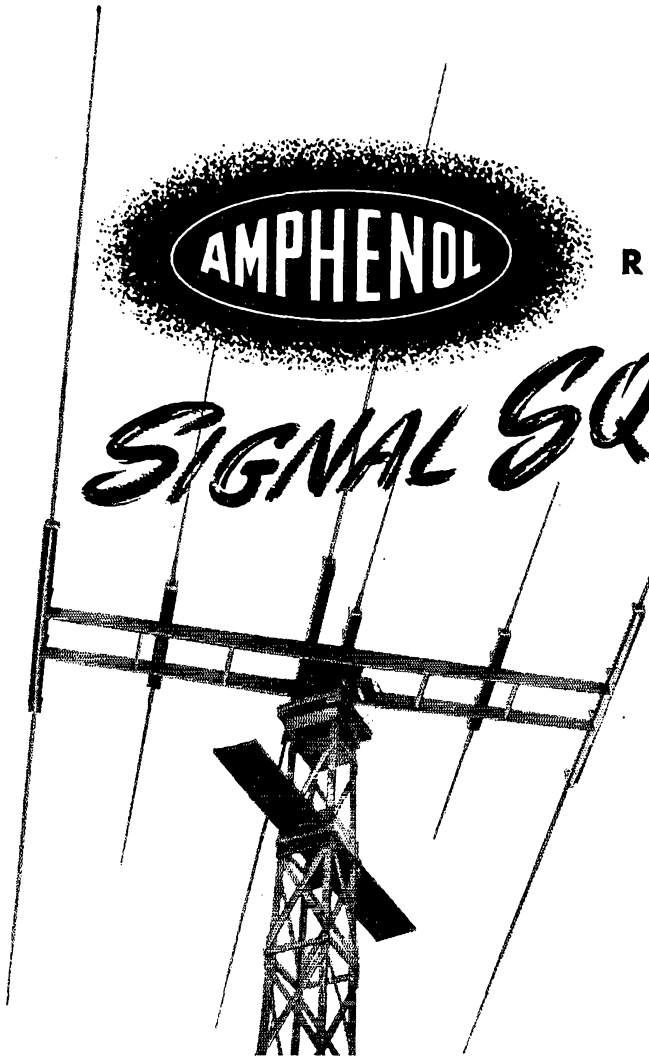
GENERAL ELECTRIC

161-F14-8850

AMPHENOL

ROTARY BEAM

SIGNAL SQUIRTER



The DX "Champ" on 10 and 20 Meters

- *Unlimited rotation either direction*
- *Inductostub matched coupling*
- *Two band operation*
- *Deluxe rotator*
- *Positive position lock*
- *High forward directivity*
- *High front to back ratio*
- *Rigid low-loss elements*
- *Easily tuned*
- *Durable and efficient*
- *Non-resonant transmission line*

EXTREMELY effective for reception as well as transmission, the Deluxe Dual-Three 10-20 Signal Squirter Antenna is the first rotary beam offering full performance on both 10 and 20 meters.

Each of the two three-element arrays is coupled to the line with a separate Inductostub inductive coupling. This feature provides for unlimited rotation in either direction without mechanical connections. Match between antenna and line is so simplified that the Signal Squirter can be assembled, installed and operated without tedious, complicated adjustments.

Field strength tests show the three-element array has better than 30 db attenuation over more than 180° to the rear, and approximately 40 db front to back ratio.

The strong, but light, Deluxe Rotator is made of quality materials. Weighing only 56 pounds, and having a base and top diameter of only 15 inches, the rotator delivers ample torque thru precision reducing gears. These are actuated by non-interfering motors. Mechanism is completely enclosed and weatherproof. A solenoid brake locks rotator in position.

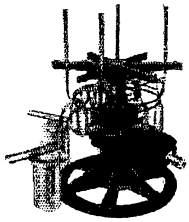
The selsyn indicator is synchronized with the array and always indicates the direction of the beam.

Center section and cross arms are light in weight, yet strong. Braced "T"-beam cross arms withstand high winds; three coats of the best synthetic enamel dependably protect them against weather.

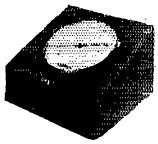
Signal Squirter Kit includes Rotator with mounted Inductostub assembly, direction indicator, center section, elements and insulators with all hardware ready for installation.

Detailed assembly and erection instructions included with each kit. See your Jobber, or write today for complete details on the Signal Squirter.

Manufactured under patent number 2,292,791



Deluxe Rotator



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QST

JULY 1947

VOLUME XXXI • NUMBER 7

PUBLISHED, MONTHLY, AS ITS OFFICIAL ORGAN, BY THE AMERICAN RADIO RELAY LEAGUE, INC., AT WEST HARTFORD, CONN., U. S. A.; OFFICIAL ORGAN OF THE INTERNATIONAL AMATEUR RADIO UNION

OFFICES

38 La Salle Road
West Hartford 7, Connecticut

Subscription rate in United States and Possessions, $3.00 per year, postpaid; $3.50 in the Dominion of Canada, $4.00 in all other countries. Single copies, 35 cents. Foreign remittances should be by international postal or express money order or bank draft negotiable in the U. S. and for an equivalent amount in U. S. funds.

Entered as second-class matter May 29, 1919, at the post office at Hartford, Connecticut, under the Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in section 1103, Act of October 3, 1917, authorized September 9, 1922. Additional entry at Concord, N. H., authorized February 21, 1929, under the Act of February 28, 1925.

— CONTENTS —

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...to give amateurs:

Built in the Hallicrafters Classic Tradition

The new SX-43 is built in the Hallicrafters classic tradition: providing custom quality, precision engineering, excellent performance and wide frequency range at a medium price. The SX-43 offers continuous coverage from 540 kc. to 55 Mc. and has an additional band from 88 to 108 Mc. AM reception all bands. CW on four lower bands and FM on frequencies above 44 Mc. In the band 44 to 55 Mc., wide band FM or narrow band AM, just right for narrow band FM reception is provided. This is a big-league, versatile, all-around receiver with the hottest ham performance ever offered at this price.

Added technical details on all these models in Hallicrafters New Catalog, No. 38. Ask your local distributor for a copy.

MORE VALUE

Never before all these features at this price

GREATER PERFORMANCE

AM-FM-CW . . . all essential amateur frequencies from 540 kc. to 108 Mc.

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Sets available after August 1947

New

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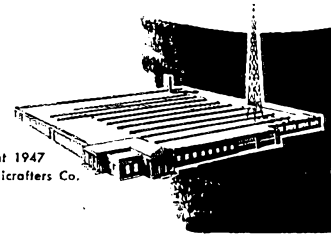

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Section Communications Managers of the ARRL Communications Department

Reports Invited. All amateurs, especially League members, are invited to report station activities on the first of each month (for preceding month) direct to the SCM, the administrative ARRL official elected by members in each Section. Radio Club reports are also desired by SCMs for inclusion in *QST*. **All ARRL Field Organization appointments** are now available to League members. These include ORS, OES, OPS, OO, and OBS. Also, where vacancies exist SCMs desire applications for SEC, EC, RM, and PAM. In addition to station and leadership appointments for Members, *all amateurs* are invited to join the ARRL Emergency Corps (ask for Form 7).

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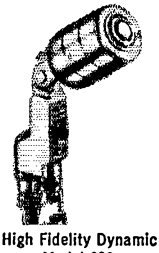

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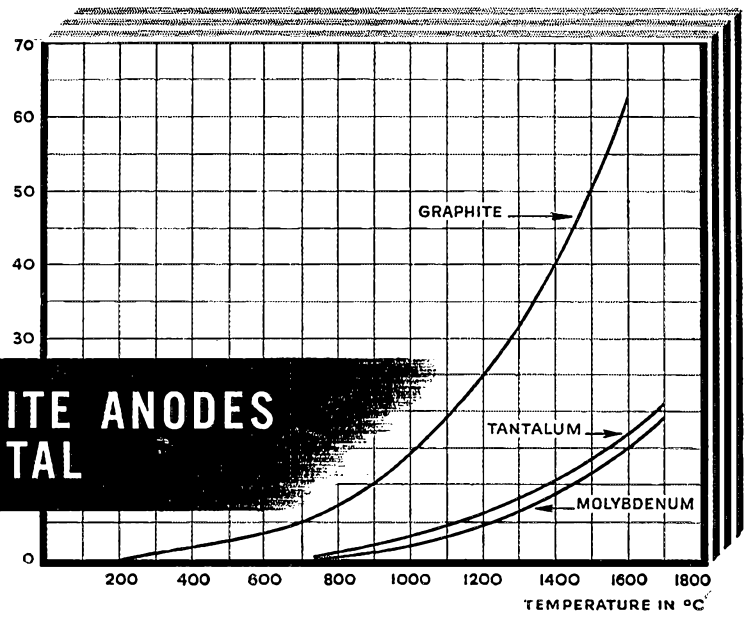

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is a noncommercial association of radio amateurs, bonded for the promotion of interest in amateur radio communication and experimentation, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is noncommercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its board.

"Of, by and for the amateur," it numbers within its ranks practically every worth-while amateur in the nation and has a history of glorious achievement as the standard-bearer in amateur affairs.

Inquiries regarding membership are solicited. A bona fide interest in amateur radio is the only essential qualification; ownership of a transmitting station and knowledge of the code are not prerequisite, although full voting membership is granted only to licensed amateurs.

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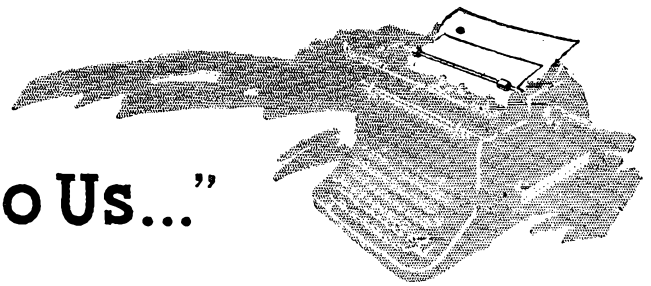
Fleming Road, Montgomery, Ala.

Southwestern Division

HANS R. JEPSEN W6KEI
6837 Ethel Ave., No. Hollywood, Calif.
Alternate: Arthur E. Schifferman, sr. W6CGI
1445 Raymond Ave., Glendale 1, Calif.

West Gulf Division

WAYLAND M. GROVES W5NW
P. O. Box 586, Odessa, Texas
W5NW at Humble Pipe Line Camp, Odessa
Alternate: Jack T. Moore W5ALA
4531 Fairway Ave., Dallas 4, Texas



"It Seems to Us..."

A WELCOME HAND

Although no one knows the precise number, in the past year about 8000 new licensees entered the amateur ranks. We're mighty "glad to have you aboard," OMs. We know that amateur radio needs an appreciable amount of new blood each year in order to remain a live and healthy family. Actually, we feel a special kind of down-deep warmth for you, perhaps because you take us back to our own beginnings and the evening we sat down to pound out our own call letters for the first time.

But right now there's one thing that worries us just a little. It's that we hear a lot of you are heading straight toward the 'phone bands for your first contacts, solely because you fear the boys on c.w. are too fast for you and can't be bothered with the slower code speed of the usual newcomer.

Shucks, OMs — tain't so. We all had to start sometime, and most of us pretty well remember and appreciate our own early difficulties. When on c.w. we're ready and willing to lend a helping hand anytime to assist you in gaining that operating confidence so necessary to the enjoyment of any kind of amateur communication. We've always encouraged the use of c.w. by the new amateur, just as we have urged that the first transmitter and receiver be home-built. C.w. is the basic form of amateur communication, a training class you should not cut. Don't shy from A1 simply because of the fear your code speed is a bit on the shaky side. Give us a call and request QRS. We'll be more than glad to comply.

But before we finish this Dutch-uncle routine, we want to say you must show that you have the desire and the initiative to improve your operating techniques and ability. Bear in mind that a poor operator is considered a "lid" only when he refuses to try to acquire operating skill. Get yourself a copy of *Operating an Amateur Radio Station*, free to ARRL members from Hq. on request, and make use of the efficient and practical procedures there specified. Then you can be sure you're off on the right foot.

So come on in, OMs, and join the fun on c.w. Find out for yourselves how coöperative the old-timer gang really is. For our part, we'll try to make every day a get-acquainted party. And we hope your first contacts are as pleasant as the one recounted below in an editorial reprinted from the February, 1933, issue of *QST*.

— *J. H.*

NIPPERS

Ever hear of "nippers"? It's a British expression — some of us Americans may need enlightenment. A nipper, be it known, is a cub — a beginner — a neophyte. Yet, to us, the word has always conveyed an atmosphere of verve and enthusiasm and youthful zest that isn't present in any of the other almost-synonymous terms. We've liked the word, for that reason, when we think of beginning amateurs. Brand-new amateurs. Young and hopeful ones. Nippers . . . egad!

Well, what we really want to get at is the idea of being courteous to beginners. Every once in a while, you know, some nipper writes us a letter filled with gratitude and a love of the world in general. In practically every case the reason behind the letter — and the feeling — is that said nipper has just started in the amateur game, had worked some well-known station, and that the OM of the w.k. station had been considerate and kind to the nipper. Invariably, such an experience causes the heart of the nipper to overflow with love of his fellow-amateur, and from that time on all amateurs are the salt of the earth.

Such a letter drifted in here a few days ago, and it reminded us that when we stop to think of it our own beginnings were similar. We lived in Washington, then, and our first halting steps as an amateur were with a half-inch spark coil. It is, perhaps, needless to say that this was many years ago — more than we begin to like to contemplate. But we got on the air, finally — somewhat nervous, decidedly self-conscious, more than a little doubting our ability to become an amateur at all. An initial rebuff would have sent us back to silence for another six months or year; a slight boost

would raise us to the heights. After all, when one breaks into the game, gets on the air for the first time, all other amateurs seem part of a glorious brotherhood, with ourselves the sole outsider, hesitantly going about the business of seeing if we, too, can enter the charmed circle. Every amateur, already on the air, is to our minds an accredited representative of the whole group, and speaking for it. An unpleasant experience with the first station we work, and it is not unlikely we will go away from there disillusioned, hating all amateurs.

We went on the air one afternoon. We didn't dare call another station. So we decided on a CQ, having a sneaking idea in the back of our head that this was a safe and cautious way to go at it. We could always pretend to have missed a reply, if the fellow behind it seemed too fast for us. We CQed . . . and then, to our utter dismay, an almost immediate answer boomed out from the crashing rotary of 3 – –, an amateur who sat in the seats of the mighty, one of the foremost stations in the country. Pretend not to have heard him? Impossible — he lived on the other side of the same town! There was only one thing to do and with shaking and clammy hand and the sweat of dispair on our brow we did it; we acknowledged the reply and, deciding to have it over with us quickly as possible, stuttered on to say we were having our first QSO as an amateur. Then we sat back, waiting for the axe to fall, waiting miserably for the terse sign-off that would indicate we were too small fry to bother with.

Ah, what a beautiful world it is, after all. And what a pleasant day that particular day was. We still remember it. For 3 – – came back, slowly and patiently, and asked us where we lived, welcomed us on the air and for half an hour kept pace with our plodding efforts, telling us about a club where most of the real amateurs went, inviting us over to his shack (we never had the nerve to take him up on it, but the mere invitation was enough), encouraging us in innumerable small ways and finally signing off with warm good wishes. It was too much for us. Amateur station "AB" (*circa* 1913) then and there went off the ether for the rest of the day, and we had to rush upstairs to tell the folks all about it and what a fine thing amateur radio was, and what great fellows amateurs were . . . all amateurs! It is one of the twists of fate that we never again worked 3 – – or even met him personally, but if he were to walk in the office while we are writing this we know we'd still feel that personal friendship toward him which was engraved so deeply twenty years ago.

An exaggerated account, or a unique experience? We think not. The letters we get nowadays prove such things still go on. And it is within the power of every one of us now on the air to hand out similar encouragement to such new hams as we may work tonight, or tomorrow, or next week. It takes but a few moments to buck up the newcomer, to show him a helping hand, and welcome him into the fraternity. It costs us but little, and the returns in goodwill are 'way out of proportion to the effort expended.

Now that January has come and gone, and we've broken all the usual resolutions we made — and expected to break — it might not be a bad idea to make a couple that will stick. And for us amateurs, it seems to us that one of the first might well be a determination to be tolerant with the stumblings of the beginner, to give a welcoming hand to the nippers of amateur radio.

—*A. L. B.*

A.R.R.L. QSL BUREAU

For the convenience of American and Canadian amateurs, the League maintains a QSL-card distributing system which operates through volunteer District QSL Managers in each call area. To secure such foreign cards as may be received for you, send your district manager a stationer's size No. 10 stamped self-addressed envelope. If you have reason to expect a considerable number of cards, put on an extra stamp so that it has a total of six cents postage. Your own name and address go in the customary place on the face, and your station call should be printed prominently in the upper left-hand corner. If you have held other calls in previous years, submit an envelope for each such call to the proper manager — there are many thousands of uncalled-for cards in the files.

W1, K1 — Charles Mellen, W1FH, 320 Cornell St., Boston, Mass.
W2, K2 — Henry W. Yahnel, W2SN, Lake Ave., Helmetta, N. J.
W3, K3 — Maurice W. Downs, W3WU, 1311 Sheridan St., N. W., Washington 11, D. C.
W4, K4 — Edward J. Collins, W4MS, 1003 E. Blount St., Pensacola, Fla.
W5, K5 — L. W. May, jr., W5AJG, 9428 Hobart St., Dallas 18, Texas.
W6, K6 — Horace R. Greer, W6TI, 414 Fairmount Ave., Oakland, Calif.
W7, K7 — Frank E. Pratt, W7DXZ, 5023 S. Ferry St., Tacoma, Wash.
W8, K8 — Fred W. Allen, W8GER, 1959 Riverside Drive, Dayton 5, Ohio.
W9, K9 — F. Claude Moore, W9HLF, 1024 Henrietta St., Pekin, Ill.
WØ, KØ — Alva A. Smith, WØDMA, 238 East Main St., Caledonia, Minn.
VE1 — L. J. Fader, VE1FQ, 125 Henry St., Halifax, N. S.
VE2 — Austin A. W. Smith, VE2UW, 6164 Jeanne Mance, Montreal 8, Que.
VE3 — W. Bert Knowles, VE3QB, Lanark, Ont.
VE4 — C. J. Campbell, VE4CC, 276 Ash St., Winnipeg, Manitoba.
VE5 — Fred Ward, VE5OP, 899 Connaught Ave., Moose Jaw, Sask.
VE6 — W. R. Savage, VE6EO, 329 15th St. North, Lethbridge, Alta.
VE7 — H. R. Hough, VE7HR, 1785 Emerson St., Victoria, B. C.
VE8 — Yukon A. R. C., P. O. Box 268, Whitehorse, Y. T.
KP4 — E. W. Mayer, KP4KD, P. O. Box 1061, San Juan, P. R.
KZ5 — Signal Officer, KZ5AA, Quarry Heights, Canal Zone.
KH6 — Andy H. Fuchikami, KH6BA, 2543 Namauu Dr., Honolulu, T.H.
KL7 — J. W. McKinley, KL7CK, Box 1533, Juneau, Alaska.

Meteor Detection by Amateur Radio

A New Field of Observation

BY OSWALD G. VILLARD, JR.,* W6QYT

• **You're combing through the DX bands when suddenly there's a strong burst of signal which rapidly dies down into the background. Where did it come from, and why? The "why" was probably a meteor trail; this article tells how to use these signals from shooting stars for systematic meteor observation, night or day, good weather or bad.**

An interesting and little-known portion of the rapidly-expanding body of knowledge now being assembled on the ionosphere is the subject of meteors and their effect on radio propagation. In a previous article,[1] the author told how Doppler whistles, caused by meteors entering the ionosphere, can be heard on the signals of high-power short-wave broadcasting stations. The purpose of this account is to describe a method of hearing meteor whistles and other effects on the signals of ordinary amateur stations, using straightforward receiving techniques. An amateur station can, in fact, be used for "counting" meteors automatically, with a sensitivity far greater than that of the human eye. That meteors can thus be painlessly "counted," when the sky is overcast or bright with daylight, should be of considerable interest to astronomers as well as to radio engineers concerned with the behavior of the ionosphere, for the new technique of meteor detection by radio promises to yield valuable information in both fields of knowledge. Meteor spotting therefore provides the inquisitively-minded amateur with an interesting opportunity to put his hobby to use in gathering worthwhile scientific information.

Meteors are much in the spotlight of public attention these days, because the V-2 and similar rockets are rapidly encroaching on that domain of the upper air once inhabited exclusively by shooting stars and fireballs. An important question is: what happens when these two different manifestations of matter collide? Will the embryo space ship be completely destroyed, or only punctured like a partridge riddled with buckshot?

These and similar interesting speculations are left to the Jules Vernes of our time. As far as the present discussion is concerned, it suffices that radio has been shown to provide a new tool for the study of meteors. In view of cosmic hiss and solar static, radio equipment may some day be as commonplace a piece of astronomical gear as the telescope.

Some Facts about Meteors

Meteors are, in a very real sense, the driftwood of outer space. They are simply particles of matter — the rubble left over, perhaps, when our solar system was constructed. The particles are graded as to size: the very largest, fortunately, are quite rare; yet the very smallest are so numerous that counting them strains the imagination. Particles large enough to survive the plunge through our atmosphere are called meteorites. There is a crater in Arizona *one mile in diameter and 600 feet deep*, caused in prehistoric times by the impact of one of these visitors hurtling in from outer space.

The meteors one sees ordinarily are astonishingly small in size — perhaps as big as a pea. On an average night the casual observer will see between two and eight meteors of this size per hour. If a count like this could be maintained over the entire surface of the earth for a period of twenty-four hours, the grand total would be about 24 million meteors. If all the meteors of *all* sizes which strike the earth every 24 hours could be counted up, the total would come out to be some eight billion meteors!

The most remarkable thing about meteors is their speed. We must think of the brilliant flash of a falling star as being caused by an object hurtling through space at something like 25 miles per second, or about 50 times as fast as the V-2. It is small wonder that when these tiny pellets of cosmic dust collide with particles of our atmosphere, a violent reaction ensues. Those air molecules unfortunate enough to find themselves in the path of a meteor are given a tremendous acceleration by the impact. Glancing off at various angles, they in turn collide with other molecules, and so forth. The resulting agitation is not unlike that produced by the passage of electricity through the rarified upper air, and the result is a visible glow similar to that of the gas in a neon sign. The same ionization that produces the glowing streak, or tail, of the meteor, can also reflect radio waves. Another example of a visible glow produced by ionization is the aurora borealis, which is caused by a mechanism as yet not too clearly understood. Six-meter enthusiasts who have made DX contacts by pointing their beam

* Department of Electrical Engineering, Stanford University, Calif.

[1] O. G. Villard, jr., *QST*, p. 59, January, 1946.

arrays directly at the aurora, thus bouncing signals back from its sides, have taken advantage of the reflective properties of an ionized region.

Most meteors are distributed more or less uniformly in space and appear at random intervals from random directions. There are certain times of the year, however, when these sporadic meteors are supplemented by clouds of cosmic dust particles all traveling in the same direction, which produce displays called meteor showers. The shower meteors are bits of matter sloughed off by comets, and they follow along the same path as the parent comets even though the comets themselves may have long since burned out or disappeared.

Whistles & Bursts

The effect of meteors on radio propagation has been speculated upon and studied for many years. Ionosphere investigators in 1933[2] found a change in the over-all level of *E*-layer ionization during a meteor shower. Later, sudden unexpected rises and dips found in charts of radio field strength were traced to meteors.[3] In 1941 reflections from meteor trails were detected on ionosphere echo-sounding records.[4] Not long thereafter, the Doppler whistles caused by the motion of the meteor trails were discovered,[5] and during the war 100-megacycle radar echoes from meteor ionization were identified and reported.[6] Moreover bursts of signal received beyond the normal range of f.m. stations were connected with meteors.[7]

Recently, however, research in this field has gone ahead rapidly. During the Giacobini-Zinner meteor shower of October 9, 1946, the wartime radar detection of meteors was duplicated with great success,[8] while at both Stanford University[9] and at Harvard University[10] meteors were detected by their Doppler whistles as well. If there had been any doubts up to that time that meteors were the cause of the effects previously noted, they were removed on what meteor investigators will remember as "G-Z day."

Each meteor, entering the ionosphere about 50 or 60 miles up, produces a thin cylinder of very intense ionization until it is burned out or dissipated. Oddly enough, only some 10 per cent of the total energy in a meteor is wasted in friction; the remaining 90 per cent is spent in producing ionization. Moreover, the speed of a meteor changes very little (perhaps 10 per cent) during its brief life, and its course is, for all practical purposes, a straight line.

It is conjectured that the intense ionization contained in the thin cylinder rapidly diffuses outward, thus increasing the diameter of the ionized region. However the intensity of the ionization contained in the cylinder is thereby decreased, and its level soon drops below that required to reflect a radio wave of given frequency. At any frequency, then, the strongest reflection from a meteor trail will be obtained when the dimensions of that trail are such that the largest volume of ionization is present of an intensity sufficient to reflect that frequency. If a very high operating frequency is picked, the cylinder of ionization is capable of reflecting a signal only when it is relatively small in diameter, for only then does it have sufficient intensity. And a small cylinder will return only a weak signal because of its small "echoing area." When the radio frequency is up in the several hundreds of megacycles, the size of a cylinder capable of reflecting those frequencies is so small that only a very feeble reflection can be obtained. Consequently meteor reflections have not so far been noted on frequencies much above 100 megacycles. On the other hand, when lower frequencies are used, the cylinder of ionization can become quite large and still reflect a signal.

The energy reflected from meteor trails produces two different types of effects noticeable at the receiver when c.w. signals are used. The mechanism involved is illustrated in Fig. 1. It is assumed in this sketch that the transmitting and receiving aerials are so located and orientated that direct signal from the transmitter is reduced to a very low value (of the order of a few microvolts) at the receiver. The frequency must be high enough so that no reflection from the ionosphere directly overhead is obtained. Moreover it should be so high that no "long-scatter" signals are returned from points some distance away. In fact, the ideal frequency to use is one just high enough so that no long-distance transmission in any direction is possible, since "long scatter" cannot then exist. Under these conditions it will be readily possible to hear bursts of signal reflected from the sides of the meteor trails, as well as Doppler tones produced by signals scattered from the moving head of each trail. Energy scattered back from the moving head of the ionization columns arrives at the receiver via a path of rapidly-changing length. This path-length change causes an apparent shift in the frequency of the reflected signal, which in turn gives rise to an audible beat note when the reflected signal is combined with energy reaching the receiver via a path of unchanging length.

Once the column of ionization has become fully formed, the signal reflected from it traverses a path of constant length so that no Doppler shift, and hence no beat note, occurs. As far as the receiver can tell, the signal from the transmitter has then suddenly increased in

[2] Mitra, Syam and Ghose, *Nature*, p. 533, Feb., 1934.
[3] J. A. Pierce, *Proc. I.R.E.*, p. 892, July, 1938.
[4] J. A. Pierce, *Physical Review*, p. 625, 59, 1941.
[5] Chamanlal and Venkatamaran, *Electrotechnics*, p. 28, 1941.
[6] O. P. Ferrell, *Physical Review*, p. 32, 1946.
[7] *Electronics*, p. 105, Jan., 1945.
[8] Bateman, McNish, and Pineo, *Science*, p. 434, November 8, 1946.
[9] L. A. Manning, et al., *Physical Review*, p. 767, Nov., 1946.
[10] J. A. Pierce, *Physical Review*, p. 88, Jan., 1947

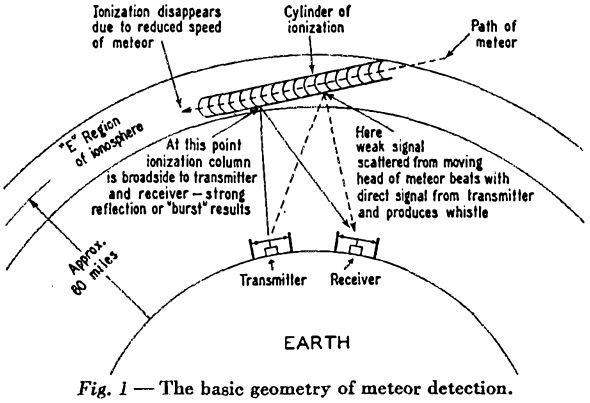


Fig. 1 — The basic geometry of meteor detection.

strength; this sudden increase is called a "burst." The burst will be strongest when the position of the column of ionization is such that a line can be drawn from the transmitter and receiver perpendicular to the cylinder at some point. There results a broadside reflection that will be much stronger than the signal scattered back when the column is so positioned that this cannot occur. (It should be remembered that the *E* region of the ionosphere, where meteor ionization occurs, is a relatively thin layer.) The effect is analogous to the flash of light when sunlight is reflected by a mirror into the eyes of an observer. The mirror can be *seen* at all times — which is to say it reflects back *some* light — but only when it is correctly orientated does it produce a flash.

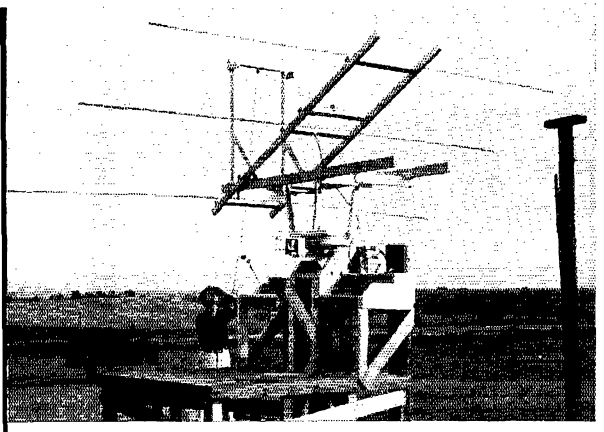
Of the two effects — "Doppler whistles" and "bursts" — the latter are, of course, much more easily detected, because the broadside reflection is so much stronger than the scattered energy returned from the moving head of the average meteor trail. However, the strength of the "whistle" is not so dependent on the orientation of the meteor's path. The head of the column of ionization, being small and of rounded shape, apparently scatters signals back well in many directions. Consequently most meteors that are large enough will produce a whistle. However, only those meteors which travel along exactly the proper path will produce a pronounced burst.

This difference in behavior of "whistles" and "bursts" is readily noticed in practice. Using the set-up described in this article, one often hears the telltale whistle of a meteor boring into the ionosphere, without any perceptible change in received field strength — or "burst" — whatever. These whistles correspond to the meteors that caromed off in such a way that no broadside reflection could occur. Then again, one notices "bursts" without hearing any accompanying whistle. These "bursts," it is reasoned, are produced by meteors following the correct path for broadside reflection, but so small that the energy scattered from their moving heads cannot be heard. The most dramatic-sounding meteors of all are those that begin with a high pianissimo whistle and end with a low, fortissimo grunt, or "burst." Here the "burst" occurs when the meteor trail passes the point at which it can return a broadside reflection. Interestingly enough, this point is also the point at which the Doppler beat note goes to zero, since when the meteor is moving along a path perpendicular to a line drawn between the meteor and the transmitter and receiver, there is no change in path length and hence no Doppler shift of the radio frequency.

It has been found that the ratio of whistles to bursts is rather sharply dependent on the operating wavelength. If one listens to short-wave broadcasting stations in the 25- or 31-meter bands, one hears a relatively large number of whistles as compared to the bursts, although the latter are somewhat obscured by the variable "long-scatter" signal always present. Many of the whistles last as long as one or two seconds. In the 27-Mc. band, however, the whistles are less frequent than the bursts and they are of shorter duration. It is likely that at still higher frequencies (say 100 Mc. or so) whistles would be heard much less frequently, if at all. The bursts also become of shorter duration as the frequency is increased. At 27 megacycles, the average burst is about half a second in duration. At 50 megacycles, they appear to be still shorter. When the receiver beat oscillator is off, bursts sound like a "thump"; with the beat oscillator on, they sound like a sharp "ping."

Detecting Meteors

The experimental set-up used at Stanford University to detect meteors is extremely simple. The radiated signal is provided by the Stanford Radio Club's transmitter, W6YX. Input to the final stage is 950 watts. Two types of transmitting antennas have been successfully used: the first is a simple half-wave doublet roughly 16 feet long and 8 feet above the ground, giving a radiation pattern consisting of a broad lobe pointed straight up. The doublet was supplanted by the arrangement shown in the photograph. This is nothing more than a three-element beam so arranged that it can be directed vertically upward, or to any intermediate angle, by means of a rope and pulley. A rotatable transmitting antenna is a great help in reducing the signal radiated in the direction of the receiver, since the null off the ends of the elements can be found experimentally and pointed in the direction of the receiving site. This null may or may not be exactly aligned with the direction of the elements,



Something different in beam antennas: the W6YX tiltable three-element rotary! The antenna can be pointed vertically for meteor detection, as well as horizontally for ham QSOs.

depending on whether the system is exactly balanced to ground or not.

Directivity is not necessarily an advantage in the transmitting antenna, since power gain is obtained by decreasing the width of the beam, which cuts down the area of the sky from which meteor reflections can be obtained. The practical effect is to make the number of echoes heard less frequent. Those which are heard, however, are stronger.

The receiving location at Stanford is an experimental building about a mile away from the amateur transmitter and somewhat below the direct line of sight. The receiving equipment is shown in the second photograph. For purposes of illustration, the NC-200 receiver is shown outside the building — it is normally located inside where there is a heater! A ten-foot post, set in the ground, supports the 16-foot 2-by-4 on which the 11-meter dipole antenna is mounted.

The unique feature of this antenna is that it not only can be turned in any desired direction but can be tilted at will. It is connected to the supporting post by what is in effect a swivel joint. Tilting and turning is accomplished by means of fishlines tied to the ends of the antenna; an awkward method, but one that works! The object is to find that position of the receiving antenna at which the direct signal from the transmitter is almost completely balanced out. Just why this antenna must usually be tilted in order to find the null is not very thoroughly understood; it is conjectured that local distortions of the field by reradiation from adjacent antennas, power lines, etc., gives the incoming wave a polarization that is far from horizontal. It is commonly observed that the apparent direction of arrival of a signal, under similar circumstances, may be far different from the true direction. However, this much can be said for the tilted antenna: in all cases, no matter how bad the unbalance to ground, or how many the obstructions (such as cars) close at hand, it has always been possible to find a sharp null by properly rotating and tilting it. The signal from the transmitter at the receiving site is about 30 db. above S9 on the NC-200 S-meter when a nondirectional antenna is used; using the dipole, this signal can be reduced in strength until it drops into the noise level.

There is no special reason why the receiving and transmitting antennas were located as close together as they were at Stanford, except convenience. As a matter of fact, the closer they are together the more difficult it is to find and maintain a deep null, and the receiving antenna must often be tilted until it is far from horizontal. These difficulties can be avoided by greater separation between transmitter and receiver. If the separation is great enough it may be possible to do away with special receiving and transmitting antennas entirely, provided the aerials available shoot the majority of their power toward the zenith.

It is important that a sensitive receiver be used for meteor detection, and that the antenna be properly matched to it. Receiver sensitivity, in this case, is the equivalent of transmitter power; with the latter set at the 1-kilowatt maximum, and antenna directivity restricted, system performance can only be improved by improving the receiver. The best indication of a receiver's sensitivity is the change in noise level when the first tuned circuit is tuned through resonance with the gain control wide open and with no signal being received. Unless there is a noticeable change when this is done, the set simply isn't sensitive.

The procedure used in making the tests was to radiate an unmodulated signal from W6YX, null out this signal at the receiving site, and then maintain an aural and a visual watch for meteor reflections. Tests of any duration were made in the 11-meter band, where AØ operation is permitted. The transmitter was identified by keying the call letters every ten minutes.

When To Listen

The arrival of a meteor will be announced either by a brief whistle audible over headphones or loudspeaker, or by a sudden "kick" of the receiver's S-meter. Often the whistle and kick will nearly coincide. The pitch of the whistles in most cases descends rapidly to zero, ending in a "grunt." In some instances it may go to zero and then start to rise again, showing that the meteor has approached, passed by at right angles, and then begun to recede. In most cases, however, the meteor will pass through the ionized region or will burn itself out before an "up" whistle can be formed.

Receiver and tilting 27-Mc. dipole antenna used for receiving meteor whistles. The antenna is rotated and tilted by means of fishlines until the direct signal from the transmitter is balanced out.

♦

An oscillogram of a meteor whistle is shown in Fig. 2. This oscillogram, believed to be one of the first of its kind, was made by transcribing a phonograph recording of the whistle on a 16-mm. motion-picture sound track. At the left of the record (time runs from left to right) will be found random fluctuations caused by the noise output of the receiver in the absence of meteor signal. These fluctuations gradually become regular as the whistle fades in, and the downward change in pitch can readily be seen. As the whistle pitch goes to zero, the strength of the reflected signal increases and presently the receiver is blocked by the "burst" or broadside reflection. The background noise accordingly disappears. The burst then fades away and as the set recovers, the noise again puts in its appearance. During the burst, when the receiver noise is absent, a series of regularly-spaced marks will be found on the record. These are 15-c.p.s. timing pulses added to give an idea of the duration of the burst.

The best hours for hearing meteors, unfortunately, are the wee small ones early in the morning. This is because the earth, while performing its daily rotation, is at the same time moving forward in space along the track of its yearly orbit around the sun. From midnight on, that tiny speck of the earth's surface that we call "home," is moving forward in space at a speed equal to the *sum* of the motions resulting from the earth's spin and that of its orbital travel. During the afternoon and early evening hours the net forward speed of "home" is the *difference* of these two motions. The situation is the same as that of a fly clinging to the rim of a moving wagon wheel, considered with respect to the road's surface. The fly is moving forward faster when he is on the top of the wheel than when he is down near the road. When our portion of the earth is moving forward in space most rapidly, the ionosphere directly above us runs into the most meteors, and vice versa.

However, meteors can be "heard" in the late morning and early evening hours too; they are simply less frequent, and it may be necessary to wait a longer time to hear one. It has been found that the fishing is best between the hours of 2 and 4 in the morning. Interestingly enough, these are the best hours for visual observation as well.

On ordinary nights, the number of bursts heard on 11 meters with the set-up described above varied between something like 40 or 50 per hour during the early evening hours, up to something over two hundred per hour during the early morning hours.

The number of whistles heard was roughly one tenth the number of bursts. (A reduction in transmitted power will not greatly affect the number of meteors detected. In the course of some tests with the W6YX buffer-amplifier, whistles and bursts were plainly heard with a radiated power of roughly 150 watts. And no attempt was ever made to improve the performance of the receiver by adding additional r.f. preamplification!) In the vicinity of the various meteor showers the number will be considerably greater. The Lyrid meteor shower of April 21, 1947, caused an increase of roughly 3 times in the number of meteors "heard," for example.

There follows a tabulation of the nine principal meteor showers each year, taken from Reference 6:

Name	*Duration in Days*	*Date of Maximum*
Quadrantids	3	Jan. 2
Lyrids	4	April 20
Eta Acquarids	8	May 2–4
Delta Acquarids	3	July 28
Perseids	35	Aug. 11–12
Orionids	14	Oct. 19–23
Leonids	3	Nov. 14
Andromedes	2	Nov. 24
Gemenids	14	Dec. 11–13

The above dates should be taken as only approximate, as there is a variation from year to year. The exact dates of each shower may be obtained in advance by consulting such publica-

Fig. 2 — A sound-on-film record of a meteor whistle and burst. A — random set noise before appearance of meteor; B — the "whistle," starting with a high pitch at the left and rapidly descending to zero-beat at the right; C — the "burst," when the signal strength washes out the receiver noise; *D* — the burst tailing off, set noise increasing; E — signal no longer perceptible and set noise again dominates.

The "ticks" in the burst region (C-D) are time signals at intervals of 1/15 second, so the major burst signal lasted approximately 1/4 second in this instance.

tions as *Sky and Telescope* magazine, which may be found in any public library.

A great many other things will be heard as well as meteors. Since the receiver must be wide open, with the direct signal from the transmitter reduced to so low value that it does not operate the receiver's a.v.c. or cause any change in gain, there will be a continuous roar of set noise in the loudspeaker. Needless to say, a receiving location that is electrically quiet is essential. Any cars moving in the vicinity will give rise to reflections which will upset the balance; they usually give rise to a fluttery motion of the S-meter needle and a low-pitched rumble in the loudspeaker.

Some Possibilities

It is extraordinary to think that meteor trails, occurring as they do some 50 or 60 miles from the observer, should be able to reflect radio signals of about the same strength as airplanes flying overhead roughly one mile away. Yet, echoes from strong meteors often kick the NC-200 S-meter up to S9 or above. The size of the ionized region produced by a meteor must clearly be large. If an airplane, which can be thought of as an irregular object approximately 100 feet in diameter, returns an echo of given strength at a distance of 1 mile, an irregular object such as a meteor trail must be at least 50 times as large in order to return an echo of equal strength at 50 miles. This implies that the meteor trail must be roughly 5000 feet or one mile in diameter. Moreover, since the tests were made at 11 meters, with the transmitter and receiver virtually at the same place, *the ionization contained in this trail must be intense enough to reflect an 11-meter wave fired directly at it, i.e. — at vertical incidence!* Presumably if this ionization is allowed to diffuse outward until it is only strong enough to reflect, say, a 7-Mc. wave at vertical incidence — which is a level of ionization commonly encountered in the normal ionosphere — the diameter of the ionization column would then be very much larger.

It is, of course, also possible for radio signals to be reflected from meteor trails at glancing incidence, as might be the case when transmitter and receiver are a hundred or so miles apart and a horizontally-traveling meteor passes over the midpoint of the path. Meteor ionization of given intensity would then reflect radio signals of very much higher frequency. The 6-meter band "opening" during the Giacobini-Zinner meteor shower, reported by E. P. Tilton and others, is an example of this effect. Similarly, the 144-Mc. reflections observed by G. R. Abell, jr.,[11] the momentary 28-Mc. band openings reported by B. Henke,[12] etc., are in all probability caused by the same mechanism. It is interesting in this connection to note that the Federal Communications Commission has recorded at its monitoring station at Grand Island, Nebraska, bursts of signal reflected by meteors from an f.m. station in Boston, Massachusetts, operating in the 42-Mc. band![13] This 1400-mile transmission represents about the maximum possible distance for one-hop *E*-layer propagation.

Although there is no doubt that meteors *can* cause the effects described in this article, the evidence at hand is not by any means extensive enough to make it possible to say that they are the *only* cause. Cosmic-ray bursts, for example, have been seriously proposed as a source of momentary radio reflections. It is furthermore quite possible that whatever mechanism produces sporadic *E* could also give rise to signal "bursts" of brief duration.

To heighten the mystery still further, although a great many coincidences between visually observed meteors and whistles or bursts have been obtained at Stanford (and it is really impressive to see a big meteor go sailing overhead while listening to its whistle in the loudspeaker!) it has nevertheless been found that a certain percentage of the meteors fully bright enough to be heard by radio, and apparently occurring in the correct portion of the sky, are simply not heard at all.

It is therefore clear that a count of whistles or bursts cannot yet be relied upon to give an indication of the *absolute* number of meteors colliding with our atmosphere; however, as an indication of the *relative* number, the method is very sensitive and consequently holds much promise. The behavior during showers, as well as the observed nightly maxima between 2 and 4 A.M. shows that meteors play a very large — if not the sole — part in the formation of whistles and bursts.

But further observation is needed, and in this field the radio amateur is in a position to make a unique and important contribution to our common knowledge of the ionosphere. Anyone owning a medium-powered transmitter and a sensitive receiver can use them to spot meteors on cloudy nights as well as clear. Reports of meteor ionization effects observed are needed and would be most useful. The author will be glad to correspond with anyone interested in this type of work.

Acknowledgment

The experiments described in this article have been carried out jointly by W. E. Evans, jr., R. A. Helliwell, W6MQG, L. A. Manning, W6QHJ, and the author. Members of the Stanford Radio Club who have assisted in various ways include: L. A. Roberts, W6YWX, R. O. Beaudette, W7FXI, and J. W. Menne, WØLTW.

[11] G. R. Abell, jr., *QST*, p. 48, Nov., 1946.
[12] Bruce Henke, *QST*, p. 61, Jan., 1947.
[13] Federal Communications Commission Docket No. 6651, Sept. 28, 1944.

A One-Man Skyhook

Building a Simple Portable Mast

BY L. L. LEWIS,* WØBQT

A SKYHOOK always is a problem to the ham, especially to one who isn't so fortunate as to live close enough to Nature to be able to make use of a handy tree. The brass pounder who owns his home can put up a heavy structure with some assurance that he can make use of it for a few years to come, but those who for one reason or another must move about from time to time must think twice before putting up a stick which isn't as portable as the furniture. The author happens to be in the latter class.

The mast shown in the photograph has several desirable features. It is easy to build and erect. Although it is constructed of light wood, it is rigid and strong and the height may be extended to forty feet or possibly more. Only three guy wires are used. After all the pieces have been cut to fit, the mast can be set up in about an hour by one man and is just as easily dismantled for moving.

As the photograph shows, in general the mast follows the popular "A"-frame pattern. Each of the two legs consists of a 20-foot 2 × 2 at the base and a 20-foot 1 × 2 at the top. The two pieces in each leg are overlapped about one foot and

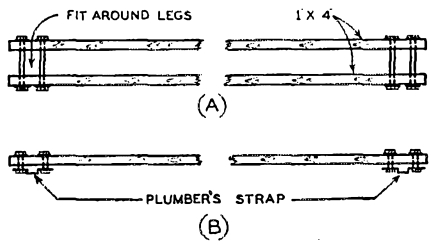


Fig. 1 — Sketch showing details of wood cross-braces and method of fastening.

fastened together with carriage bolts. The spacing between the legs tapers from about six feet at the bottom to zero at the top where the tips of the 1 × 2 pieces are fastened together.

Five horizontal spacing strips from leg to leg are used at intervals between the base and the top of the mast. Those at the bottom of the legs (not shown in the photograph) and at the overlapping joint between the two sections of the legs are pieces of 1 × 4, the one at the joint consisting of two pieces, one piece on each side of the joint. The others are single strips of 1 × 2. Strips of 1 × 2 also are used for diagonal bracing in the center sections. Diagonal wire braces with turnbuckles are used between the base and the first horizontal brace. Additional diagonal bracing near the top may be added if desired.

The legs are not drilled for the cross-bracing. The double horizontal brace at the center of the mast is made in the form of a clamp, as shown in Fig. 1A. The other horizontal braces are fastened to the legs with brass screws and the joints are strengthened by metal pipe straps as shown in Fig. 1B. The diagonal braces are bolted together where they cross each other and also where they cross horizontal braces. At the points where they make a diagonal butt joint with the legs, they are fastened with long thin brass screws.

Only three guys are necessary with this mast. Since the legs are fastened to anchors in the ground, no side bracing is required. (This often helps when neighbors are unwilling to make concessions to the advancement of the art!) Two guys are bridled to the leg joints at the center, one running directly forward and the other to the rear. The third guy fastened to the top of the

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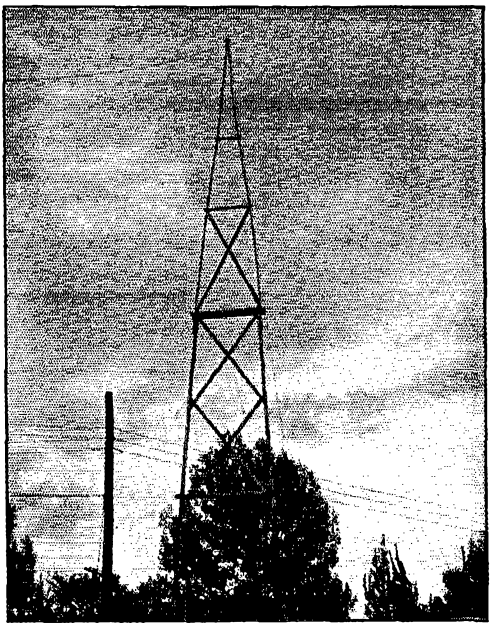

A forty-foot lightweight mast made of 1 × 2 and 2 × 2 lumber. Wire cross-bracing is used at the bottom. A 1 × 4 spreader at the base does not show in the picture.

mast runs back to oppose the pull of the antenna.

Knowing the distance from the ground to the point where the lower guys are attached, and the distance from the base of the mast to the front-guy anchor, it is easy to calculate the length of the front guy by taking the square root of the sum of the squares of these two distances. With the mast laid out on the ground pointing forward from the base and the feet pivoted at their anchors, the front guy wire should be measured off and fastened to its anchorage. Then the mast should be lifted so that a stepladder or other prop can be placed under its center. If this doesn't raise the mast high enough to enable it to be pulled up into position with the back guys, the front guy may be loosened up a foot or two and the mast "walked up" the rest of the way by hand. There should be no danger in doing this if the weather is calm, since the front guy will hold the mast in a slightly tipped-back position until the rear guys can be fastened. The mast then can be straightened up.

With proper fittings at the top and the addition of a fourth guy wire forward from the top, the structure should support a lightweight rotatable array. It has been up several seasons and has withstood a number of windstorms and blizzards. It has been raised and lowered several times by one person and once was transported over a hundred miles along with the household goods.

HOLD the presses, Mr. Printer! — E. H. Armstrong has just given an anxiously-waiting radio world the details of his startling new invention, superregeneration. In fact so much importance has been placed by radio men on this long-rumored discovery that *QST*'s staff went all out to have the report of its salient features make the pages of the July 1922 issue. Amazingly simple are its circuits, we learn from the month's leading technical article, which also gives a review of superregenerative theory as expressed in the inventor's IRE paper. Mr. Armstrong promises amateurs further information on practical hook-ups at an early date.

M. W. Burnham, prominent British radio manufacturer, has paid his Transatlantic wager and Editor Warner is now sporting a new topper. It's a handsome headpiece adorned with hand-paintings of both the Union Jack and the Stars and Stripes, symbolizing Anglo-American amateur coöperation in the successful ocean spanning.

Beverage antennas and British receiving equipment, both lively topics of discussion since the Transatlantics, are aptly treated in this issue. E. B. Dallin, W1FK, authors "Some Suggestions Regarding the Beverage Antenna," presenting the theory, dimensions and performance data of this radiator. "Some British Tube Equipment" reports Headquarters tests of an actual model of the Burnham Ultra III receiver, a unit utilizing honeycomb coils, sans tuner.

Rounding out the month's technical fare, L. C. F. Horle's excellent paper, "Modulation in Radio Telephony," traces the development of the radiophone art from the early days of absorption modulations to present-day grid and plate modulation, and George E. Hokes' "Notes on the Design of Small C. W. Transformers" presents a wealth of information for the constructor.

The Hoover Cup for 1921, for the best all-around amateur station in which the major portion of the apparatus was homemade, has been awarded to Louis Falconi, 5ZA, Roswell, New Mexico, by unanimous vote of the Board of Direction. A 200-watt c.w.-i.c.w. rig, 1 kw. spark and variometer-type regenerative receiver make up the equipment of this outstanding station.

Recent months have seen the successful completion of the Police Chiefs Relay and the New England Division Daylight Tests, as reported this issue. The time-sharing operations of Chicago-area amateurs, which contributed substantially to the smooth working of the "Chicago Plan," are explained in detail by Central Division Manager Mathews.

Members, meet the Headquarters gang! This issue pictures the rapidly-growing League staff at a recent dinner. Among those present are President Maxim, Secretary Warner, Circulation Manager Houghton, Assistant Editor Phelps and Traffic Manager Schnell. "Who's Who" pictorially introduces Northwestern Division Manager Howard F. Mason and Florida District Superintendent M. F. Harrod. Station descriptions feature 7XG, Portland, Oregon. Eunice Randall, 1CDP, is shown at the microphone of radiophone WGI, pursuing her nightly chore of reading bedtime stories.

The proposed new radio bill of the Department of Commerce is printed for the information of the membership. There is hope among the fraternity that in its adoption there will be found an end to the confusion presently reigning in the broadcast bands.

OUR COVER

Shooting the dual 6-10 array at W1HDQ, with the West Hartford horizon in the background, was a tough assignment for our photographer, but he finally managed it from a precarious position on the ridgepole of the old Selden Hill house. Details of the all-metal array appear on page 52 of this issue.

Low-Frequency N.F.M.

And the Differences Between Frequency and Phase Modulation

BY BYRON GOODMAN,* W1DX

• F.m. and p.m. seem to be surrounded by more mystery than a.m. ever was. With experimental bands soon to be available at 3.9 and 14.2 Mc., interest in the subject should be increased considerably, so the following article is intended to clear up some of the hazy points. A simple p.m. modulator is described for those who want to get in on the ground floor.

Now that narrow-band frequency (and phase) modulation may soon be permitted in portions of the 3.9- and 14-Mc. bands, this seems like a good time to look at some of the points that have not been covered in recent issues of *QST*. There seem to exist several popular misconceptions of just what the modulated carrier of an f.m. or p.m. signal looks like and acts like, and it is the purpose of this article to attempt to dispel these ideas and replace them with clearer pictures.

Everyone is familiar with pure amplitude modulation — a simple picture of the distribution of energy in the spectrum of an a.m. signal is shown in Fig. 1. The carrier frequency is represented by a single vertical line, as in 1-A. If the carrier is modulated by a single frequency, F, of sufficient amplitude to produce 100% modulation, frequencies called "sidebands" are developed on either side of the carrier, with an amplitude equal to one-half the carrier amplitude as in Fig. 1-B. They are spaced in frequency from the carrier by the amount in cycles equal to the modulating frequency, as indicated by $+F$ and $-F$, relating to the carrier frequency. If the modulating power is made up of a complex wave that can be resolved into two frequencies, as in Fig. 1-C, sidebands occur for each of the two components of the modulating frequency. Speech is a complex form that is practically always made up of two or more frequencies. However, the important thing to remember about a.m. is that *for each modulation frequency, there exists a single pair of corresponding sidebands, and no more.* The simple representation in Fig. 1-C does not necessarily take into account the relative phase of the modulating-frequency components, but it is adequate to consider that the sideband amplitudes never exceed half the carrier amplitude for 100% modulation. Further, when a sideband on one side of the carrier is at a maximum, the corresponding sideband on the other side is also at maximum.

Frequency and phase modulation do not lend themselves to such simple pictures. It is generally understood that frequency modulation is obtained by changing the carrier frequency at the frequency of the modulation, and the greater the amplitude of the modulation the greater the frequency change, or *deviation*, from the mean carrier frequency. Phase modulation, on the other hand, is obtained by shifting the *phase* of the carrier frequency at the modulation frequency, and the greater the amplitude of the modulation the greater the phase change. With a little thought it can be seen that as the phase of the carrier is changed, by speeding up or slowing down the r.f. alternations during the audio modulation cycle, the *frequency* of the carrier must change at the same time, since more or fewer alternations than normal must occur during the speeding-up or slowing-down process. Hence f.m. and p.m. are similar in that the carrier frequency is changed during the modulation cycle.

Then it starts to get complicated! When a single tone is used to modulate a carrier in either phase or frequency, not a single pair of sidebands results, as with a.m., but theoretically an *infinite* number of sidebands develops. The magnitude of the sidebands depends upon the amplitude of modulation, with the sidebands close to the carrier being the larger and the remote sidebands existing only theoretically for all practical

* Assistant Technical Editor, *QST*.

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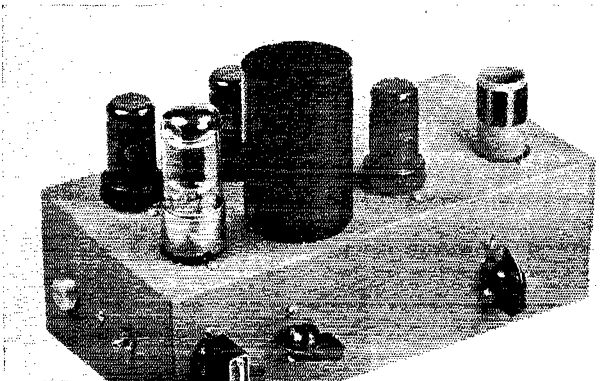

A simple phase-modulator unit that can be used to drive the average crystal-oscillator stage. Receiving tubes are used throughout, and the output is about one watt. The black shield houses one of the coils. Power plug and gain control are at the rear.

July 1947

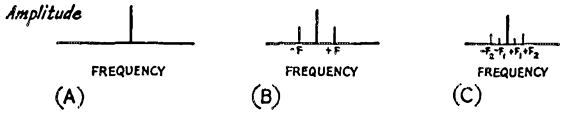

Fig. 1 — Spectrum analysis of an a.m. signal. The unmodulated carrier is shown at A, modulation by a single audio frequency is shown at B, and modulation by two frequencies is represented in C. There is a single pair of sidebands for each modulating frequency, and the sidebands are removed from the carrier by that frequency.

purposes. To examine the procedure in an orderly fashion, assume a carrier modulated by a single 1000-cycle tone. With very little modulation, only the first pair of sidebands have any significant amplitude, and the picture looks similar to the one for low-percentage amplitude modulation. As the degree of modulation is increased, the second and third and higher-order sidebands begin to be significant, as shown in Figs. 2-B, 2-C and 2-D. Notice that the sidebands occur at regular 1000-cycle intervals. This is a significant point, since many seem to believe that f.m. (or p.m.), can be made to occupy less spectrum space than a.m. by keeping the frequency swing low. Such is not the case — the instant *any* modulation is applied to the carrier, sidebands exist removed from the carrier by the modulation frequency. Fig. 3. shows how the amplitude of the sidebands varies with the index of modulation — for some degrees of modulation, some sidebands disappear and so does the carrier. Also, some pairs of sidebands will be out of phase with each other for high degrees of modulation.

Modulation Index

What we have elected to call "degree of modulation" in the above discussion is more correctly known as the "modulation index." The modulation index is defined, for f.m., as the ratio $\frac{\triangle f}{F}$, where $\triangle f$ is the frequency deviation and F the highest modulation frequency. For p.m., it is defined simply as the phase change, in radians (one radian = 57.3 degrees). The curves in Fig. 3 apply to either f.m. or p.m., if the modulation index as described above is substituted for "degree of modulation."

The definition of modulation index helps to clarify the distinction between f.m. and p.m. and how their audio characteristics differ when rectified by the same detector system. In an f.m. system, for example, a modulation index of 2.0 means that the maximum deviation divided by the highest modulation frequency is equal to 2.0. If the top audio frequency is, for example, 5000 cycles, then the maximum deviation will be ± 10 kc. The f.m. transmitter with an index of 2.0 and a top audio frequency of 5000 cycles will deviate ± 10 kc. for full modulation *at any audio frequency below 5000 cycles.* Any greater deviation doesn't mean "overmodulation" as we know it for a.m., but simply that the signal can no longer be described as having an index of 2.0. If the detection system is designed to give maximum output for a deviation of ± 10 kc., then a greater deviation will result in distortion *in this detector,* and it might be described as "overmodulation," but only for that particular detector. Whether the modulating signal is 100 or 5000 cycles, maximum undistorted output from the detector will be obtained when the deviation is ± 10 kc. in either case. Note that this represents a modulation index at 100 cycles of 50. If Fig. 3 were extended to values of index ("degree of modulation" in sketch) of 50, it would be found that the total number of significant sidebands would be multiplied enormously. But with the modulation frequency of 100 cycles, these sidebands are now only 100 cycles apart, and actually the significant sidebands (less than 30 db. down) do not extend out as far as the fewer but more widely separated sidebands of the 5000-cycle modulation frequency. It is therefore readily apparent from the examples in this discussion that, with f.m., the modulation index gives rather incomplete information on the band-width unless the highest audio frequency is also specified.

In p.m. and any given modulation index, the *number and amplitude* of the sidebands are exactly the same for any single modulation frequency, since the index in this case is only the number of radians of phase swing either side of zero required to give the phase modulation. However, the sidebands are separated by the modulation frequency, so a low frequency of modulation will result in a narrow bandwidth and a higher modulating frequency will cause the signal to occupy more spectrum space. If the index is low (0.5 or less), so that only the first sidebands can be considered as significant, this gives a spectrum picture quite similar to that for a.m. Fig. 4 illustrates the comparative spectrum space occupied by f.m. and p.m. signals for different modu-

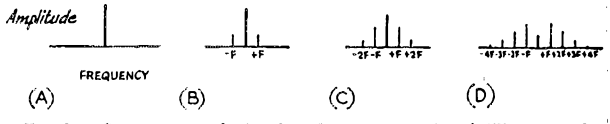

Fig. 2 — Spectrum analysis of an f.m. or p.m. signal. The unmodulated carrier is shown at A, and modulation by a single frequency is shown in B, C, and D. B corresponds to a low degree of modulation. C and D show what takes place as the modulation is increased. All sidebands are spaced an amount equal to the modulating frequency. Note that the amplitude of the carrier decreases as the modulation is increased.

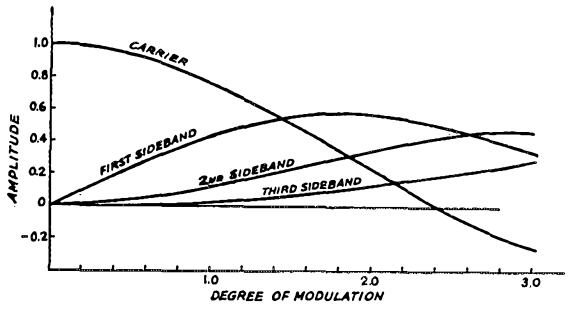

Fig. 3 — Showing how the amplitude of the sidebands of an f.m. or p.m. signal varies as the modulation is increased. If the curves were extended for greater values of "degree of modulation," it would be seen that the carrier value goes through zero at several points, as do the various sidebands. Amateur n.f.m. and n.p.m. should be confined to a degree of modulation equal to 0.5 or 0.6, so the additional sidebands are not significant.

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lation indices and modulation frequencies.[1] The p.m. pictures show immediately why pure p.m. received on an f.m. detector will be lacking in "lows," since the f.m. detector requires that modulations of equal intensities but different frequencies have roughly the same deviations. The condition can be corrected, of course, by attenuation of the "highs" at the transmitter or receiver. The latter is generally more convenient, since most receivers have a "tone" control that can be cranked over to give the necessary attenuation of the higher frequencies.

One point worth noting about p.m. is the fact that it does not necessarily require a long string of frequency multipliers following it in order to obtain a usable index. Readers familiar with the Armstrong system of f.m. know that p.m. is used at a low level and converted to f.m. Such a system does require considerable multiplication, for reasons that will be described, but this is only because f.m. is the desired end product. It is not impossible to obtain an index of 0.5 in p.m. without any multiplication, and, indeed, this seems to hold the most promise for simple work on the 75-meter band.

Reference to Fig. 5 will show why f.m. obtained by phase modulation requires so much multiplication. For a p.m. signal, plotting deviation *vs.* modulating frequency gives the solid line sloping up from the origin. Since f.m. requires nearly the same deviation for all modulating frequencies, it is necessary to modify the audio characteristic, as shown by the dotted line. This results in the f.m. characteristic indicated by the dashed line, but note that it reduces the deviation to that obtainable through p.m. at the lowest usable audio frequency. To minimize distortion, the phase modulation is held down to a low level anyway, and the total result is a very low modulation index at the control frequency. Such technique is not necessary in amateur work, and hence p.m. looks good for our low-frequency bands. Phase modulation suffers in its ability to reject noise, but this is not under discussion, although it is of course a big point in the Armstrong system, and accounts for the use of f.m. and a high index.

It is important that one more point be clarified in this discussion. The pictures given for single-tone f.m. or p.m. show a rather discouraging bandwidth for any narrow-band application, if exactly the same condition were to hold for complex modulation by two or more frequencies. However, when a complex wave is used to frequency- or phase-modulate a carrier, the resulting sidebands are not the same as would be obtained by superimposing the pictures of modulation by the component tones. The existence of the sidebands in f.m. or p.m. always results in the reduction of the carrier-frequency amplitude (see Figs. 2 and 3), and the *total* energy always remains the same. If two sets of sidebands exist, corresponding to two modulation frequencies, both of these sets of sidebands draw from the carrier, and the resultant effect is to reduce the

[1] The information for these sketches and for Fig. 2 was obtained from Hund's *Frequency Modulation*, McGraw-Hill Book Company, an excellent text for further study of the subject.

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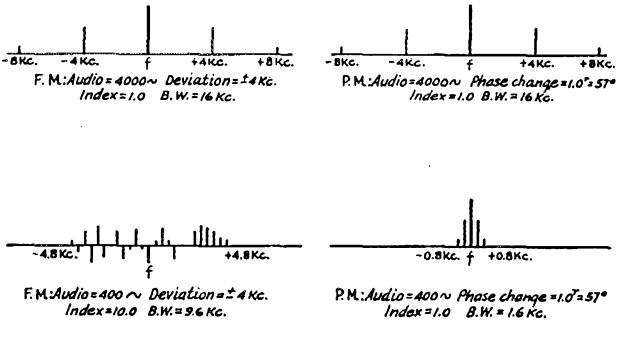


Fig. 4 — A comparison of the bandwidths of f.m. and p.m. signals for different modulation frequencies. A modulation index of 1.0 and an upper frequency limit of 4000 cycles are assumed. Note that the sketch for f.m. with an index of 10 (lower left) shows the relative phase of the sidebands. Bandwidths are based on neglecting sidebands down more than 30 db.

amplitude of the sidebands, since the carrier sets the limit on total available energy. For this reason, a single audio frequency will yield higher-order sidebands than will a complex wave of the same amplitude. This means that a single tone applied to an f.m. or p.m. signal may show several sets of sidebands, while voice modulation of the same amplitude will not show as many. As a result, speech occupies less channel space than a single tone of the top frequency existing in the speech for a given modulation index.[2]

Index Multiplication

Another point that is often confusing is what happens to f.m. and p.m. signals at the harmonic frequencies of the carrier. At first glance, one might think that, if a carrier is frequency-modulated at its fundamental by a 1000-cycle tone, to give a pair of sidebands removed from the carrier by 1000 cycles, then the carrier *and the sidebands* would have harmonics, and so the sidebands would move out from the carrier at the harmonic frequencies. However, this is not the case, any more than it is with a.m. Unfortunately, there is no simple physical picture that can be given of the process of modulation of any type. We all know that sidebands are generated under modulation, and it can be shown readily by mathematics that the sidebands will appear. We

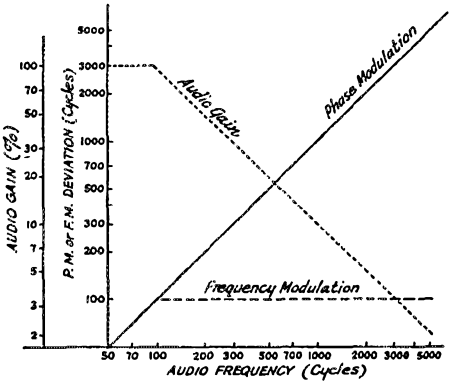


Fig. 5 — The necessary audio correction (dotted line) to correct a p.m. characteristic (solid line) to f.m. (dash line). Note that this limits the resultant f.m. deviation to the highest uncorrected p.m. deviation. This is the principle used in wide-band f.m. transmitters, but it is not necessary for amateur work.

can show the existence of the sidebands with a "spectrum analyzer," but they just seem to be something we have to accept on the basis of mathematical and practical proof. It isn't too many years since the "great sideband controversy" raged between the English and American engineers, the English holding that sidebands existed only in the mathematics.

[2] Crosby, "Carrier and Side-Frequency Relations with Multi-Tone Frequency or Phase Modulation," *RCA Review*, July, 1938.

The harmonics of the carrier result from distortion of the carrier in some nonlinear element, such as a vacuum tube. But the sidebands are a result of the *operation* performed on the carrier (a change in amplitude, frequency or phase). The change of frequency or phase is multiplied in direct proportion to the frequency multiplication generating the carrier harmonic frequency, but the sidebands set up are the same as those produced by direct modulation of a carrier fundamental but with the greater index of modulation. Hence in most f.m. and p.m. work it is customary to do the modulation at a low frequency and frequency-multiply until the necessary index is obtained.

Measuring Bandwidth

It will be necessary for any operator using narrow-band f.m. or p.m. to check his transmissions and to be sure that his signal is occupying no more spectrum space than an a.m. signal, in keeping with the definition of n.f.m. The future of f.m. and p.m. in the amateur bands depends on those who use it during the trial period and, since it is proving to be such a boon to those heckled by BCI, it would be unwise and unfair to jeopardize its future by giving it a bad name on the air — and with the FCC monitoring stations. For this reason, it is the duty of every user of f.m. and p.m. to do his best to insure that his equipment is properly checked and monitored. Unfortunately, this is not a simple problem, and no such clean-cut solutions as exist for a.m. are known at the present time.

In the case of wide-band f.m., it is possible to apply single-tone modulation and increase the modulation until the carrier disappears.[3] This corresponds to an index of 2.4 for the first disappearance of the carrier, and 5.5 for the second. This is not a convenient method, however, for a station operating on 14 or 28 Mc., unless the operator has access to stable receiving equipment at 56 Mc. or some such high harmonic frequency. One would then establish the audio level required to give the necessary deviation, knowing that the index would be divided by the order of multiplication, and then keep his modulation below this level, by means of a 'scope or some other audio-level indicator. Figuring on an operating index of 0.6 at the operating frequency, this method would require a 56-Mc. receiver to check a 14-Mc. signal and a 112-Mc. receiver to check a 28-Mc. n.f.m. transmission, either one with excellent frequency stability and good selectivity. A 3.9-Mc. signal can be checked, of course, by a receiver capable of tuning to 15.6 Mc.

Another method, which is unfortunately beyond the reach of most amateurs, is to use a special "spectrum analyzer" designed for n.f.m.

[3] Crosby, "A Method of Measuring Frequency Deviation," *RCA Review*, April, 1940; also: Grammer, "Getting on 56-Mc. F.M.," *QST*, June, 1940.

This is an instrument similar in principle to a panoramic receiver, but in this case it requires a few refinements such as a crystal-filter i.f., a slow sweep rate, and a long-persistence screen (to handle the slow sweep rate). Such a device would make an excellent club project, but it is hardly likely to become standard ham-shack gear. However, it is quite possible that it will be the sort of thing the FCC monitoring stations will use for checking amateur n.f.m. transmissions, since it offers an instantaneous picture of the bandwidth. This is no hardship on the n.f.m. gang, however, because the same instrument turned on maladjusted a.m. signals would also tell the sad story about them.

Since the precise methods are involved and expensive, we must fall back on something a little more simple and less complicated. One redeeming feature of n.f.m. is that one can listen to it as it will sound on the air without turning on the whole transmitter, and this provides an excellent opportunity to do all the testing without putting the signal into an antenna. By tuning in the harmonic of the n.f.m. unit on the band where operation is to take place, one can get a rough check on the bandwidth by noting how much room the signal takes in comparison with a.m. signals on the same band. The most precise method available to the average amateur to measure the bandwidth is to use his communications receiver and its crystal filter as a sort of "poor man's spectrum analyzer." If the receiver is accurately calibrated in kilocycle steps — which means that the absolute calibration can be off but the kilocycle divisions accurate — or if a suitable calibration chart can be made to find out how many dial divisions per kilocycle exist at the operating frequency, the problem is fairly simple. The receiver must be stable, of course, and any measurements should only be made after a suitable warm-up period. Suppose, for example, that one is setting up his f.m. or p.m. signal in the 14-Mc. band. The oscillator and possibly one or two following stages are turned on, to give a reasonable signal in the receiver tuned to 20 meters. The signal level should be equivalent to an average signal in the band, as judged by the S-meter, and it may be necessary to short the input of the receiver to get it, unless the oscillator and other stages are operating at a low power level. The receiver crystal filter is set to its sharpest position, the b.f.o. is turned on and the a.v.c. turned off. It may be necessary to reduce the r.f. gain slightly, to avoid overload of the receiver. Tune the carrier on the peak of the crystal and set the b.f.o. for the usual beat note, around 500 or 600 cycles. If the receiver is accurately calibrated, either by the manufacturer or by the operator making a calibration curve, detune it exactly 3 kc. If the calibration isn't available, it will be necessary to modulate the f.m. or p.m. unit with a 3000-cycle tone, which can be obtained from an audio oscillator built or borrowed for the occasion. The 3000-cycle modulation will cause sidebands to appear on either side of the carrier, spaced by 3000 cycles, and one of these will serve as a reference point. The amplitude should be kept low, so as not to introduce more than one pair of detectable sidebands.

After the receiver setting is established 3 kc. off the carrier frequency, talking into the microphone and experimenting with various voice levels will give some level at which the voice is heard to splash over occasionally. This represents the upper limit of modulation level that should be used. Once the proper level has been established, it can be monitored by a 'scope or other voice-level indicator connected in the audio amplifier ahead of the frequency or phase modulator, unless one is willing to run the risk of depending upon the setting of the gain control and one's memory of his voice level, bearing in mind his responsibility not to give n.f.m. a bad name, or the FCC a chance to tag him. There is nothing simple that can indicate directly from the carrier, as in a.m. work, since a properly-adjusted f.m. or p.m. transmitter will be accompanied by no amplitude changes under modulation.

If the operator's voice is naturally high-pitched, the 3-kc. figure may be slightly unfair, and perhaps 3.5 or even 4 kc. is a more reasonable limit. However, there aren't very many necessary components existing in normal speech that run this high, if there are any, and they are just as likely to be introduced by distortion in the audio amplifier or modulator. The best practice, as in a.m., is probably to limit the upper response of the audio amplifier to the useful frequencies below 3 or 3.5 kc., by means of suitable filters.

A Simple Phase Modulator

During the past few years, a number of different types of phase modulators have been described in the literature. The new Raytheon cascade-modulation system[4] is interesting, but it requires a number of stages and the tuning procedure does not lend itself too well to rapid frequency change, as is often required in amateur work. Other systems using balanced modulators in one form or another are at a disadvantage mainly because their apparent complexity will frighten a few potential customers for p.m., although they are actually quite satisfactory in every respect.

One of the attractive things about p.m. is that it can be applied to the transmitter at some point other than the oscillator, without any alterations that might impair the frequency stability. Until we have quite accurate methods for measuring and insuring bandwidth of f.m. transmissions, it seems highly desirable to avoid the use of direct

[4] Marks, "Cascade Phase-Shift Modulator," *Electronibs*, December, 1946.

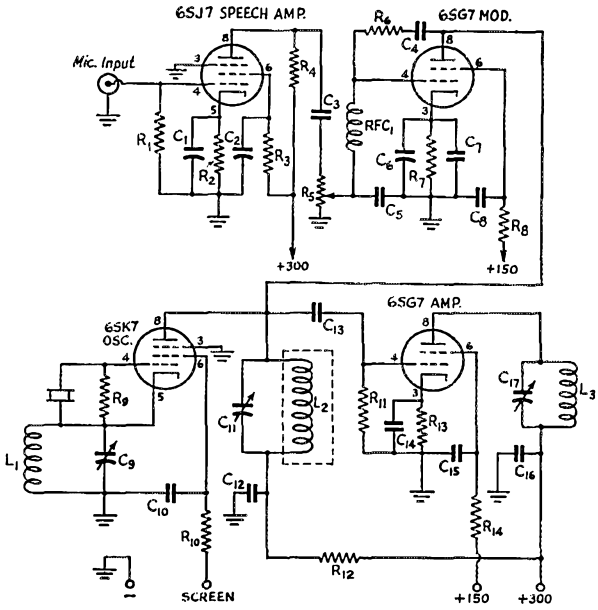


Fig. 6 — A simple phase-modulator unit.

C_1, C_6 — 10-μfd. 250-volt electrolytic.
C_2 — 0.1-μfd. 400-volt paper.
C_3 — 0.01-μfd. 400-volt paper.
C_4, C_{10}, C_{12} — 0.001-μfd. mica.
C_5, C_7, C_8, C_{14}, C_{15}, C_{16} — 0.0047-μfd. mica.
C_9 — 100-350-$\mu\mu$fd. adjustable mica (made by combining plates from two Mallory 954 adjustable micas.
C_{11} — 35-$\mu\mu$fd. midget (Millen 20035).
C_{13} — 100-$\mu\mu$fd. mica.
C_{17} — 50-$\mu\mu$fd. midget (Millen 20050).
R_1 — 1.0 megohm.
R_2 — 1500 ohms.
R_3 — 1.2 megohms.
R_4 — 0.27 megohm.
R_5 — 1.0-megohm volume control.
R_6 — 0.47 megohm.
R_7, R_{13} — 270 ohms.
R_8 — 1000 ohms, 1 watt.
R_9 — 0.1 megohm.
R_{10}, R_{12}, R_{14} — 2000 ohms, 1 watt.
R_{11} — 22,000 ohms, 1 watt. Subject to experiment. See text.
L_1 — 13 turns No. 26 enam., close-wound, ¾-inch form (National PRF-1).
L_2 — 40 turns No. 26 enam., close-wound on 1-inch diam. form. (Millen 45000). Supported ½ inch above chassis on bushing, and shielded by 807 shield (Millen 80007).
L_3 — 43 turns No. 26 enam., close-wound on 1-inch diam. form (Millen 45004).
RFC_1 — 2.5-mh. choke (National 100S).

reactance modulation on the oscillator to obtain an f.m. signal. This fact alone makes p.m. a natural for amateur use. Also, it is more difficult to obtain a high index of modulation with p.m. than with f.m., so the bandwidth is inherently more limited.

The simplest phase modulator we have been able to find is one suggested in Mr. Hund's book.[5] The author suggests using a reactance modulator across the tuned plate circuit of a driven r.f. pentode amplifier. When the reactance modulator changes the tuning of the circuit in accordance with the modulation, the phase angle of the effective tuned circuit is changed and hence the phase of the voltage developed across it. Since the phase change across a tuned circuit of $Q = 10$ or higher is fairly linear for a range of $\pm$ 25°, all that is required is a reactance modulator capable of detuning the tuned circuit the necessary amount. Assuming a Q of 20 for the circuit, an angle of 26.5° is obtained when the detuning is an amount equal to $\frac{1}{4Q}$. This works out to be $\frac{1}{4 \times 20} \times 3.9 = 0.04875$ Mc. = 50 kc.

approx. A Q of 20 will be obtained at 3.9 Mc. with a total tank capacity of 50 $\mu\mu$fd. and an effective parallel resistance of 16,300 ohms (from $Q = 2\pi fRC$). A change of $\pm$ 1.2 $\mu\mu$fd. will swing the 50-$\mu\mu$fd. tank $\pm$ 50 kc., and this is easy to obtain with a reactance modulator. From the design equations,[6] this can be obtained with a reactance modulator using an inductive element of 2.5 mh., a resistive element of 0.5 megohm and a mutual conductance change of $\pm$ 240 μmhos. This is a reasonable range for almost any of the better receiving-type pentodes.

An experimental model was built and is shown in the photographs. The wiring diagram, shown in Fig. 6, shows how simple the unit can be. A 6SJ7 speech amplifier builds up the signal from a crystal microphone sufficiently to give enough swing for the reactance modulator. A gain control, R_5, allows the gain to be reduced when the transmitter output is on 14 or 28 Mc., since the multiplied modulation index at these frequencies might be too high. The reactance modulator is slightly different than those previously described in that it uses an inductance-resistance divider, RFC_1R_6, to obtain the quadrature current rather than the more usual condenser-resistor combination. The principle, however, is practically the same, and it requires no elaboration here.

A Tri-tet oscillator is used, with straight-through operation; i.e., the plate circuit is tuned to the crystal frequency. Since this type of operation requires a well-screened tube, the 6SK7 was selected. The effect is the same as if a separate crystal-oscillator tube were used to drive an amplifier, since the plate-circuit tuning or loading has no effect on the crystal oscillation. This is important if one is to obtain pure phase modulation. If VFO were to be used, the VFO would feed into a tuned circuit between grid and ground of the 6SK7, and the tuned cathode circuit would be replaced by a bias resistor and

[5] See Footnote 1.
[6] Hund, *Frequency Modulation*, p. 166.

by-pass condenser. In the unit shown, the tuned cathode circuit is resonant around 4.5 Mc. Its tuning will affect the amount of oscillator output slightly, but the major control of output is the value of oscillator screen voltage. This was made convenient to adjust in the model by bringing out the lead separately (marked "screen") and running it to the regulated 150 volts through an adjustable resistor. The value isn't critical, and several fixed resistors are all that is necessary to make the adjustment. The oscillator output must be adjusted to avoid overdriving the amplifier. The inductance L_2 is shielded to avoid self-oscillation in the amplifier, and the plate by-pass condenser, C_{16}, is mounted across the tube socket to shield the grid and plate pins from each other.

Since this particular unit is only a model and will probably not fit too well into anyone's ideas about how such units should be constructed, only the tuning details will be included. The operator with VFO can use the circuit by making the oscillator changes mentioned earlier, and the station requiring more power output from the unit will require additional power stages following the 6SG7 amplifier. The output of this little unit is enough to light a small pilot lamp, representing about one watt of power, enough to drive the usual crystal-oscillator stage. The direct substitution of larger tubes throughout the unit is not recommended, unless a well-shielded tube like the 802 is used, since one is likely to encounter the usual difficulties with feed-back if beam tetrodes are used.

The first step in putting the unit in operation is to adjust the crystal oscillator. With the screen of the oscillator connected directly to the 150-volt source, and with normal voltages on the rest of the unit, adjust the cathode-circuit condenser, C_9, until the crystal oscillates. A 0–1 milliammeter between the bottom of R_{11} and ground will serve as an output indicator, and a receiver should be used as an additional check on the signal. When oscillation of the crystal has been checked, add resistance in the oscillator screen lead until the grid-current reading reaches a low value, of around 0.1 ma. or less. It should still be possible to swing the tuning of C_{11} without throwing the crystal out of oscillation or even affecting the frequency. If it can be thrown out of oscillation, readjust C_9 or reduce the value of the screen-dropping resistor. In the unit shown, 0.2 megohm could be connected in the screen lead without stopping crystal oscillation.

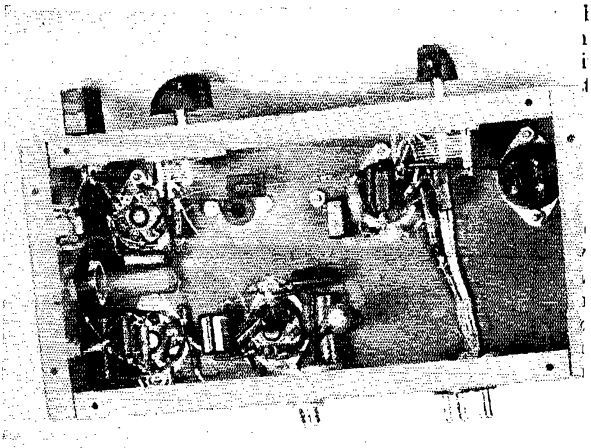
If a VFO is being fed into the unit, the screen voltage of the 6SK7 should be reduced until the drive on the 6SG7 amplifier is as specified for crystal operation.

Using a small lamp load or the grid current of the stage the 6SG7 is driving, resonate the output circuit L_3C_{17}. If it tunes broadly, it probably indicates that the stage is being overdriven, or that the 6SG7 is oscillating, although no trouble with oscillation was encountered in this unit. The modulated circuit, L_2C_{11}, will tune broadly because it is loaded by R_{11}, but it should be centered on the broad resonance peak or otherwise the modulation will fall off.

Talking into the microphone and monitoring the signal on 14 Mc. will give you a check on the modulation, in the manner described earlier in this article. It will be found that more than enough modulation can be obtained for 14 Mc. when using an 80-meter crystal, but on 3.9 Mc. the best reception is obtained when using crystal-filter reception methods, as outlined previously.[7] For 3.9-Mc. work, it would probably be better to do the modulating at 1.95 Mc.

No great claims are made for the unit, except that it is a simple thing to get going and it will enable all of us that are interested to take advantage of the opening of the lower-frequency bands to p.m. Somewhat greater swing can be obtained by increasing the value of R_{11}, and this might be necessary if a low-output microphone is used. If listeners report "no lows," explain that you're using p.m. and suggest that they crank up the tone control on their receivers. However, a cheap crystal microphone may have poor low-frequency response, so the fault may be in your own equipment if you are using a bargain microphone. Good practice would indicate a low-pass filter ahead of the reactance modulator, to limit the high-frequency response and consequently the bandwidth, and such a filter could be put in the circuit ahead of the gain control.

[7] Grammer, "N.F.M. Reception," *QST* March 1947



A view under the chassis of the phase modulator. The Tri-tet cathode circuit is mounted on the side of the chassis near the microphone connector.

Happenings of the Month

MEMBERSHIP DUES

As announced more prominently elsewhere on this page, ARRL dues have been raised effective July 1st. Although we believe that League members generally will feel, from their contacts with everyday life, that a rise in dues at this time is an expected and a reasonable thing, perhaps you will want to know more specifically some of the reasons which prompted our Board of Directors to take the action.

ARRL last year spent approximately $7.25 on behalf of each member. This does not include our disbursements for non-*QST* publishing activities, but only the necessary expenditures for producing *QST*, for having the Communications Department and a laboratory and a headquarters station and a Technical Information Service, for sending speakers to conventions and clubs, for the preservation of our frequencies and operating rights, and for the holding of Board meetings and paying the administrative expenses of directors, SCMs, QSL Managers, etc. — strictly organizational matters.

While ARRL has always expended for such things far more than was received in membership dues, the disparity has been greatly increased. Only our rate of growth, and our success in other publishing activities, has preserved the League at the $2.50 rate of dues set by the Board in February, 1926 — over 21 years ago. Everyone knows what has happened to expenses since that time, and particularly as a result of the war. Traveling expenses, salaries, postage and communication rates, supplies, maintenance items — all are materially higher now. The cost of printing *QST* last year was nearly 50% greater than it was in 1941; the average issue in that year was about 106 pages, while for 1946 the average was about 156 pages. The sheer fact of the matter, looked at businesswise, is that ARRL can no longer afford to put out even *QST* at $2.50 per year.

The rise in dues is, actually, an adjustment to provide a reasonable contribution by each member toward the costs of the service he rightfully expects from his organization.

CIRCULATION MATTERS

You probably saw a motion adopted by the Board at its annual meeting directing the Headquarters to look into delays in the delivery of *QST* as concerns renewed and new memberships, and to put something in *QST* for the information of the membership.

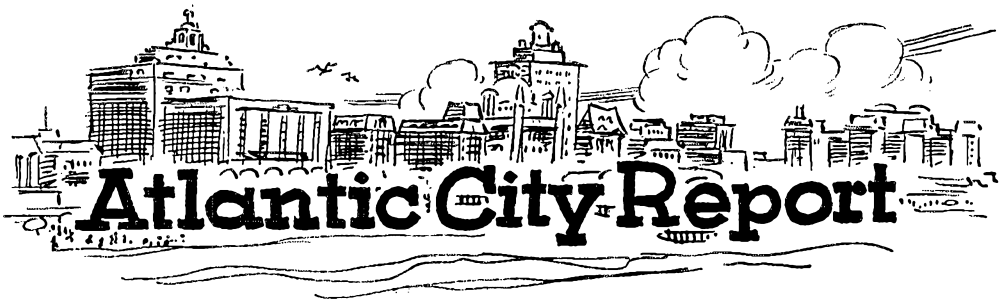
The whole world seems to be creaking at its tasks, trying to recover from the pressure of growth that was delayed by the war. Almost every business activity you know is loaded beyond its prewar capacity and most people are working harder than ever before. ARRL has been no exception. In 1945 our membership increased a third, and last year it increased a third over that! *QST* circulation is double what it was a few years ago. Not only that but the printing plants are overloaded, paper is extremely difficult to get and often of bad quality, and the mails are overloaded and magazine mail in particular seems to be moving slower than before and frequently inconsistently. It has been a very trying period for almost all American activities and in some respects it is far from over.

At Headquarters we were pretty well swamped for a long time and, despite new methods and equipment and more personnel and much overtime, we were unable for some months to give our prewar standard of service. If you have had occasion to observe the performance of the circulation departments of other magazines, including the best known ones in the country, you will know that relative to the usual performance ours was actually splendid. But it wasn't what we were used to, wasn't what you fellows expect and was a matter of much distress to us. Gradually things improved with us. We have doubled our Circulation Department's staff, completely overhauled our methods, worked like the devil — and we are out of the woods now. We have many thousand dollars worth of new equipment on order and as it comes in during the coming year we shall become much better prepared for the future growth of the League. But, even though

(Continued on page 94)

Increase in Dues

• Effective July 1st, ARRL membership dues in both the United States and Canada are increased fifty cents a year, by action of the Board of Directors, and apply to both full and associate memberships. Dues, including subscription to *QST*, are now as follows: In the United States & Possessions, $3 a year. In the Dominion of Canada, $3.50 a year. In all other countries, $4 a year. In the special case of "family memberships" in the United States and Canada, without *QST*, as limited by By-Law 4, $1 a year.



THE FIRST TWO WEEKS

With the Atlantic City international telecommunications conference only two weeks old as we write, it is not surprising that we must start out by saying that there are no conference decisions yet to report. The meeting has barely shaken down into a working machine and as far as battles go it is still in the preliminary stage of sparring and eyeing-up.

In three neighboring resort hotels on the Boardwalk here, about 800 people are gathered from 65 nations. About 200 of these people are in the secretariat and the others comprise the delegations of the participating administrations. Opening with a formal plenary session on May 16th, with the major address by U. S. Assistant Secretary of State Norton, the conference elected FCC Chairman Charles R. Denny, jr., head of the U. S. delegation, as its permanent chairman, and Francis Colt deWolf, chief of telecommunications of the Department of State and U. S. vice-chairman, as its own vice-chairman. Ten committees were set up, five of them either formal or of transitory importance and five of them important working committees of the conference, and to these ten committees chairmen and vice-chairmen were elected from the ranking personnel of visiting delegations. The first week-end was largely spent in orientation and the establishment of contacts, and on the following Monday the conference settled down to what is now a steady routine of daily committee meetings. These have followed quite accurately the course explained to our readers in recent *QST* articles, starting with organizing meetings to inspect the field of work to be done and then breaking down into subcommittees to whom the actual work is parceled out.

There is an official United States delegation here of 38 Government people, not counting its office force, including the best-qualified people the nation possesses. There are, in addition, 60-odd representatives of American operating companies and agencies who work daily with the delegation, making a U. S. team of about a hundred. Amateur radio is quite well represented. In addition to President Bailey, IARU is being represented by G6LJ and G6CL, respectively president and general secretary of the Radio Society of Great Britain; Alex Reid, general manager of the Canadian section of ARRL; YV5AP for the *Radio Club Venezolano*; CX1CC for the *Radio Club de Uruguay*; and Lt. Commander Cerdan, of the Mexican navy, for the *Liga Mexicana de Radioexperimentadores*. The ARRL representatives, serving with the U. S. delegation, are Asst. Secretary Budlong, Technical Director Grammer, General Counsel Segal and Managing Secretary Warner. The foreign delegations contain a total of fifteen or twenty additional amateurs as delegates or technical advisers. And we're pleased to say that there are a few on the U. S. delegation, too. All in all, there are enough to inspire the local Atlantic City boys to throw an international hamfest on June 7th, and we've already heard of a few delegates visiting local shacks to talk back to home.

This conference involves quite a few things of importance to us amateurs beside allocations. In the 165 documents issued by the conference up to this date there are about 2400 proposals for changes in the Cairo regulations. An important matter to us is the general amateur operating regulations, on which there are numerous proposals for amendment from foreign administrations. Some seek simply to distinguish between amateur and experimental stations while others propose various changes in the restrictions imposed upon international amateur communication. France proposes that in the international bands between 5 and 40 Mc. we be limited to 300 watts input, solely to put all amateurs on an equal basis in the bands of worldwide coverage. France also has a proposal, for some unknown reason, to forbid the administrations from using the figures Ø and 1 in amateur calls. Then we have a host of smaller things to watch: the rules on stability, tolerances, harmonics, the structure of amateur calls, the Q code — both to get some things we want and to prevent the imposition of some things we don't want.

Another matter of importance, probably little appreciated by the average amateur, is that of the international amateur definitions. Heretofore there has been a left-handed approach to this matter, a single definition of an amateur station serving to drag in the description of what an

amateur himself is. The League is seeking an additional definition of the amateur service to give us greater recognition, and a proposed text has been put forward by the United States, defining our work as a service of experimentation, self-training and intercommunication. This proposal ran into an odd opposition from the United Kingdom, which has some queer quirk in domestic law about permits to engage in experimental work. Although admitting that amateurs experiment, and although perfectly willing to have them do so, U. K. felt obliged to oppose any direct reference to experimentation in the definition! After repeated conferences with us and the exchange of several cablegrams with London, the matter was finally resolved at subcommittee level by the adoption of an acceptable compromise text defining the amateur service as "A service of self-training, intercommunication and technical investigations carried on by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest." There is then to be a simplified definition of an amateur station as a station in the amateur service.

All these matters are additional to the subject that interests all of us most profoundly, the question of frequencies. Many nations have filed comprehensive proposals for revision of the Cairo frequency table. As background for the developing story of Atlantic City which we expect to report to you month by month, suppose we start out by giving you a digest of these proposals so far as they concern amateurs, *bearing in mind that these are only the initial prebattle proposals* of these countries and that they may be altered in either direction as tense days pass into weeks. You already know the U. S. and Canadian proposals, so we'll omit those and briefly report the other countries, alphabetically:

Australia doesn't do too well by us, proposing amateur bands at 3.5–3.8 Mc., 7–7.2, 14–14.4, 21.1–21.5, 28–30, 50–54, 166–170, and higher bands beginning at 1215. *Chile*, in a limited proposal covering only 2–6 Mc., proposes 3.5–3.75 for amateurs. *China* offers amateurs superlative backing, praising their work and proposing 3.5–4 shared with fixed, 7–7.3, 14–14.4, 21–21.5, 28–29.7, 50–54, 144–148, 220–225, 385–414, and higher bands beginning at 1215. *Czechoslovakia* wants 7.1–7.3 for broadcasting, and a v.h.f. allocation that would squeeze out most of our bands. *Denmark, Finland, Iceland, Norway and Sweden* join in proposing 1.715–2 shared with fixed and mobile and limited to 10 watts, and 3.5–3.6. Excepting Finland, these same countries propose 7.2–7.3 for broadcasting, "no longer experimentally necessary to amateurs." *Ecuador* pays a nice tribute to amateurs, proposing that they retain all Cairo bands plus a new one 21–21.5, and that the 11-meter band be widened 50 kc. and made worldwide ham. *France* proposes 3.5–3.6, 7–7.15, 14–14.4, 21.1–21.45, 28–29.7, 70–71, 144–148 shared, 420–460 shared, and higher bands beginning at 1215. The proposal of *India* includes 1.715–2 shared with four other services at 10 watts but gives no indication of intentions near our other bands except that it is clear that nothing is contemplated in 41–108. *Ireland* backs loran for 1.715–2 but shows no other amateur position. *Rumania* has filed proposals up to 24 Mc., including amateur bands at 3.5–3.7, 7–7.3, 14–14.4 and 21–21.5. *Switzerland* suggests 1.925–2, 3.65–3.95, 7–7.2, 14–14.4, 21–21.45 and 28–30. The *United Kingdom* proposes 1.715–2 shared, with 10 watts input, 3.5–3.6, 7–7.2, 14–14.4, 21.25–21.45, 28–29.7, 166–168, 400–415 shared, and higher bands beginning at 1215. *U.S.S.R.* proposes 3.5–3.9 shared with fixed and land mobile, 7–7.15, 14–14.4, 21.1–21.5, 28–29.7, 70–72.8, 174–178, and higher bands beginning at 1145. *Venezuela*

Under the banked flags of sixty nations, the international administrative radio conference opens with a plenary session at Atlantic City on May 16th.

Col. Sir Stanley Angwin, head of the United Kingdom delegation, chairman of Committee 5, the all-important committee on frequency allocations.

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gives strong support with the proposal of 1.8–2 shared with navaids, fixed and mobile, 3.5–4, 7–7.3, 14–14.4, 21–21.5 and 28–29.99. Again we emphasize that all these are initial expressions, before the endeavors at reconciliation.

To deal especially with the negotiation of a new frequency table the conference has established an Allocations Committee under the chairmanship of Col. Sir Stanley Angwin, head of the U. K. delegation and the leader of this work at Madrid, Cairo and Moscow. The allocation ladder interesting every country, the attendance at the meeting of this group, Committee 5, have approached those of the plenary assembly. (As a side-light, amateurs will be interested to know that these larger meetings make use of the simultaneous-translation equipment of the United Nations. Each delegate wears around his neck a small battery-operated chest receiver with instant-heating tubes and a selector switch for the desired language, the neckstrap being an antenna fashioned of 300-ohm Twin-Lead. The transmitter is a "low-power device," operated under the inductive-field regulations of FCC, and carries seven channels separated by 12½ kc., beginning at 100 kc. English, French and Spanish are carried simultaneously.) Well, supposing that you were chairman of a 65-nation committee that had made a couple of thousand proposals for amending the Cairo table, how would you start work? It is, you can see, a very difficult problem, with the initial proposals poles apart. It is almost impossible to exaggerate either the greatness and diversity of the world's radio needs or the difficulties of bringing this many nations, of diverse philosophies and cultures, into agreement. There are many possible means of attack. In this situation Sir Stanley has proposed a method of approach not heretofore employed at world conferences as one most likely to succeed in the present circumstances, and it has been adopted by the committee. The first need being to cut down the size of the working group, a subcommittee has been appointed consisting primarily of the countries that filed substantially complete allocation proposals. There are ten such countries participating, including all the major powers, under the very competent chairmanship of Dr. Y. Y. Mao, an ex-XU, of the directorate-general of China's telecommunications service. This subcommittee has been in all-day session for the past week in a preliminary shakedown maneuver. It is endeavoring to obtain the first expression of composite views of the countries represented as concerns allocations between 2.85 and 25 Mc., and to get these views in terms of the requirements of each of the five major services: aero mobile, amateur, h.f. broadcasting, fixed, maritime mobile. It is getting these requirements independently for each service, without respect to the others, in the deliberate knowledge that they may exceed the actual spectrum space. Moreover, it is taking these data separately for each 2 Mc. or so of the high-frequency spectrum. When this work is finished it will be possible to examine a slice of the spectrum, say 6 to 8 Mc. for example, and see just what are the stated needs of the five services in that range. After these data have been inspected by the main committee and adequately talked about, it is probable that they will again be farmed out to the subcommittee to attempt the difficult task of reconciliation or compression or sharing. If progress is sufficiently promising it is likely that similar subcommittees will be established soon to work similarly on the low end and the high end of the spectrum.

All this work of seeking agreements is extremely difficult and slow, often not realistic, and completely illustrative of the vast complexity attending worldwide allocation endeavors. It is entirely too early to judge whether the present attempt has a good chance of success. It is pos-

(Continued on page 100)

Coupling the VFO to the Crystal Stage

A Simple Shielded Capacitive System

BY T. A. HUNTER,* WØNTI

WHEN a VFO is not permanently part of the transmitter but is used intermittently as a crystal substitute in conjunction with a crystal-controlled oscillator, the matter of coupling between the VFO and the crystal stage always presents a problem. Ordinary capacitance coupling is the simplest method but is at a disadvantage if the distance between the VFO unit and the transmitter is more than a foot or two. A coupling lead of even this length radiates appreciably, causing interference in receiving near the transmitter frequency unless the oscillator is keyed or switched off. It may also involve the danger of transmission on the fundamental, either directly or through the transmitter to the antenna when the transmitter is working at a harmonic frequency, or cause a back-wave when operating at the fundamental. Perhaps worse yet is the potential source of feed-back it presents.

In low-impedance arrangements radiation may be negligible but coupling losses are appreciable if the complication of an additional tuned circuit at the crystal position is to be avoided. The loss introduced by any of the various cathode-injection schemes is considerable and the idea is of practical value only when the VFO unit delivers a fair amount of power.

In contemplating the design features of a buffer amplifier to be used between the Collins 70E-8 permeability-tuned oscillator[1] and the crystal stage of a transmitter, much consideration was given to this problem. It was finally solved by using coaxial cable to make the interstage connection. In the manner used, the cable is effectively part of the tuned circuit across which it is connected, its capacitance being in parallel with the usual tank condenser. The arrangement is shown in Fig. 1. While this means that a random length of cable cannot be used, the compensation provided by the associated tank condenser makes critical cutting to length unnecessary. Greater variations in length may be compensated for by the use of a permeability-tuned inductance, as shown in the circuit diagram at L_1, or by otherwise altering the coil. This system has proved to be more efficient than single-wire capacitance coupling while all of the disadvantages of the latter are eliminated, since the line is shielded. In one application, even though adjustment of the buffer condenser caused considerable change in the frequency of the oscillator, the coupling cable nevertheless was "cold."

While the principle has been applied in this instance to the output of a buffer amplifier, it may be used, of course, in any similar low-power application where there must be appreciable distance between stages.

Design Procedure

The maximum length of lead which may be used depends upon several factors besides the one of attenuation. The step-by-step design procedure is as follows:

1) Determine the length of lead required between stages.

2) Determine the resulting capacitance (capacitance per foot times the length of cable).

3) To (2) add minimum interstage capacitance (approximately 60 $\mu\mu$fd. between screen-grid stages including tuning-condenser minimum).

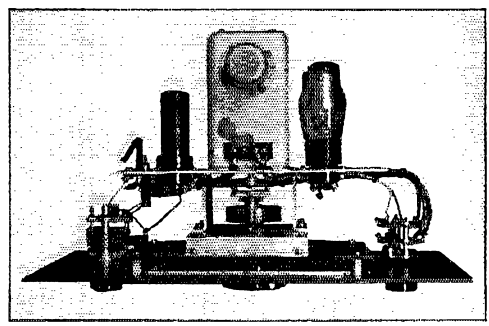
4) Calculate variable capacitance required to cover the desired frequency range by the following formulas:

$$C_{max} = \left(\frac{f_{max}}{f_{min}}\right)^2 (C_{min})$$

$$C_{var} = C_{max} - C_{min}$$

5) Determine inductance or coil size from the ARRL Lightning Calculator or by any other method.

Cable capacitance per foot may be obtained from the manufacturer's literature. In concentric cables it varies from approximately 10 $\mu\mu$fd. per foot for the low-capacitance types to 30 $\mu\mu$fd.



The VFO unit. The oscillator is the shielded unit at the center, the 6AG7 buffer stage to the left, and the voltage-regulator tubes to the right.

* Project Engineer, Collins Radio Co., Cedar Rapids, Iowa.

[1] Hunter "Permeability-Tuned Oscillators," *QST*, August, 1946, p. 42.

The capacitance of cables of the more common types may be taken as 29 $\mu\mu$fd. per foot for 50 to 55 ohms and 21 $\mu\mu$fd. per foot for 70 to 80 ohms. The capacitance of the popular Twin-Lead is lower but this type of line may be used at a sacrifice in shielding. Capacitance per foot runs from 6 $\mu\mu$fd. per foot for 300-ohm line to 20 $\mu\mu$fd. for 72-ohm line. *Illustration:*

Length of cable — 5 ft.
Cable — RG58-U.
Capacitance per foot — 28 $\mu\mu$fd.
Total cable capacitance — (28) (5) = 140 $\mu\mu$fd.
Minimum circuit capacitance — 60 $\mu\mu$fd.
Total minimum capacitance — 140 + 60 = 200 $\mu\mu$fd. = C_{min}
Desired frequency range — 3500 to 4000 kc.

$$C_{max} = \left(\frac{4000}{3500}\right)^2 (200) = (1.14^2)\ (200) =$$

(1.3) (200) = 260 $\mu\mu$fd.
C_{var} = 260 − 200 = 60 $\mu\mu$fd.

Since the circuit minimum is seldom known to any great degree of accuracy, it is advisable to select a condenser with a somewhat greater capacitance range than the value as calculated above. In this case a 100-$\mu\mu$fd. condenser (whose actual variation in capacitance is usually less than 90 $\mu\mu$fd., especially when mounted on grounded metal) should do the job within a comfortable margin. The ARRL Lightning Calculator shows the inductance required for resonance at 3500 kc. with a capacitance of 260 $\mu\mu$fd. to be 8.4 μhy., and that a coil of 21 turns of No. 20 d.c.c. wire 1 inch in diameter will give this inductance.

Practical Application

The photograph shows how the Collins 70E-8 has been combined with the buffer amplifier as a unit on an 8 × 14-inch panel. As the circuit diagram indicates, a 6AG7 is used in the buffer. This tube requires very little excitation and is ideal for use with a low-power oscillator. As a straight amplifier with only 5 volts r.m.s. signal at the grid, the output is 0.2 watt which is enough to drive an 807 for further amplification or frequency multiplication.

The output of the oscillator is coupled through a piece of 52-ohm coaxial cable which should be made as short as possible to keep signal leakage down. C_6 has been added to shunt the output of the oscillator to reduce its output to the minimum required for adequate excitation for the same reason. A permeability-tuned inductance is used in the output tank circuit in conjunction with a 100-$\mu\mu$fd. variable condenser. The output cable in this case is a piece of RG58-U five feet long. This cable is of a type readily available in the surplus market. C_5 is used primarily to isolate the line from the d.c. plate voltage.

Both oscillator and buffer operate from the same plate supply but the voltage for the oscillator is regulated by a VR-105 and VR-150 in series. A keying jack is provided in the cathode circuit of the amplifier.

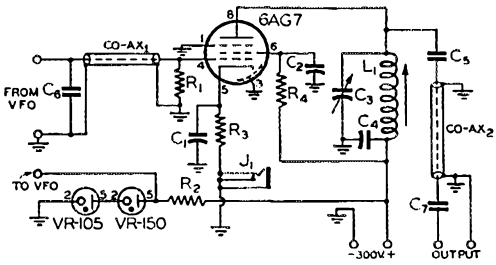


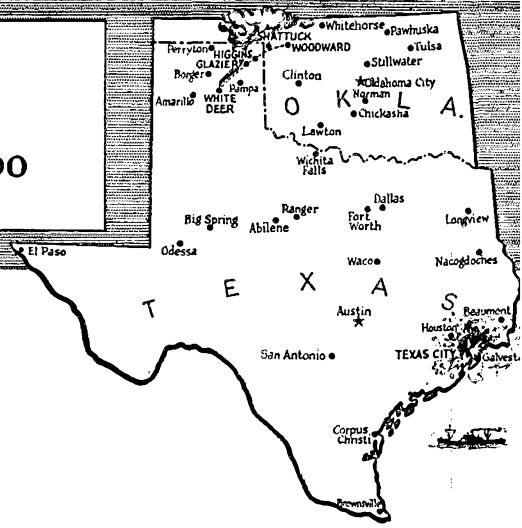
Fig. 1 — Circuit diagram of the 6AG7 buffer amplifier.
C_1, C_2, C_4 — 0.01-μfd. paper.
C_3 — 100-$\mu\mu$fd. variable.
C_5 — 1500-$\mu\mu$fd. mica.
C_6 — 47-$\mu\mu$fd. mica.
C_7 — 10- to 20-$\mu\mu$fd. mica (see text).
R_1 — 22,000 ohms, ½ watt.
R_2 — 2500 ohms, 10 watts.
R_3 — 1000 ohms, 1 watt.
R_4 — 47,000 ohms, 2 watts.
L_1 — Approx. 15 μhy. — 34 turns No. 24 enameled ¾-inch diameter or 32 turns No. 32 enameled on 0.32-inch powdered-iron core.
Co-ax$_1$ — RG58-U 52-ohm coaxial cable as short as possible.
Co-ax$_2$ — RG58-U 52-ohm coaxial cable five feet long (see text).
J_1 — Closed-circuit key jack.

In the photograph, the oscillator unit is the shielded unit in the center. This unit, the 6AG7 and the two VR tubes are mounted on a subpanel spaced out from the control panel to make room for the dial mechanism and flexible shaft coupling. The output tank circuit is to the left, with the adjustable inductance, L_1, mounted next to the 6AG7 so that its terminals are close to those of the tuning condenser, C_3, mounted on the panel. The switch to the right is used for switching the plate-voltage and keying circuits for 'phone, c.w. or stand-by conditions. In practice it has been found that the residual signal from the oscillator is reduced to such a level that it is necessary to switch it off only when working at the fundamental and then only when working close to the receiving frequency.

In feeding the crystal-oscillator stage, trouble with self-oscillation may be encountered unless this stage always is worked as a doubler if the oscillator tube is not a well-screened type. This difficulty may be minimized by using the smallest coupling capacitance (C_7) that will give adequate excitation to the crystal stage and in extreme cases by detuning the 6AG7 tank circuit when working straight through. In regenerative crystal-oscillator circuits in which a feed-back capacitance is used between grid and cathode, it is usually necessary to disconnect the feed-back condenser to prevent oscillation.

Amateur Radio Operations:

•TEXAS–OKLAHOMA TORNADO
•TEXAS CITY EXPLOSIONS



BY HAROLD M. McKEAN,* W1CEG

FATE dealt wanton death, hurt and destruction to the West Gulf area on two occasions in April. The Texas Panhandle-Oklahoma tornado exacted an estimated toll of 150 fatalities, 1800 injured, 3000 homeless and $8,000,000 material damage. A week later, the series of disastrous Texas City explosions and fires added to this score the mountainous figures of approximately 600 dead, 2000 injured, 2500 homeless and $100,000,000 property damage.

After each disaster, as the buffeted citizenry staggered to its feet, angels of mercy were on the scene — angels borne on electronic wings. In this benefactor the stricken populace found an Amateur Radio meeting the test of its first major postwar communications emergencies. That the operations generally were overwhelmingly successful, there is no doubt: Headquarters' files are crammed with praises from the Red Cross, Salvation Army, FCC, civic officials, press, radio, and the people themselves.

To record the achievement of the hundreds of amateurs who coöperated to see the emergencies through, and to point the valuable lessons learned, *QST* presents a full report of these outstanding demonstrations of amateur radio public-service operation.

WHEN a careless "gust" flicked 18 empty boxcars and 2 cabooses off the Sante Fe tracks at White Deer in late afternoon of Wednesday, April 9th, the derailment was charged off by seasoned Texans as just another freak of tempestuous Panhandle weather. The blow had all the earmarks of being local; it left no swathing trail. In fact it wasn't until it dropped in for supper at the small town of Glazier, 75 miles to the northeast, that the hit-and-bounce tornado showed its true colors. Unsuspecting Glazier was swept completely off the Texas landscape, except for a lone house, and with its obliteration went all means of warning Higgins, 10 miles and 20 minutes away. Higgins suffered sorely in lives lost and property damage, being larger and more exposed. Here again electric power and wire communications were wiped out, and so, as the disaster-bent tornado crossed the Oklahoma line and ground 50 miles inward under cover of early-evening darkness, the towns of Shattuck and Gage, and especially the city of Woodward, were easy prey. There was to be no Saturday night rodeo in Woodward this week; in its final fling the twister had splintered 100 city blocks of this thriving county seat.

Ironically, the sun looked down on the devastated cattle, wheat and oil country for only a brief period on Thursday, and then, as if dismayed, went into hiding for a week while rain, sleet and snow pommeled the area. Such was the weather under which all relief agencies — amateur radio included — were to operate.

First word of the catastrophe trickled into the more fortunate Texas and Oklahoma cities late Wednesday night. From these meager early reports, it soon became apparent to relief-minded amateurs that every bit of emergency equipment would have to be transported into the torn area, no small task in country where the distance between population centers is measured in round figures of fifty or one hundred miles.

Thursday morning saw many hams on the trek into the disaster area. Driving in from the Texas Panhandle came several mobile 28-Mc. 'phone stations: W5EGJ/5, Perryton, who opened up first at Higgins and then Shattuck; the XYL-OM team, W5HYF/5 and W5HF, who stopped at Miami and Higgins and relayed reports of casualties, communications needs and road conditions back to W5WX and W5HYT in their home city

* Assistant to the Editor, *QST*

The "bucket brigade" relief crew at W5IZW/5, Higgins. L. to r., L. E. Jordan, W5IWQ, G. A. Langford, W5LEP, J. Berry, W5JQC, and John Nappier. W5JZB, W5HCR, W5FVN, W5JHA and W5LUK also assisted. The pails and cans are strategically placed to catch rain water coming through the ceiling of the damaged schoolhouse. (*Amarillo Globe-News photo*)

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of Amarillo, via W4JTF, after which they continued on to Woodward; W5LTM/5, accompanied by W5LGU and W5KXE, all of Amarillo, who participated actively in local relay.

In early afternoon, W5IZW, White Deer, with W5JZB and W5LLZ, Phillips, arrived at Higgins with LLZ's HT-9 transmitter and S-40 receiver, which were installed immediately in a roofless schoolhouse as portable W5IZW/5. This outfit, operating 75-meter 'phone, was powered from an alternator furnished by the Red Cross.

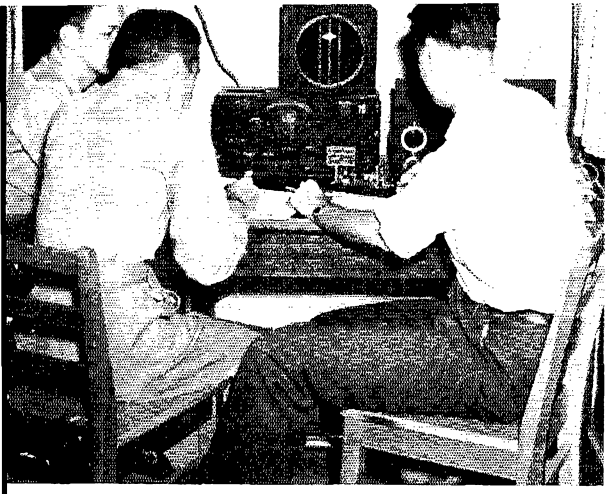
Meanwhile, in the east the "Okies" were also on the move. W5JFY, W5LHP and W5LGI, members of the Oklahoma A. & M. College Radio Club (W5YJ), arrived in Woodward from Stillwater in midafternoon, setting up their 40- and 80-meter c.w. rig in the Community Building which was serving as emergency headquarters for the Red Cross, Salvation Army and State Highway Patrol. Shortly afterward, W5JYT/5 and W5MHL, Chickasha, installed their battery-powered Army-type c.w. portable in the Woodward fire house.

The W5IZW/5 mainstays: Tom Eller, W5IZW, pushes Higgins tornado traffic, while Charlie Stratton, W5LLZ, stands by to relieve. Bonita Wilson, rear, typed messages. (*Press Assn. photo*)

With stations manning the disaster scene and hooks jammed with relief-agency traffic carrying pleas for medicine, clothing, supplies and shelter, the need for fast handling loomed. As early as 3 P.M. the recently-organized Oklahoma Emergency 'Phone Net (3860 kc.) was alerted. In short order, rigs also were fired up in stations of the Northern Texas 'Phone Nets (3920 kc.). There was action in c.w. bands too, with the speedy Oklahoma C.W. Net (3682 kc.) and the faithfully-drilled North Texas Traffic Net (3657.5 kc.) responding to roll calls.

The roster of stations active in the outstanding emergency work of these organized groups includes: *Oklahoma Emergency 'Phone Net* — W5s AI, AHT, AQF, ATJ, BLW, CFN, CHE, DRE, EGC, ESB, GOL, EZK, FDQ, FMB, HGC (*NC*), GZK, HFW, HXC, HXI, HXU, HXM, ITF, JDH, MAH, NXV, WQ; *North Texas 'Phone Nets* — W5s APW, BCK, BFA, DSV, DVQ, DXR, ECE, EGJ, EVI, EYX, GNH, HKK, HSC, HUU, IJQ, IVW, JHA/MJU, KRZ, MNL/DAS, MSB, QA; *Oklahoma C.W. Net* — W5s AAJ, ADC, AHT, ATJ, EGA, FMF, GVS, GZU, HGC, HKH, HXG, HXU, IGO (*RM*), JBX, JFY, JKS, LOW, MJN; *North Texas Traffic Net* — W5s ASA, BBH, BEY, CDU (*RM*), FMZ, GZU, HCH, ILZ, ISD, LSN, LOS, LVR, JDZ.

By Thursday evening, on-the-scene portables had begun clearing their hooks at machine-gun rate. The "bucket brigade" at W5IZW/5 (W5s IZW, LLZ and JZB, with relief ops W5s IWQ, JQC, HCR, LEP, FVN, JHA and LUK) afforded Higgins yeoman service, operating 75-meter 'phone from their classroom "shack" while rain poured through the ceiling, at times reaching a depth of two inches on the floor. W5BFA, Borger, assisted by relief ops W5s HCR, ICU and KYM, acted as control for the Texas 'phone nets and proved to be a major contact for the Higgins station, as did Acting Net Control W5EYX (W5s



Dan Hearn, W5LHP, Boss Fries, jr., W5LGI, and Byron Looney, W5JFY, Oklahoma A. & M. College students, who set up and operated W5YJ/5, Woodward.

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LFY, LTM and GZZ relief operators), Amarillo, W5EGJ, Perryton, and W5IJQ, Pampa. Large quantities of outgoing Higgins traffic were fed into Western Union channels by W5IJQ, W5BCK and W5JHA/W5MJU (OM and XYL), all of Pampa, and by W5DVQ, Abilene, and W5ECE, Ranger. Of the hundreds of messages traveling this route, only one was undeliverable, a high mark for accuracy.

Bulk of the outgoing Woodward W5YJ/5 c.w. traffic went to WØTQD for relay north, and to SEC W5AHT (W5LW relief op), Pawhuska, where it was continued along either the c.w. nets for long-distance handling or fed across town into the Oklahoma Emergency 'Phone Net control, W5HGC, for statewide routing. Hundreds of messages were expedited by this splendid demonstration of c.w.- and 'phone-net cooperation. The Woodward W5JYT/5 c.w. portable handled considerable traffic during the short time its batteries held up.

Not only did inclement weather thrust cold and dampness on the operators working in damaged buildings; it also brought heavy QRN and contributed to numerous breakdowns of equipment. There was some relief of traffic pressure when striking telephone workers forgot their grievances and returned to work, but not for long. The communications needs of relief agencies continued to mount. Requests for additional stations and operators were sent out, and Thursday night W5IAN and W5AVM arrived from Amarillo, setting up first at Higgins and later transferring to the Woodward Community Hall, 40 miles away, where there was urgent need for a 75-meter 'phone outlet. After a bang-up start, the band went dead, and so the operators made a hurried Cook's Tour to Amarillo and back — 350 miles — returning with additional equipment and spare ops in the persons of W5CYX and W5KYD. Mobile parties already on the scene, W5s HF, HYF, KXE, and LGU, pooled equipment and operators to make this set-up, signing W5AVM-/5, 100% Amarillo-manned-and-equipped. W5-CHE and W5WI, Tulsa, also responded to the appeal for reinforcements, setting up in the same building and operating first 'phone and then c.w. Two other stations reported as operating in the area are W5FQD and W5IRZ.

At times 75-meter 'phone-band QRM — mostly unintentional, though there were a few examples of noncoöperation — made it almost impossible to copy the weak signals of the on-the-scene stations. To relieve the situation W5DAS, Northern Texas SCM, contacted the Dallas FCC office on Friday and was successful in getting their coöperation in the issuance of a request that emergency 'phone-net frequencies be cleared by ±20 kilocycles. The SCM was also active at his Dallas station, W5MLN, where considerable traffic was handled with the aid of W5GZH and W5JQY.

As Saturday dawned, the Oklahoma A. & M. group, W5YJ/5, completing 42 hours of continuous watch and with exams coming up, sent out a call for relief. It was capably supplied by W5-JBX, Tulsa, who dropped out of the Oklahoma C.W. Net and drove 200 miles to Woodward to set up portable and continue c.w. operations. However, when the W5YJ/5 operators reached Stillwater, they fired up the regular 500-watter and continued on the air — professors go hang!

Further relief was afforded Woodward when after an all-night drive of 350 miles over snow-

Lt. Cmdrs. J. D. Jones, jr., W5OJ (standing) and R. W. Wheeler, jr., W5BQT, in company with W5LKQ, W5MPV and Naval personnel, took Fort Worth and Norman (Oklahoma) Naval Reserve communications units to Woodward to relieve weary amateurs there. The Fort Worth unit was also active during the Texas City disaster. (*Fort Worth Star-Telegram photo*)

At Borger, Ray Samberson, W5BFA, assisted by W5s ICU, KYM and HCR, cleared 755 urgent tornado messages in 116 hours of operating.

blanketed roads, Naval Reserve units from Fort Worth arrived, in company with a similar group from Norman, Oklahoma, 100 miles away. There were many regular and reserve Naval personnel assisting, as well as civilians. Amateurs in the group were W5s BQT, LKQ, MPV and OJ. With FCC permission, the combined units signed W5BQT's call on 40-meter c.w. A heavy volume of traffic was relayed commencing Sunday at noon, at which time the group relieved W5JBX. W5CVW, Fort Worth, proved a major outlet for this station, aided by many other amateurs in that area — W5s AA, CF, CHU, CVA, FIR, LHF and LIU are reported. An exceptional relay of this group was the clearance of Woodward Army traffic for the Pentagon, Washington, D. C., which traveled the W5BQT/5-W5CVW-W3USA circuit in minutes flat.

There was no rest for the weary. During the wee hours of Sunday, W5IZW/5 notified Acting Net Control W5EYX that two freight trains had collided just outside Higgins, the result of tornado-disrupted railroad communications. With skip set in and QRN running S8, W5EYX at Amarillo had difficulty in pulling through even this bare report. EC W5APW, Chico, Texas, the only other station monitoring W5IZW/5 at the time, also had difficulty hearing him. Taking the situation in stride, the amateurs arranged for W5APW to QSY down the 'phone band and alert W5BFA, Borger, 100 miles from Higgins, who was busy relaying emergency traffic on another 'phone-net frequency. W5BFA immediately retuned to the Higgins frequency, but he too found W5IZW/5 unreadable. Finally, with the assistance of the Higgins station switching to c.w. and numerous repeats, Santa Fe Railroad traffic reporting trainmen killed and equipment damaged was moved out of the area.

Amateur participation in the handling of the tornado emergency knew no state or sectional boundaries. The following stations have been named by disaster-area amateurs as affording full coöperation in moving traffic and clearing frequencies: W1EMF; W2PJF; W4s CRI, JEP; W5s AGZ, CIX, EGX, EIH, FQI, HFW, HOT, ICS, JSP, KIP, OL, QI, VT; W6s FW, KKO, MTH, PAP, PXP, ZHW; W7s CGL, FTV, GC, IGM; W8PEG; W9OOL; WØs AEQ, BRN, CPV, CVN, CWK, FP, GCT, GHI, IDD, IQZ, JAS, KSY, OZN, PCY, REB, RED, RKM, YUS, ZVP.

Many of these stations were key outlets feeding the stations of the following supporting nets: Arkansas, Colorado, Illinois, Indiana, Louisiana, Missouri, Nebraska and New Mexico c.w. nets, Kansas Traffic Net, Michigan QMN Net, Pioneer Net, Pelican Net, RBL Net and TLAP; on 'phone: Arkansas, Mission Trail, Iowa, Kansas, Minnesota, Rocky Mountain and STEN nets.

Five days after the tornado struck, on Monday night, April 14th, relief authorities and civic officials announced that they had the situation back in hand. Weary and begrimed amateurs on the scene, still faced with long journeys home, relayed QRT to the many nets that had been working by their side. There was mass throwing of switches as amateurs sought long-overdue rest — many stations had been on the air continuously for over 100 hours.

Respite was to be brief, however; within 40 hours these same amateurs would be working together again, softening the blow of still another major calamity.

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The Amarillo gang at W5AVM/5, Woodward. L. to r., Tex Smith, W5CYX, Bob Jones, W5LGU, Corky Killian, W5KYD, Irv Doss, W5HF, Jean Doss, W5HYF, Jim Redfearn, W5AVM, and Dick Jones, W5KXE. W5IAN also worked with this group.

TEXAS CITY, population 15,000, on the west shores of Galveston Bay, was busily engaged in manufacturing chemicals and refining oil and sugar on Wednesday morning, April 16th, when a fire was discovered aboard the French Lines freighter *Grandcamp*, docked at the municipal pier. The ship was loading ammonium nitrate and already carrying twine and peanuts. At 9:12 A.M. the ammonium nitrate, which can ordinarily be treated with impunity, was heated to its decomposition temperature and the *Grandcamp* disintegrated in a monstrous explosion. Hot chunks of steel that were once her hull and superstructure rained down on homes and buildings and pierced oil tanks which dotted the countryside, touching them off in a holocaust that engulfed the area. One minute later three frightful explosions leveled the Monsanto Chemical Company's new $19,000,000 styrene plant. Within 60 seconds two square miles had been laid waste, hundreds killed, thousands injured . . . the Texas City Fire Department had fought its last fire.

At Galveston, seven miles across the bay, W5ZG saw the flash and felt the rumble while sitting in his office. Forty-five miles to the north, in Houston, the shock was strongly registered and the foreboding black haze plainly visible. So it was that in this dark hour the geography that gave Texas City such strong neighbors was welcome succor for the thousands of maimed, shocked and burned. Modern hospitals were close by — hospitals watched over by sympathetic and accomplished medical people, such as neurosurgeon W5PB, who in his spare moments between ministering to the hurt at Texas City, Galveston and Houston hospitals, found time to lend his weight to another important emergency operation — the amateur radio communications effort.

By noon — three hours after the explosions — the first amateur portable and mobile set-ups had moved into Texas City and were on the air. Other radio communications groups arrived there this first day too, including the Army, Navy, Coast Guard, U. S. Engineers, FBI, and local and state police. It was in supplementing the functions of these agencies, coöperating with and supporting the efforts of civic and relief officials, that amateur radio best exercised its talents.

Almost two score amateurs, identified with a dozen different stations, braved operation in the burning gas-filled explosion-torn city. They include: W5KMZ/5, Goose Creek, who worked 75-meter 'phone and 40-meter c.w. with relief ops W5s JDD, LZI, IC and KGO; W5FQQ/5, Houston, set up at the official message center, City Hall, where 75-meter 'phone was employed, W5s BHO, BZO, CNX, EEX, FGV, ON and others assisting; W5BD/5, Angleton, installed in the Chamber of Commerce Building, operating 40- and 80-meter c.w. with the help of W5HNH and W5LUN; W5DEW/5-W5BUZ (XYL and OM), 10-meter 'phone; W5FFX/5, Longview, at Red Cross Hq. using W5IYJ's kilowatt 75-meter 'phone, with W5IYJ and W5KMZ as relief ops; W5JEW/5, Fort Worth, 40-meter c.w.; W5ABQ/5, San Antonio; W5DEG/5, 75-meter 'phone; W5GLS/5, Pasadena; W5KZT/5, Houston, 10-meter 'phone; W5LGM/5, Fort Worth, 10-meter 'phone; W5MAK/5, San Antonio, 75-meter 'phone with relief ops W5LFM and W5LVD; W5MTS/5, San Antonio, the SCR399 portable unit of the Kelly Field Amateur Radio Club — W5MGO chief op, assisted by a number of club members.

During the hours immediately following the first explosions many lives hinged upon the speedy handling of requests for additional hospitalization, ambulances, plasma, oxygen and gas masks. It was in this work that amateurs performed creditably. W5KMZ/5, on the scene at 11:45 A.M. the morning of the explosion, handled over 200 urgent messages. W5FQQ/5, arriving from Houston with police escort, put his portable at the service of the Texas City message center, City Hall, which was under the direction of Paul Franklin, superintendent of the Houston Police Department Radio Division and a former

W5DAS/W5MLN was one of the many Dallas stations participating in both emergencies. Here Northern Texas SCM N. C. Settle relays Texas City traffic while Horace Childers, W5HJX, handles the land line. E. S. Coleman is at the left. (*Dallas Times-Herald photo*)

amateur. From this post W5FQQ and his relief ops worked closely with Mayor Trahan, City Engineer Osborne and Chief of Police Ladish of Texas City. Over 300 messages of high priority were handled for these officials, the Army, Red Cross, Salvation Army, telephone company and police departments. In midafternoon the W5BD/5 crew arrived and got on the air, originating Red Cross traffic which was fed into the STEN c.w. chain. Later in the evening, W5DEG/5 reached the area, setting up near W5BD/5. The two stations coöperated in feeding traffic over the best route available — 'phone or c.w.

FCC officials from Houston, directed by Regional Manager Joe H. McKinney, were on the scene continuously to supervise and coordinate the activities of the various services. They kept in close contact with amateur operation, giving immediate consideration to requests for frequency clearance and, on several occasions, lending their authority to the unsnarling of knotty QRM situations in the 'phone bands. Amateurs also provided a Texas City-Washington circuit from Mr. McKinney's forces to George S. Turner, chief of the FCC Field Engineering & Monitoring Division, and to FCC Chief Engineer George E. Sterling, W3DF, one route being W5BCU-W9NLP-W5LSH-W3USA.

An outgrowth of this close coöperation was the setting up of a highly efficient three-cornered 'phone net — Texas City to Galveston and Houston — on a cleared frequency of 3869 kilocycles. To assure the success of this net, FCC Engineer Cain was in attendance at W5FQQ/5 for 20 hours, ordering stations off the frequency when necessary. W5FQQ, W5FFX and W5KMZ held down the vital Texas City spot, the Galveston wing was maintained by W5KVM and W5ZG, and in Houston W5IGS (W5IGX relief op) and W5FQI held the fort, in turn feeding the well-organized emergency net of the Houston Amateur Radio Club, via a 2-meter link. HARC members, W5s JIY, JMI, IMF, LSE, ADZ and IYR, pitched in to keep W5EAL, the official Houston message center, in full operation. This station maintained contact with the following Houston stations by land line: W5KZT and W5LPX on 10-meter 'phone; W5BCU (W5KWV relief op) and W5PB on 20- and 10-meter 'phone; W5BBV on 40-meter c.w.; and W5CAB (W5s JRQ, MAD and MUA relief ops) on 80-meter 'phone. B.c. station KTHT worked closely with Houston amateurs, while in Galveston KLUF afforded a similar tie-in.

There were many narrow escapes among the amateur fraternity when on the first night the S.S. *High Flyer* crumbled in an explosion equally as destructive as that of the *Grandcamp*, adding hundreds of new names to the death and casualty lists. W5FQ and W5EEX, who had stayed in the city despite warnings to evacuate, were on the air at the time and badly shaken up. The thunderous roar was picked up by the FQQ microphone and heard by a number of amateurs (windows in the shack of W5IGS, Houston, shook 21 seconds after the explosion was heard via W5FQQ's carrier!). Undaunted, the W5FQQ/5 operators stayed on the scene to handle an expected pile-up of additional emergency traffic. The crew at W5BD/5 also were felled by the blast, an assistant, Mr. C. L. Woodside, cut by flying glass, and the station log partly destroyed. W5DEG/5, nearby, miraculously escaped injury. Serving in the line of duty as members of Naval communications units operating within 100 yards of the *High Flyer*, CARM C. H. Lewis, W4ETC, and CAP W. B. Webb, W5LTG, both survived with minor cuts and bruises.

Hour by hour, ARRL's Communications Department maintained contact with the emergency effort, through AEC officials and FCC. Operators "BM" and "JR" at W1AW vigilantly monitored the frequencies used by emergency nets and stations, reporting all developments to Headquarters immediately. The final QST declared the emergency over as of midnight, Thursday, April 17th.

B. H. Standley, W5FQQ, Houston, was operating portable in the Texas City city hall four hours after the initial blast. At his right is Ernest Smith, clerk; the nurse is Mrs. E. L. Brockman. Disregarding all warnings to evacuate, W5FQQ and W5EEX were on the air when the *High Flyer* exploded. Though badly shaken up, they continued the outward flow of emergency traffic. Among the other ops at this station were W5s BHO, BZO, CNX, FGV and ON. (*Dallas News photo*)

"Agony traffic" — inquiries relating to personal safety — did not fare too well in this emergency. Fanned to an all-time high in volume by banner headlines and special broadcasts reporting the spectacular disaster, these messages were accepted in good faith by stations the country over and relayed into the stricken area. However, amateurs at Houston and Galveston, near the scene, faced with the task of expediting traffic bearing mainly on the welfare of the explosion victims, used good judgment in filing most of this influx while high-priority traffic alone was moved. This personal-inquiry traffic was eventually turned over to the Red Cross in bulk, for further handling.

The combined influences of skip and strikes resulted in many circuitous relays to assure message delivery. Traffic for Fort Worth, originated by W5LGM/5, portable-mobile in Texas City, was given to KP4AJ on 10-meter 'phone, who in turn relayed to W5JQY, Dallas. W5JQY couldn't make telephone delivery to Fort Worth, 30 miles away; consequently he gave the traffic to KH6FD on 10, who obligingly fed it back to W5OJ, Fort Worth. W5OJ made the delivery by dial telephone — 30 minutes after the message had left Texas City!

There were at least three occasions when amateurs in different parts of the country provided communications from Monsanto Chemical Co. branches to officials of the ravaged styrene plant at Texas City: the company's Springfield, Mass. office made inquiries through W1FAU, the Oak Ridge, Tenn. plant's traffic traveled via W4FDF-W5ACL-W5BGG, and the Dayton, Ohio plant contacted via W8LJ-W5LSD.

The Southern Texas Emergency Net, both the c.w. and 'phone links, turned in an emergency communications job that reflects favorably on their many hours of preparation and drill. Both branches were in full operation within a few hours after the first explosion. Confronted with the need for dispatching traffic to all 48 states, members report exemplary coöperation from the following networks: North Texas 'Phone Nets, North Texas Traffic Net, Oklahoma Emergency 'Phone Net, Oklahoma C. W. Net, Georgia Cracker Net, RBL Net, Mission Trail Net, Indiana C.W. Net, Delta 'Phone Net, Pelican Net, Louisiana State Net, Hit & Bounce Net and the Pioneer Net.

Amateurs in 48 states, GI hams as far away as Japan, and operators in neighboring countries, all sensed the emergency and contributed their time and station facilities to the successful completion of the Texas City operation. It would be unfair to close this report without giving recognition to the work of these additional stations:

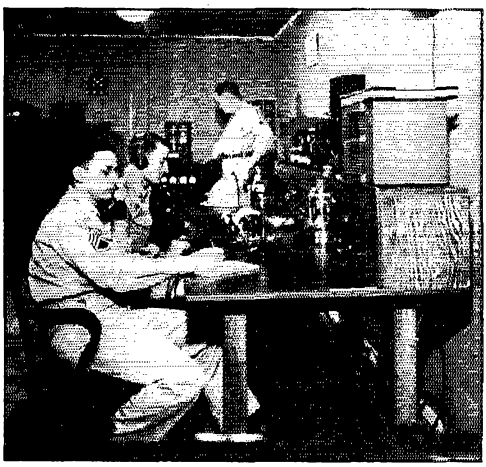
W1HMH.

W2s ABM, AIK, ANH, AQA, BO, BR, JGX, JXH, OCL, ODO, PJV, URA.

W3s DJZ, KOU, HN.

W4s ATF, DIU, ELL, INC, IU, JLB, JPW, KAU, KU, OJZ, UL.

W5s AHT, APP, APW, AQK, AUU, AYH, BB, BBH, BCG, BFA, BFI, BMI, BQT, BP, BSR, BYX, CCD, CHE, CIX, CNG, CVQ, DMK, DRE, DVI, ECE, EFC, EIX, ELE, ENC, ERS, EVI, EYV, EWZ, FAH, FDC, FGJ, FH, FMA, FNY, FOF, FOY, FUD, FWE, FYO, GEL, GCP, GEP, GHF, GJU, GKI/5, GMT, GQU, GWF, GZ, GZH, HBZ, HDY, HFO, HGC, HHT, HHV, HIF, HJB, HJX, HKK, HOU, HQR, HRO, HSX, HXI, HXM, ICS,



W5AAF, Kelly Field Amateur Radio Club station, San Antonio, handled Texas City emergency traffic via STEN, including requests for dispatching generators, supplies and aircraft to the stricken city — one generator went to W5FQQ. The station also maintained direct contact with W5MTS/5, the club's portable amateur station at Texas City. L. to r., S/Sgt Lewis R. Alverson, W5KHA, S/Sgt. William Fortune, W5MGO, and T/Sgt. Fred M. Skelton.

IFU, IGO, IHR, ITA, ITK, IVT, IVU, IXD, IYG, IZ.

Also W5s JBZ, JKS, JMJ, JNK, JO, JPJ, JUZ, KFY, KHN, KTE, KUG, KWB, KYJ, KZP, LCU, LHB, LHK, LK, LKL, LLG, LMO, LOD, LQN, LRP, LSC, LST, LUA, LVB, LVD, MA, MAW, MCZ, MIF, MKL, MLK, MLN/DAS, MRI, MSB, MUR, NW, NWP, NY, OL, PAY, TN, USA, VT.

W6s AOE, BTV, DZE, IDY, MKH, MQR, NTU, OT, PAP, PRQ, QWZ, RBQ, REB, TI, TT, SSN, UZX.

W7s AEX, IGM.

W8s KAH, NS, TTE, VNG, VOS, ZM.

W9s MAT, NZZ, UZ, VGV, WKN.

WØs BMU, FFB, GCT, GFQ, GZR, HIR, HTR, IIQ/4, KFL, PCY, VXV, WKS.

J2AAO, J2AGA, J2FOX, J2ROC, J3GNX, KH6AF, KP4CL, VE1DW, VP9F.

A Standing-Wave Meter for Coaxial Lines

Another Approach to Direct Reading of S.W.R.

BY H. O. PATTISON, JR.,* W2MYH, ROBERT M. MORRIS,** W2LV, AND JOHN W. SMITH,*** W2TW

• As is often the case in radio, practical solutions to the same problem are obtained simultaneously and spontaneously by different groups. A gang in New Jersey had unsatisfactory results adapting the Micromatch principle to co-ax line and came up with a different device to do the job. Essentially a resistance bridge, it has been operated satisfactorily as high as 144 Mc., and it is a cinch to build. If you use coaxial line at all, this direct-reading s.w.r. meter is something you should have in the shack.

It doesn't take much effort to sell an amateur on the idea of using a standing-wave indicator. As a matter of fact, most of us have been using one for years — in the form of a neon bulb passed along the transmission line.

Now as long as you stick to open wire, or balanced lines, the little neon bulb or galvanometer and loop isn't too bad as an indicator. However, a recent *QST* article[1] described an astounding new device, the Micromatch, which is much more sensitive, and in addition measures power levels. At first glance it looked like a simple gadget — but did you ever try to build one? If you did, you probably found out that all the fits of temperament are not limited to stage and screen stars!

Yes, sir, the Micromatch can be a very critical devil. It is supersensitive as to placement of components — and apparently capable of deciding not to work just because of the way you part your hair.[2] It's almost enough to reaffirm your faith in the neon bulb.

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** 22 Mountain View Rd., Millburn, New Jersey.
*** 3 Dellwood Drive, Madison, New Jersey.

[1] Jones and Sontheimer, "The Micromatch," *QST*, April, 1947.

[2] The inventors of the Micromatch aren't quite convinced of this, but they do describe some of their recent findings and suggestions for improvement of the device elsewhere in this issue. — *Ed.*

[3] Whaley, "New High-Frequency Bridge," *W. E. Oscillator*, Oct., 1946.

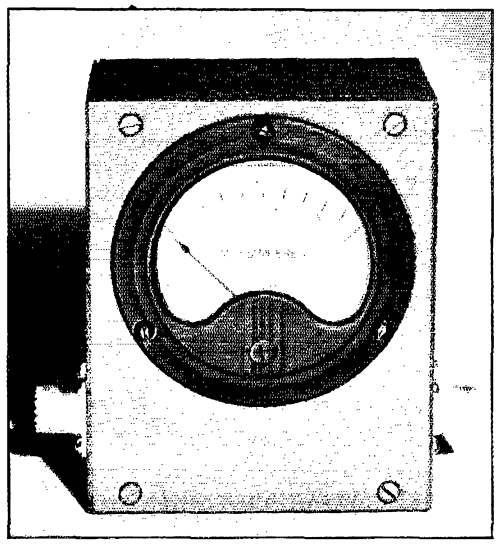
[4] The full development of the theory is given in the original article, but anyone familiar with bridge balance will see that when the coaxial line looks like a resistance equal to R_1 the bridge will be balanced if R_3 ($+C_1$) and R_4 ($+C_2$) are also equal. Actually the condensers are used only to prevent a d.c. short-circuit, but the bridge arms must have equal reactances as well as resistance to balance over a wide frequency range. — *Ed.*

Now all this is true for balanced lines — but you ain't heard nothin' yet. The fellow with a co-ax line is the one who really needs a standing-wave detector — he can't use the neon bulb — and the Micromatch, as shown in *QST*, just won't function properly on an unbalanced line at 28 Mc.

The Circuit

Actually the solution is very simple — and it all goes back to an original standing-wave meter which was designed specifically for coaxial use, where it is most needed. Such a meter was first described in Western Electric's house magazine, *The Oscillator*.[3] The little meter shown here is a direct outgrowth of the one described in that article — with certain refinements and simplifications. The circuit is shown in Fig. 1, and it will be seen that it is a resistance bridge, with R_1, R_3, R_4 and the coaxial line making up the elements.[4]

First of all, let us point out that this meter is made to read standing-wave ratios for *one* cable impedance only. The one to be described happens to be designed for RG-8/U, or any other 52-ohm cable. If you wish to design it for RG-11/U, RG-13/U, or any of the 73-ohm cables, the only



A simple s.w.r. meter for use with co-ax lines, mounted in a 3 × 4 × 5-inch box.

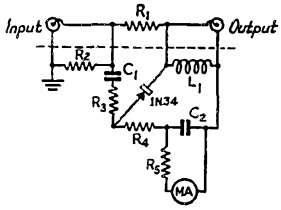


Fig. 1 — Wiring diagram of the simple s.w.r. meter for coaxial line.
C_1, C_2 — 470-$\mu\mu$fd. mica.
R_1 — 1-watt composition resistor, value equal to impedance of line being measured.
R_2 — 10 ohms, 1 watt.
R_3, R_4 — 56-ohm 1-watt composition. Exact value not important but the two resistors must have the same value.
R_5 — 470 ohms, ½ watt.
L_1 — Good r.f. choke at operating frequency. Not required if antenna system is closed type that offers d.c. return. At 28 Mc., 40 turns of No. 36 d.c.c. wound on a 1-watt 0.1-megohm resistor is satisfactory, or a regular 2.5-mh. choke should be good.
MA — 0–1 milliammeter.

change necessary will be to substitute the proper value for R_1. You might even want to be fancy and design some sort of a plug-in resistor for R_1.

The model illustrated here works well in the 28-Mc. region. It is built from standard components and can be copied verbatim by those whose principle interest is 10 meters. However, for general use on other bands some modifications would be advisable. Condensers C_1 and C_2 should be in the order of 0.001 μfd. for use in the lower frequency bands.

For use on higher frequencies it is recommended that the bridge elements be assembled into a much more compact form than the one shown here. Keep all leads as short as possible, and mount the resistors and condensers in a tight group against the brass partition.

The choke L_1 is added to give a d.c. return path when measuring antennas with a split radiator, and it can be eliminated if a folded dipole, "T"-match, or other type of closed radiator is used. Resistor R_2 is added to improve the regulation of the r.f. energy fed into the device and to improve the accuracy at high standing-wave ratios. Resistor R_5 is added to improve the linear response of the meter and thus make for more accurate readings as the standing-wave ratio approaches unity.

Construction

From a construction standpoint there are no tricks — it can be built in any form as long as the basic feature of shielding the coaxial section from the rest of the bridge is retained. The meter shown here is built into a standard 3 × 4 × 5-inch metal box. The partition is a piece of sheet brass flanged on two sides and fastened by four self-tapping screws.

A piece of polystyrene (3 × 1 × ¼ inches) is bolted to the brass partition, and through this insulator two 10–32 bolts extend into the shielded cavity. Where the bolts pass through the brass, large clearance holes are drilled to prevent a short-circuit.

As the picture shows, the two bolts support the resistor R_1 in the cavity — all other parts are shielded by the brass partition. For the sake of convenience they are mounted on a terminal board attached directly to the meter lugs.

Method of Operation

To use this standing-wave ratio meter, you simply connect a source of r.f. power to the input terminal. This can be done by connecting a short length of co-ax (the exact length is unimportant) to the transmitter output and to the input terminal of the s.w.r. meter. The plate voltage of the final amplifier stage should be reduced and the buffer may have to be uncoupled a bit if you are in the kilowatt class. With no load on the output of the meter, adjust the r.f. source until the meter reads full scale. Then couple on the line to be measured — and it reads direct to

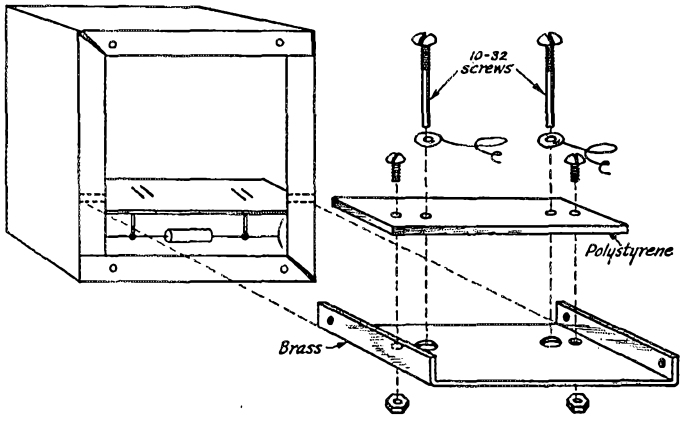
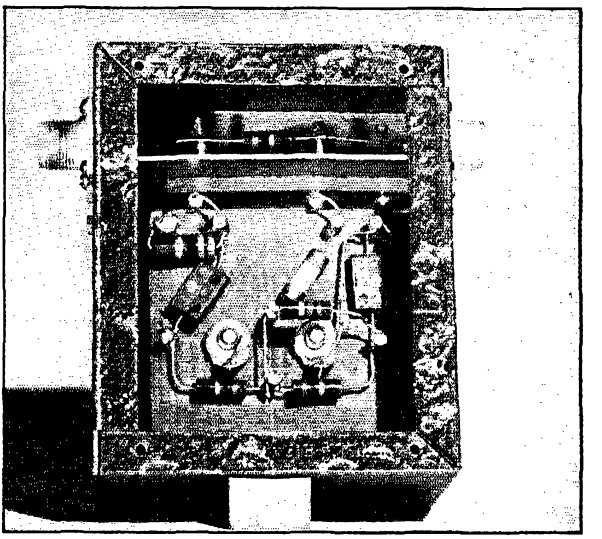


Fig. 2 — Constructional details of the compartment shield.



A rear view of the s.w.r. meter, showing how the components are shielded from the center-conductor bus. Note how all of the parts are mounted on one board which in turn is supported by the meter terminals. The upper frequency limit of the meter can be increased by using shorter leads in the bridge portion of the circuit. The r.f. choke was not included in this unit, because it is used with a closed-circuit antenna.

♦

s.w.r. No tricks . . . no adjustments . . . no fuss! And provided you wire the components correctly it works the first time.

Calibration

A calibration curve has been made for the instrument shown here. For all practical purposes this can probably be used for any other meters built following this design. However, for those who wish to change the design, or who wish the added accuracy of an individually-calibrated meter, the procedure is as follows:

First, make up a dummy-load resistor consisting of ten one-watt 500-ohm *carbon* resistors in parallel, soldered in canopy fashion around a coaxial plug. The resistance value of this should be exactly equal to the impedance of the line to be measured.

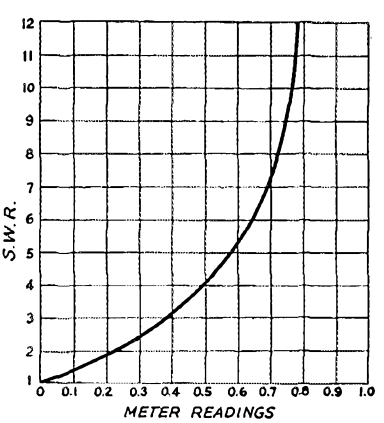


Fig. 3 — Calibration curve of the s.w.r. meter. This will serve as a rough guide — for greater accuracy the meter can be calibrated as described in the text.

Second, connect the dummy load to the output of the meter and make the first measurement, as described above. This first reading should be approximately zero.

Third, remove one of the one-watt resistors from the load, accurately measure the new resistance value of the load — then take a new reading. Continue this process of removing one resistor, measuring the new resistance, then taking a reading. You will then have ten meter readings for ten different resistor values.

Fourth, using the formula $\frac{R_t}{R_x}$ = s.w.r., where R_t is the terminating resistance and R_x is the line impedance, you can then calculate the standing-wave ratios. Plot the s.w.r. against the meter readings on a chart — and there you are.

The s.w.r. meter can be used to measure the standing-wave ratio either at the transmitter end of the transmission line, or it can be carried to the roof of the house or the top of the tower and used to set the adjustment of the antenna impedance to that of the line.

It might be well to point out that the user of this device almost certainly has surprises in store for him. If a standing-wave ratio below 2 is achieved you really have something, and you may have to be satisfied with something higher than 2. It was found upon checking a 4-element beam that the standing-wave ratio of 1.6 achieved at one position of the beam rose to over 3 when the beam was pointed in a different direction, because of the proximity of other antennas.

Someone once compared the standing waves in coaxial line to the light in the ice box. The only way to tell what happens to either one is to get inside and look. Well, okay, brother — here's the little gem that lets you look inside your line.

1947 ARRL-Member Party Results

THE Fifth ARRL-Member Party, held during the first week-end of January, was the continuation of a popular series that had its beginning in 1938. The 1947 get-together was the first held in six years. Old acquaintances and friendships were renewed, new ones made, and typical comments received indicate that everybody had a good time. Some operators reported conditions slightly below average, but the usual crop of good scores was in evidence nevertheless. Logs were received from 307 members in 66 ARRL sections.

Award Winners

The highest-scoring League member in each of the sections active during the Party will receive a combination ARRL-membership and call letter pin of exclusive design. The winners of these awards are: *W1BFT*, *W1BIH*, W1GKJ, W1JYH, W1LLX, W1LWA, W2BBK, W2EQD, *W2IOP*, W2PGT, W2TNN, *W3BES*, *W3HUM*, W3KWL, W3TWI/4, *W4AXP*, W4BGO, W4BRB, W4DXI, W4FNS, W4FXU, *W4KFC*, *W5AQE*, W5EUK, W5LUY, W5VT, W5WZ, *W6BIP*, W6EPZ/5, *W6HZT*, *W6IPH*, W6MI, W6RDP, W6SRU, W6TN, W6UTV/7, *W7ECI*, W7EPM, W7EMT, W7JHN, W7ONG, *W7QAP*, W8JM, W8SCW, *W8WZ*, W9GFF, *W9NH*, *W9RQM*, W9ZWR, WØCFB, *WØGBJ*, WØIJK, WØJRI, WØPDN, *WØSJT*, *WØWUU*, *K6CGK*, KL7AD, KP4KD, VE1HJ, VE2SU, VE3EF, VE4PK, VE5HB, VE6ZM and VE7EH. Congratulations, fellows! Among these winners, 20 were section leaders in at least one previous ARRL Party; their calls are listed in italics. A special word of congratulation is in order for W8WZ (ex-W8OFN) and W9RQM, who have led their respective sections in each of the five ARRL Parties!

Outstanding Scores

Highest score submitted was—yes, you guessed it—that of W3BES: 52,930 points, 370 contacts, 67 sections. Jerry has made it a habit to be high man in these parties; he also led the field in 1939 and 1940. A close second, W9RQM, worked 360 members in 66 sections for 50,280 points. Third highest scorer was W4KFC with 48,230 points, followed by W8WZ, 47,520, and W1TS, 45,500.

Among the other high scorers are W6HZT 45,500, W2IOP 43,032, W1BIH 36,704, W3BXE 35,910, W8RSP 33,852, W1BFT 33,822, W1LWA 33,804, WØJRI 33,800, W8UZJ 33,550, W1UE, 33,540, W4BRB 31,842, W6EPZ/5 30,056, W1JYH 29,160, VE3EF 28,329, W8SCW 28,050, W8ZFA 26,564, W3KWL 25,694, W1LLX 25,422.

Leaders in number of members worked: W3BES 370, W9RQM 360, W4KFC 346, W8WZ 335, W1TS 325, W6HZT 319, W2IOP 301, W8RSP 274, W1BIH 271, W3BXE 260, WØJRI 260, W1UE 255, W1LWA 253.

Leaders in number of sections worked: W3BES 67, W2IOP, W6HZT, W8WZ, W9RQM 66, W1TS, W4KFC, WØJRI 65, W3BXE 63, W1BFT, W1BIH, W8RSP 62, W4BRB, W6EPZ/5, W8UZJ 61, W1UE 60, W1LWA, W1RY, W6BIP, W9NH 59, W2BBK, W3KWL, W3TWI/4, W8NZI, W8ZFA 58.

The highest scorer in each district: W1TS 45,500, W2IOP 43,032, W3BES 52,930, W4KFC 48,230, W6EPZ/5 30,056, W6HZT 45,408, W7QAP 22,344, W8WZ 47,520, W9RQM 50,820, WØJRI 33,800.

Participants' Comments

"Lots of fun! Discovered my rig could be improved for break-in operation. Some of the fellows still change their ECO frequency with full power on (not so good!). First contest I have been able to participate in since before the war and it really seemed like old times."—WØARH. "I was using only about ten watts and when I worked a KL7 I thought maybe it was time to quit and rest on my laurels. Hi. Had lots of fun." — W2EGG. "One thing the contest proved to me is that a properly-operated low-power rig under even fair conditions can get out very well. The contest also brought out my operating faults and I surely intend to improve." — W9NON. "I did not make a very high score but certainly enjoyed the party, worked many new states and tested my little 30-watt rig. Am sure that if I had used VFO I could have tripled my score easily. Sure looking forward to the next Party." — VE6ZM. "My membership expiration date actually is 0157, but no one would believe it on the air! I soon tired of having to explain this date and used 1247 instead. It was a good contest." — W4BGO. Interruption: "At 7:00 P.M. Sunday, the Community Church in my block caught fire and burned to the ground, causing a five-hour power failure. This incident changed me from a ham operator to a ham fireman and ended my contest aspirations!" — W6OMR. "It won't win any prizes, but I'm proud of my score. The party was a lot of fun. Particularly, it gave me a good idea of how my antennas are working." — W9GMZ.

(Continued on page 102)

Additional Notes on the "Micromatch"

BY MACK C. JONES,* W1PNX, AND CARL SONTHEIMER**

SINCE the first article on the Micromatch appeared in April *QST*, considerable work has been done to increase its usefulness and accuracy.

The instrument was made more accurate at 30 Mc. by the substitution of a capacitor attenuator (C_2, C_3 and C_4 in Fig. 1) in place of the single 820-$\mu\mu$fd. capacitor C_2 in the original schematic diagram. This change minimizes the effect of the series inductance of most 820-$\mu\mu$fd. capacitors and allows the instrument to read standing-wave ratio more accurately at the higher frequencies.

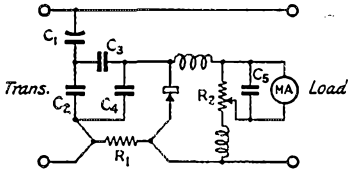


Fig. 1 — The revised circuit of the Micromatch.
C_1 — 3-15-$\mu\mu$fd. midget *variable* (not "fixed" type as shown in schematic).
C_2, C_4 — 220-$\mu\mu$fd. mica.
C_3 — 82-$\mu\mu$fd. mica.
C_5 — 0.0047 mica.
R_1 — 1.1-ohm resistor (9 10-ohm 1-watt resistors in parallel). Other values same as in original.

The values of capacity are chosen so that the same voltage appears across the capacitor C_4 as originally appeared across the 820-$\mu\mu$fd. capacitor. The theory of operation of the instrument remains unchanged except that the expression for E_c now becomes:

$$E_c = \left[\frac{C_3}{C_3 + C_4} \times \frac{C_1}{C_1 + C_2 + \dfrac{C_3 C_4}{C_3 + C_4}} \right] E$$

The short section of transmission line through the instrument was modified so that the lines have a spacing of approximately ½ inch, and one

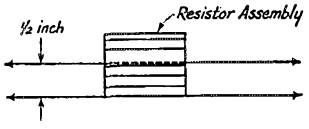


Fig. 2 — A sketch of the transmission-line spacing in the Micromatch.

of the lines runs through the resistor ring as shown in Fig. 2. This brings the characteristic impedance of this section of line closer to 300 ohms and thus causes no appreciable discontinuity throughout the frequency range of the instrument.

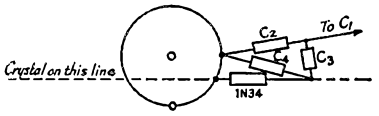


Fig. 3 — Placement of components in the Micromatch to avoid stray coupling.

The placement of parts within the instrument is very critical, particularly around the 1N34 crystal. The crystal should be placed on a line perpendicular to the parallel wires, as shown in Fig. 3. The three fixed capacitors should be connected in a triangle with very short connections. This triangle should be in a plane perpendicular to the transmission line. This placement reduces the voltage induced in the capacitor attenuator and crystal circuit by the current flowing through the transmission line.

These modifications to the design have improved the performance of the instrument at 30 Mc. to the point where it is comparable to the performance on the lower frequencies. They are incorporated in all production units.

Silent Keys

IT IS with deep regret that we record the passing of these amateurs:

W1AVB, John K. Barber, jr., Cos Cob, Conn.
W1HPM, J. Brodie Smith, Manchester, N. H.
W1KUZ, John J. O'Brien, Providence, R. I.
W3VRU, William H. Brown, jr., Aliquippa, Pa.
W5ECL, Dr. William B. Thomas, jr., Amarillo, Tex.
W6TO, William F. Davis, Fresno, Calif.
W9FCW, Herbert E. Cremer, Kankakee, Ill.
W9JPX, Arnold K. Dickmeyer, Indianapolis, Ind.
Ex-W9MWU, 1st Lt. George H. Freer, USA, Chicago, Ill.
W9YKJ, Wynne H. Davis, Chicago, Ill.
GM6UU, T. Readshaw, Bonnyrigg, Scotland.

* M. C. Jones Electronics Co., 96 N. Main St., Bristol, Conn.
** 7 Leonard St., Riverside, Conn.

Looking Over the Postwar Receivers

The National NC-173

THE NC-173 is the first receiver of entirely postwar design to be put out by the National Company. It fills in the gap between the lower-priced NC-46 and the NC-2-40. The frequency range includes a band from 48 to 56 Mc. as well as the usual span of 540 kc. to 30 Mc.

The circuit basically is a superheterodyne, of course, with one r.f. stage, two stages of i.f. and two of audio, including the power-output stage. Such accessories and conveniences as a panel-controlled antenna trimmer, crystal filter, amplified a.v.c., S-meter and audio noise limiter are included.

Tuning System

The tuning system is of the parallel-condenser bandspread variety with separate calibrated dials for general coverage (or bandsetting) and bandspread. Tuning is further facilitated by a gear reduction so that it takes 9 revolutions of the 2-inch tuning knob to cover each of the general-coverage bands and, on the bandspread ranges, 10 turns to cover the 3.5-Mc. band, 7 turns for 7 Mc., 8 turns for 14 Mc., 4½ turns for 28 Mc. and 4 turns for the 50-Mc. band. The ranges of 48 to 56 Mc., 12 to 31 Mc., 4.3 to 12 Mc., 1.6 to 4.3 Mc. and 540 to 1600 kc. are selected by a five-position switch.

A separate high-frequency oscillator is used in the frequency converter and plate voltage for this stage, as well as plate voltage for the b.f.o. and screen voltage for the r.f. amplifier and mixer, are regulated by a VR tube. Although the instruction book lists them as mica, the h.f.o. trimmers in the receiver sent to us for test are ceramic. All other trimmers and padders are mica.

I.F. Amplifier

Relatively-high C is used in the i.f. amplifier tuned circuits which serves to reduce the flare at the bottom of the selectivity curve, through reduction in stray couplings, and to minimize frequency shift with a.v.c. action or adjustment of the manual gain control. Also, the amplifier is more tolerant when tubes are replaced or if tube capacitance changes with age. Loss in gain through the use of transformers of this type is compensated for by the high-gain 6SG7. The selectivity of the crystal filter is adjustable in five steps.

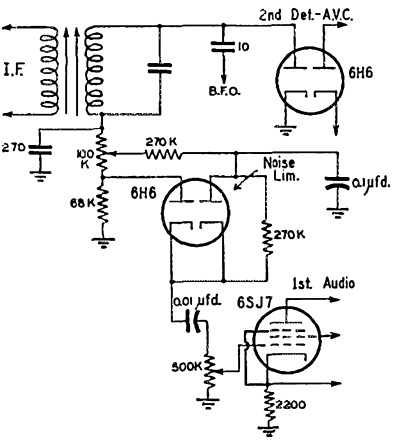


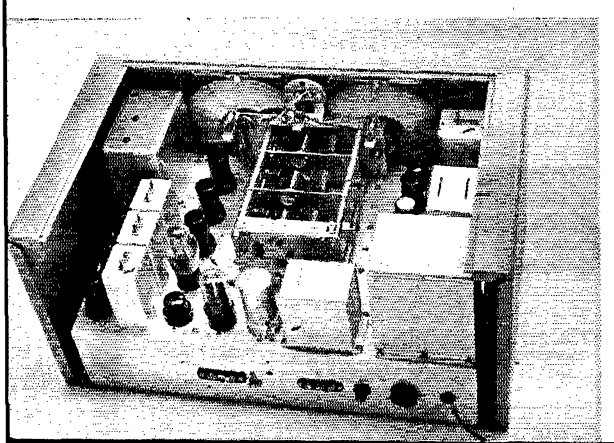
Fig. 1 — Circuit diagram of the noise-limiting system in the NC-173.

A.V.C. & Noise Limiter

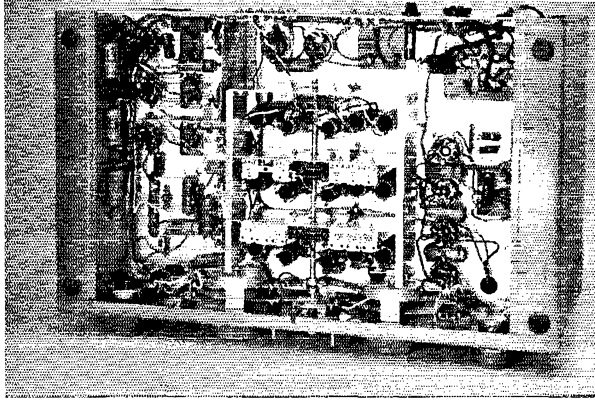
The a.v.c. system is arranged so that the b.f.o. signal does not affect its action nor the reading of the S-meter. This is accomplished by taking the a.v.c. signal from the grid of the second i.f. amplifier while the b.f.o. signal is fed to the second-detector diode in the usual manner. Because the b.f.o. signal cannot go backward through the i.f. amplifier, it does not get into the a.v.c. system. Since the b.f.o. signal does not render the a.v.c. system inoperative, advantage may be taken of the benefits of a limited amount of a.v.c. in c.w. reception and the S-meter is usable.

The S-meter scale is calibrated in S-units from 1 to 9 with approximately 4 db. per S-unit, and in db. above S9 from 0 to 40 db. The no-signal reading does not require readjustment.

The noise-limiter circuit is shown in Fig. 1.



Looking into the NC-173 from the rear. The i.f. section is to the left, power supply at the rear and audio along the right-hand edge.



Bottom view of the NC-173. The coils for the h.f. circuits are in the shielded compartment at the center with the switch shaft running through the middle. The dial controls are flywheel-loaded.

♦

A conventional series noise limiter that cuts the peak of the wave appreciably causes a noise-producing transient charge to accumulate at the audio coupling condenser which follows. In this circuit a second diode is used to remove this transient charge at a superaudible rate, thereby preventing the limiter from producing noise of its own. A panel control permits manual adjustment of the threshold at which limiting starts.

Audio

The audio system includes a simple tone control of the condenser-potentiometer series type connected across the output of the first audio stage. The headphone jack connects the 'phones across the 8-ohm voice-coil tap and insertion of the plug cuts out the 'speaker. If greater headphone volume is desired, the connection may be shifted to the 500-ohm output-transformer tap which is provided for feeding a 500-ohm line. A second jack permits phonograph pick-up connection to the input of the first audio stage.

The receiver may be operated from either 115- or 230-volt a.c. supply by proper connection to the dual-primary power transformer. A plug and socket at the rear of the receiver may be used for connection to batteries and to an external send-receive switch.

Tube Complement

Type 6AG7s are used in the r.f. and i.f. amplifier stages and 6H6s in the second-detector, a.v.c. and noise-limiter circuits. The a.v.c. amplifier is a 6AC7. Type 6SJ7s in the b.f.o. and first-audio stages, the 6V6GT/G, the 5T3GT/G and the VR-150 make a total of 13 tubes.

The rounded corners, smooth lines and "dustable" gloss finish of the receiver cabinet and the 'speaker enclosure reveal a conservative modification of current modernistic exterior styling which should be pleasing to the ham who still likes to have his receiver look more "communications" and less "SWL."

— *D.H.M.*

HAMFEST CALENDAR

CALIFORNIA — Many opportunities for hamfesting are promised those radio amateurs identified with police communications who attend the Associated Police Communications Officers Conference, Los Angeles, August 25th to 29th.

GEORGIA — The Amateur Radio Club of Savannah is sponsoring a hamfest on Sunday, July 20th, at the General Oglethorpe Hotel, Wilmington Island. Guest speakers, prizes, contests and refreshments are the attractions. Registration will begin at 10 A.M. at 233 E. Boughton Street. Tickets will be $3.00 for adults and $1.50 for children.

MONTANA — Having failed to find much interest in reviving the old WIMU hamfests held for years in the Jackson Hole country of Wyoming, the Southeastern Montana Radio Club called a meeting at Billings on March 2nd at which arrangements were made for holding the First Montana Annual Hamfest. This is to occur in Livingston and vicinity, at the north entrance of Yellowstone National Park, on August 8th, 9th and 10th. In addition to hamming, fishing and swimming and other park activities will be available. A special organization was formed to conduct these hamfests. W7BWH of Livingston is president, W7KJS is vice-president, W7FIN is secretary-treasurer. Area vice-presidents are W7CPY of Glendive, W7EMF of Butte, W7DSS of Great Falls and W7FOM of Missoula. Write W7FIN for further particulars.

PA. — The South Hills Brass Pounders & Modulators will hamfest at Spreading Oaks Grove, South Park, Pittsburgh, Pa., on Sunday, August 3rd, starting at 1:00 P.M. Admission is $2.00, which includes a box lunch and prizes, chief among which will be a good ham receiver. Further information may be obtained from Edward Lips, c/o Tydings Co., 632 Grant St., Pittsburgh 19, Pa., or from Charles Schuler, 2944 Spring Street, Pittsburgh 10, Pa.

WEST VIRGINIA — The Charleston Radio Club (KVARA) will stage a hamfest on Saturday, July 5th, at Charleston. Prizes, short talks, and entertainment for YFs and YLs have been planned, the feature attraction being a 2-meter hidden-treasure hunt. Registration: $2.50 in advance, $3.00 on hamfest day. Two buffet meals are included. Registration starts at 9 A.M. Sunday at the WCHS Auditorium. Additional information may be secured from Bill Dixon, 901 Grant Street, Charleston, W. Va.

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ALBERTA — The Glacier-Waterton International Hamfest, believed to be the first of its kind, will be held Sunday, Monday and Tuesday, July 13th, 14th and 15th, at Waterton Lakes, Alberta. W7FL, W7BOZ, VE6SR, and VE6DR are in charge of arrangements. An excellent program has been planned, including a talk by ARRL Canadian General Manager, Alex Reid, VE2BE, boat trips, dancing, prize drawings, junk box auction and equipment demonstrations. Bring along your ancient radio gear for VE6DR's display. Tourist accommodations are available. Stan Read, VE6SR, Glenwood ville, Alberta, Secy.-Treas. of the affair, will gladly handle reservations: OMs $3.00, XYLs $2.00.

ONTARIO — The Thousand Island Amateur Radio Assn. will hold its first hamfest on July 6th at Brockville in the Thousand Islands. Site of the affair is on the banks of the St. Lawrence River, so hams are invited to bring the family for an outing. If hotel accommodations or cabins are required, send reservations to the secretary, VE3WG.

A basket picnic, sponsored by the West Side Radio Club and the Toronto Amateur Radio Club, will be held at Hanlan's Point, Toronto Island, on July 5th. Further information may be secured from F. L. Edwards, VE3MI, Secy. Picnic Committee, 119 Victoria St., Toronto, Ont.

Foreign Notes

GREAT BRITAIN

R.S.G.B. is again issuing BERTA and WBE certificates to qualified amateurs. For applicants who are not members of the British society, a fee of 2/6, or equivalent amount in other currency, is charged. Applications, with supporting proofs, should be submitted by registered mail to General Secretary, Radio Society of Great Britain, New Ruskin House, 28 Little Russell St., London,

The R.S.G.B. representatives at Atlantic City meet some friends in the United Kingdom delegation. L. to r., Group Captain H. G. Blair, Air Ministry deputy director of signals, J. C. Clarricoats, G6CL, R.S.G.B. general secretary, Col. Bric S. Cole, G2EC, chairman of British Joint Communications Board, and R.S.G.B. President Stanley K. Lewer, G6LJ.

W.C.1. Claimants must certify that licensed power was not exceeded in effecting the contacts for which the award is sought. A minimum readability report of R3 and a tone report of at least T8 must be recorded on each QSL or letter submitted. Contacts with mobile stations (other than ships) are acceptable provided the exact location of each such station is clearly indicated in the evidence submitted. British mandated territories and protectorates are regarded as being a part of the British Empire. The decision of the Council of R.S.G.B. will be final in event of disputed claims.

The British Empire Radio Transmission Award may be claimed by any fully-licensed amateur who submits evidence of having effected two-way communication on amateur frequencies with amateur radio stations in at least 25 of the British dominion call areas and in at least 15 of the British colonial call areas. Either telegraphy or telephony may be used; an appropriately-endorsed certificate will be issued for work exclusively by telephony.

The Worked the British Empire certificate may be issued to any fully-licensed amateur who produces evidence of having effected two-way communication on amateur frequencies with at least one British Empire amateur radio station located in each of the following continental areas: North and South America, Europe, Asia, Africa and Oceania. Separate awards will be made for telegraphy on any of the amateur bands, telephony on any of the amateur bands, telegraphy on 28-Mc. band and telephony on 28-Mc. band.

At their discretion, upon receipt of formal application, the Council of R.S.G.B. may authorize the secretary of a sister-society to approve applications for WBE from nonmembers of R.S.G.B., thus avoiding trusting cards to overseas mails. In such circumstances, the I.A.R.U. member-society will assume responsibility. Applications for awards other than WBE must be submitted directly to R.S.G.B.

FINLAND

The man back of OIX7, and indeed often the voice at the microphone of the experimental station heard on 28,424 kc., is K. S. Saino, OH2NM, engineer for the Finnish Broadcasting Company. OIX7 was established to collect additional data concerning antenna arrays and m.u.f. and, in working amateurs all over the world, many interesting observations have been made.

EIRE

At the Annual General Meeting of the *Irish Radio Transmitters' Society*, officers were elected as follows: president, T. D. O'Farrell, EI6F; vice-president, H. A. Hodgens, EI5F; honorary vice-presidents, J. Devine, J. Gallagher; trustees, N. H. F. Waring, EI8J, and T. D. O'Farrell,

(Continued on page 110)

Visiting the Flag Monument at Cardenas, Matanzas, Cuba, were these members of the *Radio Club de Cuba:* front row, l. to r. — CO5AP, 2GS, 5AA, 5PN, 5CN and two daughters; rear — CO2MS, 2DT, 5AL, 2IF (2BG's XYL) and CO2BG, secretary of R.C.C.

How's DX?

CONDUCTED BY JOSEPH E. GRAHN,* WICH

How:

Along with requests for QTHs, the best time to knock over a certain juicy one, what do we use for a rig, etc., come a half dozen or more requests for the best procedure to use in this DX-chasing game of ours. A question like that is, of course, like asking a fisherman where he caught that big one.

However, one should be able to arrive at some of the answers by pure reason alone. Judging from some of the stuff on the air, DX procedure should include the following features:

1) Get yourself a lousy signal.

2) *Keep the transmitter on the air!* If you haven't heard any DX for 20 seconds, call "CQ DX."

3) If someone calls some DX you haven't heard yet, move in and give a shout — he *might* come back to you. When your pals tell you about it afterward, you can tell them the power leak came on.

4) Don't pay any attention to LM, ML, etc., sent by the DX station to indicate where he's listening. That's only a decoy — the real *smart* guys call on frequency no matter what happens. When he doesn't come back, start testing your transmitter on the same frequency, to help along the QSO.

5) During a busy period when you've called a DX station at least 20 times and he always comes back to someone else, move on to his frequency and call "CQ VU" or whatever his prefix is. He just can't resist answering your CQ instead of one of the twenty-five dumb guys who call him in the old-fashioned way.

Of course, if you're serious about the deal, and would like to try a revolutionary procedure, do plenty of listening before you call, study the receiving habits of the DX you're trying to snag, and if short calls and "BK" are indicated, by all means use them.

* 53 Quinapoxet Lane, Worcester, Mass.

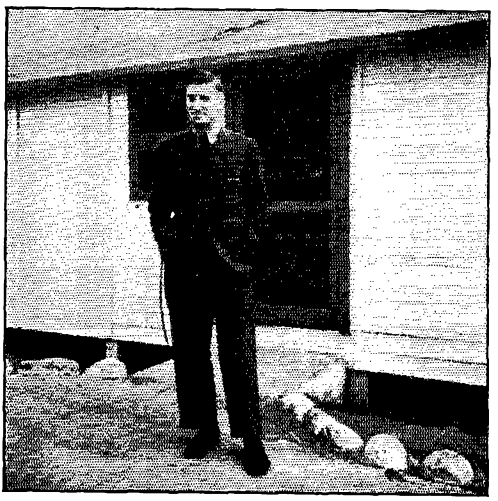
What:

So far the reports about 80 have been very scarce, but W3WJF, who likes the band, wishes more of the gang across the pond would use it. He latched onto **G8WF** (3542), **G4GJ** (3535) and **FA8BG** (3539) . . . . Despite summer QRN, BM of W1AW has had nice QSOs with OZ4FT and F3MS.

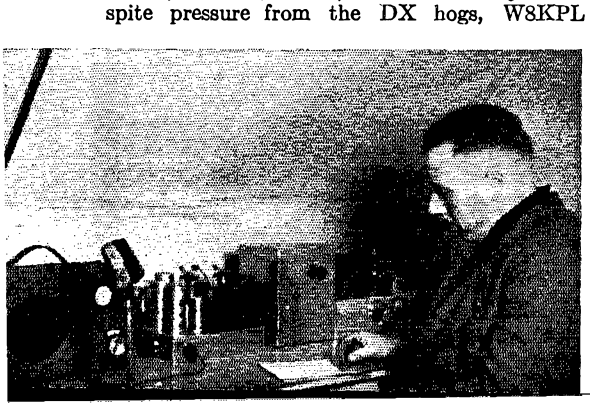
The activity on 40 seems to have slackened considerably also; however, W5JPC worked J2AHI, KP4CC, PK6AC, W6VDG/KG6, TG9JK, VK3ZC, ZL1MQ, ZL3GU, VK2PA, ZL2MM, KH6DD, W2EKK/J2, KH6BM and KP4DH . . . . W9BRD, with parallel 6L6s and 75 watts, dug up **OX3AB** (7190), **FA8BG** (7020), **YR5V** (7150), **ZK1AH** (7190), **W6NQG/KM6** (7110), **HK3P3** (Rod claims that's the call) (7100), **KP6AB** (7150) and **ZS6KS** (7240), with several Europeans thrown in. He swears 40 really pays off if you've got a good crystal in the receiver.

The exodus seems to have been to 20 the past month or so, with lots of newcomers reporting some nice stuff. W9PSR kept busy and happy working UA3AG, G3LR, VK3HG, J4AAK, PK6HA, VQ8AK, I1ADW, YS1DS, KS4AC, KH6DQ, VK6AP, OZ2XA, SM5YS and UA9CB, which are the best of a long list . . . . W3DKT snagged TA3SO, LI2JC, FB3AC, ME4AB, TF3EA, UB5KAC and OI2KAB, giving him a total of 101 postwar . . . . The pick of the lot from J2AHI are **UA4HI** (14,080), **UN1AA** (14,035), **VQ3HJP** (14,044), **MX2AG** (14,035), **I6USA** (14,100), **NY4CM** (14,030), **GM6VC** (14,020), **D4AOZ** (14,082), **OK1WX** (14,075), **LA4U** (14,030), **UA3AF** (14,110), **LU7DV** (14,070) and **GW8UH** (14,005) . . . . The "unusual" luck at W8WWU is: **CN8BL** (14,080), **HI8MAF** (14,050), **W8LXN/KG6** (14,025), **OX3GE** (14,045), **VR5PL** (14,065), **W7KLQ/J9** (14,050) and **VS7IT** (14,050) . . . . W5FQG reporting for the first time, sends in a list any DX

hunter would call big game: **J2AIA** (14,025), **J3AAH** (14,080), **J2FOX** (14,070), **J2AAU** (14,035), **WØFTV/KG6** (14,080), **KA1RP** (14,090), **UAØKFC** (14,035), **PK2RK** (14,070), **OK1NS** (14,375), **OA4BX** (14,010) and **KL7AP** (14,065) ._._._ The new ones at W7DIS include **MX3KG** (14,140), **C1ZC** (14,000), **F3DM** (14,115), **ON4PZ** (14,000), **HB9AW** (14,009) and **NY4FB** (14,013) ._._._ The 40 watts at W2QHH is still getting out nicely: **VK6SA** (14,090), **OH2PK** (14,140), **VR5PL** (14,100), **ZD2Y** (14,120) and **VK4BI** (14,050), plus several Europeans ._._._ W6SN tells that despite the sunspots and the usual butters-in on the West Coast, he managed to sneak in **HS1AL** (14,035), **CN8MZ** (14,105), **OH5OA** (14,040), **EK1TF** (14,025), **EK1AA** (14,045), **PK6BY** (14,000), **CT1JS** (14,075) and **ZC6DD** (14,100), to name the choicest ._._._ W4FNR kept busy knocking off stuff on all bands; on 20 they were XU8RJ, EK1AS, FT4AN, VK7AB, EL4A, OE9AA, UH8AF and LA8B ._._._ WØLAE confesses to latching on to **VS2BL** (14,002), **CP1AF** (14,080), **W8QZE/KW6** (14,100), **UA3AG** (14,100) and **PK6VR** (14,000). Now up to 91 postwar, W3JTC recently grabbed ET1IR, W3EKK/VK9, TF3EA, UA9CB and SU1US ._._._ With BCI and other QRM factors, WØJRN is tickled to have worked ZM1CK, I1ZZ, SM7YE, PAØFLX, KA1ABU, VK5JU, VE8AY, G2UT and VK7DW ._._._ With a folded-up indoor antenna and **HZ1AB** (14,082), UB5AC, ZD1KR, TI2BF and W3EKK/VK9, W2ALO has raised his total to 96 postwar ._._._ The pick at W5CPI is PZ1WK, ZM6AC, UI8AA, YI1DD, ZD4AB, UA9CC, SV1RX and UQ2AB, bringing his total up to 100 postwar ._._._ Best ones at W6TMP, with 70 watts and a "clothesline radiator," are J9ACS, KA1ABT, PK6HA, OI2KAL and J2AAK ._._._ W1ME added a few new ones such as **XMAC** (14,069), **UD6AA** (14,072), **UR2KAA** (14,069), **UG6DW** (14,006) and W2WMV/C9, giving him a total of 132 postwar ._._._ Some of the stuff at W4BPD is **VU2AZ** (14,210), **VU2FO** (14,145), **VS6JA** (14,210), **AR8MO** (14,105), **W6KE/KW6** (14,050), **UAØUA** (14,080), **PK1RX** (14,150), **UA9DP** (14,070), **PK5LK** (14,100), **PK1SS** (14,080) and **PK4IP** (14,095) ._._._ W6MHF's ten watts and *eight*-element beam grabbed NY4AE, NY4CM, ON4GU, G2DM, VP9T, LU7DN, ON4VU, J3AAE, VO6U, ZK1AB, FA8BG, PAØCE, VO2R, CE3DZ, G3LR, G5SR and G6QB. Despite pressure from the DX hogs, W8KPL came through with **CN8EF** (14,190), **UA3KAK** (14,100), **OK3AL** (14,100), **PZ1OY** (14,040), **OX3SL** (14,100), **MD5AA** (?) (14,075), **OK1PN** (14,100) ._._._ Raising power from 200 watts to 600 watts helped W3GHD knock off EA7AV, ZD3B, UD6BM, YU7LX, TA3SO, UI8AA and UH8AF, bringing his postwar total to 114 ._._._ W4LAP, with 75 watts to p.p. 807s, has undoubtedly lost plenty of sleep in swapping signals with **HE2UD** (14,040), HE1AZ, **ZK1AH** (14,010), LI2JC, CR7AD, KP6AA, ZM6AC, FT4AN and VKs and Gs by the barrelful ._._._ A few picked out of a swell list from W3BXE include: **FA9ED** (14,121), **YV8AE** (14,098), **EP2XZ** (14,045), **YI2AM** (14,111), **UB5FE** (14,093), **UO5AD** (14,032), **YU3B** (14,102), **OH4NF** (14,065), **UC2AC** (14,012) and **ZD1KR** (14,058), which brings Jack up to 96 postwar ._._._ Apparently the 20-meter 'phone gang are not chasing the DX as usual; however, W5ASG chinned with VS9AB, YJ1AB, J9CRP, VK4NK, KV4AD and FK8NW, for a nice 128 postwar ._._._ W7FLD talked himself hoarse grabbing off C6RA, C7TY, C7WY, C9YC, W9FEZ/J5, KA1JM, YN1HB, YV5AB, CR1OCB, EL4A, GM2UU, G8GP, G3QV, ZS1W, ZS1CG, ZS1DU, OZ7GB, OZ4PA, D4ACV, OX3GC and F7AJ ._._._ W2TXB, who has a postwar total of 67 countries and *no* Asian, wonders if it is possible



Meet Bill Gibbs, first op at CN8EE. If you haven't heard or worked him from his African QTH, you'll surely remember him as W1DTS/CT2.



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PAØPR, W. F. G. de Ruijter, Dorpsstraat, Netherlands, is active on 80, 40 and 20. The rig consists of a 6L6 crystal oscillator, 59 doubler and 807 final. PAØPR thanks all U.S.A. hams, particularly W6EVQ, for sending equipment which made possible his postwar transmitter and receiver.

***QST* for**

to make the DXCC without that continent. Has anyone ever done it?

The brethren who stick with 10 get in some good ones now and then. W9HB warbled to the tune of **ZC6FP** (28,490), **VS7RF** (28,100), **KP6AA** (28,680), **XZ2AF** (28,400), **XZ2YT** (28,375), **VU2CQ** (28,375), **PK1MJ** (28,316), **YS1RT** (28,200), **XZ2DN** (28,214), **YI2AT** (28,000), **VU2AJ** (28,310), **VU2GB** (28,170), **HZ1AB** (28,450), ZE2JA, VQ4ERR and ZE1JS, and now has 89 postwar . . . . . W8NOH got KP4BQ, KZ5NB, VP5EM, OA4AK, FA8DX, RAEM, ZS1BV, I1GX, OX3GG, KG6AO, PAØVB, G6AW, D4AOJ, F8NT and G8ZD . . . . . W2PUN has a fast-time WAC that is not to be sneezed at: G4CJ, OQ5BA, LU3BQ, J9LG, W7RMB and J9AAK, all in 59 minutes . . . . . W6PBV exchanged the spoken word with OA4AL, PY1CQ, J2LPG, J2FOX, J2MAX, LU5AD, LU4PA and J2CDJ/J2. Bob says he runs a kw. into a rhombic when everyone is in bed so they can't see the lights blink . . . . . W6EAY, who is very QRL with the Bureau of Standards, doesn't get on much, but works VK3ZB, VK3MR and ZL1AX with regularity . . . . . A late report of some new ones on ten gives W5ASG 136 postwar . . . . . W7EYS got into the scramble and came out with VK3ZJ, J9KC, W6MYR/Saipan and D4AQY; his 20-'phone list includes KA1AQ, KA1CB, CE1AO, CE2CC, J2AHA, J2EAR, J2AAO, W6VTO/C1, PK1GN, C1CH, C4AK, J3GNX, J2EUG and J2ROC, which explains why the throat-spray bizz is picking up . . . . . After 20 years of rag-chewing and traffic handling on the lower bands, W6DTY decided to try some DX. With two dipoles (10 and 20) twelve feet off the ground, he has completed WAS and WAC twice . . . . . W1EKU playing around on ten voice snagged PY3QK, PY1FM, I1NQ, I1RO, FA8DX, EK1AA, ZS2AZ, VQ4ERR, ZL3LE, ZS6CX, ZC6JF, HH2CW, CE1AH, XE1KE and VP5EM.

Where:

Thanks to the DX gentry, we have some nice QTHs, but first we will throw in a couple at no extra charge: HS1SS, U. S. Military Attaché, American Embassy, Bangkok, Siam; communications and QSLs for KA should go to Philippine Assn. of Radio Amateurs, Radio Training Institute Bldg., 345 Palma, Quiapo . . . . . W6TEU sends along: PK1PW, Piet Venweerlee, R/O SS *Tjimanoek*, C/o JCJL, Batavia, Java, N. E. I. . . . . From W7ONG: VS1AQ, Capt. L. K. Ayre, CHG, S. E. A., L. F., GPO, Singapore . . . . . W5BGP helps with: VR2AP, Nandi Airport, Nandi, Fiji Islands; W6OQ/KG6, 334 North Army Airbase, C/o PM, San Francisco, Calif.; CN8BA, P.O. Box 50, Casablanca . . . . . A few nice ones from W9HB: XZ2AF cards go to 71 Hatch Road, Norbury, London SW 16, England; VS7PW, Tony Wilson, Sandringham Estate, Agras, Ceylon; OK4IDT, Banska Bystrica, Czechoslovakia; YR5G, P.O. Box 326, Bucharest, Roumania . . . . . From W2TJB we get: KP4EJ, B. P. Showalter, Box 14, Naval Air Station, Navy 116, C/o FPO, New York City . . . . . Many of the gang don't know that all QSLs for U.S.S.R. go to the Central Radio Club, P.O. Box 88, Moscow (the "Foreign Notes" section of May and October *QST* carries a full listing of foreign QSL Bureaus) . . . . . OX3BF is Earl Baker, RM3c, Navy 1503, FPO, New York City . . . . . ME5AA came through with some swell cards and the QTH on same is: 7th Hq. Signal Regiment, MELF, Egypt, Canal Zone . . . . . From WØJRN we have: C1BK, P.O. Box 409, Shanghai, China; W7GXR/KG6, APO 234, C/o PM, San Francisco, Calif. . . . . W8WWU says cards for W7KLQ/J9 go to Det. 44, AACS Sqdn., APO 86, Iwo Jima, C/o PM, San Francisco, Calif.; VP4TAA, Winslow Acase, 94 Frederick St., Port of Spain, Trinidad, B. W. I. . . . . A couple from W5JPC: VE8AY, Box 324, White Horse, Yukon; KL7IN, Box 1231 Ketchikan, Alaska . . . . . We thank W3JTC for: TF3EA, Box 1080, Reykjavik, Iceland . . . . . From W1NW: OE9AA, APO 565, Klagenfurt, Austria; HA1KK, Box 185, Budapest 4 . . . . . W2SHZ contributes: OI2KAB, C/o OH6NS, Vasa, Finland; KL7HO, 175 Sig. Svc. Co., APO 942, Seattle, Washington . . . . . KG6AD, APO 234, C/o PM, San Francisco, Calif. . . . . W3DPA contributes: W3KXO/Iwo Jima, W. J. Horonzy, 624 ACWS, APO 86,

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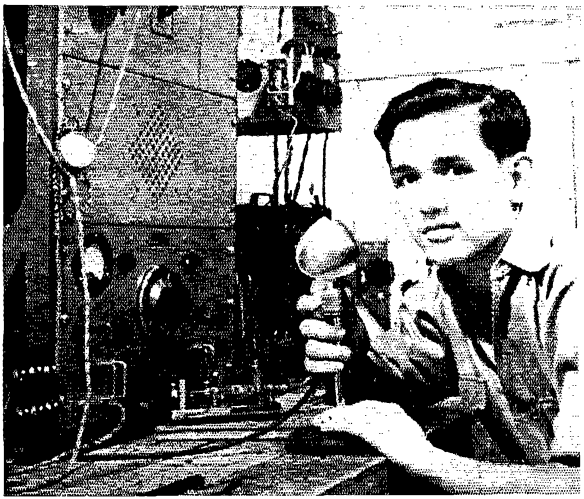


David T. Evaroa, ZK1AH, is only 17 years old and the only Polynesian native in the Cook Islands to hold an amateur license, but it doesn't stop him from putting out an excellent signal with 100 watts input to an 813 final. Antennas seem to be no problem with ZK1AH, since he has doublets for 10, 20 and 40, and a Zepp on 80, all backed up by a Vee beam. Power is a problem, however, and is obtained from motor generators fed from a 24-volt battery. ZK1AH should know when the bands are hot, because he works at making ionospheric measurements.

An All-Metal Array for 6 and 10

Light Weight and Low Wind Resistance in a Stacked Array

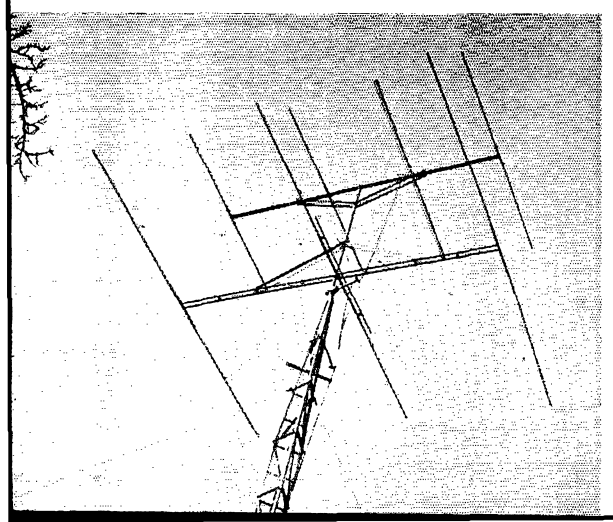
BY EDWARD P. TILTON,* W1HDQ

THE dual array for 28 and 50 Mc., described in the February issue of *QST*,[1] worked out very well indeed. The 50-Mc. portion was responsible for the first transmission of 6-meter signals across the Atlantic, and the 28-Mc. part had provided the means for keeping in touch with v.h.f. enthusiasts distributed over much of the world. The array would probably have been working today, without change, but for a 70-mile wind that laid it low one night in January. Since the fairly-high wind resistance of the wooden antenna frame was a considerable factor in the collapse of the supporting tower, it was decided to see what could be done in a new design to reduce weight and wind resistance to an absolute minimum.

Three months of daily use of the array at W1HDQ, and successful duplication at numerous other stations throughout the world, had convinced us that its element arrangement and feed systems could not be greatly improved in a simple low-cost design, so mechanical problems were the principal consideration in the new project. The idea of all-metal construction was attractive. It affords complete bonding, for lightning protection, and it can be both lighter and stronger than wood, if properly thought out. In addition, we had run across a supply of one-inch angle stock of that wonderful alloy known as 24ST aluminum at a nearby aluminum smelting works. This material is light and strong, and it can be worked very readily. If purchased from some salvage source, the cost is low, and even if it has to be bought new, the price should not be found prohibitive.

* V.H.F. Editor, *QST*.

1 "A Stacked Array for 6 and 10," Tilton, *QST*, February, 1947, p. 38.



Looking up at the all-metal dual array.

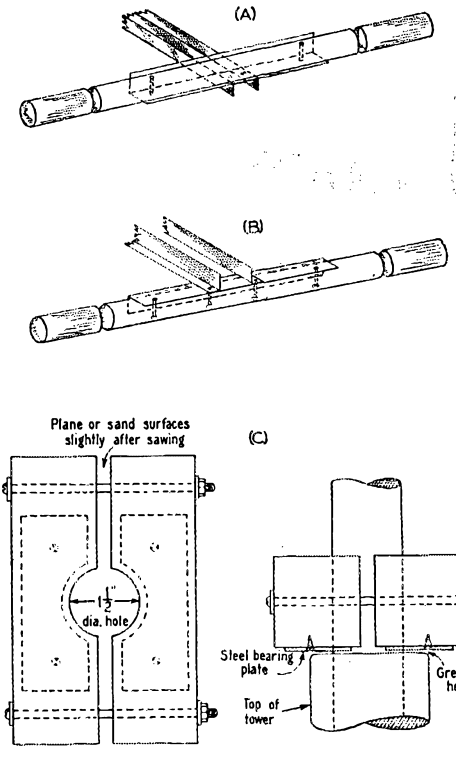
• There are ways to build an all-metal beam other than by employing the familiar "plumber's-delight" approach. The dural angle stock used in this stacked array for 28 and 50 Mc. provides a strong, lightweight structure that requires a minimum of bracing. The entire array, exclusive of the vertical support, weighs only about 20 pounds, and its erection can be handled by one man, if need be.

Mechanical Details

The lot of angle stock we found was in 10-foot lengths, but it was a simple matter to splice pieces of it together to make the booms which are 150 and 160 inches long, for the 50- and 28-Mc. booms, respectively. The 6-meter boom consists of two 150-inch lengths of angle stock fastened together to form a channel that is two inches wide and one inch high. This channel is mounted with the open side down, fitting over the top of the 1½-inch galvanized pipe that is the vertical center member of the system. The two pieces of angle stock which make up the 10-meter boom are mounted on either side of the vertical support, with the elements suspended from the bottom surface of the boom. To stiffen the elements, crossarms of the angle stock are used as cradles for each one, those for the 50-Mc. array being 12 inches long and those for the 28-Mc. elements being 30 inches for the parasitic elements and 25 inches for the radiator. Other short pieces of angle stock, cut to the width of the boom and fastened across it with machine screws, provide additional stiffening.

The booms are maintained in a horizontal position by braces which are also cut from the angle stock, four braces for each boom. These, and the booms, are fastened to the vertical support with ¼-inch bolts, three inches long. The holes that pass these bolts should be made as small as possible, since a loose fit will allow the booms to move from side to side.

The bracing so far described was insufficient to prevent swaying of the 10-meter elements in a vertical plane, so sway braces made of small



Detail sketches of portions of the dual array. A — The 50-Mc. boom is comprised of two pieces of angle stock mounted edge-to-edge to form a channel. The elements are fastened to the boom by means of a cradle, also of angle stock. B — In the 10-meter array, the two portions of the boom are separated, and mount on either side of the vertical support. The elements and their supporting crossarms are attached to the lower surface of the boom. C — The bearing for the array is made from a block of wood, drilled to the pipe size, and then sawed lengthwise. It is faced with a pair of steel bearing plates where it rests on the top of the tower.

galvanized steel wire broken up with insulators were added. These guys have no apparent effect on the performance of the array, the gain and directivity patterns being at least as good as those of the previous dual installation.

This design was worked out with the idea of providing something that could be handled by one person, if necessary. Like the man who built a boat in his cellar, we did all the mechanical work on this array in the basement laboratory at Headquarters, but getting it out of the cellar presented no problem, since it was assembled entirely with the use of machine screws and tapped holes. Reassembling the structure atop a 40-foot steel tower was handled entirely by the writer. Ground man in the operation (it helps to have someone to send up parts as needed) was John Paddon, VE3BLZ, who also provided several invaluable ideas in the design stages of the project.

As far as element length and spacing are concerned, the new array duplicates the previous one almost exactly, but for those who may not have back copies of *QST* handy, the principal dimensions will be repeated. The 50-Mc. array uses a folded-dipole radiator, with a 4-to-1 conductor ratio and 300-ohm line feed. The length is 110 inches over all. The reflector is 116 inches long and is spaced 46 inches in back of the driven element. The first director is 105 inches long, and the spacing is the same as the reflector, 0.2 wavelength. The forward director is 103 inches long and is spaced 57 inches, or 0.25 wavelength, from the first director. A more complete description of this array, and a discussion of the problems encountered in its original design, will be found in *QST* for June, 1946, page 60. No provision was made for tuning the array, since scores of duplicates of it had given satisfactory results under a wide variety of installation conditions.

The 28-Mc. array is similar to its predecessor, except that the spacing is a full 0.2 wavelength for both reflector and director. Separation between the two arrays was increased to 6 feet, since the room for this additional spacing was available and it represented no mechanical problem. The driven element is fed with a "T"-match, the connecting clips between the "T" and the radiator being set at approximately 25 inches out from the center of the system. The radiator is 198 inches long, the director 188 inches and the reflector 208 inches. The parasitic elements are 80 inches either side of the driven element.

The element lengths given above provide optimum performance at approximately 50.5 and 28.7 Mc. The 6-meter array gives a good account of itself over the lower half of the band, while the 10-meter portion can be used almost anywhere in the 10-meter 'phone assignment. Standing-wave ratio is low near the design frequencies, but it will rise sharply if the 10-meter array is used for 11-meter work. Some juggling of the line length may be required to make the system load on 27 Mc., but it still gives a gain of 5 or 6 db. over a dipole at this frequency.

Putting It Up on the Tower

Since the 6-meter array was going to be up out of reach when the job was completed, it was mounted in place first. The center support was fastened in a temporary position, with the top extending about 18 inches above the tower. The 6-meter array, which had been assembled on the ground, was then hauled up the tower on a rope and set in place over the top of the pipe, bolting it

and its braces in place. This was not a difficult task, because its total weight was less than ten pounds.

Because its larger size would make it difficult to handle with elements attached, the 10-meter boom was assembled around the vertical support before mounting the elements. The vertical member, with the 6-meter beam attached, was hoisted up to a point where the mounting holes for the 10-meter boom just cleared the top of the tower. The boom was assembled about the vertical support, but with the cross braces between the middle and one end of the boom removed. This permitted the boom to be tilted at a sharp angle, while the parasitic elements were screwed into place, after which the whole assembly was raised to a horizontal position, the angle braces bolted in place, and the driven element added.

The small wire sway braces were attached to the elements before they were mounted, of course. Each of these guys was provided with a small turnbuckle, so it was merely necessary to fasten them loosely in position and then adjust the tension as required, to eliminate swaying and maintain element alignment. An assistant on the ground is helpful at this point, as small variations in element alignment are more easily detected from below.

A bearing, on which the array rests, was made from a section of "two-by-four" about a foot long. A 1½-inch hole was drilled in the middle of the block, after which the block was sawed lengthwise. The two portions were bolted together on either side of the pipe support. The bottom of this block was covered with two pieces of sheet steel, attached to the block by means of countersunk-head screws, and the bearing surface was covered with heavy grease, before bolting the block to the mast.

The two 300-ohm lines are fastened to this block, which rotates with the array. From here they drop to another anchorage which is fixed, enough slack being left to permit rotation of the array through slightly more than 360 degrees. From this point, the feeders are pulled up tight to the point where they enter the house.

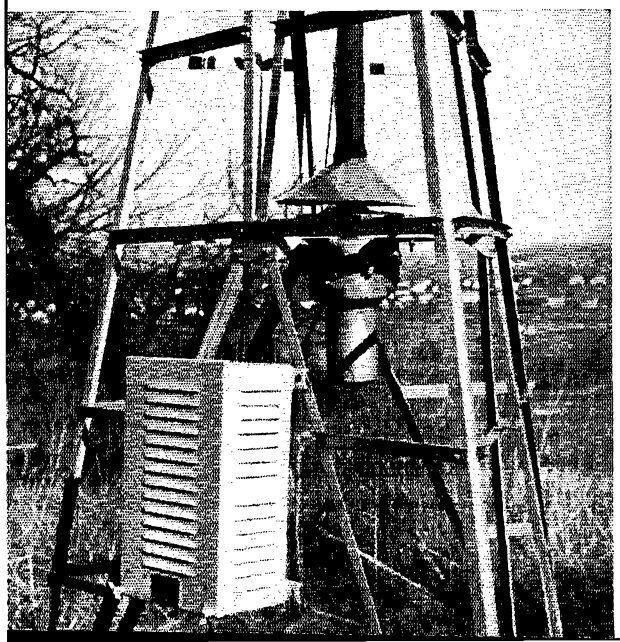
Electrical Rotation — Cheap!

The rotating device employed cost a total of thirteen bucks — ten for the motor, a propeller pitch-changing motor from an aircraft-surplus source, and three dollars more for six lengths of aluminum mast sections, used for the drive shaft.

These pitch-changing motors are just about ideal for antenna rotation. They have plenty of power for the job, since the unit contains a gear box with a 9000-to-1 reduction. The motor is reversible, and it operates on either a.c. or d.c., on anything from 12 to 30 volts, the latter value giving an antenna rotation speed of about one r.p.m. The high gear reduction provides a positive brake on the antenna, and there is less than one degree of coasting when the power is cut.

Control of the motor from the operating position is handled by a d.p.d.t. (center position off) switch, and a three-wire line from the operating position to the tower, where we have a 25-volt transformer and a 110-volt a.c.-operated reversing relay, mounted in a box on the side of the tower at eye level, near the motor.

Mechanical coupling between the motor and the drive shaft is made by means of a wooden block, turned to the proper diameters in a lathe. This fits tightly into the hub at the top end of the motor assembly, and the other end slides into the hollow drive shaft, to which it is bolted. The motor assembly has a convenient mounting flange, which is an integral part of the gear box, providing a mounting arrangement that can be adapted to almost any type of tower quite readily. To keep water out of the assembly, we cut a cone from a sheet of aluminum and fastened it around the drive shaft, just above the top of the gear box.



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The rotating system used with the dual 6–10 array is constructed entirely of war-surplus material. The rotator is a propeller pitch-changing motor, the drive shaft is made of aluminum mast sections bolted together, and the transformer, reversing relay and their housing are radar components. Note the sheet-aluminum cone used to keep rain out of the drive-motor assembly.

Hints and Kinks For the Experimenter

VERSATILE 'PHONE MONITOR

FIG. 1 shows the circuit of a versatile unit that will find several uses in almost any 'phone station. It can be put to the following uses: (1) to monitor the audio quality of the signal; (2) to observe carrier shift and thus detect overmodulation; (3) to read (after calibration) average percentage modulation. The circuit is simple to construct, easy to adjust, and as reliable as most of the more expensive commercially-built gadgets of similar nature.

A dual triode is used, with one section diode-connected, the other serving as a Class A audio amplifier. A 0–1 d.c. milliammeter is switched to read either the plate current of the diode or the output of the audio amplifier.

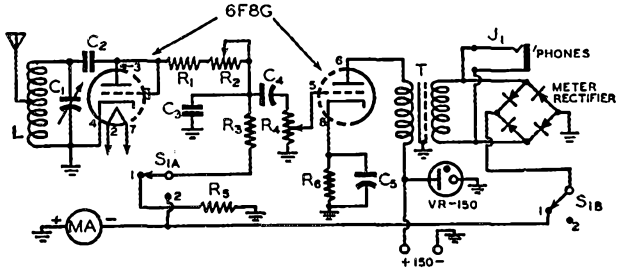


Fig. 1 — Circuit diagram for a versatile 'phone monitor that includes means of observing carrier shift and percentage of modulation.

C_1 — Receiving-type variable, suitable to tune desired range with L.
C_2, C_3 — 0.0001-μfd. mica.
C_4 — 0.01-μfd. paper.
C_5 — 20-μfd. 25-volt electrolytic.
R_1 — 33,000 ohms, ½ watt.
R_2 — 10,000-ohm potentiometer.
R_3 — 4700 ohms, ½ watt.
R_4 — 0.2-megohm potentiometer.
R_5 — Equal to meter resistance.
R_6 — 2200 ohms, 1 watt.
L — As required to tune to desired range with C_1.
J_1 — Open-circuit 'phone jack.
MA — 0-1 d.c. milliammeter.
S_1 — D.p.d.t. toggle switch.
T — 3:1 audio transformer.

To use the unit as a simple quality monitor, the pick-up antenna is loosely coupled to the output of the transmitter, and the tuned circuit resonated. R_4, and the coupling to the transmitter, then serve as a volume control. The meter switch should be set to Position 2 when this use is made of the unit. In this position, it reads the plate current of the diode, and also serves as a resonance indicator.

For observation of carrier shift, the same procedure is followed. Any change in the meter reading under modulation will indicate carrier shift.

When an oscilloscope is available, the unit may be calibrated to serve as a direct-reading percentage-modulation indicator. To calibrate, the unit is coupled to the transmitter, R_4 is turned all the way off, and the meter switch is placed in Position 2. The coupling is adjusted to provide a full-scale reading while the carrier is unmodulated. R_2 permits a fine adjustment of this reading. The meter switch is then set to Position 1, and sine-wave modulation is applied to the carrier. Observing the modulation at the same time on a 'scope, the audio level should be increased until the carrier is 100 per cent modulated. R_4 is then adjusted to provide full-scale deflection of the meter. Thus, the meter has been calibrated to read full scale on 100-per-cent sine-wave modulation. When speech input is used on the transmitter, the meter will read only about 25 per cent of full scale at 100-per-cent modulation. R_4 can be used to bring the meter to full-scale deflection at 100-per-cent *average* speech modulation by similar calibration against a 'scope, after which sine-wave modulation would cause the meter to read off scale. It should be remembered that the transmitter should never be modulated so heavily that the meter reads full scale, because while the *average* may be well under 100 per cent, *peak* speech values will be well in excess of 100 per cent, causing illegal splatter. Properly used, however, this unit can serve as a highly satisfactory indicator.

— *Wilf Moorhouse, VE7US*

—...—

SECOND-HARMONIC FILTER FOR 75-METER 'PHONE TRANSMITTERS

ELIMINATING radiation of the second harmonic of a 75-meter amateur 'phone transmitter is especially important, because this harmonic falls outside of other ham bands and causes illegal interference with services in the 7.7–8-megacycle range. The low-pass pi-section filter shown

(Continued on page 116)

An Inexpensive Crystal Substitute

Using a Surplus BC-375 Tuning Unit as a VFO

BY HAROLD W. HARRISON,* W5DFZ

• Surplus TU-5B tuning units from the BC-375 Army transmitter are currently available for less than $4.00. Only a few additional small parts are required to convert one of these units into a stable temperature-compensated VFO which may be used to replace the crystal in crystal-controlled transmitters. This article demonstrates one way of doing it.

SINCE trying a VFO with a Type 59 tube back in 1936 we have always been partial to crystal-controlled transmitters. But postwar competition is a little tougher than it was back in those days and, after about six months of crystal control on 28-Mc. 'phone, we, like many others, finally found it was VFO or succumb to QRM.

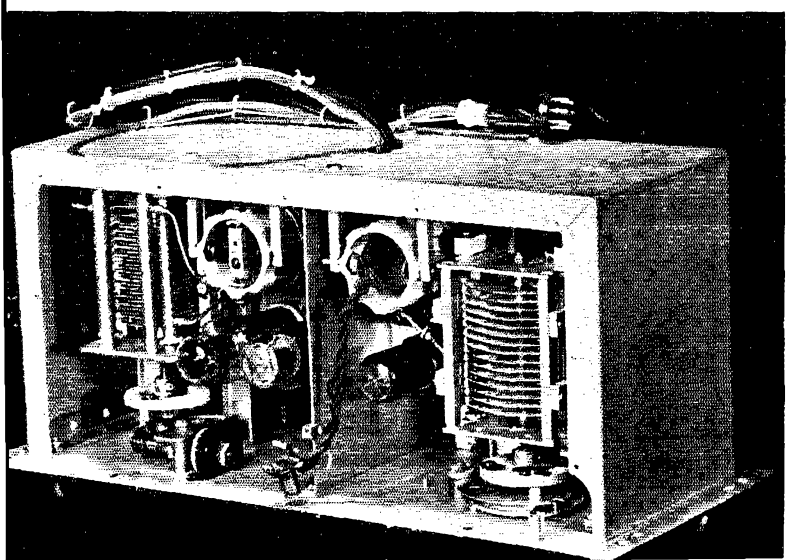
One prejudice against VFO was brought about by previous experience with a band-setting condenser, used to provide bandspread, which changed frequency calibration every time the VFO was shifted from one band to another. As soon as we saw one of the TU-5B tuning units (1500–3000 kc.) we decided that it was the answer to all of our problems. This is one of the separate BC-375 drawer units now available on the surplus market. It has a micrometer dial that provides 2500 divisions over the 180-degree rotation of a 140-$\mu\mu$fd. condenser. This gives a spread of about 440 divisions for the 14-Mc. band. Since the latter is one of our narrower bands, plenty of mechanical bandspread is provided on all frequencies from 3.5 Mc. through 28 Mc. In addition, the unit has a high-C tank circuit with a temperature-compensated coil, four temperature-compensating condensers, and room for a buffer-doubler.

After some speculation a 6G6-G was chosen as the oscillator and a 6V6-GT for the buffer-doubler, the two stages being choke-capacitance coupled. Oscillator plate-and-screen supply is stabilized with a VR-150 voltage regulator. The circuit is shown in Fig. 1. An untuned buffer was tried between the oscillator and the buffer-doubler but several tests showed that it did little good so it was removed.

* P.O. Box 2725, Little Rock, Ark.

Construction

The first step in the construction of the ECO was to remove all of the parts from the TU-5B tuning unit with the exception of the two vernier dials, the two tuning condensers, the antenna-coupling switch, S_1, and the four 100-$\mu\mu$fd. oscillator padding condensers with their temperature-compensating trimmers mounted below them. The first padding condenser, C_1, is disconnected without disturbing its associated temperature-compensating unit by cutting it loose from the grounded mounting strip with a hacksaw. This must be done to permit the tuning condenser, C_5, to cover the desired range, including the 11-meter band. The second step was to remove the wire from the oscillator coil, L_1, and rewind it with 15 turns of No. 10 tinned. The turns were spaced to occupy 3 inches on the form and the coil was tapped 5 turns from the ground end for the cathode connection. It was then remounted as before. It will be noticed that there are two rods holding a copper loop inside the



The revamped TU-5B unit from a BC-375. The oscillator and voltage regulator are in the left-hand compartment. In the buffer-doubler section, right, the dial-lamp resonance indicator can be seen coupled to the tank coil.

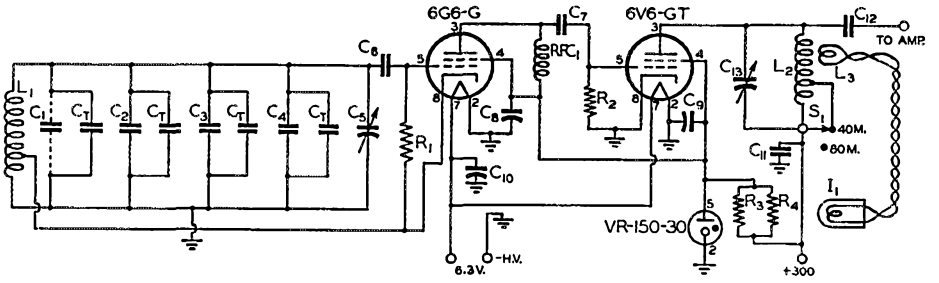


Fig. 1 — Circuit diagram of the TU-5B VFO.

C_1 — 100-$\mu\mu$fd. mica (disconnected from circuit as described in text).
C_2, C_3, C_4 — 100-$\mu\mu$fd. mica.
C_T — Temperature-compensating padders.
C_5 — 140-$\mu\mu$fd. variable.
C_6 — 100-$\mu\mu$fd. silvered mica.
C_7, C_{12} — 30-$\mu\mu$fd. mica.
C_8, C_9, C_{10} — 0.01-μfd. paper.
C_{11} — 0.006-μfd. mica.
C_{13} — 160-$\mu\mu$fd. variable.
R_1 — 47,000 ohms, ½ watt.
R_2 — 0.1 megohm, ½ watt.
R_3, R_4 — 5000 ohms, 10 watts.
L_1 — 15 turns No. 10, 2 inches diameter, 3 inches long, tapped 5 turns from ground end.
L_2 — 22 turns No. 14, 2 inches diameter, 2 inches long, tapped at center.
L_3 — 2 turns No. 14 to fit inside form of L_2.
I_1 — 6-volt 150-ma. dial lamp.
RFC_1 — 2.5-mh. r.f. choke.
S_1 — Antenna-coupling switch in TU-5B unit.

oscillator coil. Moving a setscrew on one of these rods causes the loop to change position inside the coil. This may be used to vary the oscillator frequency a few kilocycles if any trouble is encountered in making the oscillator cover from 3395 to 4000 kc.

The third step was to make a bracket 1½ inches by 4 inches and mount it between the oscillator coil and the front panel. The sockets for the 6G6-G oscillator and VR-150 are mounted on this bracket. An octal socket for the 6V6-GT was placed on the buffer-doubler side of the tuning unit. Since temperature compensation is provided, there is little to be gained by mounting the tubes externally.

The buffer coil, L_2, was then stripped and rewound with 22 turns of No. 14 tinned wire spaced to occupy a length of 2 inches. This coil is tapped at the center and the antenna coupling switch, S_1, is connected as the band-changing switch to short out half of L_2 when using the second tube as a doubler.

Since the rest of the transmitter is metered in every stage, it was decided to use a dial lamp coupled by a two-turn loop placed inside the buffer-doubler coil to indicate resonance in this stage. The loop and 6-volt 150-ma. dial light are connected by about six inches of twisted line. This dial light consumes very little power from the buffer-doubler at about half-brilliance and results in no detectable difference in grid current to the following stage. Power is taken from the crystal-oscillator supply in the transmitter, since it has enough reserve to handle the extra load easily.

Because an octal socket is used for the crystal mount in the transmitter, it was easy enough to wire the extra pins to the power supply so as to make it possible to make all connections in changing from crystal control to ECO simply by removing the crystal and plugging the ECO cable into the crystal position.

When the ECO is in use, the crystal-oscillator stage is used as a frequency doubler. To minimize reaction between the ECO and the buffer-doubler, it is advisable always to operate the latter as a doubler when operating on harmonics of the ECO, even if this means cutting out a doubler stage in the transmitter proper.

We were pleasantly surprised after putting the ECO into operation with the transmitter on 28 Mc. to receive reports of very good stability. Although the ECO tuning is not ganged with that of the buffer-doubler, it is easy enough to shift from one part of the band to the other. An additional source of gratification is the low cost of the unit. Without power supply the complete cost, including the TU-5B tuning unit, tubes and all parts, was a little less than ten dollars. In stability it seems to compare very favorably with most units costing considerably more, and the appearance leaves nothing to be asked.

About the Author

• Prior to the war, W5DFZ's radio activities were mainly the pursuit of DX and experimenting. Came the great conflict, however, and Harold W. Harrison became a radio instructor for Uncle Sam, followed by a stretch of duty as a civilian radio technician associated with the U. S. Navy at Key West. Nowadays he is applying the experience so gained to his instructing in the ex-GI courses at the Draughan Radio School, Little Rock, Ark. W5DFZ has attended El Dorado (Ark.) Junior College and Arkansas State Teachers College.

The World Above 50 Mc.

CONDUCTED BY E. P. TILTON,* W1HDQ

WILL a 50-Mc. WAS be made in 1947? With the states-worked totals of a number of the leaders now up to 30 or more, it begins to appear possible. Lack of activity in a few critical states is still holding the scores down, but at least three states were removed from the no-activity column during May. South Carolina, Mississippi, Wyoming and Montana are still to be heard from, and activity is rare enough in Vermont, West Virginia, Kentucky, Tennessee, Arkansas, Idaho and Nevada so that a contact with any of these is still regarded as a prize. There are several other states where only a few stations have yet shown up, but the work of the few representatives in these states has been well done. During May, Colorado, Nevada and Tennessee were removed from the black list by WØVIK and WØWYX, W7NCR and W4FQI.

May, 1947, probably provided more skip openings than any of the long line of opening months in the history of v.h.f. skip work. With reports covering the first 27 days of May in hand at this writing, we find that sporadic-*E* skip was worked on 18 of these days, and the band was open almost continuously during the latter part of the month. Practically every time there was E_s skip on 10, there was something doing on 6 also, thanks to the growth of activity and the improvement in techniques.

Most of the work thus far reported was of a single-hop nature, but there was some long-haul stuff, too. Early in the evening of May 25th W4HVD, Langdale, Alabama, worked W6UXN, and W4EID, Jacksonville, Florida, worked two W6s. At 11 A.M. on the 26th, W2RND, Margate City, N. J., worked W6LSN, Long Beach, Calif., for the year's best *E*-layer DX to date.

Variations on the usual skip DX pattern were provided by VE1QZ, Halifax, and VE1QY, Yarmouth, Nova Scotia. On May 23rd, VE1QZ worked 34 stations in W1, 2, 3, 4, 8 and 9, these being among the first VE1 contacts ever made on 50 Mc. This opening was unusual in the shortness of the skip involved. A contact was made between VE1QZ and W1DEO, Portland, Maine, less than 350 miles, and your conductor worked VE1QY, another 350-mile hop. W3CIR/1, Boston, was being heard by VE1QY at this time, a distance of less than 280 miles. These sound like tropospheric-bending distances, but the signals of the VE1s were obviously of sporadic-*E* origin, since they were fading violently and they have not been heard before or since, except when the band was open for E_s work.

Our first taste of 50-Mc. work with a maritime-mobile station came on May 16th, when

*V. H. F. Editor, *QST*.

MAY GOES OUT LIKE A LION!

50-Mc. DX breaks all records—W1s, W2s and W4s make WACA

In an unprecedented series of daily openings, during which sporadic-*E* skip was worked on 50 Mc. every day from May 16th to June 2nd, 6-meter activity reached an all-time high. The states-worked totals of several stations rocketed toward the 40 mark, a new DX record for *E*s work was set, and numerous calls were added to the WACA list.

After only 11 days on 50 Mc., W4DRZ, Ft. Lauderdale, Fla., had all call areas and 33 states to his credit. On May 27th he worked W7FFE, believed to be the first v.h.f. contact between Florida and the Pacific Northwest, a distance of more than 2700 miles. W7ACD, Shelley, Idaho, worked 63 different DX stations in 14 states and VE7 between May 27th and 28th. WØYKX, Woodbine, Iowa, worked 8 call areas and 18 states on May 27th. W4FLH, Miami, Fla., got 8 call areas and VE3 on the 26th and 27th. W7QAP, Tucson, Ariz., worked 18 states from the 26th to the 29th and heard W3CIR/1, W1PJC and W1ATP. W9ALU, Metamora, Ill., made WACA with 18 watts input. W4QN, W4GJO, W4DRZ and W4EQR made the first Florida WACAs on May 26th.

The evening of June 1st provided the first W1-W6 and W2-W7 work of the year, the earliest opening of this sort on record, and W1CLS, W3CIR/1, W1HDQ and possibly others, joined W1LLL in the select circle of W1s who have made WACA on 50 Mc. The W6s were in for more than an hour, working scores of W1s. W1CLS worked W6GGM, W6LSN, W6ANN, and W7TXM, Tucson, Ariz. W3CIR/1 had the same list, minus W6GGM. W1KHL, with 30 watts input, worked W6ANN. W1GJZ, Greenwood, R. I., worked W6LSN and W6ANN, as did W1LLL. W1HDQ worked these two, plus W7QLZ/7, mobile, in Buckhorn Canyon, Ariz. Clyde was running 10 watts input, and using a whip antenna! This opening provided the first v.h.f. contacts ever made between the East Coast and the Pacific Northwest, several New Jersey W2s working Oregon and Washington.

There was international DX, too. The first W-XE work was accomplished by XE1KE, Mexico City, who worked W5VY, W5GVZ and W5FRD. G6DH, G8RS and an ON4 worked FA8IH on May 26th on 5 meters. G6DH also worked ON4KN, and G2TK was reported heard by F9AQ and F9BG in Toulon. American commercial harmonics were heard up to 59 Mc. by G6FO on May 24th. G5BY worked I1XW on May 30th and F3JB, F9AQ and F9CY on June 4th.

W5BSY/MM, aboard the S.S. *Crest of the Waves*, in a position about 400 miles east of Miami, worked W2BYM, W8ANN, W3OMY, W8CMS, W4FBH, W4BBR, W4EQM, W8NSS, W8CSE, W4WMI, and W4HVV, in that order. On Sunday May 18th, he heard W1CGY and W1AW, between 9:15 and 9:30 P.M., at a time when no other DX was reported heard or worked. His signal was heard by W1LRE, Feeding Hills, Mass., briefly at about this time. By then, W5BSY/MM was 250 miles southeast of Bermuda, en route to Genoa, Italy. We may be hearing from another of the MM crew soon, as WØTKX/MM, aboard the S.S. *Ft. Winnebago*, was on the air while in port in Providence, R. I., and promises to be active on 50 Mc. on a run to South American ports.

Here and There on 6

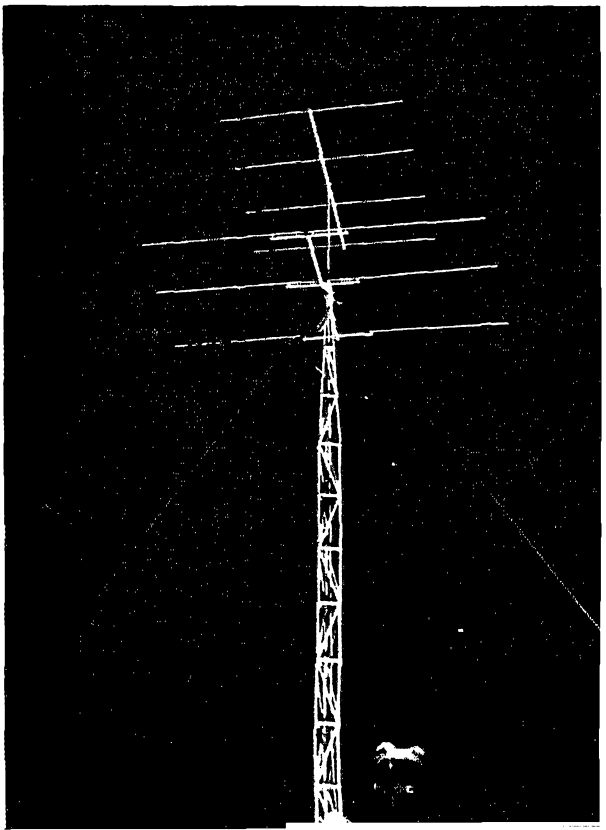
Those Florida W4s really have a time of it when the band is open for fairly-long skip. The Florida peninsula is often the only spot from which signals can be heard over the whole northeastern part of the United States; thus about six stations scattered around the southern part of Florida find themselves with literally hundreds of stations in W1, 2, 3, 4, 8, 9 and sometimes 5 and Ø, and several Canadian provinces all lined up and waiting for a shot at them. On one good opening, W4GJO was heard to remark to W1CLS that he was his 50th different station worked during that evening. At about the same time, W4FLH had worked 30 stations in 6 call areas, and was still going strong!

The W9s and WØs, being within single-hop range of nearly all the country have a considerable advantage in the WAS competition, but they will not capture the trophy without a good run for their money from W1LLL. By eternal vigilance, Brownie has run his total up to 33 states, a figure which is equalled only by W9ZHB, at this writing, as far as is known. Brownie still lacks West Virginia, South Carolina, Mississippi, and Tennessee, on this side of the Mississippi, though Tennessee is in prospect, in view of the appearance of W4FQI, Oak Ridge, on the band on May 27th. With the whole northeastern part of the country waiting for a crack at him, W4FQI disappeared from the band, after working W1CLH and W3CIR/1. This is probably the first time in history that W1LLL ever missed working a new state the first time it appeared on the band!

To know when to give up and when to stick with the band is always a problem. On the 23rd, after a session which started with the VE1s and then swung around to W4, most of us thought that the skip would eventually bring on W9s and WØs, too. But by 11 P.M., after six hours of waiting in line to work the handful of W4s who were doing a land-office business in Florida, a lot of us gave up and went to bed. Then, around 11:15, bedlam in the form of scores of W9s and Øs broke loose, and the wildest session of the year was underway. North and South Dakota, Minnesota, and Wisconsin stations were roaring into the East, and working the West Coast stations, too. It looked like a double-hop set-up, but no reports of transcontinental work have been reported. The same W4-WØ switch took place during the evening of May 27th, and local-caliber signals were exchanged between the East and Middle West for a period of more than two hours.

One of the loudest and most consistent stations from the Middle West this season has been WØTQK, Parkville, Mo., and with good reason. With a full kilowatt, a 4-element rotary, and a fine location, Art has forged close to the top of the states-worked list, in about two months of operation.

Not all the strong signals are coming from the kilowatt boys, however. Some outstanding low power signals have been heard, too. W9FKI, Rantoul, Ill., with 30 watts input and a 4-element



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Night shot of the dual array at W1CLS, Waltham, Mass. The top section is a 4-element 50-Mc. system with 0.2-wave spacing, while the lower is a 3-element array for 28 Mc., employing 0.15-wave spacing for the reflector and 0.13 for the director. Both beams are fed with a common open-wire line, and matching is provided by a ¾-wave transformer for 50 Mc. and a ¼-wave section for 28 Mc. A switching relay is mounted just below the 10-meter array.

rotary only 9 feet above ground was doing all right on several occasions, and on the evening of the 27th, W9EX, Belleville, Ill., was holding his own on the low end of the band, with a "powerful little 5-watter." Out in the West the converted MBK rigs have worked their share of the North-South skip, some of them running less than 5 watts.

Last fall, on a trip to Halifax, Nova Scotia, we were pleased to find considerable interest in 50-Mc. work on the part of the VE1s. To be sure, most of it was at the transceiver level, but there were at least two crystal-controlled rigs ready to go, too. From then until this spring, those boys have been waiting for a chance to cash in on the promises we made that there would be scores of Ws to work them the first time they broke down the path. The session of May 23rd was their first real chance, and they made the most of it. At Halifax, VE1QZ could hardly believe his ears when he got an answer to his first CQ at 1708 AST (from W1LLL, of course!) but he had plenty of opportunity to prove that he was not dreaming between then and 2340, during which time he worked the following stations: W1s LLL, CGY, AEP, HDQ, DEO, GJZ, EYM, MUX/3, KMZ/3; W2s LBK, RLV, BYM, IDZ, RK, QVH; W3s OR, KFM, GUF, DBC, KML, OMY; W4s WMI, HVV, KMA; W8s UB, TOB, SFG, CMS, ANN, CEQ; W9s HGE, DRN, IZQ and VZP, for a total of 34 in 13 states in 6 call areas. He would like to have it known that he will QSL on all these contacts. His address is 76 Quinpool Road, Halifax, N. S.

From Yarmouth, N. S., VE1QY worked W1HDQ, W2PWP, W2RLV, W3OR, and WØs DZM, URQ, JHS and QIN on the 23rd. He made contacts on May 26th, 27th, 28th and June 1st, also, accounting for 12 states and 29 different stations. VE1BC and VE1OW have been monitoring the band, but have no rig on 6 as yet. They heard most of the stations worked by VE1QZ, plus about 6 others. The first VE1-W contact is believed to have been made by VE1QY, who was reported worked by W9ACU, Browning, Ill., on April 26th.

Up to this year, contacts with our brethren across the border have been a distinct rarity, but now the activity in Canada is coming along nicely, and VE1, 2, 3, and 7 calls begin to appear quite regularly in the reports of stations worked by Ws. There are concentrations of activity in VE3 and 7, and VE2 is now represented by VE2KH and VE2GT at Valois, Quebec. These two fellows make a point of being on each Monday night from 9:30 to 10 P.M. EDST, and are watching the band closely for openings at other times. They were doing business with W4, 9 and Ø on the evening of the 27th. What has become of the VE4s in the region around Winnipeg remains a mystery.

RECORDS

Two-Way Work

50 Mc.: KH6DD — J9AAK
4600 Miles — January 25, 1947

144 Mc.: W3KUX — W1MNF
425 Miles — May 16, 1947

235 Mc.: W6OVK — W9OAW/6
186 Miles — March 2, 1947

420 Mc.: W6FZA/6 — W6UID/6
170 Miles — September 28, 1946

1215 Mc.: W1BBM — W1ARC
3 Miles — April 7, 1947

2300 Mc.: W1JSM/1 — W1ILS/1
1.6 Miles — June 23, 1946

5250 Mc.: W2LGF/2 — W7FQF/2
31 Miles — December 2, 1945

10,000 Mc.: W4JPH/3 — W6IFE/3
7.65 Miles — July 11, 1946

21,000 Mc.: W1NVL/2 — W9SAD/2
800 Feet — May 18, 1946

We know that multiple-hop sporadic-*E* skip is fairly common on long overland paths. We have had scores of contacts on 5 and 6 meters over distances beyond 2000 miles, but what happens over these distances when the intervening area is an expanse of ocean? The lack of positive results with G5BY last summer seems to indicate that the chances are not too good, but we have two reports which seem to point the other way. One is a third-hand report that VE7AEZ heard the c.w. signal of VK2NO at 10:20 P.M. on May 8th. Direct reports from the two principals have not yet been received, so no verification is possible. On the afternoon of May 11th, when the band was open to W7, WØDYG, Omaha, Nebraska heard a station calling CQ on about 50.5 Mc., saying "This is the Hawaiian Islands calling." He called him and asked him to use c.w., and the station came back, but by this time the signal was too weak to copy solidly, but Todd believes that it was KH6DF — or some West Coast boy pulling his leg!

You can't always believe all you hear in regard to DX reports, as OA4BG will testify. Following a week-end spent on 6, John received a report of reception by a station in VE8. This report received quite wide circulation, as did a similar one of the reception of OA4AE in Duluth, Minn., but both reports have proven to be false. A lesson is to be learned from such goings-on: when you hear a DX signal, copy everything you can. Get all the possible details — time, transmission content, strength, degree of fading, direction of arrival — so that a positive check can be made. Since anything can happen these days on 6, it is of utmost importance that we be able to check any unusual reports for authenticity.

If the Pacific Islands can be worked via sporadic-*E* skip, it should happen this summer.

(Continued on page 118)

Correspondence From Members-

The Publishers of *QST* assume no responsibility for statements made herein by correspondents

"THE BEST YEARS OF OUR LIVES"

9428 Hobart St., Dallas 18, Texas

Editor, *QST:*

Thank you for all your kindnesses of past, present and future. But I will let you in on a little secret. It isn't the OM here who doesn't have any time to operate.

It was some fifteen years ago when he first broached the subject of QSL cards to me, a starry-eyed bride. Of course it was pretty plausible. He had plenty of spare time, and it was a good way of getting a few foreign stamps to add to his collection. And incidentally — *only incidentally*, mind you — I could help him in a pinch. "There aren't many fellows lucky enough to have a little wife, etc." So he wrote ARRL.

Time has passed. Things have changed. The family has now increased to include two children, two dogs, a cat, a goldfish, and — *only incidentally* — the fifth-district QSL Bureau.

Where, oh where is the OM's spare time? Nonexistent, that's where it is. Where, oh where are the breakfast dishes? In the sink. Where is the XYL? Sitting on the floor sorting QSL cards!

I tell you, if I didn't get so many good laughs out of it I'd quit. But human beings, if I may stretch a point and include hams under that heading, are pretty funny. They will trust us with almost anything sooner than an uncancelled stamp. You'd think — you'd honestly think — that stamps were rare collectors' items. Guys will 'phone, drive for miles and miles, send messages over the air, even send money, before they will part with a single thing like a stamped, self-addressed envelope.

Then there are the fellows who send the envelopes without the stamps. Also under this heading come the stamped envelopes, but blank. And I defy you to top this: the guys who don't put their calls *anywhere*, inside or outside.

Who went to the convention? The OM. Who sorted every card, and I do mean *every* card when he got back? Right. "Look dear, I just didn't have time to, etc."

Has the baby had her sunbath? Have the dogs been brushed? Have the diapers been washed? No.

And you know what he says? The man says, "Look dear, you are pretty lucky. The fifth district has about the fewest cards of any."

Well, I have to hurry along. The postman just came. But I just wanted you to know, Mr. Editor!

— *Bernice May, W5JKM*
Assistant W5 QSL Manager

COURTESY TO BEGINNERS

5302 Columbia Ave., Dallas, Texas

Editor, *QST:*

. . . Although I have been licensed only a short time, I have been a Morse and Continental operator for 25 years; the most certain indication of a "lid" in the land-line business is the fellow who, in addition to taking all the weights off his bug, saws off a portion of the weight rod in order that the dots will be fast and plentiful. The net result is a lot of hash, and general all-around nuisance, and a young amateur has no chance with the splattering mess. The "hot" boys, of course, believe that they are setting the air waves afire, and that they are in a very select group, because of their wonderful ability (?) to use the fast bug. I agree heartily that the group is a particularly select one, in that most of them hold a priority on lousy sending. . . .

There definitely should be a change of attitude toward the new amateur, and some degree of patience exercised in working with him; give him the same chance that you had when you were coming into the amateur field, and make him feel that he is a welcome addition to the art, instead of an intruder or impostor. I am not asking any quarter personally, because I can take it with any of them, but I do believe that postwar amateurs are not being given the consideration they deserve.

— *O. A. Boyer, W5LNK*

HANDS ACROSS THE SEA

17 Lexington Ct., Midland, Mich.

Editor, *QST:*

When you finished that European contact did you stop to think that the man at the other end was probably cold and, if not actually hungry, has been living on a monotonous and inadequate diet for years?

I have heard many hams express sympathy and hope that conditions there would improve. But we can offer more encouragement by sending that contact a food package. Necessary blanks and information can be obtained at your post office. Suitable items are: margarine, cooking fats, dried peas, peaches and prunes, chocolate, prepared cake and pie-crust mix, cheese, tinned meats, peanuts, candy and coffee. Also vitamins.

I lived on a civilian food ration card in one of those countries for 3 months and lost 20 pounds. It's tough! Let's prove that the brotherhood of amateur radio means more than exchanging QSL cards. 73.

— *R. J. Anderson, W8BIE*

"CANINES"

Oshkosh, Wis.

Editor, *QST:*

These new "canine" calls are really the thing — for a guy that is interested only in getting five or ten minutes of QSO out of each contact. I know it sounds like DX, and there wasn't too much publicity about the prefix, but why should the discovery that I'm just a "glorified W9" terminate what might have been a nice chat? I'm not new to radio even though the call is, and I've been looking forward to a good rag-chew for quite awhile . . . Wat sa?

— *Richard P. Hinz, K9AAS*

HAM SPIRIT

246 East 148 St., Bronx 51, N. Y.

Editor, *QST:*

. . . This great fraternity is bigger and greater than most people know or even think it is, and I believe more people should know some of the great and wonderful things that aamteurs are doing besides promoting better radio communication — and that is to help his fellow man in time of need. . . .

When the boys on the 10-meter band found out about my condition — that I was bedridden and had to tune my receiver by the reflection of a mirror — I made many friends and many of them came to see me; they put up an antenna

(*Continued on page 136*)

Operating News

F. E. HANDY, W1BDI, Communications Mgr.
J. A. MOSKEY, W1JMY, Asst. Comm. Mgr.

GEORGE HART, W1NJM, Communications Asst.
LILLIAN M. SALTER, Communications Asst.

Amateur Emergency Communications Lauded. In the Texas City disaster and the West Texas-Oklahoma tornado amateur radio communication was called upon unexpectedly again to fulfill its public-service rôle. We are happy to record that even with other communications in operation, amateur radio rendered vital service from the emergency areas. The greatest credit is due amateur operators who (1) stood by to avoid QRMing, (2) acted as monitors on frequencies *near* those carrying emergency traffic to keep them clear, and (3) handled useful traffic in accurate orderly fashion, on voice or c.w. All who contributed constructively to the sum total of amateur accomplishments may well be proud. The detailed story of amateur work in these disasters appears elsewhere in this issue. At least two hundred ARRL Public Service Certificates will be issued to the amateurs known to be responsible for outstanding public services.

Lessons from Emergency. The situation caught some amateurs short on operational knowledge. Letters and scores of reports register various sentiments about things observed. Who would think that the first and best thing to do outside a known emergency zone would be to *listen*? Who would stop to think that instead of rushing on the air with inquiry messages about the safety of Aunt Nellie in the emergency area, that it might be better *first* to look for directed (and perhaps QRR) calls from the affected areas? What about *priority* to the important official-agency traffic *out* of the area to help safeguard life and property of all persons remaining there? The unexpected *can* happen in your community. These *are* fundamental considerations — like the idea that every amateur should subscribe to the ARRL Emergency Corps!

W8SXQ writes, "Foolish quibbling such as *what's the FCC Order Number* in place of a spirit of coöperation in disaster ought to result in revokation of licenses." The full authority of FCC under Section 12.156(d) was vested in its designation of a score of specified amateur stations to assist in promulgation of its emergency announcement, to police designated frequencies, to warn amateurs observed not in compliance and report them to FCC for investigation. But the Washington action did *not* in this case carry or require an order number.

W9BRD was "amazed to see a number of stations that never listened on their own frequency before transmitting . . . calling in . . . coupling an expression of willingness to help with a request for a signal report . . . when they should merely have *listened* to be called if needed by stations in the emergency zone. . . ." Though of importance for proper and accurate 'phone work, reports had it that many messages had not been given proper numbers or preambles. Also the recommended phonetic alphabet was *not* being used for spelling difficult or unusual words resulting in garbled signatures and addresses. One amateur reported he heard no use of numbered-text messages. He said these would have saved transmission time in the secondary or "personal-inquiry" phase of the communication work. W5NW advised us, however, that ARRL numbered radiograms (from CD Form 3 and in the back of every ARRL Log) were successfully utilized.

There was a tendency to overrate individual inquiry messages as "priority" when this classification ought only to apply to official agency messages *out* of an emergency area, with like rating on some of the replies thereto. The chief lesson (we think) is that every active operator ought to *join the ARRL Emergency Corps*. By so doing one is supporting organized amateur service for any and every emergency. He can enjoy and benefit from *advance* discussions, literature, and participation in exercises covering such matters as procedure, priorities, and other factors. By such alignment with AEC one justifies his license as "in the public interest." His support contributes to our emergency readiness. Once in the AEC you are on the "inside" in any amateur-service community plans worked out by your emergency coördinator. Your local ARRL EC can provide appropriate blanks and give you information on the Emergency Corps . . . or write Headquarters.

Use C for Chirp: RST 359C. *Operating an Amateur Radio Station* and each ARRL Log as well give the exact definitions for readability, signal-strength and tone points of the RST scale. Addition of the letter X is there suggested for "crystal-control characteristics." The letter C likewise is specified to indicate if any *chirpiness* is present. In view of reports that a large number

of amateurs are receiving FCC citations for chirpiness and instability the wider use of C following RST reports is perhaps in order. One ham wrote that he was cited for instability, expressing indignation since his log was filled with T9 reports. The tonal definitions by themselves do *not* indicate either positive or negative information on *stability* but describe varying degrees of ripple, musicality, and roughness. A T9 report indicates only a *pure* DC note! Help your friends by adding a C whenever instability is noted. You can check signal stability in an instant by adjusting the b.f.o. in the receiver to zero beat, whenever stable propagation conditions permit.

On-The-Air Time and Power. The latest survey of band occupancy has permitted analysis of the operating characteristics of groups of amateurs expressing but a single type of interest in amateur work. The following tables show the number of hours spent on the air in fifteen days of a typical month.

Intensity of Interest		*Average Power*	
TFC	50.5 hrs. av.	DX	467.6 watts
DX	31.5 hrs. av.	TFC	375 watts
RCC	17.75 hrs. av.	RCC	153 watts
EXP	14 hrs. av.	EXP	138 watts

The above is easy to understand. Traffic men keep schedules and enjoy consistent night-after-night operation. Their time on the air counts up. Their fun gives them valuable automatic self-training in operating technique. Their traffic work serves other amateurs and sometimes the public. The DX man keeps few skeds operating oftener than not when he feels like it. He may be off for periods of fade-outs or may spend many hours listening for elusive stations. Note his highest power average! The rag-chewer is third-high in power and time, probably because his work is more "casual" and conducted less intensively. While the experimenter shows least hours of operating time, one must bear in mind that his time off the air may exceed by two or three times the time in which he is trying out his constantly-modified equipment.

Club Ideas! The Dade Radio Club (Florida) issues a good bulletin, including in each number an Achievement Roll. The calls of local ARRL officials, a directory of appointments held by club members (ORS, OBS, etc.), the calls of those holding Code Proficiency Certificates, and a listing of all holding awards, WAS, WAC, and the like appears in this section.

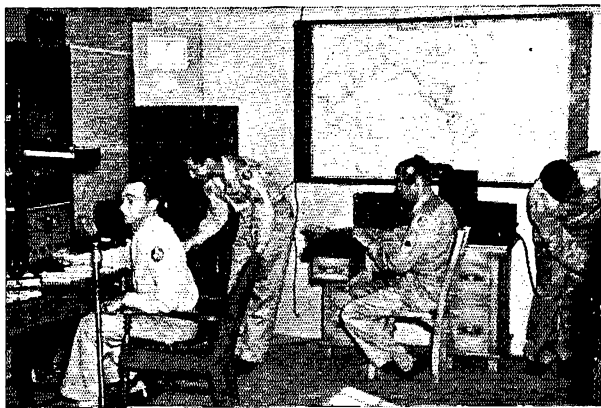
The Calgary Amateur Radio Association (Alberta), VE6QS secretary, plans contact with other VE6 clubs. His letter includes two suggestions: (1) If any member happens to belong or can arrange contact with other organizations, such as Boy Scouts, he will invite their representatives to attend summer outings. CARA will demonstrate portable equipment . . . then assist the interest of the younger fellows. (2) Qualified members will offer to handle traffic for local organizations and hobby enterprises such as the local chess club, pigeon-fanciers club, or model-airplane clubs where sked-points can be lined up.

OES Appointment. Every Division with the exception of Ontario and Vanalta, now has one or more ARRL Official Experimental Stations. The N.E. and S.W. Divisions lead in OES appointees. This appointment is available to League members operating licensed amateur stations with definite experimental objective in any U.S.A. or Canadian section[1] at frequencies of 50 Mc. or above. The group aim is production of data to aid in discussion and knowledge of transmission phenomena peculiar to the higher frequency bands. Monthly reports reach "Station Activities" and "The World Above 50 Mc." Future bulletins and plans to this group will cover some projects in weather-radio correlation that should prove of utmost interest to keen experimenters. In another column we are pleased to report a complete listing of calls of OES. If *you* have v.h.f.-u.h.f. interest and a good station on the air you also should belong to this group. See pages 66-67, March 1946 *QST*, for full information or drop a card to ARRL headquarters for a booklet describing the appointment. An appropriate application form for your SCM[1] will be sent members on request.

DXCC. Attention of all readers is invited to the first listing of postwar Century Clubbers in these pages. Hats off to the unremitting diligence of these guys to have accomplished so much DX in such a short time. One station already has made the award on both 'phone and c.w. Interested? See June 1946 *QST* (page 74) for detailed rules for this award.

— *F.E.H.*

[1] Communications Department field-organization Sections are designated for each part of the League's operating territory. See page 6, *QST*, for the complete list.



The Orlando Army Air Base Amateur Radio Club, W4KTE, in action! Reactivated members of the famous Chennault's Flying Tigers, 14th Air Force, the boys like to think of their station as "The voice of the tiger." Four BC-610s furnish coverage from 3.5 to 30 Mc. Receivers: three SX-28s, two BC-342s and an HQ-129X. Antennas: 28-Mc. rotary, 7-Mc. half-wave doublet, folded dipole, and a long wire usable on all bands. Left to right: Capt. Chet Keene, W1LXU, trustee; T/Sgt. Iacovitti; Master Sgt. Kier; S/Sgt. Delzell.

DX CENTURY CLUB

Since the announcement of the new DX Century Club rules in March *QST*, ten DXCC certificates have been awarded for contacts made since the end of the war. First to qualify was W1FH; his total stands at 137 countries confirmed! Second to make the grade was Vincent Suhoski, W2CYS, whose application was accompanied by 108 acceptable confirmations. Marwin Gonsior, W6VFR, was the third DXer to meet the requirements for the coveted new award. Others who qualified are listed below. Our heartiest congratulations to these DX experts on working 100 countries and acquiring the necessary confirmations in little more than a year of operating.

As this *QST* goes to press, the Number 1 all-'phone postwar DXCC award is being issued. The recipient is none other than Charlie Mellen, W1FH! His achievement in being first to qualify for both the regular DXCC certificate and the special all-'phone award deserves more than passing mention; it indicates plenty of know-how in this DX game. Too, it reveals his discovery of one of the most important secrets of DXCC success — how to get the QSL cards after working those rare countries. Good going, Charlie!

DX CENTURY-CLUB AWARDS

DXCC certificates based on postwar contacts with 100-or-more countries have been made to the amateurs listed below. The countries-worked totals indicated have been certified by examination of written evidence under the award rules as published in March 1947 *QST*.

W1FH	**137**	**W8HGW**	**104**
W1CH	**114**	**W1IAS**	**100**
W2BXA	**110**	**W1AXA**	**100**
W6VFR	**109**	**G6ZO**	**100**
W2CYS	**108**		

Radiotelephone: **W1FH 101.**

BRIEFS

Reprints of the Postwar Countries List published in February *QST* are available from Headquarters. We'll be glad to send you a copy upon receipt of a postal or radiogram request.

—•••—

The Raleigh Amateur Radio Club is sponsoring a contest to encourage the construction and use of v.h.f. gear. Any licensed amateur in North Carolina who has never worked a station more than five miles distant on any band above 30 Mc. is eligible to take part. The same station may be worked on more than one v.h.f. band and a multiplier of 2 is allowed for all contacts made on 144 Mc. or higher frequency bands. Only contacts made between April 1, 1947 and December 31, 1947 may be counted. Prizes are offered for the first- and second-highest scores submitted. Entries must list calls of stations worked, date and time of contacts, bands used, and should be sent to W4HVV, 2010 Reaves Drive, Raleigh, N. C.

COUNTRIES-LIST ADDITION

As mentioned at the time of publication, the ARRL Countries List, published in the February, 1947, issue of *QST*, will have additions made to it from time to time. Right now there is a single addition: Isle of Man ..... GD. This should make a lot of the gang happy, but after reconsideration of the case, it was decided that there was enough political difference between Isle of Man and the other British Isles to justify the separate listing. Please add it to your list, and watch this department for other changes as they are made.

EMERGENCY SUGGESTIONS

"During the recent Texas City disaster MTN did its part. There were loopholes to be plugged up in any future emergency that may arise. A recent issue of the *Blazer* outlined the idea of having a list of telephone numbers usable in emergencies. Phone numbers listed in a convenient manner in our logbooks so we could reach, without searching thru the telephone book, other hams with skeds to points we may require, hams with emergency power, police or fire departments, Red Cross, etc.

"Liaison with an emergency net such as the SARO is a 'must.' If a disaster strikes your area have you any plans as to what to do? Know who and where and what, so that you can go into immediate action; delay may be costly. Experience has taught our members to move traffic with the minimum of delay and confusion. Judging by the recent Texas City experience, we need a little brushing up. Messages were heard that were *different* from what they were at the point of origination. (W6QDE, for example, heard three of his messages relayed to Texas from Porto Rico. The number was correct; the station of origin had been changed; the check was missing, but the place of origin was correct. But some of the names in the text, which was a welfare inquiry, were misspelled or changed. The signature was *snafu*.) *Accuracy* is essential. Without it a message may be useless. Needless repetition of messages was heard. In repeating back, read a message at conversational speed. Stress any names or words that may be potential errors.

"When an emergency strikes it is *not* always a good idea to solicit traffic with a disaster area as its destination. People in a stricken area are undoubtedly anxious to get word out to loved ones, and don't need an inquiry to originate traffic. So, it seems best to hold in-going messages, and, at the same time keep an ear out for any outbound traffic. Remember it may be difficult for hams or the Red Cross to locate individuals or families in a disaster area. Naturally, traffic concerning evacuating, getting food and medical supplies, doctors and nurses, transportation, etc., holds priority over any 'personal' traffic."

— *Mission Trail Blazer*

APRIL CD QSO PARTY

The April CD QSO Party was a very successful get-together judging from the enthusiastic comments made by the ARRL appointees who took part. Conditions appeared to be a bit above average and many of the gang reported making good DX contacts with relatively low power.

Top score was made at W6RBQ by visiting op W3DGM (W6RBQ himself was en route to the ARRL Board Meeting). Mel's log contained this enthusiastic comment: "Listen to that gang of wolves clamoring to work me! This is the kind of stuff I dreamt about in E. Pa. — 17 QSOs in 17 minutes!" A regular CD Party high-scorer, W4EOP, placed a healthy second. It doesn't take high power to produce a high score. W9BRD used 75 watts input on 3.5, 7 and 14 Mc. to take third place.

The next CD QSO Parties are scheduled for July 26th–27th and October 25th–26th. These quarterly get-togethers are lots of fun. Any holder of an ARRL appointment is eligible to take part. If you have a good 'phone station, why not drop a line to your SCM (address on page 6 in each *QST*) asking for application blanks and information on the Official 'Phone Station appointment. Every 'phone station that is operated in line with correct practices should be included in the OPS roster. Similarly, amateurs who are sincerely interested in message handling and net operation are invited to apply for appointment as Official Relay Station. V.h.f. experimenters will be interested in the Official Experimental Station appointment. Get ready for the fall operating season now. Write to League headquarters or to your SCM for complete information on how to qualify for one of the several ARRL appointments.

Claimed Scores (C.W.)

Station	*Score*	*Contacts*	*Different Stations*	*Sections*
W6RBQ	409,386	208	160	53
W4EOP	391,860	305	199	53
W9BRD	271,135	251	160	51
W1LLX	251,450	229	166	48
W3TWI/4	243,225	229	161	46
W8ROX	227,810	212	163	46
WØNQD	215,600	220	148	48
W2AYJ	189,945	195	145	44
WØBQJ	159,310	178	132	47
W9NH	153,900	174	127	44
W9LFK	144,800	154	140	41
W1GKJ	140,875	169	120	41
VE3EF	139,400	158	124	46
W8JM	138,460	155	127	45
W1FTX	124,820	152	116	42
W3AIZ	124,030	151	119	39
W1NXX	120,105	147	118	39
W3EIX	105,840	141	108	36
W8DAE	102,680	130	111	40
W2PZE	102,600	146	105	30
W2TNN	99,750	133	112	38
W6CMN	99,099	91	79	42
W4AYV	93,440	122	106	40
W4FWZ	90,090	117	87	37
W9NUF	86,275	119	103	42
W3LWN	77,575	107	107	38
W8YDR	76,160	112	98	38
VE7AEU	75,087	81	65	38

Others with scores of over 50,000: W5JPC 72,150, W1IKE 71,370, W7EMT 69,510, VE1EK 67,580, W3GJY 66,490, W1IC 62,715, W6VAQ 60,242, W3ADE 58,500, W2ALH 57,720, W2NIY 57,185, W6EYH 57,035, W6FDR 54,280, W7CZY 53,064, W9EGQ, 53,010, W1BIH 52,800, W7QAP 52,650, W9FKI 51,330, W2EC 50,350.

ORS Rodney Newkirk, W9BRD — third high in the April CD QSO Party — and his compact station layout. Atop the BC-348 receiver is Rod's pride and joy, a home-built gang-tuned transmitter using 6F6 ECO — 6AG7-6AG7-6L6-parallel 6L6s, capable of operation from 3.5 through 30 Mc. Normal input is 100 watts on c.w. and 50 watts on 'phone. The receiver audio section is used as a grid modulator for 'phone work. A converter ahead of the 348 provides 28-Mc. reception.

BRIEFS

It is suggested that members of the Old Timers Club who wish to get in touch with other OTC members to talk over the "good old days" of amateur radio sign OTC after their call.

—•••—

The Communications Department would welcome more entries in its Article Contest. The author of each article accepted for publication is awarded a $10 prize, consisting of $5 in Victory Stamps and $5 in ARRL supplies or publications (except *QST*). Give this contest a try. Articles may be on any subject in the field of amateur operating or organization and are selected on originality and value to the fraternity. Entries should not be more than 500 words long. Please mark your contribution "For the CD Contest."

—•••—

A War Department circular issued in September, 1946, authorized use of Army-owned radio equipment in the amateur bands on posts, camps, or stations, to encourage training, create interest in radio communications and for morale purposes. Known to be active at military installations under this arrangement are groups at W5AAF, Kelly Field, Texas; W5USA, Barksdale Field, La.; Orlando Army Air Base, W5KTF; Smoky Hill Amateur Radio Club, WØJCR, Salina, Kansas; Langley Field Amateur Radio Club; McDill Field, Florida; Columbus Air Base, S. C.; Jackson Air Base, Miss.; Memphis Air Base; Marietta Air Base, Ga.; Morrison Field, Florida.

BRASS POUNDERS LEAGUE

(April Traffic)

Call	Orig.	Del.	Rel.	Extra Del. Credit	Total
W7FST	–	432	432	–	864
WØBHY	286	361	–	20	667
W6FDR	68	136	184	134	522

The following make the BPL with over 100 "deliveries plus extra delivery credits":

W6FDR	233*	W3ECP	135*
W3BHN	232	W6TT	130
W6LUJ	178	W8SCW	117
W3KWL	152	W3ECP	109

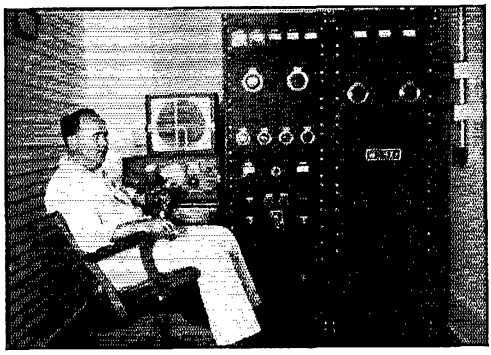
A message total of 500 or more, or 100 "deliveries plus extra delivery credits," will put *you* in line for a place in the BPL. The Brass Pounders League listing is open to all operators who qualify for this monthly "honor roll."

* March.

MEET THE SCMs

Bert T. Weidner, W5HXI, SCM of Oklahoma since last October, was born in Bethany, Missouri, September 12, 1895. A graduate of the University of Oklahoma with the degree of petroleum engineer, he now is in the employ of the Eason Oil Company as general superintendent of natural gasoline.

Weidner received his first amateur license in 1939, having become interested in amateur radio two years earlier. A past-president and present member of the Oklahoma City Amateur Radio Club, he formerly held OPS and OBS appointments and has taken part in almost all operating contests held since receipt of his license. During the recent Texas-Oklahoma tornado and Texas City emergencies, SCM Weidner participated in the outstanding relief work of the Oklahoma Emergency 'Phone Net. W5HXI also rendered valuable aid during the 1940 Amarillo ice storm.



W5HXI enjoys the luxury of a separate room in the house. Transmitter line-up: X-EC-VFO-6L6-RK39-HK54-p.p. 250TH. Receivers: SX-17 and SP-400SX. Skywires for each band are half-wave doublets. A Karr transmitter is on hand for emergency use. Most of SCM Weidner's work is accomplished on 3.85-Mc. 'phone, although the 14- and 28-Mc. bands also are used.

Bert's diversions, in addition to amateur radio, include hunting and fishing; his favorite sport is baseball.

In spite of the fact that Bert's various duties and activities require a great amount of his time, his splendid attention to each detail of the SCM office is such as to command the respect and co-operation of Oklahoma Section members.

OFFICIAL EXPERIMENTAL STATION

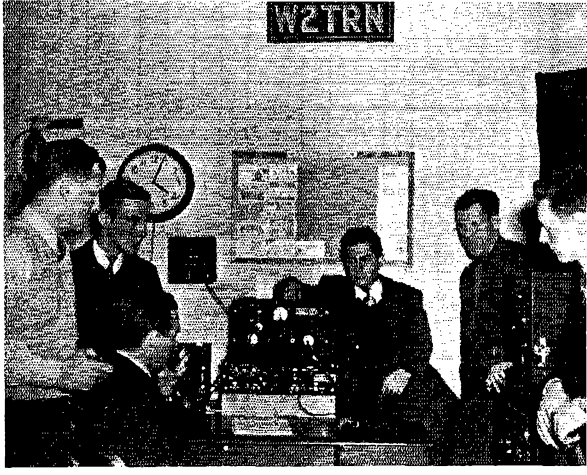
Steadily increasing interest in the OES appointment has been evidenced by workers with stations at 50 Mc. and above, since initial announcement of OES in March 1946 *QST*. The listing of stations that follows will permit OES to look for each other on v.h.f. openings and facilitate exchange of letters within the group.

Atlantic	W9YDX	*Roanoke*
W2LAO/3	WØPKD	W8SPY-W8TDJ
W2PZB	WØQFZ	*Rocky Mountain*
W3LVY	WØVFM	W6DLR
W3MNA	WØZIS	W7FST
W3QCN	WØZJB	W7MQL
W3WBM	*New England*	*Southeastern*
Central	W1BRL	W4ERS
W9AB	W1COX	W4FBH
W9FJI	W1CTW	W4LNG
W9IDZ	W1DQH	*Southwestern*
W9MBL	W1HDQ	W6DEY
W9NNX	W1HFB	W6JUM
W9ONB	W1IJ	W6MKW
W9UIA	W1ILS	W6MU
Dakota	W1JOJ	W6OHM
W9VET	W1JSM	W6SQN
Delta	W1JXP	W6VTC
W5BNW	W1KB	W6WNN
Great Lakes	W1LJT	W7QAP
W8UKS	W1LMU	W7RLC
W8WRN	W1LNX	W7SNI
W8WXK	W1MEP	*West Gulf*
Hudson	W1OAI	W5BHO
W2GYV	W1OJT	W5CHU
W2IXK	W1OLP	W5CXE
W2JWO	W1WS	W5DAS
W2OHE	W9UQP/1	W5HXJ
W9WHM/2	*Northwestern*	*Canada*
Midwest	W2SLW/KL7	VE1HJ
W9HAQ	W7CZY	VE1QZ
W9OKF	*Pacific*	VE2RZ
W9VWU	W6PIV	VE2YG
W9WNL	W7TJI	VE4DG
		VE5MW

SUMMER TRAFFIC SCHEDULES

Members of several nets have indicated their willingness to continue traffic operation on a skeleton schedule during the summer months. In addition to those reported in June *QST* "Operating News," the following will operate June through September as indicated:

Atlantic-Pacific Trunk	7085	8:30 P.M. EST, Tues., Fri.
Eastern Mass. Net	3745	7:00 P.M. EDST, Mon., Wed., Fri.
Nutmeg Net (Conn.)	3640	7:00 P.M. EDST
Pine Tree Net (Maine)	3550	7:00 P.M. EDST
Western Mass. Net	3760	7:00 P.M. EDST
Traffic Outlet	3705	10:00 P.M. EDST Wed.
Trunk Line C	7085	8:30 P.M. EDST, Tues., Fri.



Amid a flurry of dots and dashes, the Rutgers University R.O.T.C. Amateur Radio Club station, W2TRN, made its debut in February. The opening was climaxed by a message received from W2USA, Governor's Island, N. Y. From the Chief Signal Officer, First Army, Col. Grant A. Williams, it congratulated the Rutgers group on being "the first R.O.T.C. university station in the First Army Area to open an amateur station." Furnished and serviced by the Signal Corps, the transmitter is an SCR399, receiver a BC-342. Left to right: W2PGY, president; W2UFP, secretary; W2FBZ, W2SWY, W2UDS, chief operator; W2SDL, activities manager.

♦

CERTIFIED CODE SPEED

ARRL offers all amateurs official certification of their code receiving speed. Do you *know* how fast you can copy? Have you something on paper to prove your proficiency to those with raised eyebrows? ARRL's Code Proficiency Program provides the means for you to determine your receiving speed, and receive a certificate to prove it. Here's how . . .

Once each month a special W1AW transmission is made to enable you to qualify for a Code Proficiency Certificate, at a speed of 15, 20, 25, 30 or 35 w.p.m. If your initial certificate is for a speed below 35 w.p.m., you may later try for endorsement stickers indicating progress above your first certified speed. See W1AW schedule for details on frequencies used for Code Proficiency transmissions.

The next qualifying run will be on July 14th. The text on that date, received successfully by ear at the highest speed you can copy, should be sent to ARRL for checking. To avoid errors in transcribing, send your original copy. *Attach a statement certifying over your signature that the text submitted is direct copy, made from reception of W1AW by ear, without any kind of assistance, personal or mechanical.* If you qualify, you will receive a certificate, or appropriate endorsement sticker for certificate you already hold. Those who qualified in the past should submit new copy only if speed is higher than previously certified.

Do you need practice? If you want to "brush up" before trying the official "qualifying run" use the W1AW practice transmissions nightly, Monday through Friday, 10:00 P.M. EST, at speeds of 15, 20, 25, 30 and 35 w.p.m. When you feel qualified for at least 15 w.p.m., make copy of the monthly official run and submit copy. Then work for the endorsement stickers, right up through 35 w.p.m.

QST lists in advance the text to be used on several of the CP schedules. This makes it possible to check your own copy. It also provides a means of obtaining sending practice since it permits direct comparison of one's fist and tape sending. To get sending help hook up your own key and buzzer and attempt to send right in step with the tape transmissions. Adjust your spacing in the manner indicated as necessary for self-improvement.

Date	Subject of Practice Text from May *QST*
July 2nd:	*A Table-Top Kilowatt*, p. 13
July 8th:	*Narrow-Band F.M. for Voice Communication*, p. 20
July 10th:	*House Cleaning the Low-Frequency 'Phone Bands*, p. 24
July 14th:	Qualifying Run, 10:00 P.M. EST
July 16th:	*Atlantic City-1947*, p. 29
July 18th:	*C. W.-Transmitter Monitoring*, p. 34
July 22nd:	*Eliminating Car Noise in 28-Mc. Mobile Reception*, p. 37
July 25th:	*A Novel Ten-Meter Beam*, p. 59
July 28th:	*Spurious Transmitter Radiations*, p. 66
July 31st:	*Relax, Men! Use Haywire*, p. 68

ISLAND EMERGENCY

The Palmyra Island group was visited by extremely high moon tides coupled with generally stormy conditions during early January. Certain portions of Palmyra Island itself and other smaller islands were inundated, causing concern for personnel stationed in the area. Official government communications were functioning, though badly overloaded, but facilities to handle the numerous personal messages of inquiry were inadequate. The activities of KP6AB were responsible for assuring anxious persons in Hawaii and on the U. S. mainland that relatives and friends on Palmyra were safe. In contact with KH6FI, W7BTG/KH6 and W6OLD/KH6 on 14-Mc. 'phone, he handled many such messages. To exchange messages with the U. S., KP6AB shifted to 7-Mc. c.w. and worked several traffic schedules with the following: W2BO, W2HIQ, W4PL, W6IOX, W6JUF, W6KSY, W6KYV and W7QE.

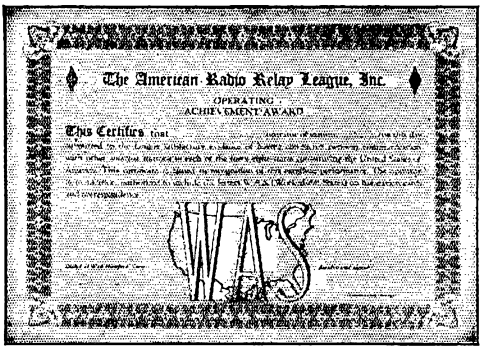
BRIEF

Correction: W1MTC was erroneously listed as the second-highest non-OO participant in the first postwar Frequency Measuring Test. The runner-up was W1MTO. Addition: W2BO was omitted from the list of Official Observers who took part in the FMT. His measurements showed an average error of 34.28 parts per million. Our apologies, OMs.

WAS — "WORKED ALL STATES" AWARD

An attractive certificate is offered by ARRL to those radio amateurs who work *all forty-eight* of the United States. Written proof of such contacts, in the form of QSL cards or other written confirmations, is required. The WAS certificate is available to all amateurs, upon proper qualification, regardless of affiliation or nonaffiliation with any organization; ARRL membership is not a prerequisite.

Headquarters has received numerous inquiries during the last several months concerning issuance of the WAS award. The question most frequently asked is, "Do my prewar QSL cards count toward WAS?" Prewar cards are acceptable and may be combined with those resulting from postwar operation in making your application. No special award is made for postwar work.



One certificate only is issued to each amateur who qualifies under the award rules. If requested, endorsements are issued in recognition of WAS on a particular band or by a particular mode and are appended to the initial award. Cards must list information supporting any claim to special endorsement. If, for example, you are applying for a 28-Mc. 'phone WAS endorsement, examine your cards carefully before sending them to Headquarters to make certain that each lists data proving that your contact was made on 28 Mc. and on 'phone. Do *not* add your own band or mode indicators. Endorsements are granted only on the basis of information written on the card by the operator of the station with which you have made contact. Many requests for endorsement have been refused because applicants altered cards or added their own data. If you already hold WAS and apply for an endorsement, please send your certificate along with the cards supporting your claim.

Here are the few simple rules to follow in applying for the WAS award:

1) Two-way communication must be established on the amateur bands with all forty-eight United States; any and all amateur bands may be used. A card from the District of Columbia may be submitted in lieu of one from Maryland.

2) Contacts with all forty-eight states must be made from the same location. Within a given community one location may be defined as from places no two of which are more than 25 miles apart.

3) Contacts may be made over any period of years, and may have been made any number of years ago, provided only that all contacts are from the same location.

4) Forty-eight QSL cards, or other written communications, confirming the necessary two-way contacts must be submitted to ARRL headquarters.

5) Sufficient postage must be sent with the confirmations to finance their return. No correspondence will be returned unless sufficient postage is furnished.

6) The WAS award is available to all amateurs.

7) Address all applications and confirmations to the Communications Department, ARRL, 38 La Salle Road, West Hartford, Conn.

List your missing states and go after QSOs with them. You will find it a very considerable operating achievement. How complete is your coverage? Your certificate awaits you.

IOWA AMATEURS SERVE

A serious communications emergency presented itself in late January when rain, sleet, snow, 60-mile winds and dropping temperatures descended on Iowa from the northeast. By nightfall southeastern Iowa was cut off from the outside world. Roads were hazardous, telephone and telegraph poles and lines had broken under the weight of ice and snow; electric power lines snapped. Amateur operators transmitted orders for repairs to points as far away as the Eastern Seaboard.

That night the Iowa Southern Utilities, with headquarters in Centerville, requested assistance from WØCPU who contacted the Iowa 75-Meter Net on 3970 kc. Much traffic relating to restoration of electric service was handled. ISU representatives made their headquarters at WØCPU.

All members of the network in the state outside the emergency area policed 3790 kc. Assistance also came from amateurs across the country, including ARRL Headquarters Station W1AW.

The emergency-network key stations included WØCPU; WØKZI, Ottumwa, relieved by WØCFB; WØNYU and WØCVM in Burlington; WØUOP, Des Moines, control station, assisted by WØOCG and WØREN; WØWML, Newton, assisted by WØNNM; WØTWX in Iowa City; and WØFPO, WØCVU and WØBPG, in Cedar Rapids. WØTNI operated WØNMA, while WØNMA supplied two portables and kept them serviced. WØEQZ operated one portable in Mt. Ayre and WØVNM operated another in Leon. In Creston, a portable furnished by WØCPU was operated by WØDMX.

With wires broken the Associated Press turned to the Iowa 75-Meter Net to transmit news releases from Des Moines to several newspapers in southeastern Iowa.

News of a death in the stricken area was relayed by amateurs to relatives in four directions, and acknowledged within an hour of the original transmission. As a result, relatives in Missouri, Nebraska, Texas and Illinois were contacted although all commercial communications were cut off.

For 59 hours the amateurs of southeastern Iowa stayed at their posts, serving in countless ways. Utilities executives and representatives of other agencies served were lavish in their praise of the services performed by the Iowa 75 Net and other amateurs who coöperated.

W1AW OPERATING SCHEDULE

Operating-Visiting Hours

Monday through Friday, 8:30 A.M.–1:00 A.M.
Saturday, 7:00 P.M.–2:30 A.M.
Sunday, 3:00 P.M.–9:00 P.M.

A mimeographed local map showing how to get from main state highways (or from Hq. office) to W1AW will be sent to amateurs advising their intention to visit the station.

Official ARRL Bulletins containing latest information on matters of general amateur interest are transmitted on regular schedules:

Frequencies: 3555, 7145, 14,150, 28,060 and 52,000 kc. (voice — 3950, 14,280, 52,000 kc.)
Times: Monday through Friday, 8:00 and 11:30 P.M. EST (0100 and 0430 GCT, Tuesday through Saturday)
Sunday, 1:00 A.M. and 8:00 P.M. EST (0600 Sun. and 0100 Mon., GCT)

Bulletins are sent simultaneously, first at 25 w.p.m. and then repeated at 15 w.p.m., on all frequencies during the early schedule to facilitate code practice. Telegraph bulletins are followed, in turn, by voice transmissions on 3950 kc. and 52,000 kc. simultaneously, and then on 14,280 kc. Any changes from this schedule will be announced.

Code Proficiency Program: Practice transmissions at five speeds, 15 through 35 w.p.m., are made Monday through Friday on the above-listed frequencies, starting at 10:00 P.M. EST (0300 GCT, Tuesday through Saturday). Approximately ten minutes practice is given at each speed. Next certificate qualification run is scheduled for Monday, July 14th.

General Operation: W1AW engages in two-way work with amateurs, as follows:

Monday through Friday, all times EST—

11:00 A.M.–11:30 A.M.*	28,060-kc. c.w.
11:30 A.M.–12 noon*	29,150-kc. voice
3:00 P.M.–3:30 P.M.	14,280-kc. voice
3:30 P.M.–4:00 P.M.	14,150-kc. c.w.
4:30 P.M.–5:00 P.M.	3850-4000-kc. voice
6:00 P.M.–7:00 P.M.	7210-kc. c.w.
7:00 P.M.–8:00 P.M.	3555-kc. c.w.
9:30 P.M.–10:00 P.M.	3555-kc. c.w.
12:15 A.M.–1:00 A.M. (Tues. through Sat.)	7210-kc. c.w.

Saturday and Sunday (excepting dates of official ARRL activities).

Saturday: Midnight–1:00 A.M. (Sun.)	3555-kc. c.w.
Sunday: 1:45 A.M.–2:30 A.M.	7210-kc. c.w.
6:00 P.M.–7:00 P.M.	3850-4000-kc. voice
7:00 P.M.–8:00 P.M.	7210-kc. c.w.

*Subject to change during operators' vacation periods.

The station staff:
John T. Rameika, W1JJR, "JR"
Wm. H. Matchett, W1KKS, "BM"
James E. White, W1PHW, "JE"
W1AW is not open on national holidays.

A.R.R.L. ACTIVITIES CALENDAR

July 14th: CP Qualifying Run
July 26th-27th: CD QSO Party
Aug. 19th: CP Qualifying Run
Sept. 13th: CP Qualifying Run
Sept. 19th: Frequency Measuring Test
Oct. 17th: CP Qualifying Run
Oct. 18th-19th: Emergency Corps Test
Oct. 25th-26th: CD QSO Party
Nov. 12th: CP Qualifying Run
Nov. 14th-16th and 21st-23rd: Sweepstakes Contest
Dec. 16th: CP Qualifying Run

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Jan. 16th-Dec. 15th: 1947 V.H.F. Marathon
Jan. 1st-Dec. 31st: Most-States V.H.F. Contest
First Saturday night each month: ARRL Officials Nite (Get-together for SCMs, RMs, SECs, ECs, PAMs, Hq. Staff, Directors, Alt. and Asst. Dirs.)

MAINE EMERGENCY

During early March a heavy snowfall accompanied by 80-mile winds swept over eastern Maine. The entire northern part of the state was cut off from wire communications with the outside. Maine amateurs were instrumental in providing emergency communications for the press, telephone and power companies.

Among the more serious communications problems caused by the storm was that of providing contact between Bangor and Presque Isle. At Bangor, W1KOB went on 3.85-Mc. 'phone and hooked up with W1PRW at the Presque Isle Army airfield. Traffic was handled for the press and public utilities until skip conditions made contact difficult. W1ARV of North Anson, Maine, who could hear and work both stations without difficulty, stepped into the breach at this point and acted as a relay station. When, two days after the storm, W1KOB had to leave the air, W1ARV took over the circuit, making the necessary contact with Bangor via a direct landline. The 3.5- and 7-Mc. c.w. bands were employed when poor conditions made traffic handling impossible on 3.85-Mc. 'phone. W1OCU at Houlton, Me., worked into the emergency net and rendered valuable assistance. At Presque Isle, W1POD and W5FAS/1 also helped materially in maintaining contact with Bangor. Others, whose calls are not available, played an important part.

All amateurs who assisted in the emergency were publicly thanked along with other agencies in a half-page newspaper ad published by one of the utilities served.

BRIEF

'Phone stations we can do without working: Fellows who laugh by saying "Aitch Eye."

• All operating amateurs are invited to report to the SCM on the first of each month, covering station activities for the preceding month. Radio Club news is also desired by SCMs for inclusion in these columns. The addresses of all SCMs will be found on page 6.

ATLANTIC DIVISION

EASTERN PENNSYLVANIA — SCM, Jerry Mathis, W3BES — MW, who is in Austria, hears the local boys on 28 Mc. on his EC1A. CAU nabbed four stations off frequency. ELI is ORS once more. AQN reports the following stations in the York AEC net: BKB, EDO, GES, HFG, IXG, IQF, LHG, and MYK. OK is back in the ORS fold. QEW is enthusiastic about the E. Pa. Traffic Net. We welcome HCT back in the E. Pa. Net for the first time postwar. OML avers that the E. Pa. Net is doing a fine job. Orchids to GMK for organizing the net and supplying many of the lads with crystals. MCQ represents the Schuylkill 28-Mc. Net and feeds the E. Pa. Net. MGL, act. mgr. of the Susquehanna Valley ARC, reports as follows: Our 144-Mc. transmitter hunt was held on the 27th at 1:30 P.M. with a tone modulated signal. Two movies were shown at the club meeting on the 18th. BFH has a pole up at his new QTH and will run a kw. on all bands. KZM worked his first Russian on 14 Mc. DEC has a portable 3.85-Mc. 'phone rig in his car. WBL uses 144 Mc. in his car. QJP is building an all-band switching kilowatt. UOH, LYU, and MXT are on 28 Mc. MQE runs 50 watts to an 807 on 3.5-Mc. c.w. SEL is on 144 Mc. with crystal-control and a superhet receiver. KPH and MXE are rebuilding. MGL has finished his new e.c.o. GMK reports having four different NCS on the E. Pa. Net. BXE, with his little 809 and washline antenna, has worked 97 countries postwar. GHD has 600 watts and has passed the century mark in countries worked. ENX is designing a 14-Mc. rotary that will fit on a row house roof without overlapping. BES has one hundred countries confirmed postwar. The Frankford Radio Club, despite its reputation as the country's outstanding key pushers, took five, including first and second, out of the first ten places in the 'phone DX Contest. EM, ex-HFE, will confirm that the 4-125A tubes will not stand 2500 volts positive on the control grids. It cost him 50 dollars a microsecond to find it out. Field Day preparations are going ahead apace in most of the section's radio clubs. Correspondence regarding AEC should be sent on BXE. Traffic reports should be sent on the first of each month to BES. Keep the reports rolling in. Traffic: (March) W3ELI 20. (April) W3QEW 150, ELI 40, OML 31, EU 28, GMK 26, AQN 16, OK 10, IXN 8, VMF 8, BXE 6, HCT 6, KMS 6, BES 2, CAU 2

MARYLAND-DELAWARE-D. C. — SCM, Eppa W. Darne, W3BWT — The "Argument Radio Club," inactive during the war, now is in operation. Its members are chiefly the gang in lower Delaware and the Eastern Shore of Maryland. Officers are: JMO, chairman; DTO, vice-chairman; FJK, moderator; GKT, secy. Meetings are held the first Monday of each month at the Episcopal Parish House in Milton, Del., at 8:00 P.M. The club has a novel "on the air meeting" each Sunday at 4:00 P.M., 'phone and c.w. on 3875 kc. with JMO as NCS. The Baltimore Amateur Radio Communications Society had Dr. D. H. Andrews of Johns Hopkins speak at one of the April meetings on "Radio Detection" utilizing the Andrews bolometer. The Capitol Suburban Radio Club has a license for its club station, NEW. The Washington Radio Club, at its April meeting enjoyed a talk and demonstration by 2BAV, W. F. Hoisington, on "The Absence of Ground Effect on High Gain Beams" and an "Old Timers Night" featuring exhibits of ham apparatus of bygone days, and yarns and experiences of older hams. The Section Net is in full operation on 3650 kc., Mon., Wed., Fri., at 7:30 P.M. EST or 8:30 P.M. DST. LVY is net control station. All members of the section are urged to report into this net, exchange message traffic, and gain operating experience. LVY, ECP, MJQ, FPQ, AKB, and JVG have been active in the net at this writing. The Potomac Valley Emergency Net is operating in grand style with WN, PA, KBX, FPQ, ECP, CIQ, AQV, AHQ, UA participating; also 4BIG, BCT, and KUC are working in the net. FPQ and the PVEN gang are to be congratulated. CDQ is trying to solve the antenna problem at new location. EOV has opened a new ham store on H St., N. E., Washington. DF, George Sterling, now is chief engineer of the FCC. MSK has 86 countries and 36 zones to his credit. CIC is heard frequently on 144 Mc. Larry's new shack is the most ideal the SCM has ever had the pleasure of seeing. EYX has a new Collins transmitter and receiver. EQK is working nice DX on 14 Mc. HOP has his beam antenna up again, after losing it in a windstorm. HUM is building a new shack at his new QTH, 406 Whitestone Rd., Silver Spring, Md. AWS, MPP, VH, and 2RCX/3 are heard frequently on 144 Mc. VP worked FA8GX on 28-Mc. 'phone with an 8-watt portable rig. GQF is on 9 cm. and wants to arrange schedules. HG has installed speech clipper. NAQ and NFS are new calls heard on 28 Mc. KMB traded his bug for a mike and blossoms out on 28-Mc. 'phone. BOY, KOL, AEG, MWY, JOT, and CBP, all within a five-block radius, have organized the Hamilton Radio Protective Assn. on 28-Mc. 'phone. KHJ gets out nicely on 7-Mc. c.w. BKZ schedules KL7IR. MPS gets out well with 70 watts on 7-Mc. c.w. and 28-Mc. 'phone. NFC is a new YL operator in Baltimore. For the present she will operate the OM's rig, JMA, 350 watts to a three-element beam on 28-Mc. 'phone. MRM is on 28-Mc. 'phone using folded dipole inside antenna. JJD usually is on 28 Mc. AKB has been appointed Asst. SCM. ISF has 10 watts to a temporary rig on 3.5 Mc. MUU is building a new broad-tuned bandswitching exciter. Traffic: W3ECP 303, LVY 156, FPQ 74, BKZ 64, JJD 9, KHJ 5, BWT 4, EYX 3.

SOUTHERN NEW JERSEY — SCM, Ray Tomlinson, W2GCU — The DVRA and the TRS combined activities in the June Field Day under the heading of the Trenton Emergency Radio Corps, operating under the DVRA call, ZQ. The HTRA covered Field Day under its own banner at the Trenton State Fair grounds. QSO record for the first postwar year of the amateur radio at 2HAZ brings forth a total of 326 contacts. ZI is official tie-in station between SNJ and NNJ ORS Nets. WI purchased a new Meissner Signal Shifter. SXK is new ORS. QOK finally got the new 14-Mc. job working and knocked off ON4OQ in Brussels. While listening across the band recently HAZ heard W6VDG/KW6 on Wake Island; KP6AA, on Palmyra Island; and KS4AC on Swan Island. SAI sold his "BC610 driver" and rebuilt the entire rig. ROE is very proud of the new 28-Mc. beam. RDK has 95 countries. TNN made 75,000 points in the CD Party. BEI maintained 269 schedules with G6BY over a total of 76 hours. RDK worked country No. 101. The officers of the newly-formed Hunterdon County Amateur Radio Assn. are: IMA, pres.; OFW, vice-pres.; Eddie Arnitz, secy.; MZW, treas. SOR, on S.S. *Muncie Victory*, is keeping watch on 3.5 Mc. at 0230 GMT, and on 14 Mc. at 2115 GMT Tuesdays and Thursdays. VX finally has 144-Mc. superhet and crystal-control. Traffic: W2RG 61, QUH 60, ZI 30, RPH 18, ORS 12, SXK 11, HX 10 (Mar. & Apr.), BEI 9, QZF 7, RDK 4, CFB 4 HV 1, PIN 1, PSZ 1.

WESTERN NEW YORK — SCM, Charles I. Otero, W2UPH — The NYS Net will resume operation Sept. 1, 1947. This net has been built up into a fine organization thanks to the efforts of ITX, Acting Net Manager. It is composed of 24 stations: AOR, BLO, BVR, EQD, FCG, GWY, ITX, LRW, NAI, NHY, NNK, NVB, PGT, QOM, QZI, RIZ, RUF, SAG, SZK, WUW, OGH, SZ, RME, and PZJ. Among these, RUF and NAI are XYLs. Activity reports for the net show RUF ahead of the fellows. If you want to become highly proficient in traffic-handling and net operations, join the NYS Net. Watch 3720 kc. during the summer and see if you can contact ITX. The time is 7 P.M. EST Monday–Friday. A second DX get-together was held by the Rochester Area DX men and the following were present: QCP, DOD, FBA, QJM, QM, MA, AFQ, QEV, BJH, RLI, TXB, PUD, CNT, TEX, QAA, WPJ, QEW, VTR, BZN, PZU, EBO, PUN, PWY, UPH, QCF, RSL, and 3HBA. The purpose of the dinner-meeting was to discuss the formal organization of the group along the same lines as the DX Club in Northern California. A temporary Chairman, PUD, was appointed with a temporary committee, made up of DOD, FBA, PUN, PWY, PYW, QCP, TXB, and UPH, to handle the details of organization. RARA's hamfest was an outstanding success. TGK has a new harmonic. RXM has a new jr. operator. EBF, radio aide for Erie County, is back in Buffalo and on 3.5 and 7 Mc. c.w. At a joint meeting of RAWNY and KBT, RX was M.C. who introduced John Reinartz, research engineer for RCA, who spoke on Dual Inductors. UYG and RM monitored bands during Texas emergency. RGO was in charge of the Niagara Falls Field Day activities. The Falls Net on 144 Mc. is going FB, all crystal-controlled, but squish boxes were used for the April drill. PJV is on 144 Mc. and wants to contact the gang. If you want to make a schedule with PJV, give him a call on 7290 kc. almost any night at about 6 P.M. Or drop a card to L. Colby, PJV, 122 Main Street, Owego, N. Y. PNZ is using a signal squirter of about fifty watts on 14-, 7-, and 3.5-Mc. c.w. with an 807 in the final and has an SX-25 receiver. QHH, with 40-watter, has worked 3EKK/VK9, 6VDG/KW6, VR5PL, 8LXN/KG6, HP4Q, CX4CZ, LA4IA. AOR would like to know the whereabouts of ex-8MPN, who was in Plattsburg, N. Y., back in 1934. Traffic: W2FCG 43, AOR 42, SZK 36, SAG 11, FSB 10. PZC (8FUG) 6, QHH 3.

WESTERN PENNSYLVANIA — SCM, Ernest J. Hlinsky, W3KWL — RAT is new PAM. QCN is EC of Mercer County. LWH is ORS. The Conneaut Radio Club saw what the Erie gang can do with 144 Mc. MQA has an 809 final. VIS uses 25-watt 'phone on 3.85 Mc. NFM is on 28 Mc. 8ATQ is now 3KSI and is using p.p. T40s. LGM is rebuilding to 35TGs. LOD reports the McKean County Radio Club is becoming emergency conscious. GJY worked 103 stations in 32 sections in 7½ hours in the CD Contest. NFZ is on 144 Mc. NFR has SCR-522 for 144 Mc. BHN shows excellent traffic work mixed with radio chess. YA is constructing 250TH final, c.w. only. MLN, now at new QTH, says the FCC surprised him with a pink ticket. MHE has rocks all over 7 and 3.5 Mc. running 300 watts to 810. TGP is using new beam. WFB is using c.w. again. LQQ still keeps 'em rolling in ORS. LWN worked 38 sections on 3.5 Mc. in the CD Party. NBU is operating portable in Pittsburgh on 28-Mc. 'phone with 55 watts input. BWP is doing an excellent job as OO. PJJ has reconstructed 28-Mc. beam. 8ZMP/3 is on 14 Mc. at Wilkensburg, Pa. SHG and KXU suffered antenna losses during storm. 3LTB/KH6 is now at Pearl Harbor, T. H., and looks for the Pittsburgh gang on 28 Mc. He claims the distinction of having silver-plated antenna elements for beam. 'Phone men take notice. A 'phone net known as the "Tuesday Club of the Air" is being organized. Write or contact RAT, 503 Lloyd St., Pittsburgh, if interested. RAT, PJJ, VNE, LGM, LGL, RAP, and LFM are represented. UUG worked 79 countries on 28-Mc. 'phone. New Mercer County hams are NCD, MQW, and NDD. Remember the hamfeast at Pittsburgh Aug. 3rd at Spreading Oaks, South Park. MJK reports summer schedules on 3.5 Mc. are off but he is active on 7 Mc. Hit & Bounce Net, 6 A.M. EDT. UVD worked VK5JS with 21 watts on 14 Mc. The Coke Center Radio Club, Connellsville, received ARRL club charter. Traffic: (Mar.) W3YA 48, MLN 1. (Apr.) W3BHN 464, KWL 443, TWI/4 273, MJK 154, PY 35, RAT 27, MHE 25, LOD 13, NCJ 11, BWP 10, UVD 7, LQQ 6, LWN 4, IQQ 2.

CENTRAL DIVISION

ILLINOIS — SCM, Wesley E. Marriner, W9AND — RMs: Northern-EVJ, Central-SXL, Southern-JTX. PAM: UQT. SEC: Southern-FIN. Special Coordinator: FXB. Illinois c.w. Net, 3765 kc., meets at 6:15 P.M. CDST, daily except Saturdays and Sundays. The Illinois Emergency 'Phone Net, 3940 kc., meets at 9 A.M. Sundays. Nearly 400 attended Moline-Rock Island Hamfest held at the Farmall Club, April 27th. Among those who attended were EVJ; FST; FLQ; AND; AWA; FFQ; AGV; HLF; AHV; LIP; QLZ; ØACL; ØPJR, the Iowa SCM; 9AA; John Reinartz, 3IBZ; ZHB; and UQT. KMN had the ART-13 on the air in the April CD Party and made a score of 45,320 in ten hours. FKG is on 3.5-Mc. c.w. with 813 final. DBO is on 7- and 3.5-Mc. c.w. UPW has new bandswitching turret coil for antenna-tuner in transmitter. New skywire at TZQ won't take soup on 3.5 Mc. but he pours 500 watts to it on 7 Mc. NUF is working for an M.S. in electrical engineering, and thinks he may go to W6 Land. He put up a 204 ft. antenna ala BRD. BRX is correcting BCI troubles while waiting for gear to arrive and put up two half waves in phase for 14 Mc. until rotary beam materializes. March traffic total at D4AON/W9QKJ was 3. You can find Ken on 14,080 kc. at 9 P.M. CST. His address: Lt. K. N. Harding, 0-704838, 501st Air Service Group, APO 633, c/o Postmaster, New York City. YBY is pleased to see the Family Album back in CD bulletins. He has trouble with his rig on 28 Mc. NN is on 7 Mc. every night with WEA and YIX looking for excitement. A four-way was held one night with AND; all three had Millen VFOs and AND has one on the shelf. JMG changed his OBS schedule to Mondays 7 P.M. 3525 kc.; Saturdays 3 P.M., 7050 kc. New hams: ROB, operating on 14- and 7-Mc. c.w. from Chicago, has National 2-40D receiver and pair 807s final. ZST is new at Bloomington. ZPC is new at Elgin. Club news: KL7BG was home for a visit with Kickapoo Club at Bloomington and visited with SXL, who says Johnny took an RME-45 back with him to Fort Richardson, where the Russians pour in but very few W9 signals are heard. The River Park Amateur Club has two rigs, one on 28-Mc 'phone, the other on 7-Mc. c.w. Code and Theory classes are held each Friday night, meetings the 2nd and 4th Thursdays of each month. RUK received a dinner invitation from CIU, Chicago, via a ham station in Iwo Jima. High Frequency: IAW and FKI are on 50 Mc. nightly. BON is on 50 Mc., n.b.f.m. On April 12th HH and several others operating mobile 28 Mc. publicized the fact there would be a meeting of the greater Chicago mobileers that evening. The only way you could find out the meeting place was to contact another mobile unit. Calling was supposed to start at 7:45 P.M. The only location given was Central Chicago. By 8:45 P.M. 28 mobile operators had gathered at the designated place. The "Mobileers" Club was organized. HH was elected president and FXB, secretary. The following hams attended: JGL, FXB, QIO, RHZ, MDO, WJU, HH, RJU, UCN, KGO, JYJ, SXE, KLQ, GGW, ABR, EMX, LLX, OMP, ONT, SWG, FAB, CBA, BYB, WZO, EQC, RJO, BAD, and KQT. Winnetka on the north, Hammond, Ind., on the south, and Aurora on the west truly represent greater Chicago and any ham having any type of mobile equipment from a handie-talkie to a rig in an automobile is eligible to join. DX Listings: All Illinois DX hounds, please send in your postwar total if over 50. ERU 108, GNU 68, AWA 67, KMN 56, AND 54. New ECs: IBS and BMV. ZGP is new call on 14-Mc. c.w. Traffic: W9JTX 330, EVJ 221, SYZ 87, FKI 80, SXL 45, UQT 30, MRQ 29, FST 18, FIN 14, KMN 12, YTV 8, NN 7, YBY 4, EBX 2, AND 2, JMG 1.

INDIANA — Ted K. Clifton, W9SWH — Fellows, could you have a station on the air within one hour if all power failed? Would you know how to move traffic if you did have a station which was emergency-powered? Indiana now has 15 active radio clubs. Do you belong to one? If not, write your SCM for the name and location of the nearest club. Michigan City Amateur Radio Club has elected the following officers: LJI, pres.; TVV, vice-pres.; OCP, secy.-treas.; Don Nixon, publicity. The club meets the first Friday and

the third Monday of each month at 907½ Franklin St. in the Denwood Recording Studio. MDK is chairman of the Emergency Communications Committee of the new Evansville Tri-State Amateur Radio Society. 8DQ now is 9AW. LKI has his portable station on at Hamilton Lake. CYC has returned to Pierson, Mich., for the summer. YDA is new ORS. DPI spoke at the Tri-State Amateur Radio Society of Evansville. New calls in Muncie are YHA, who is 14 years old, and ZPX. FXI is president of the CQRY net on 7174 kc. each Thurs. at 7 P.M. CDST. This net consists of all railroad-employed amateurs. The DARA of Muncie held Field Day at DeSoto, 8 miles northeast of Muncie, and used the call HJJ. New officers of the New Castle Amateur Radio Assn. are: PHV, manager; ZSC, executive aide; MBL, technical aide. Meetings are held the last Saturday of each month. JXA is on 3.85, 3.5, and 7 Mc. with new HQ-129X and a Meissner Signal Shifter for exciter. QLW has a vertical for 14 Mc. CLO is on 14 Mc. with 75 watts from Jasper. The Fort Wayne Radio Club used the call RJY from Franke Park on Field Day while operating on a 24-hour basis on 'phone and c.w. on four bands. Officers of the Indianapolis Club are: JPX, pres.; DNQ, vice-pres.; DSC, treas.; BHC, secy. The club publishes a paper called "Ama-Chewer." Traffic: W9RCB 357, NH 280, DHJ 31, SWH 15, DGA 14, UKT 7, YDA 5, TT 4, DOK 3, NZZ 3, PMT 3, QLW 3.

WISCONSIN — Acting SCM, Ralph Klein, W9DKH — IQW is going to try 28 Mc. this summer. FAA, at La Crosse, and ESZ, at Bay City, handled quite a lot of River traffic during the telephone strike. RQM is getting rig ready for 50 Mc. opening. Reliable CFP reports two new stations on at Racine, STO and SFP; TXI is learning Spanish; DUR is having trouble with key clicks; and KZU has 807 troubles. HEE sends in nice news about Wisconsin Valley Radio Club. New officers for coming year are as follows: RQM, pres.; ESV, treas.; JBF, secy.; FZC, custodian, and HEE, activities manager. All visiting hams are invited to their summer meeting at Marathon Park. A good time is promised with refreshments, prizes, and an interesting program. GAA and HEE, of Schofield, are on 28 Mc. with 25 watts and 1 kw. respectively. TED, a new ham at Wausau, is on 7-Mc. c.w. and 28-Mc. 'phone with 807 final. QJW, of Auburndale, commercial operator at WLBL, reports some good luck on short skip. KXK, of Waupaca, has a new TEMPCO 75. Paul says it works FB on all bands. VHA, another newcomer at Wausau, has a new HT-9 transmitter and a new RME-45 receiver to go with it, not to mention a three-element beam. JBF has bandswitching rig with pair 813s in the final — 'phone and c.w. ZTO is trying hard to get the rig on the air, but is looking for new QTH. His landlord is alergic to ham radio. FHU, of Mosinee, also runs a pair of 813s in the final. JAW, Two Rivers, is looking forward to 28-Mc. mobile marine this summer on Lake Michigan. OVE has mobile going in car on 28 Mc. and is going to tour the State this summer. QZO, DDG, and NVJ are heard regularly on 28 Mc. from Sheboygan. OMO is on 3.5-Mc. c.w. with 6L6 from Manitowoc. Traffic: W9LFK 151, FAA 119, ESZ 80, IQW 22.

DAKOTA DIVISION

NORTH DAKOTA — SCM, Raymond V. Barnett, WØEVP — SSW maintains regular schedules with Pioneer Net, Canadian Air Force International Boundary Net and North Dakota AEC. He is most active, or at least most faithful, in making a monthly report. Several members of the Cendak Club handled flood level traffic for Army Engineers. GJJ is proud possessor of a new National NC-2-40D receiver. In accord with Bylaws *QST* is soliciting nominations for SCM, my term having ended. Send them in. When nominated and elected, the new SCM will rate the best coöperation of all North Dakota amateurs. Traffic: WØSSW 33, EVP 13.

SOUTH DAKOTA — SCM, P. H. Schultz, WØQVY — WUU, EHO, GCP, and BLK are carrying on informal schedules while waiting for South Dakota net to be organized. QVY visited SDE, HDO, GCP, and ZXZ at Mitchell, NGM and ILL at Huron, and BJV at Watertown. Two SWLs at Winner are ready for their tickets. FJR worked PK6HA and a Swiss station to give them their South Dakota contacts for WAS. YEZ is helping BLK with traffic. Equipment at the Sioux Falls Amateur Radio Club station, ZWY, consists of a Supreme transmitter and a Hammarlund HQ-129X, donated to the club by the Power City Radio Co. The antenna is a 132-foot Zepp, which is strung from the top of the church to the top of the parsonage, about 40 feet above ground. The club operates on all bands including 28 Mc. and works either e.c.o. or crystal. Crystal frequencies are 14,100 and 7150 kc. Traffic: WØWUU 4.

MINNESOTA — SCM, Walter Hasskamp, WØCWB — One of the main activities of April was the handling of traffic for the U. S. Department of Engineers, St. Paul District. Ever since the start of the telephone strike both MSN c.w. and 'phone nets together with the coöperation of stations in Wisconsin, Iowa, North Dakota, Illinois, and Missouri have handled an enormous amount of traffic pertaining to flood conditions, dam reports and river stages up and down the Mississippi River and its tributaries. A glance at the traffic report will show in part how much was handled. BPK received a letter stating it is planned that the Army 'phone and c.w. nets will be reactivated in the near future. They perhaps will be reorganized on a much greater and world-wide scope. NCS is busy building a 50-Mc. converter. VJH has a new HQ-129X. ITQ has new rig with an 813 in the final. EA, formerly FUZ and SCM of Northern Minnesota, is to return to Bemidji about August 1st. He has been aboard ship along the West Coast. YPN blew modulator transformer and now has only 250 watts on 'phone. TPN is new station at Winona operating 3.5- and 7-Mc. c.w. from St. Mary's College. PPZ is building new pre-selector. DEI has new Meissner Signal Shifter. UWG has exciter for new rig on the air. TMS is new ham at Brainerd and is on 7-Mc. c.w. with low power war surplus rig. The Fairmont Radio Club has moved into new quarters at the city hall. RPT has done a slick job of redecoration on his shack. JNC has worked 54 countries postwar so far. ZWW has been helping BHY handle engineers' traffic. Your SCM attended the April meeting of the St. Paul Radio Club. New ORS are RPT, PNQ, EHO, NQD, CCF, and CWB. BHY now is our SEC. Thanks, gang, for the swell job of traffic-handling this month, and will you please keep those reports coming in regularly? Traffic: WØBHY 667, DNY 251, PPZ 194, BBL 155, VJH 92, EPJ 78, FQT 57, AGO 48, PNQ 47, ITQ 31, MRX 26, CWB 25, BPK 19, EHO 18, NCS 18, RJF 16, JIE 15, RPT 9, MKI 7, BOL 4, JNC 3.

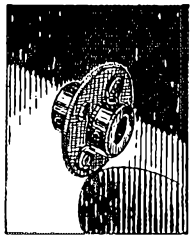
DELTA DIVISION

LOUISIANA — SCM, W. J. Wilkinson, jr., W5VT — SEC for Louisiana is KTE. KUG is holding down the RM job with CEW as PAM. IYL has been QRL for some time. FYS is building new rig. MJT says he will be active soon. JFR is giving them the works on 7 Mc. He along with IYL, FDC, IHR, MOQ, KZM, EKY, and BSR are all in the Emergency Net with EKY as NCS. BPL is on 7 and 14 Mc. MXJ and MXP are new licensees in New Orleans. JHM is building 28-Mc. rig for car. JPJ says he hopes to have new 310 VFO by next season. KRX is keeping schedules with Pelican Net. KTE has new twin three beam on 14 Mc. FPX has been rebuilding but now is active again. MBY is new operator in Ferriday. Appreciation is hereby extended to HHT, CNG, BSR, KZM, HOU, and JPJ for their untiring efforts during Texas City emergency. Also to all others whose calls are not known. KUM is pounding c.w. on 3.5 Mc. LQO has new rig going now and is looking for QSOs on 7 Mc. LQV has been on 3.5, 7, and 14 Mc. The Louisiana State Traffic Net is operating on 7100 kc. at 7 P.M. CST during the summer and will be on 3550 kc. about the middle of September. Again we would like to have applicants or recommendations for Emergency Coördinator appointments in Alexandria and Baton Rouge. VT received heard card from Scotland on 3.5 Mc. JET has been QRL. Traffic: W5KUG 162, KTE 98, VT 66, JPJ 59, KRX 31, BSR 25, FPX 3.

MISSISSIPPI — SCM, Harold Day, W5IGW — PAM: VJ. WZ shifted to 7 and 14 Mc. for the summer. HGL, OO, has nearly completed a pair of 810s final, one kw. HZP is working on bugs in his newly-built medium-power rig. LAK, with 47 states confirmed, needs South Dakota. GG has FB new folded dipole working on 14 Mc. MSD, new Vicksburg ham, is on 3.5-Mc. c.w. LEA is working on 7 Mc. DNS says 4EDG visited CUU, DEJ, and himself, and carried off all his big bottles (radio tubes). DNS and DEJ pooled their gear and have a swell emergency rig. The Delta 75 Fone Net now meets at 7:30 A.M. Sundays. LN, OPS, runs a full gallon on 813s, modulating with 810s and using AMC. Drop me a card with your ideas on the best time to have next year's state-wide ham meeting. Thanks this month to EGE HGL, DNS, WZ, LN, LAK. Traffic: W5IGW 361, WZ 108, LAK 100, EGE 58, LN 7, DNS 5, HGL 2.

TENNESSEE — SCM, James W. Watkins, W4FLS —

(Continued on page 74)



HOOKES' joint and Joe's joint are two very different things. In fact, we probably should say no more about Joe's joint. However, the Hookes' joint, or universal joint, which is the basic linkage for many of our flexible couplings is worthy of consideration on this page.

We have found that the general tendency is to give more credit to the flexible coupling and its ability to connect two shafts than it may actually merit. On the other hand the fellow who "builds his own" finds the need for extending condenser shafts or gain control shafts, ganging condensers, or connecting dial and tuning condenser in almost every project. So with this thought in mind we want to review some of the capabilities and limitations of the Hookes' joint type of flexible shaft coupling.

The Hookes' joint in its simplest form is capable of connecting together two shafts which are in the same plane and intersect at an angle. In most practical applications such as connecting dial and tuning condenser this angle may be only a very few degrees so the coupling design need not accommodate a large amount of angular misalignment. The coupling is often fabricated with a flexible material such as canvas bakelite between the two members and its application is definitely limited to connecting shafts which are in the same plane and intersect at only a slight angle.

It should be remembered that if a Hookes' joint is used which permits appreciable angle between the shafts, the two shafts do not turn through the same number of degrees during parts of a revolution. The difference in rotation during parts of a revolution becomes greater as the angle between the shafts is increased. This situation may be of importance if it is desired to gang two tuning capacitors whose shafts are in the same plane, but at a considerable angle.

It is often necessary to connect two shafts which have parallel displacement as well as being at an angle to each other and it also may be necessary to have the two shafts turn through the same number of degrees at all times. This situation can be handled with two Hookes' joints, which have a section of shaft between them. This joint can couple two shafts which are at an angle and in the same plane, or shafts which are parallel to one another (but not in line), or a combination of each. The double Hookes' joint has the further advantage that even though the section of shaft between the two joints may not turn through the proper number of degrees at all times, the driving and driven shafts which have parallel misalignment, can be made to keep in step by the proper phasing of the two Hookes' joints.

Here again the actual angular and parallel misalignment in practical applications may be only a few degrees and a small part of an inch respectively so the simplified Hookes' joint construction may be used. It probably will not even be necessary to have the two joints phased properly. The proper phasing, incidentally, is to have the Hookes' joints turned so that the suspension members of each joint, that are fastened to the idler shaft, are in the same plane.

To sum up the situation, a single Hookes' joint can be used to connect two shafts which are in the same plane and intersect at an angle and used in application where the angular difference in rotation between the two shafts is unimportant. Two Hookes' joints and an interconnecting shaft are required to connect two shafts which are not in line, or, not in line and also intersect at an angle. If the angular difference in rotation between the two shafts with parallel misalignment must be zero, the two Hookes' joints must be phased correctly.

Well, enough of Hookes' joint, let's go over to Joe's.

DUDLEY CAMPBELL

The Chattanooga Club had the pleasure of a visit from BMM, Director of the Delta Division, who told about the League and its operation. DDF is on 3.85 Mc. with 300 watts. DKX got a real sunburn working atop his new beam. EAL is after the elusive DX on 28 and 14 Mc. FEI has a 28 Mc. mobile rig going and working out fine, especially from atop Lookout Mountain. GYE also has a 28-Mc. mobile rig and is getting FB reports. HOJ has a new VFO and is tickled pink over the many T9X reports. HPA has a code class on Monday afternoon for the young hopefuls of the NARC. HRS is playing around with 112 Mc. IQY is on 7 Mc. most of the time. JSM is building a new control panel. HFK has 150 watts to a pair of T20s on 14 Mc. LCB is working out well with a single 807 and a new beam. GQQ is going strong on 3.85 Mc. with a BC-610. KH finally made contact with 4AYE/MM on 27 Mc. 3TWI/4 hopes to get his W4 call soon. LHQ has a new T125 final with about 300 watts on 14 Mc. GJV has a new Meissner Signal Shifter and a new National NC-173 receiver. BD is new OPS at Signal Mountain. GQQ is new EC for Nashville area. ERJ is OBS in Watertown. QT built a new high-fidelity amplifier and the first week he used it in the rig he worked five Js. HHU is heard on 14-Mc. 'phone. During February PL made the highest single operator total, 2102 points, that has been made since the war. Traffic: W4PL 365, 3TWI/4 273, LHQ 15, KGY 14, QT 8, FLS 3.

GREAT LAKES DIVISION

KENTUCKY — SCM, Joseph P. Colvin, W5IEZ/4 — KYF is going great guns with usually 14 reporting daily, reports TXC. KYN has room or more stations, so send in your applications. CIC is proud papa of 6½-lb. girl. CMP wants 144-Mc. contacts. IXN has new 14-Mc. antenna. JHU is trying f.m. broadcast antennas. JXB has new p.p. 813 bandswitching final on all bands. QDZ has new 28-Mc. beam. KAP is building new shack. Travel keeps JRW off the air. KUP is using BC-610 on four bands. KWO is putting long wire antenna across Kentucky River. TFK is convalescing from bad leg injury. UWR is farming and hamming. TXC is working KYF and 28-Mc. f.m. mobile. IZH has developed new f.m. antenna. LBW is working 28-Mc. 'phone and building new home. KCZ, now W8ZVM, is working on 50 Mc. LZS is building 50-Mc. transmitter. Late sleeper NDY seldom makes KYF. IYV is at school in Lexington. EDV remotes basement transmitter from living room. NEP makes KYN infrequently. LXP is new call in Louisville. LQX is new ham in Paducah. FQQ is building folded dipole for 14 Mc. BAZ is sending code on 29,354 kc. for local hopefuls. CDA is getting new rig together. LTU is working KYN. LTQ is on 3.5-Mc. c.w. LUB is trying 28-Mc. 'phone. JTJ is too busy to go fishing. KBY and JTZ are working 14 Mc. Due to heavy school work, W5IEZ/4 has been forced to resign as SCM of Kentucky. Youse guys and gals, get the news in, either by card or by radio, but get it in! (For the SCM by W4BAZ.)

MICHIGAN — SCM, Joseph R. Beljan, W8SCW — SEC: SAY. Excellent emergency work was done within the State during the April flood. In Grand Rapids the members of the GRARC, operating on 28 Mc. with fixed and mobile stations, aided in getting food and boats to the stricken areas and relayed traffic for the auxiliary police. Up Flint way the Genesee County Radio Club worked on 144 Mc. using walkie-talkies, mobile and fixed stations. The gang worked with the Red Cross directing rescue operations, and provided a police link for four hours and a telephone line for fifteen hours. At Lansing the Central Michigan Amateur Club provided communications between Red Cross Headquarters and the emergency housing; 24 operators working in shifts handled a total of 365 messages. Help was also rendered the Lansing City Police and the Sheriff's Department. The Michigan Emergency Net stood by at all hours. SAY is newly appointed SEC and the Michigang is urged to send in data on their present emergency equipment and organization, or ask him for information. New appointments: SEC SAY. ORS TYE and YDR. Section Net certificates were issued to NOH and TYE. Best wishes for the success of the new club at Allegan. MCRC election: OGV pres.; PYW, vice-pres.; YDR, secy.; and CHJ, treas. Grand Rapids has eight mobile units and thirty fixed stations reporting in on its emergency net. 9GQS now is at Evanston, Ill. Ex-9NEZ now is 8ZGQ. Ex-9DOJ now is signing 8PRL. FWU now is ER. Congrats to NJH and NLV on the new YL arrivals to the family. QZE is with PAA on Wake Island. WLV operates FA8DX. UQR moved to Ferndale. QAM moved to DX paradise at Lowell. MTE is sporting a new Meissner Signal Shifter and ZCH a new e.c.o. TRN schedules Baffin Island. UTC is DXing on 14 Mc. RFW and CYX are working 50 Mc. NCB is working n.b.f.m. with high power. GHV is building new shack in the basement. UKV reports increased activity on 5 P.M. QMN. RUU succeeded in getting three-element parasitic on his apartment. CSL has beam and BC-610 all fired up. ZGZ put up new beam and worked Malta right off the bat. ZBH has new rig on 14 and 7 Mc. SOE is rebuilding his 28 Mc. rig. Traffic: W8SCW 284, NOH 148, IHR 58, UKV 54, TYE 52, DNM 45, RJC 36, FX 33, ABH 27, WWL 25, YDR 19, TRN 18, DPE 17, UFR 14, YDZ 14, AIZ 13, PVB 13, MTE 11, VPE 11, ZCI 11, WET 8, TBP 4, URM 4, ER 1, QFF 1.

OHIO — SCM, William D. Montgomery, W8PNQ — EIU and YPS are new ORS. TIH is new EC for Mansfield District. We understand the Cuyahoga Radio Assn. Hamfest, held in Cleveland in April, was a huge success. The Dog House Net Picnic, held at Serpent Mound Park May 4th, also was well attended. OPX and SBB report the arrival on April 9th of their first harmonic, a YL. TQ is on the mend from his recent illness, and should be back on the air by this time. BI allegedly has a new dream antenna which is supposed to really squirt the signals. QYD now has 21 states on 50 Mc. The RTT Net is reported to be FB on its weekly schedule, with QHV as Net Control. THJ says that since he has cracked up his plane he will stick to ham radio for a while. DS, of Cleveland, wants more boys in the Emergency Corps. Plans are being formulated by EBJ and QV for a Cleveland Club Council. This sounds like a fine idea for large communities where more than two clubs are active. COX now is AF. Welcome is extended to WV, who is back on 14-Mc. 'phone after a five-year hitch in the Navy. PZA has boosted her 25 watts to 400 to facilitate her contacts into the BN and QMW Nets. ZXU, a newcomer in Marion, is on 28 Mc. ARP has a new jr. operator. Our SEC, UPB, reports as follows on the Emergency Corps in Ohio: Cincinnati has 21 members, with 50- and 144-Mc. drills each Monday night; Cleveland has 13 members and 13 emergency-powered rigs; Middletown has 4 members; Dayton with 8 members conducts regular drills, and has 8 portable and mobile rigs; Springfield is well represented and active with regular drills and has connections with the Red Cross and the Boy Scouts and even has "real life" drills whenever freight cars run into hotels. Carty requests monthly reports from ECs even if nothing has happened during the preceding month. Don't let him down, you ECs. Our Ohio OOs are on the job, and doing their best to help their brother amateurs keep on the track. Their reports show that there is room for improvement but that progress is being made. WRN reports that UZ and WRN are about the only active 144 Mc. Columbus boys on now, but that more are expected. He also reports that PUO now is 6AAP, in California. OXG now is FF with 1 kw. on 28 Mc. YFJ reports that AFG is a new ham in Fremont. PMJ and BUM are trying to establish contact on 420 Mc. with revamped BC-645s. KKE and PNQ are ditto. LCY reports that JJY now has worked 100 countries. PSE was heard on Army Day handling 28-Mc. 'phone traffic from KH6USA. ROX reports that AIY is a new Cleveland ham and that UWM has an FB 1-kw. rig. NDN reports from Cincinnati that he is hearing more 50-Mc. stations since he built his new three-element horizontal (45 ft. high) beam. The last QCEN meeting featured a debate by six members, "Resolved, that 'phone operation should be permitted in the 40-meter band." It was interesting and we understand the judges awarded the nod to the 'phone side of the debate. In closing, let me thank all you fellows for the reports, cards, and letters that you are sending in each month. We can't print all of them here, but keep them coming anyway, as they are much enjoyed even if we don't have time to answer more than a small part of them. Traffic: W8RN 119, UPB 95, EQN 83, PIH 73, EBJ 60, PZA 60, CBI 55, PMJ 48, DAE 29, PUN 24, WE 19, MPG 18, ROX 15, BEW 13, AQ 11, QV 10, PSE 9, JFC 9, LCY 8, TIH 7, BCJ 3, EFW 3.

HUDSON DIVISION

EASTERN NEW YORK — SCM, Ernest E. George, W2HZL — NSD reports for the gang in Troy on 144 Mc. Twelve stations are very active, adding to the gang from Schenectady to make 144 Mc. a hot spot in the Tri City area. He also is working some extra fine DX, having 73 countries and 29 zones to his credit. ITX reports NYS

(*Continued on page 76*)

YOUR REPORT

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MANUFACTURERS OF PRECISION COMMUNICATIONS EQUIPMENT

Net will cease regular operation May 30th and will resume Sept. 1st, but will have reduced summer schedules to be announced later. *QNC*, Vol. 1, No. 3, lists 24 stations on 3720 kc., a sure FB net. NIV can't find a ground at his QTH so he has buried a few miles of wire in an attempt to make one. KLM now is pushing out 100 watts on 144 Mc. but still can't hear the boys calling him. Too bad! Comments from ZMB, "I'm trying to get this antenna up in a hurry so I can get down on forty. Anybody can talk on 'phone but —." Traffic: W2LRW 151, ITX 111, NAI 70, EQD 63.

NEW YORK CITY AND LONG ISLAND — SCM, Charles Ham, jr., W2KDC — EC drills held in Queens every Monday on 144 Mc. show 4 mobiles and an average of 10 fixed stations busy. FI reports increased activity in Nassau in the 144 EC Net with an average participation in drills of 30 stations. NI has a new transmitter on 144 Mc. LPJ, QBS, and JPY never miss a drill. RH, Portchester, aids the net by relaying. The crystal mobile rig of ORZ can be heard anywhere in the county. In Brooklyn all fixed 144 EC Net stations are requested to operate either crystal-controlled or m.o.p.a. so spot frequency operation can be attained. A new 28-Mc. EC Net has been formed, with LVI as Assistant EC. The Metropolitan Amateur Radio Society, Inc., newly affiliated, has in operation two emergency nets, one on 28 Mc. and the other on 144 Mc. HG and NXT successfully operated mobile cross-band on 224 and 144 Mc. from Eagle Rock, N. J. QYS and MBU are new net members. NXT, UOL, and OHE use crystal on 144 Mc. Active Suffolk stations in the 144 EC Net include ADW, BFA, FCH, JFP, LCK, LUD, OEO, OQI, PDU, US, UFY, UDP, EBT, and DOG. KNA is active, but is forced to report into the Nassau EC Net. OEO is rebuilding his 28- and 3.5-Mc. rig with an 810 in the final for 500 watts. US is crystal on 144 Mc. with a new "Silver" transmitter. LCK is on 28 through 3.5 Mc. with 125 watts to a pair of 809s. PDU's 8 P.M. nightly code practice tape can be heard on 29 Mc. JWO demonstrated 420-Mc. gear at the Suffolk County Radio Club meeting. HWR now has an 813 in the final on 28 and 14 Mc. 3.5-Mc. C.W. EC Net schedules follow: Group One, Mondays 8 P.M.; Group Two, Tuesdays 8 P.M.; Group Three, Wednesdays 7:30 P.M.; NCS, Sundays 3 P.M., 3600 kc. Suffolk (Group 3) leads with 23 stations, almost all crystal-controlled on 3600 kc., which include ADW, CJZ, CKU, FCH, KDN, EBT, KOA, LCU, MZB, NMP, PDU, PNB, RDO, RIJ, TPZ, UDP, US, OQI, OEO, BTC, WH, LYH, and DOG. Most recent additions to this net's roster are OXM, UZX, and UGV. JZX is active on 144 Mc. under call LJJ. UGH, secy. of Grumman Amateur Radio Club, won an ARC-5 recently. PCV is using crystal and new eight-element beam on 144 Mc. NI wangled a telephone pole for 144-Mc. beam. PIA runs 300 watts on 28- and 3.5-Mc. 'phone. LRI is trying 144 Mc. with a 958 acorn transceiver. LUX has LGS as second operator on day shift. GGN is going out for 14-Mc. DX, LPJ ditto on 144 Mc. AOD is using BC-406 on 144 Mc. RUZ is using a Jap 807 buffer for an 811. BDA is rebuilding for 14-Mc. 'phone. HNC is on 3.5, 7, and 14 Mc. FNI has new final using V-70D. VA has an SX-42 on 28-Mc. 'phone. BAA is heading for 50 Mc. KDC is moving to new house in Westbury adjoining a 100-acre field and has 100-amp. 200-volt service. BO relayed Texas City disaster messages back to Texas during skip; he monitored 7050 kc. continuously for 34 hours. QYZ has Meissner 150B and BC-348 receiver. LXZ has Super-Pro and is on 7 Mc. with 15 watts to a 25L6. PWJ is using low power on 3.5-Mc. 'phone. UVA is on 144 Mc. using Mark II and folded dipole. EC reports T.L.A.P. started summer schedule; 3630 kc. has been discontinued until fall. 3KOW/2 is using Meck 60T transmitter on 28-Mc. 'phone. JXH handled 46 emergency messages from ARC to Texas City with good help from CMM and OOL. HMJ relayed HK3CX to HB9CE with traffic. MZB worked FA8IH on 3.5-Mc. c.w. Traffic: W2BO 171, OBU 158, LR 117, QYZ 101, TYU 92, EC 52, SJC 51, JXH 50, BGO 25, LGK 25, LYH 20, OUT 18, HMJ 10, SKV 10, PWJ 7, ALH 5, MZB 3.

NORTHERN NEW JERSEY — SCM, John J. Vitale, W2IIN — Asst. SCM, T. J. Ryan, 2NKD. SEC: GMN. N.N.J. Net 3630 kc., daily 7 P.M. except Sunday, CGG NCS. N. J. 'Phone Net, 9 A.M. Sundays, 3900 kc., QEM NCS. MCARA and JSARA jointly operated 2GSA/2, "Ham Shack," at the Cavalcade of Progress, Asbury Park. Operators were Roy Allen, BAT, CQB, CZP, DME, HUZ, QQH, SPB, and UKU. Mr. J. Carlisle demonstrated a transvision receiver at MCARA meeting. BAT now has one. IRD, LNK, and TBZ were visitors. OCC is working on Field Day equipment. MCARA and N.N.J. extend their sympathy to IXY on the loss of her husband. The Hudson Division Convention, sponsored by JSARA-MCARA, will be held at Asbury Park in Berkley Carteret Hotel on Sept. 26-27-28. CZP is chairman, UCD, 1104 A St., Belmar, is secretary. GVZ has a Collins 30K and worked 44 countries. BYK is on 14-Mc. 'phone with 175 watts into 813 final-doublet antenna. The ARC of North Hudson meets Wednesdays at Weehawkin City Hall. UWN is on 3.5-Mc. c.w. with 40 watts and an S-40. VCZ is operating at Scott Field, Ill., on 7- and 14-Mc. c.w. with a 32RA and wants schedules with BHM, CCI, and NCY. Mrs. M. C. Fraley of the New Public Library requests lists of amateurs of Essex County and Northern N. J. SXK, Trenton, checks into N.N.J. Net. Ocean County ARA, is a new ARRL affiliated club. MMG is secretary and mailing address is P.O. Box 16, Bayville. PQS worked his Army buddy on 7 Mc. JYJ and JUD are on 7 Mc. NZC is looking for a rag-chewer on 7 Mc. OFM has RME-152 in front of BC-348 and is finishing his tower for beam. KXK worked YIZD, ZC, and VPs and has decided to finish his new final for 28 Mc. with pair 4-125As. HXO now holds 1st-class radiotelephone license. TNU is on 3.5 Mc. The Field Day committee at the Bloomfield Radio Club was under the chairmanship of ANG. BRC broke down and put up an antenna "outside." N.N.J. activity in the League "Nites" is picking up. OST has 500 watts to p.p. T-55s. HZY has 105 countries. JET is operating portable from Oceanside, in W6 Land. OXL has a busy time with two emergency messages from Texas City. By the way, don't hesitate to QSP traffic to the N.N.J. net even though some nets close down for the summer. Traffic will continue to roll along to the various channels. Someone in each net is always looking for more traffic points. Has anyone asked NCY how his cousins are doing? The jr. operator at ANG will soon out-copy Pop. Little Steve is a whiz. A new signal on 7- and 14-Mc. c.w. is NPJ in Elizabeth. OEC, at Ft. Monmouth, continues to have the usual powerful signal. QEM directs the 3.5-Mc. net activities. Metropolitan papers gave hams favorable publicity on their work in connection with the Texas City disaster. Any time you have questions about N.N.J. don't hesitate to buzz us on 3630 kc. Traffic: W2LFR 292, CQB 253, ANW 201, OEC 175, PPH 100, CGG 75, LTP 73, NKD 73, NCY 70, QEM 26, IIN 15, APL 14, OXL 14, GVZ 13, CJX 12, NIY 11, ANG 7, HZY 7, BZJ 6, BRC 4, PQS 1.

MIDWEST DIVISION

IOWA — SCM, Leslie B. Vennard, W9PJR — Ex-K7HV, lately WØRQZ, now is WØHV. ØHKN wants more 19-yr.-old-or-under members on 7120 Net. ATN reports that the Sioux City Club was active in Field Day. POY had an interesting four-way: VK2QR, WØJRY and WØLTE, the last two not ground wave but apparently around the world. AHQ's final went bad and he is off the air. NMA took part in emergency work with Worth, Mo., after tornado there Apr. 29th. HMM finally applied for ORS appointment. NLA is going high frequency, he has an SCR-522. QVA reports the Tall Corn Network soon will be on 7120 kc. for the summer. FP wants more operators for River Stage reports on high water on 3970 kc. morning, noon, and night. Traffic: WØFP 131, TIU 87, QVA 47, REH 42, WØSQV 17, HMM 16, NMA 9, HKN 6.

KANSAS — SCM, Alvin B. Unruh, WØAWP — SEC: PAH. RM: NJS. EQD has been appointed EC for Zone 13, Labette and Cherokee Counties. YUQ worked Kansas City on 144 Mc. Manhattan hams had an emergency test. HMF is secretary of KVRC, Topeka, as KRZ resigned because of press of business. YUS, at Cherryvale, is new ORS; he has 813 final and c.c.o. KEI has new SX-42. Leavenworth hams have formed a club known as RCC Club. All members are RCC. BQJ has pair of 812s final and worked in CD Party. ESL and IWS are rebuilding SCR522s for 144 Mc. OAQ and EPX handled Texas City traffic. REB, ICV, and OZN handled Woodward traffic. LQS has 813 final on 14-Mc. c.w. and 'phone, and worked 7 new countries this month. The Field Kindley Radio Club has been reorganized at Coffeyville, with the following officers: AAW, pres.; YHA, vice-pres.; YMT, secy.-treas. Activities include all-night sessions at the club station. New calls are: AAG, AAW, ABU, YHA, YJI, YKM, YMT, YWB, ZWT, ZYF, and ZYH. WKA and AWP have BC221 frequency meters. OZN had VFO drift troubles but found the drift in the receiver local oscillator when he bought frequency standard. OZN and AWP worked in CD party. Traffic: WØNOF 38, YOS 34, EPX 11, KEI 11, BQJ 7, AWP 5, LQS 5, REB 5.

(Continued on page 78)

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The 4-125A data sheet contains a circuit, and component lists of typical cw and high-level modulated r-f amplifiers, with modulator and driver stages. The data sheet is yours for the asking.—Write direct,

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MISSOURI — SCM, Mrs. Letha A. Dangerfield, WØOUD — PKB had to slight MON for school work, but offered his service to the flood control project. GCL is looking forward to vacation for some hamming. ZVS has been troubled by QRN. RCE, a new ham, got on the air with 6L6 running from SX-25 power supply, with antenna dropped out the second-story window, and worked all districts except 4, 5, and 7. He now is president of Washington U. Radio Club. IHI is on 144 and 50 Mc. and wants contacts. SKA, besides doing FB on MON, put on his 28-Mc. 'phone but is smothered by kws. and five-element beams. ZAO has been appointed EC for Poplar Bluff area and is much interested in AEC. WVS, another new ham, is making fine contacts on 28 Mc. although no real DX to date. UXB is one of the stations on the Missouri River flood emergency network. JSR belongs to the QSP Net on 7132 kc. which covers 9 states. CKS is building push pull 812s in new final and is doing fine traffic work for M. U. students. ZXX had portable rig at picnic of electrical engineers at M. U. Operators were CKS, JHH, YKB, ZXX, and ZZW. Central Missouri Amateur Radio Club plans to take part in Field Day. CMH has MO net crystal but gets home too late for drills. DEA has new QTH. DHN has new beam up. Ex-9WMD now is KP4DX. GBJ is on 14 Mc. most of the time. ARH worked with MON this month. QXO has a new exciter and new son-in-law. KIK is trying to promote AEC in St. Louis. OUD has taken over NCS for the traffic net since ZVS was QRNed out, figuring on shifting to 7 Mc. for summer operation. Gang, we really must get that emergency net set up. How about a little coöperation? Traffic: WØQXO 148, ZVS 144, CKS 70, OUD 65, PKB 63, ARH 37, DHN 36, KIK 35, SKA 33, CMH 22.

NEBRASKA — SCM, Roy E. Olmsted, WØPOB — TQD says ZMM is new Hebron ham on 7- and 3.5-Mc. c.w. ZOQ, old Morse operator, now is strutting his stuff with Continental. OHU has new HQ-129X. EXP, on 3.85-Mc. 'phone with 600 watts, is renewing old acquaintances. DNW, UBN, VHP, and RQK are having harmonic trouble. BBS is getting all set to put out again after a long absence. JHI is on 28-Mc. 'phone. SAI has been heard on 28-Mc. 'phone and rumor has it that he lost his bug. CVC and TMK are looking for new QTH. OHK finally made 7-Mc. c.w. LKE is waiting for a clear day to put up 28-Mc. doublet. Ex-LDD is working for A. T. & T. in North Platte. Ex-VHP has new ticket. GPX and BIW work 'phone in front of each other's shack. DNW and RQK work 50-Mc. 'phone; DNW with tuned pipe receiver and pair 24Gs in final, RQK with regular rig and blood, sweat, and tears. BMK now is on 3.5- and 7-Mc. c.w. with 807 in final. QNP works 3.85-Mc. 'phone and 3.5-Mc. c.w. with nice signal. ZFK is new ham in McCook. KDW, an old-timer, plans to put Danbury back on the map. Ex-QQJ now is 6WHL in San Francisco. Ex-QFT now is 6WOJ also in San Francisco. BQP is all set after school in Joliet and says ESX is due for school next. MYH is getting all set to be the other end of a QSO. FWW, an old-timer, is back on 14 Mc. after years of radar and travelling for the Navy. OKF is on the road most of the time. Traffic: (Mar.) WØTQD 432. (April) WØBQP 35.

NEW ENGLAND DIVISION

CONNECTICUT — SCM, Edmund R. Fraser, W1KQY — ADW, AFB, AMQ, CJD, DAV, EFW, FMV, HYF, IC, KKS, KYF, LHE, MHT, NJM, ORP, PJJ, and TD attended May 3rd Nutmeg Net meeting. Net Control Stations: Mon., EFW; Tues., HYF; Wed., DAV; Thurs., ORP; Fri., NJM. Control Stations remain on 3640 kc. until 8 P.M. From Sept. 1946 to April 1947, UE led the section in traffic with 1836, followed by VB 1472, EFW 653, AW 599, ORP 402, DAV 332, NJM 300, KQY 281, LOP 218, and CTI 204. Club news: CARA's operating schedules are 3589 kc. 1st and 3rd Thurs. at 7 P.M., 28,712 kc. 2nd and 4th Thurs. at 9 P.M. Meetings during summer will be held at Bryan Memorial Hall, Washington. IQE and CQF are seeking 28-Mc. 'phone contact with Rhode Island. The HCARA reorganized with HOP, pres.; LXB, vice-pres.; IKL, treas.; KHM, secy.; and DAV, act. mgr. Meetings are held every two weeks at Hartford YMCA. LRT, of the NARA, is reorganizing emergency net. MRP is active on 14-Mc. c.w. BRL has Red Cross transmitter back in operation. MARC: KKS worked CJL, CGY, HDQ, LLL, AW, KHL, and NKZ on 50 Mc. PDZ has three-element 28-Mc. beam. BRAC: FHN is using DK-3 on 144 Mc. LIG and JBK conduct code and OKT and OHI theory classes. NEQ is on 14-Mc. c.w. with 50 watts. JBK now is WAC. JRV is on 144 Mc. running 60 watts to an 829B. AZP is using three-element beam 34 feet off ground. BARA: KAB is using new Workshop 28-Mc. beam. GRU is back on 14-Mc. c.w. and 'phone with kw. LGN and KXZ are on 28-Mc. 'phone. OPG and FC have club rig working crystal with 500 watts. NHARA: TD has NC-100XA receiver. MEF has NC-101X. FMV, KAT, and MVH have 28-Mc. rigs in car. JQD sends bulletins on 7075 kc. 7 and 10 P.M. EDST. MVE is back on 14 Mc. News in general: APA worked CN8EE, OA4BX, and KP6AA. BNN is active on 14 Mc. using Meissner 150B, HQ-129X and three-element beam. DWP completed new p.p. 810 final for 14-Mc. c.w. and 'phone. FTX schedules 2TB Mon. and Thurs., 7285 kc. ZL worked ZS, ZE, ZL, VK, SU, PY, KL7, OX, and KH6 all on 7 Mc. Traffic: W1NJM 163, AW 98, VB 83, EFW 62, ORP 60, JQD 29, BDI 27, ETC 12, APA 6, FTX 5.

MAINE — SCM, F. Norman Davis, W1GKJ — SEC: LNI. PAM: FBJ. New ORS: EFR, NXX. Eastern Maine Amateur Radio Club had a fine write-up in the *Bangor Daily News*. MYI has donated a Millen exciter to the club. IKE is new OO and has new Meissner Signal Shifter, VHF-152. He also built n.b.f.m. exciter. AMR, FBJ, LOA, MBR, and OGZ all have war surplus frequency meters. PLE is running 40-watt rig and three-element beam on 28-Mc. 'phone. AWT is trying f.m. on 28 Mc. IK and CPL are on 50 Mc. DZU is building f.m. rig for 50 Mc. GPJ is on 3.9-Mc. 'phone. ODA has 813 in final. PLG has taken broadcast position at Elmira, N. Y. LRZ has Meissner 150-B. LOA has lost his bearings since OIL moved to Massachusetts! 5KUD/1 is on 3.9-Mc. 'phone at Seawall. FAP now is 2UAL and works the Maine gang on 3714 kc. LGV has moved to Massachusetts. FBJ has 28-Mc. mobile rig. KJJ divides his time between Seagull Net and 14-Mc. DX. MCW has worked over 100 countries postwar on 28-Mc. 'phone. ECM is on 3.5-Mc. c.w. NXX made his Zepp feeders longer and claims much better results. AFT runs a ten-watt rig on 3.9-Mc. 'phone that sounds like 200 watts. AI ruined his crystal by which the e.c.o. boys on the Seagull Net used to check their frequency. AUC is building high-power final. Write to the SEC if you are interested in the Emergency Corps. DHD is running 450 watts to a pair of TZ40s on 3.9-Mc. 'phone and a kw. to a 250TH on 14-Mc. c.w. Traffic: W1EFR 4, LOA 2, NXX 2, OGZ 2.

EASTERN MASSACHUSETTS — SCM, Frank L. Baker, jr., W1ALP. SEC: BL. PAMs: IN, HIL, LMB, KTE. RMs: BDU, AQE, AAL. New appointments: PXH as OO Class 3-4, PHA as OO Class 2, OBN as ORS, JOJ as OES. MCR, MF, JOJ, and BCF renewed EC appointments. New officers of the South Shore Amateur Radio Club are: NXM, pres.; LMG, WK, vice-pres.; KCP, secy.; EKG, treas. The T-9 Club had an election of officers: MNK, pres.; MQR, vice-pres.; IPK, secy.; IBF, treas. The Naval Reserve Battalion call is K1NRV and meetings are held Tuesdays at 8 P.M. PNX and CTW gave a talk at Eastern Mass. Club. DKD spoke at Brockton Club meeting. Copies of club papers were received from Framingham, Shore Line, and Merrimac Valley Clubs. The Norfolk County Radio Assn. new officers are: KBL, pres.; GDY, vice-pres.; FGT, secy.; and Ray Harris, treas. BDU says that the Eastern Mass. Net on 3745 kc. has closed for the summer, but will be on three nights a week with LML as NCS on Mondays, CCF on Wednesdays, and EMG on Fridays. JXU is on in Derry, N. H., using call PQA. MEG has new beam up for 28 Mc. NVB now is portable-mobile. LVN says emergency work is looking up in Falmouth and he has six stations all lined up. PYT is on 144.08-Mc. crystal. HNC is active on c.w. bands. HHG is working on 28-Mc. rig. NHX is on 28-Mc. 'phone. JOJ has schedules with PYT and MSY, using rig with portable a.c. generator set. PZG has bandswitching for 14, 7 and 3.5 Mc. and a rig for 27, 28, and 50 Mc. and keeps daily schedules with 4EBZ and 4BTU. OBN is working on a new 100-watt rig. 5GNV will be on 230 and 425 Mc. NF worked 2BYM on 50-Mc. c.w. and schedules BMS in Pine Tree Net on 3560 kc. AQE has new 250-watt job. NXY is getting out fine on 7 Mc. with indoor antenna at new QTH. FCZ has new Meissner 150B. IVI is rebuilding p.p. 304THs. AYG got a QSL from Czechoslovakia reporting 3.5-Mc. c.w. signals. RM says TLAP Net shifts to 7085 kc. BB, PHA, and GDY have new NC-173 receivers. LLX made 230 contacts in 48 sections in April CD Party. HIL wants Utah for 48th state for his WAS and is on 50.98 Mc. now. HNN has new Silver 50-Mc. transmitter. More stations on 50 Mc.: MX,

(*Continued on page 80*)

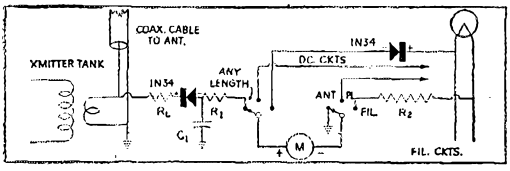
HERE ARE THE FINAL WINNERS
OF NEW SYLVANIA MODMETERS!

Listed below are the three winners selected for the final month of our crystal diode contest. They will receive—free—a new Sylvania Modmeter . . . the handy, compact instrument which monitors modulation percentage and speech quality, keeps average percentage between 60% and 90%, indicates carrier shift.

FINAL WINNERS OF CRYSTAL KINKS

1 *Contributed by:* Mr. H. Bard, W6EOS
391—5th Avenue
Chila Vista, California

At last! One meter can be used for *all* circuits in the amateur transmitter including filament voltage and RF antenna current. The diagram shows a greatly simplified meter switching circuit using 1N34 diodes as rectifiers. For data on switching circuits see Chapter 13 of the current Radio Amateurs Handbook. The multiplier resistances for the RF current and filament voltage measurement circuits must be calculated for each individual case.

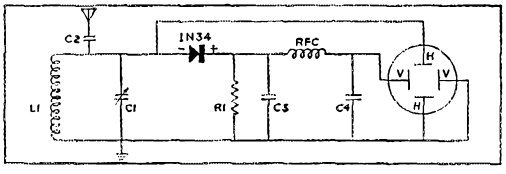


M = D.C. Milliammeter
C = .001 mfd
R_1, R_2 = Meter multipliers
R_L = Current limiting resistor (50 to 100K)

2 *Contributed by:* Mr. Samuel Laine, W2BKU
2002—45th Street
Astoria 5, New York

Improved coupling method for measuring modulation by trapezoid pattern. Eliminates phase shifts and risk met when connecting directly to modulated plate voltage.

Connect directly to plates of oscilloscope as shown below. Resonate trimmer C_1. Vary length of pickup antenna until correct pattern size is obtained. Observe trapezoid under modulation.



L, C_1 = resonant circuit at transmitter frequency
C_2, C_3 = 100 $\mu\mu$f
C_4 = 250 $\mu\mu$f
R_1 = 25,000 ohms

Heartiest congratulations to winners and thanks to all who sent us ideas. We appreciate the tremendous interest and response, which prove Germanium Crystal Diode 1N34 and Duodiode 1N35 have varied uses, many still to be discovered. Although there will not be any more Modmeters given as prizes, we would like you to continue sending in ideas. Those of interest to Q S T readers will be published.

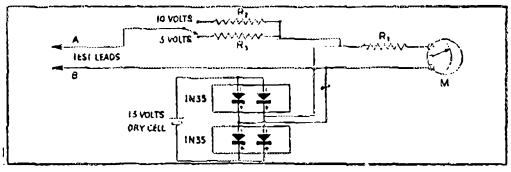
Please remember Sylvania has not thoroughly investigated these crystal kinks—and therefore cannot assume responsibility for any use made of the entries or ideas.

For more about Sylvania Crystals or Modmeters, write address below.

3 *Contributed by:* Lt. Donald Kirk, Jr., USN
Post Graduate School, U.S. Naval Academy, Annapolis, Maryland

Germanium diodes step in where fuses fear to tread! Protect your costly delicate meters from overloads by use of four 1N34's.

Fusing a microammeter is always a problem since the smallest available fuse requires approximately 5 ma to blow. The microammeter in the below circuit is protected against a 330% overload. Since the below network is symmetrical, a reversal of voltage applied to A and B will cause no loss of protection. Eventual failure of the polarizing dry cell will leave the meter short circuited rather than unprotected.



M = 0-50 D.C. Microammeters, 1000 ohms D.C. resistance Voltmeter circuit 20,000 ohms/volt.
R_1 = 19,000 ohms
R_2 = 180,000 ohms
R_3 = 40,000 ohms

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MAKERS OF ELECTRONIC DEVICES; RADIO TUBES; CATHODE RAY TUBES; FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES; ELECTRIC LIGHT BULBS

PTR, FSN, MQ, KNI, BZM, AF, ATP, DEO, and BJB. PKW is on 14- and 28-Mc. 'phone. IIM says that the Parkway Radio Club net is on each night at 7. RCQ made 51,980 points in CD Contest. HUV says that twenty-one report into the 50-Mc. Tuesday night roundup. NBS, Dedham EC, is getting the gang signed up. BCF handled two emergency traffic messages from Texas. AAL has a new HQ-129X. OJT is working on new 4-stage 80-watt 144-Mc. rig. LJT has worked 200 stations on 144 Mc. with his crystal-controlled tripler. New officers of the Shoreline Amateur Radio Assn. are: FBZ, pres.; NK, vice-pres.; KHH, secy.-treas.; MVO and DDG, trustees. Traffic: (Jan.) W1KTU 2. (Feb.) W1KTU 6. (Apr.) W1AQE 90, BDU 79, AAL 46, LML 39, EMG 33, RM 29, BB 25, HWE 11, LM 9, TY 8, LMB 6, GDY 5, IIM 5, PKW 5, RCQ 5, BCF 4, MDU 4, AGX 3, RP 3, AYG 2, HIL 2, LLX 2, NF 2, NXY 2, MGP 1, OBN 1.

WESTERN MASSACHUSETTS — SCM, Prentiss M. Bailey, W1AZW — RM: BVR. SEC: UD. The West. Mass. Net is picking up slightly with new members and more good traffic. MIM is a new welcome member and soon will be ORS again. Lee originates good traffic. EOB made a swell score in last CD Party, 231 in 48 sections. He says he is disgusted with the rig and has the rebuilding urge again. JAH is working DX on 14 Mc. BVR attended Board Meeting and visited the Pittsfield Radio Club during the month. BIV has been busy but gets on occasionally. 3IQW, who is ex-1BYJ, is down in Baltimore and is looking for contacts with the Gardner gang on 7 Mc. EAX is building kw. rig using 810s in final. PTO is new ham in Fitchburg. New members of the Fitchburg Club are IBZ and QCB. MBL now is Assistant EC for Worcester County, taking care of Fitchburg. ACP got his Class A ticket. JYA returned to the Fitchburg club. MVF is out after DXCC. JGY has new BC-348. COI is at low ebb. He's still converting the 522 and it's getting heavier by the minute. The Pittsfield Radio Club had a big meeting during the month. BVR, our New England Division Director, was guest speaker. The club has purchased a BC-348 and will soon have a 300-watt rig on the air. JLT is up to 92 countries postwar. BKG and HNE have new BC-221 frequency meters. BKG made Class I OO in last Frequency Measuring Test. AZW handled some nice traffic direct from EL5B. QCA is new ham in Pittsfield. Traffic: W1BVR 64, NY 49, AZW 40, IHI 27, JAH 11, EOB 10, MIM 8, KUE 6.

NEW HAMPSHIRE — John H. Stoughton, W1AXL — Your SCM recently was laid up in the hospital for five weeks and thus was unable to carry on the duties of the SCM office. However, I now am convalescing at home and expect to have a report for you next month. Be sure to send in any interesting news items on your ham activities, club doings, nets, etc., on the first of each month for inclusion in this column. Also, if interested in any field organization appointments, please write the SCM for application blanks.

RHODE ISLAND — SCM, Clayton C. Gordon, W1HRC — The refusal of the PRA's request for a Zoning Board approval to locate headquarters in a new location can be blamed in great part on the fact that a local ham living in that locality has succeeded in arousing the antagonism of his neighbors by B.C.I. to a point where ten of them stayed up until 11 P.M. and drove more than 8 miles to be present at a hearing to protest any more amateurs coming into the neighborhood. The innocent have to suffer with the guilty, as always. KYK worked KV4AA on 3556 kc., KS4AC on 14 Mc., and is getting ready to work DX from Cape Cod, where he has room for "V" beams, etc. QR is rebuilding a ¼-kw. rig into 810 p.p. DWO has installed 6AK5 in first r.f. of BC-348 and put a 9001 in the VFO. BTV is on 144 Mc. and is building an 809 stage for the Meissner Signal Shifter. 1NU has a 300-watt rig all but finished and has used the VFO of Sept. 1946 *QST* for his exciter stage. Mrs. Al King (QR) entertained as many of the R. I. Net as could get there April 23rd. At the meeting the members decided to operate the net on Mondays and Thursday only during the summer. Traffic: W1INU 104, KYK 58, QR 41, DWO 26, BTV 25, LKC 16, JDX 12, ODJ 7.

VERMONT — SCM, Gerald Benedict, W1NDL — Officers of Green Mountain Radio Club are: AAJ, pres.; AVP, vice-pres.; and PTB, secy.-treas. CBW is on 28-Mc. 'phone. PWX, PWB, and PPE are new hams. ETE is new to Vermont. PWB is on 28 Mc. with new Globe Trotter. NFI is building 400-watt rig. GQJ is collecting parts for 'phone rig, 9WSF/1 has 30 watts on 7 Mc. and BC-348Q receiver, and is very busy relocating his church. HOW is on 7- and 3.5-Mc. c.w. PPE is on 28-Mc. 'phone. FPS is on 14-, 3.5-, and 7-Mc. c.w. PSD, a new ham at Strafford, has an 807 on 7- and 3.5-Mc. c.w. KJG has 2 watts on 3.5-Mc. c.w. CGV has three-element beam on 28 Mc. GKA has been feeding ski reports to CCF. GKA has been appointed RM and will need all your aid on the Vermont net. Please help him in any way that you can. Traffic: W1GKA 27, AVP 12, 9WSF/1 12, EKU 1.

NORTHWESTERN DIVISION

ALASKA — SCM, August G. Hiebert, K7CBF — Stateside high frequency DXers take note: OES W2SLW/KL7, Adak, and W7RT, Seattle, are attempting to work 144 Mc. If successful it will be the first Alaskan-Continental U. S. contact. W2SLW/KL7 is using BC-1068A receiver, pair of HY75s in final, and a sixteen-element array. DM is new ORS on Adak. Recent visitor to his shack was W7JEA, captain of USAT *Stetson Victory*. BD had a new HQ-129 shipped air express from Sacramento to Moses Point. JI and JK, ex-W7ISD, are at Moses Point. W6WJR/KL7 has been working 14- and 7-Mc. c.w. with an HT-9. He would like Territorial schedules on 3.5-Mc. c.w. AD is soliciting candidates for his "Tall Tale Tribe." Only qualification — a healthy disrespect for the truth. Sorry no report last month, gang — made a Stateside trip for an XYL and didn't return in time. Traffic: KL7CF 19, BD 4.

IDAHO — SCM, Alan K. Ross, W7IWU — Firth: BAA visited Boise. He is operating from the basement these hot days. Kuna: EMT can run a kilowatt on the Gem Net frequency and is acting RM. Mountain Home: IY/7 relayed a message east for KH6KD. Nampa: JPV has a new 28-Mc. mobile in car. IYG went back East on a vacation. Boise: KJO has new rig with TZ40s. IWU has a new portable, the old 32-30 stand-by receiver and a 6A4 crystal oscillator, strictly 3.5- and 7-Mc. c.w. The Gem State Radio Club had an interesting program and demonstration on volume expansion by GTN. The club is planning a ham radio window display and possibly an exhibit at the State Fair this fall. Please make it your responsibility to report each month for the best interests of the Idaho section. What about your club meetings? Why not have the secretary send in news of the high spots once a month? Traffic: W7EMT 21, IY/7 2, IWU 1.

MONTANA — SCM, Albert Beck, W7EQM — SEC: BWH. ACD, from Shelly, Idaho, paid the Butte hams a personal visit via the air with his Taylor-Craft plane. He said he had us all located by bird's-eye view of antennas before setting down at the airport. HIZ, from Helena, stopped over in Butte to say hello. KVU, in Bozeman, gets nice DX. KHH, of Whitehall, is heard from Alaska with CAA. EQC is out of the Army and back in Butte on 7 Mc. The Butte gang is planning h.f. Field Day tests from high peaks north of the city. LBK is a new ham in Miles City active on four bands. CJN and EMF are on 50 Mc. FOM heard lots on 4 Mc. The Before Breakfast Club is active on 4 Mc. Emergency nets in Montana are doing an FB job. It won't be long until the Livingston Hamfest. Hope to see a lot of you there. Sorry not many reports this month.

OREGON — SCM, Raleigh A. Munkres, W7HAZ — Reports have fallen off this month. Must be the extra duty in the yards and gardens that is to blame. JGC, Portland, reports a 28-Mc. mobile net being formed in that city. JGC now is OO and OPS. APF, of Cutler City, sends in FB traffic report. He is to be new RM, so ORS please note. HBO, LaGrande, sent a fine report except that it mostly concerns a fishing trip where he was under the impression anything under eight inches should be thrown back! ARZ is on sick leave from KLBM and is in Seattle. JLU, of Baker, has returned from the Army with a four-element rotary under his arm. FBX, Forest Grove, has taken a job with the Government and moved to Bremerton, Washington. The report promised last month on the PARC Hamfest was not received by the SCM so it cannot be included in this report. Traffic: W7APF 225.

PACIFIC DIVISION

HAWAII — SCM, John Souza, KH6EL — KH6USA, Army Day Show station at Ft. DeRussy, had 99 QSOs from April 4th to 8th using BC-610E, SX-28, and three-element rotary. Operators were W6JXM, W4CCJ, KH6FJ, and KH6GH. The Honolulu Amateur Radio Club had an organizational meeting on April 21st adopting constitution and electing the following officers: KA, pres.;

(*Continued on page 88*)

PRs Stan Put!

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AZ, vice-pres.; GH, secy.-treas.; DU, AM, and GF, directors. IL has finally gotten Vermont on 28 Mc. using new HQ-129X with home-brewed R-9er preselector. JL is now at Barbers Point looking for a place to lay the rig down. BW copies W1AW daily and is maintaining complete file. DF lost one of its most active members in W1PJQ. KP6AC now is with BS Ionisphere Recording Station on Maui. Leo's blue-eyed jr. operator was the first American born on Palmyra. DK has new Gon-Set 56-Mc. converter. IH is taming 807. Traffic: KH6USA 382, DF 36, IL 5.

NEVADA — SCM, N. Arthur Sowle, W7CX — Asst. SCM, Carroll Short, jr., 7BVZ. SEC: JU. ECs: OPP, TJY, KEV. RM: PST. PAM: KHU. OBS: JUO. OES: TJI. KUK is on 3.5-Mc. c.w. LCK is a new man on in Boulder City. The Southern Nevada AEC meets at 7 P.M. PST each Monday on 3660 kc. The Las Vegas Amateur Radio Assn. held a meeting devoted to a demonstration of amateur radio for the teen-agers of Las Vegas. JU completed his 60-ft. vertical and final amplifier and runs 950 watts to it on 7- and 3.5-Mc. c.w. PZX has a new SX-25 receiver. SXD and JXH report activity on 7-Mc. c.w. JLN is on portable from his store in Vegas with a three-element 28-Mc. beam. KVF, the XYL of TFF, has an FB signal on 7 Mc. PGD reports good results on 3.5-Mc. c.w. GC has a "beeuteeful" 14-Mc. three-element beam at his location on the highest hill in Reno. BIC is back on the air. Traffic: W7KHU 162, TJY 68, CX 36, JU 36.

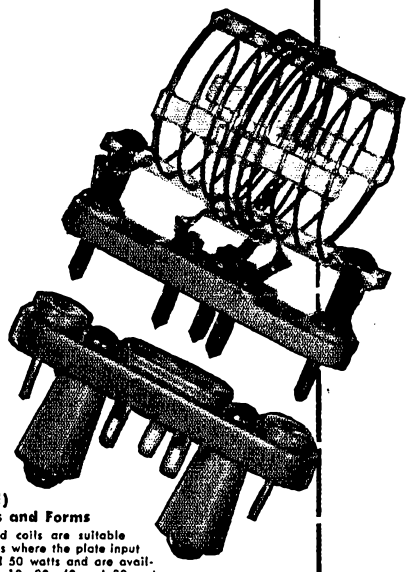
SANTA CLARA VALLEY — SCM, Roy E. Pinkham, W6BPT — Asst. SCM, Geoffrey Almy, TBK. RM: CIS. PAM: QLP. The SCCARA held a dinner meeting on April 14th with RBQ, Pacific Division Director, giving a report to the club on the special Board Meeting. RIY gave a talk on the use of radio and radar during the Battle of Britain. MLY has worked 88 countries. LCF has added an R-9er and BC-221 to his station equipment. SYW is back on the air after a five-week lay-off awaiting his license renewal. HJP was transferred from his QTH atop Mt. Tamalpais and now is instructor with the Dept. of Military Science and Tactics for Air at the U. of Minn. ZZ sends in an FB list of 72 countries worked. VZE reports handling traffic on 3.5 Mc. PBV, who expects to move his station back to San Mateo, reports some W7 contacts on 50 Mc. KC is heard on 28.5-Mc. 'phone keeping schedule with W6OMT/KH6. BO, who is ex-LFD, is relief station agent for SP. WNM has tuned his beam matching feed line using the Micromatch as described in *QST*. Jim says the instrument sure does a fine job. WUI is busy building rotary beams. DZE built a 35-foot tower for his 14-Mc. beam. MUR resigned as vice-president of SCCARA because his work requires that he be out of town a great deal of the time. The Mission Trails Net is planning a hamfest to be held on JTE's ranch in the near future. Traffic: W6JSB 78, DZE 50, ZZ 39, CIS 12, RFF 10, VZE 10, TBK 6, BPT 2.

EAST BAY — SCM, Horace R. Greer, W6TI — Asst. SCM, C. P. Henry, W6EJA. SEC: OBJ. RM: ZM. OO: ITH. EC: QDE. Asst. EC u.h.f.: OJU. QDE reports a complete set-up for Richmond with OJU, NTX, QUL, EJA, and KEK holding key positions. Tests are made several times a month and they are ready to go in any disaster. The recent Texas City disaster brought out the East Bay section at the request of the Red Cross and about 1000 messages were handled. OBJ, DUB, TT, IDY, NTU, SSN, UZX, QDE, the Mission Trail Net, the Pioneer Net, and the Oakland Radio Club did noble work. FDR has been appointed NCS of Southern Pioneer Net. Postwar countries worked to date are: TT 120, PB 101, BUY 96, TI 95, UZX 82, LDD 62. RM and MVQ are nearing the century goal. The Northern DX Club, Inc., claims that a QSL card sent and received completes a QSO and they state that all good amateurs should take part in QSLing. SSN is chief operator for the ORC. EY made his first flight on his return from the ARRL Board Meeting. CDA is working DX on 14-Mc. c.w. SXK is skipper and EMK is radio operator of Liberty Ship, *John T. McMillan*. They have a c.w. rig on board and are making a four-months' trip to KH6 and J2 Land. MQR is giving 'phone a try after many years of c.w. CRF reports both the Vallejo area clubs are doing FB. The Mt. Diablo Radio Club invites visitors. TYF has a pair of 813s in final. KZF is busy with Mission Trail Net. The Oakland Radio Club meets the first and third Thursdays of each month at 9th and Fallon Sts., Oakland Red Cross Chapter. LDD has new 1-kw. final with pair 250THs and is getting out FB. OT is getting new 1-kw. transmitter. Interest on 50 and 144 Mc. is picking up, according to ELW, with some fair DX on 50 Mc. TT handled 420 messages in 48 hours during Texas City disaster. IKQ is knocking over the DX on 14-Mc. 'phones UPV is getting a chance to work on his own rig for a change. ITH is working those hard-to-get countries on 14-Mc. 'phone. OZC will be a W7 in Oregon soon. We still are looking for a PAM and several good OBS. MFZ is appointed EC of the ORC. Are you interested in emergency work? If so, contact OBJ and sign up in the AEC. Remember, gang, there is no excuse for not answering a QSL card. Traffic: (Mar.) W6FDR 368. (April) W6FDR 522, TT 420, QXN 326, UZX 48, QDE 45, DUB 28, TI 14, MQR 11, CRF 7, TYF 2.

SAN FRANCISCO — SCM, Samuel C. Van Liew, W6NL — Phone Juniper 7-6457. Asst. SCM: Joseph Horvath, 6GPB. RM:RBQ. SEC:PTS. CEC: SRT, KNZ. EYY was a victim of power leakitis this past month, so was forced to be partially inactive. Hal and AHH both have new R-9ers and are well satisfied. RBQ is back on 144 Mc. again. NIO is working Sacramento on 144 Mc. from home location. Pete has finally gone crystal-control on 144 Mc. and is putting out a fine signal. Pete also has a fine super for 144 Mc. 3DGM has been visiting RBQ. We have a new station on under the call YZP. Jack put YZP officially on the air April 5th running a Sonar exciter in conjunction with a Millen exciter, with about forty watts to the 807 final. At present on 29-Mc. 'phone, he plans to be on 14-Mc. c.w. soon. Jack is using an S-38 receiver. QJB, formerly of Berkeley, now located at Bolinas, is active on 3.5, 7, 14, and 28-Mc. c.w. Gordan is building a new all-band 'phone and c.w. rig, 350-watt input to a pair of 35TGs and a pair of 811 class B modulators. QJB also is active on 144 Mc. Gordan is employed by RCA as a transmitter technician at their transmitting station at Bolinas. He reports new arrival in the family on April 24th — a girl, Christine Elizabeth. The San Francisco Naval Shipyard Amateur Radio Club held an election of officers on April 18th and elected the following: BYS, pres.; RAS, vice-pres.; QST, treas.; and Iris Pape, secy. Mildred Clement was chosen head of the ladies' auxiliary, with Henrietta Green and Marge Johnston as first and second alternates respectively. The San Francisco Radio Club met April 25th. The program feature was a Navy film, "Operation Cross-Roads," taken during the Bikini test. As this was a non-technical film, an invitation was extended to the XYLs. A raffle was held for both ladies and men. The Pioneer Net is on nightly at 7 P.M. on 3725 kc. and handles new set-up of hospitalized veterans' traffic. CIS handles the San Francisco end. The first meeting of the Pacific Board of Directors was held April 19th. From Marin County we have the following reports: RTH is vacationing in Texas. A report on the PAØ project shows wonderful support with many fine contributions and honest effort. The Marin County EC, Ernie Brown, has been doing a swell job with the aid of his two assistants, Joe Orr and K. D. Wilson, and deserves your full support. The president of the Marin Radio Club, OZC, is moving to Portland, Oregon, in June. We'll all miss you, Doug. Traffic: W6RBQ 32, EYY 14, NL 4, YZP 2.

SACRAMENTO VALLEY — SCM, John R. Kinney, W6MGC — Asst. SCM, R. G. Martin, W6ZF. EC: KME. RM: REB. OOs: ZF and OJW. OBS: OJW and AF. OES: PIV. OPS: OJW. ORS: REB, PIV, VDR, OJW, and HIR. KME has been appointed EC. He established first mobile-to-mobile DX QSO with 20 watts input in Sacramento Valley with ØNFA using 8 watts; also W6ONP/KG6, in Guam, reported KME R9 with same rig on 27-Mc. 'phone. WRD is chairman of committee to select site for future home and club house of the SARC, Inc. WRD had as visitors to his shack XU2LT, KH6ET, and J2FOX. His station consists of ½ kw. to p.p. 813s three-element beam, NC-240-D, a DB-20 and a Panadaptor. MBY, secy. of the SARC, is the proud father of a new YL jr. operator. 2VY/6 now is 6VY in Dixon. DBP reports having new Temco 75-GA rig and 28-Mc. three-element beam. PIV enjoyed CD Party and made a score of 46,610 and states that BVK has joined him on 50-Mc. operation. VDR has a WRL globe trotter and is revamping it for 3.85-Mc. 'phone for operation on Mission Trail Net. ZF worked following DX: D5FF, HB9AW, OK1LX, F8AZ, F8GQ, OK1CZ, ZL2GO, VK5LN, I1KN, VK2NQ, G2BQ, ZS1CZ, G6CJ, VK2HW, and HC1JW. ZF has new DB-20 and intends to remodel 813s in his new T-350-XM. WTL worked J3AAB and W6ONP/KG6 on 28 Mc. but can't work short skip to Sacramento. OJW, our OO, received an FB letter from 5LST stating that a bootlegger was using LST's call. Traffic: W6REB 278, PIV 40, VDR 18, ZF 13, OJW 10, WTL 8.

(Continued on page 84)



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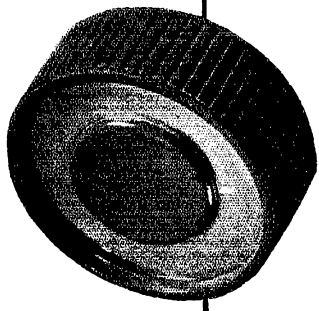
PB-16, Plug in Base Only.....Net price....$ .27
XB-16, Plug-in Socket Only.....Net price....$ .33



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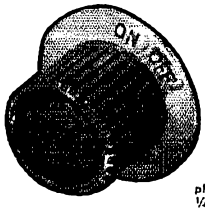
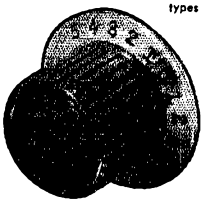
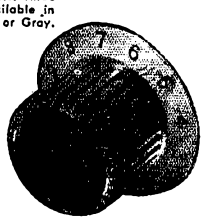


The HRS Knobs are a new series of plastic knobs with a 1⅜" diameter chrome-plated skirt. They all fit ¼" diameter shafts. Three types are available in Black or Gray.





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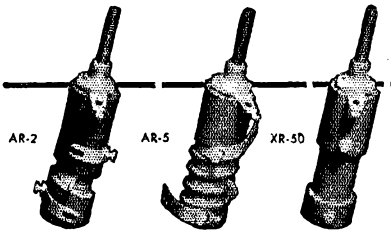

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MAKERS OF LIFETIME RADIO EQUIPMENT

ROANOKE DIVISION

NORTH CAROLINA — SCM, W. J. Wortman, W4CYB — New Raleigh hams are KFG, LBV, LOV, and LOZ. GJX now is VT, and is active on 14 Mc. with 130 watts and a souped-up SX-24. FXU went up for Class A along with KLZ. KBQ/4 is active on 3.5-, 7-, and 14-Mc. c.w. but prefers 'phone for 28-Mc. operation. The Key & Mike Club in Winston-Salem is laying plans for an extensive operation period during Field Day. BYA has been working plenty of stuff on 50 Mc. and crashed the front page of the newspaper with a headline story about emergency communication. DGV rated a newspaper story for hooking up a couple of old friends via ham radio. NI has been working on a new 45-ft. tower. BCS has his beam atop the house. LPY and HUL possess new 28-Mc. beams. KJS has the urge to increase power, and henceforth will be socking a larger hole in the old Heavyside. DCW keeps his rig going on 14- and 28-Mc. 'phone. AIT has 115, AJT 85, MR 107, GG 69, and GXB 67 countries worked postwar. KYR, secretary, reports the Greensboro Club has twenty-seven charter members and seven associates. GNF, the club station, plans extensive Field Day work with four transmitters operating continuously. BHA is the chairman. HEH handled considerable traffic during the telephone strike and rated a newspaper picture. Let's try out some of those V.h.f. bands this summer. Let us have a report of your activities. Would like to hear from Asheville, Wilmington, Clinton, Gastonia, etc.

SOUTH CAROLINA — SCM, Ted Ferguson, W4BQE/ANG — HJR reports that college studies are QRMing his ham activities but he still finds time for a rag-chew. ILP operates on 7 and 14 Mc. with 150 watts. HEV has changed his QTH and hopes to be on 14 Mc. soon. LJJ can be heard pounding them out on 7 Mc. Had a nice personal chat with AZT. FMZ has a new e.c.o. that works FB. GB has returned to Columbia and works on 28-Mc. 'phone. Traffic: W4HJR 8.

WEST VIRGINIA — SCM, Donald B. Morris, W8JM — KWI, of Clarksburg, won the MARA Third All West Virginia QSO Contest, followed by JM and MIS. With Charleston (KVARA) Radio Club as the pusher 144-Mc. activity has reached an all-time high in West Virginia with CSF, LYG, YIF, BKI, SHU, QNG, BWK, HI, VAN, and PNP all active. Another active center is Morgantown, with TDJ, SPY, YGL, FMU, KWL, and QG trying to break through to Charleston. Who'll be the first to make this contact? JDJ and ZHH, West Virginia's only licensed YL operator, visited JM. WPL attends Fairmont College and works 7 Mc. with low power. GBF and DFC were active in ORS Party with GBF going over 200,000 points. HRO, after DXing on 28-Mc. with 60 watts and a four-element beam, is now operating 7 Mc. TGV, on 7230 kc., will be glad to give you a Logan County contact. JKN has new ground plane vertical for 14-Mc. DX. JM has a modified "V" beam, which has the gang guessing and has netted 60 countries postwar. MOP has new antenna and is active in 3.85-Mc. nets. UOW, EYV, VPO, and MIS may be heard regularly on 3.85 Mc. Don't forget the Charleston Hamfest, July 5th. Traffic: W8GBF 64, OXO 27, JM 16, DFC 15, MOL 13, CSF 5, FMU 3.

ROCKY MOUNTAIN DIVISION

COLORADO — SCM, Glen Bond, WØQYT — 7JMQ, formerly 9UPT of Colorado Springs, is in Bisbee, Ariz. running 500 watts to pair 812s with three-element beam on 28 Mc. Nip has had several QSOs with ØFTV of Broomfield, who is operating W4GLF/KG6 on Guam. Ralph passes his 73 to all the Colorado gang. 7QAP of Tucson, Ariz., asks for 50-Mc. schedules. He says he has heard no 50 Mc. signals from Colorado. I know of only two here in Denver on 50 Mc. — WYX and VIK. LZY has joined the 7- and 3.5-Mc. Colorado Springs Net, which aims to have drills at 7 P.M. Mondays and Fridays. ØCNY, of Colorado Springs, is on 28-Mc. 'phone with an 807 fifty watts and an SX-28A. Through the efforts of Harry Mier, the Denver Chamber of Commerce is supplying very nice QSL cards to Denver hams. WAP, of Loveland, closed his station and went to sea to pound brass. Sure sorry to lose Mac as he was handling lots of 7-Mc. traffic. If you should see a brown Chevrolet doing some queer stunts on the highway you will know VGC has gone mobile. QDC has purchased a new QTH. ACA is on 7-Mc. c.w. and JRM has raised the power to his 813. FPZ, of Denver; DRB, of Canon City; FPL, of Boulder; EQK, of Littleton; QHI, of Pueblo, and others have a new Colorado net on 3540 kc. and are pushing traffic. 7KMD ex-9BSR, of La Junta and Edgewater, Colo., is with CAA in Douglas, Wyo. Traffic: WØDRB 65, WAP 40, LZY 4.

UTAH-WYOMING — SCM, Victor Drabble, W7LLH — The Wyoming Net is on every Monday at 8 P.M. MST on 3760 kc. Jet is building an FB 144-Mc. rig. Two local rag-chew groups for Cheyenne, one for 50 Mc. and one for 144 Mc., have been organized, headed by KEZ and OWZ. The Shy-Wy Club has divided into two groups for the Field Day activity, headed by ICZ and OWZ. BQJ built an FB folded dipole antenna using twin-lead wire. MQL does an FB job on the Emergency Corps program. BLE has a new HT-9 transmitter. NXM pounds through the QRM with his little 5-watter. KIY is doing his part on the newly-formed CUW Net. DLR is experimenting with VHF antennas and reports the new call for the Ogden club is LAB. DAD has a new three-element close-spaced beam in operation. BED is RM for Southern Utah. JPN reports working 7 states on 50 Mc. FST will be unable to continue his various ARRL activities because of illness. LLH has built a 3.5-Mc. folded dipole twin-lead antenna to overcome antenna trouble. UOM is rebuilding a four-element 14-Mc beam and an eight-element 28-Mc. beam. MDP would like summer schedules with Ogden hams. Traffic: W7FST 864, KIY 71, BED 24, BQJ 2.

SOUTHEASTERN DIVISION

ALABAMA — SCM, Larry J. Smyth, W4GBV — DXB is looking for traffic schedule on 7 Mc. His frequency is 7175 kc. IKK has 813 and VFO with 300 watts. KVD has new HK254 final with 275 watts. BGO is using 100TH. KVW is having power-line QRN. KVD worked ZL on 28 Mc. with 25 watts. 3EWN/4 now runs 900 watts and has schedules with a J2, K6, EL2, and XADT in Italy. BJN is in the market for plate transformer for his HT-9. BCU is on 14 Mc. with a two-element beam. BA is on 3.85-Mc. 'phone trying to get an Alabama 'phone net going. HA is on 14 Mc. with a pair of 810s. HZT is on 14 Mc. with 807 and 25 watts. GKM is finishing up his 28-Mc. rig. GYD is working 14-Mc. c.w. LEN and GBP are on 3.5 Mc. LEO is on 14-Mc. c.w. GHZ reports organization of the Mobile Club Emergency Net on 3.85 Mc. UL did a nice job in Texas City disaster handling traffic for 36 hours straight. ATF, of the Rebel Net, also kept busy during the Texas disaster. EW has a schedule with TL on 7120 kc. every day at 1230 CST. GWF has new three-element beam on 28 Mc. JYB is doing a swell job with his portable-mobile rig. GGC and BFU are keeping 14-Mc. 'phone hot. DPQ works 28- and 14-Mc. 'phone. Traffic: W4ATF 42, DXB 34.

EASTERN FLORIDA — Acting SCM, W. E. MacArthur, W4BYF — SEC: ACZ; Asst. SEC: FWZ. RM: BNR. PAM:ACZ. JAV and IQV are active in FWZ's Gator Net. GHP qualifies as Class I OO and also runs schedule with J2AAF. DOO is having trouble getting that Palmer to run on kerosene. Meanwhile he is running 40 watts from storage batteries. BT got Nevada after 15 years. Now for that QSL and a WAC. He is also holding the 14,140-kc. OBS spot with help from JIS. IKI, JAV, and FPK are holding the 7170-kc. OBS spot and doing a fine job. DQW is holding his end with the Rebel and Florida Emergency Nets. AAR is Miami outlet for Rebel Net and schedules DQW and GY twice weekly. AYV ran up 93,440 points in the April CD Contest and is working on a 28 Mc. rig. IP, our former SCM, who was transferred to Balboa by PAA, is living in Panama and is having his troubles trying to get a ham license there. Meanwhile he is keeping in touch through KZ5AG. FPC got some nice local newspaper publicity on a proposed 144-Mc. emergency set-up. After having been through two hurricane emergencies with 144 and 112 Mc. we know what an excellent band this is under hurricane conditions. 2GTW/4 and BTM did a nice job on the DX Contest Committee of Dade Radio Club. FPK is a candidate for DX Century Club if he can drag in the cards. BT is still waiting for that Trans-Jordan for WAC. Jax and Tampa let us down on reports this month or we would have some more dope. Get those reports in to me so that this column represents the whole section. Traffic: W4DQW 115, AAR 58, IKI 49, IQV 45, GHP 32, BYF 20.

WESTERN FLORIDA — SCM, Lt. Comdr. Edward J. Collins, W4MS — DAO has been trying out 14-Mc. 'phone. QK has been working VEs hand over fist. LZO has been operating on 14 Mc. KVG joined the 28-Mc. gang. EGN has been working 14-Mc. DX with his 28-Mc. beam. EQR has a 50-Mc. beam above his 28-Mc beam. JV has finally

(*Continued on page 86*)

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MICA — DYKANOL — PAPER — ELECTROLYTIC

(*Continued from page 84*)

started a rotary beam for his kw. rig. KXV received an R-9er from his YL. KAS keeps 28 Mc. hot with his ART-13. BFD has two new masts up. ACB is active on all bands. DXQ is back on 7 Mc. again. AXP is the big traffic-handler on all bands. IVY worked VP4 for first out-of-country QSO. CNK and EQR work 50 Mc. nightly. JPA has added an R-9er to his equipment. LRC is busy building 144-Mc. rig and radio-controlled airplane. ECT-FJR keep looking at the bands on their SX-28. EQZ-GWY have added an FB converter. JBI was worked by EGN from G5FO. KFP has been rebuilding his 28-Mc. rig.

GEORGIA — SCM, Thomas M. Moss, W4HYW — The Amateur Radio Club of Savannah will hold its hamfest the third Sunday in July. The boys at Savannah know how to put on a hamfest, and we hope it will be even better than last year's. If you missed it last year, plan to be there this time. There will be prizes, activities, and food. Bring the XYLs, YLs, and jr. operators. More details may be had from the Amateur Radio Club of Savannah, P.O. Box 1942. FCW finally made it back on the air. He is on 28-Mc. 'phone. GPQ has moved to Anniston, Ala. DJA took the exam and got his old call back. It's a jr. operator at JZV. FKE now is Class A. He had to get it to compete with the "bootleggers" already using his call on Class A bands. HYW made the Al Operators Club. We believe a lot of you are eligible for the Old Timers Club. If you held a call twenty years ago and hold a license now, claim your certificate. License does not have to be continuous. Cracker Emergency Net is going strong. The Red Cross says nice work, boys. JDR is new ORS. We hear a lot of Georgia stations on 28-Mc. c.w. with summertime conditions on 28 Mc. 9BMC is on from Georgia Tech. KTG is working fixed portable from Long Island. Interest in the Atlanta club is higher than in several years. The club welcomes you fellows around Atlanta. XYLs are invited. Atlanta now has several XYLs with tickets. Traffic: W4JBM 93, KV 68, EYK 28, FKE 18, GZF 17, HYW 15, AAY 14, GGD 5, MA 1.

WEST INDIES — Acting SCM, Everett Mayer, KP4KD — CC and CX have rigs on 50.2 and 50.25 Mc. respectively. DR also has rig on 50 Mc. CL and AJ handled Texas City emergency traffic. KD and DF handle c.w. NCS and AM handles 'phone NCS in Coast Guard Auxiliary Net. DV has FB station under construction. EN has 1 kw. on 7 Mc. and is working nice DX. AM got his WPR certificate with 25 'phone contacts. AK handles traffic and schedules KS4AC on Swan Island. AC has Millen e.c.o. CZ has BC-610 on 28-Mc. 'phone. AJ is not as active since CZ and W9UGU set up rigs in quarters. BE is using BC-457 transmitter as VFO. DY burned out power transformer but got replacement on loan basis. BJ is on 3.5 Mc. with ½-wave antenna and 4 watts. W4ETE/KP4 traded in S-40 for HQ-129X. KD works a little DX and does a bit of OO work on the side. Ex-K4DSD now is KP4ES. BI has 28-Mc. rig in car working mobile FB. Traffic: KP4AK 29, KD 14, AM 5.

SOUTHWESTERN DIVISION

ARIZONA — SCM, Gladden C. Elliott, W7MLL — We regret the passing of 6RXQ, who was killed in an airplane accident at Prescott on April 4th. 50 Mc. is becoming popular with UPF, QAP, OWX, TXM on at Tucson and JXL in Douglas. The Phoenix Club picnic was attended by more than 100. KFF has a new 100-watt rig. NRI has a slug-tuned exciter for fast QSY. KWB is on 7-Mc. c.w. at Peoria. LJN has made more than 350 contacts on 144 and 112 Mc. since the bands opened. JIY has 300 watts on 28 Mc. 8LME/7 is on 14-Mc. 'phone at Sabino Canyon. KUN is working portable-mobile. JHB is working Asia with mobile on 28 Mc. KPN has a four-element beam. TCQ/KNY, UPF, JMQ, MAE, GYK, and MLL took their Class A exams. JJN has a full kw. on 28 Mc. QZR is on 7-Mc. c.w. UPR and PEY are on c.w. QLZ and KTJ worked 85 miles on 144 Mc. KWP has 100 watts on 28 Mc. at Lowell. JSL is on 28 Mc. at Yuma. LBN and KUD are new Phoenix calls. JLZ is on 3.5- and 7-Mc. c.w. at Morenci. WKC is a Class III OO in Tucson. LYS has reduced power to 25 watts. BMC and MAE are regional WX coordinators. KRW has 250 watts on 28 Mc. Traffic: W7KOY 47, MLL 27, MAE 20, QJL 17, KRW 4.

SAN DIEGO — SCM, Irvin L. Emig, W6GC — DEY is new OES. LUJ schedules W6YOT/C7 daily. JJY shipped on tanker *Topila* and will operate 28-Mc. mobile marine. DEY has 832 and sixteen-element beam on 144 Mc. UYA,

(*Continued on page 88*)

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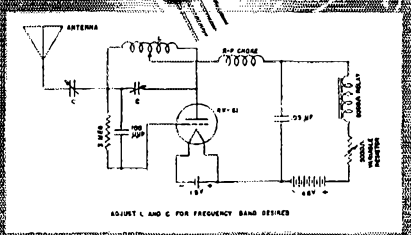

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HEATER CATHODE TYPES												
CK605CX	Characteristics of 6AK5	0.38	6.3	200	5000			120	7.5	120	2.5	-2
CK606BX	Diode, equivalent to one-half 6AL5	0.28	6.3	150				150 ac	9.0 dc			
CK608CX	Triode UHF Oscillator, ¾ watts at 500 Mc	0.38	6.3	200	5000			120	9.0			-2
CK619CX	Triode High mu.	0.38	6.3	200	4000			250	4.0			-2
FILAMENT TYPES												
2E31	RF Pentode for pocket radio	0.28	1.25	50	500			22.5	0.4	22.5	0.3	0
2E35	Output Pentode for pocket radio	0.28	1.25	30	385	1.2		22.5	0.27	22.5	0.07	0
2E41	Diode Pentode for pocket radio	0.28	1.25	30	375		20	22.5	0.35	22.5	0.12	0
2G21	Triode Heptode for pocket radio	0.28	1.25	50	75 conv. cond.			22.5	0.20	22.5	0.30	
*RK61	Gas Triode, Radio Control for model planes, etc.	0.52	1.4	50				45	1.5	special circuit		
CK502AX	Output Pentode	0.28	1.25	30	550	6.0		45	0.6	45	0.15	-1.25
CK503AX	Output Pentode	0.28	1.25	30	550	9.5		45	0.8	45	0.25	-2.0
CK505AX	Volt. Amp. Pent.	0.28	0.625	30	180		30	22.5	.125	22.5	0.04	0
CK506AX	Output Pentode	0.28	1.25	50	500	25		45	1.25	45	0.4	-4.5
CK507AX	Output Pentode	0.28	1.25	45	575	11		45	0.9	45	0.3	-2.0
CK510AX	Double Space Charge Tetrode Amplifier	0.28	0.625	50	65 ea. unit		150 both units	45	0.06			0
CK512AX	Low microphonic voltage amplifier	0.28	0.625	20	160		28	22.5	0.125	22.5	0.04	0
CK520AX	Output Pentode ⅝ volt filament	0.28	0.625	50	180	4.5		45	0.24	45	0.07	-2.5
CK521AX	Output Pentode 1 mw out at 10 volts	0.28	1.25	50	400	6.0		22.5	0.80	22.5	0.22	-3.0
CK522AX	Output Pentode 20 ma filament	0.28	1.25	20	450	1.2		22.5	0.30	22.5	0.08	0
CK551AXA	Diode-Pentode	0.28	1.25	30	235			22.5	0.17	22.5	0.04	0
CK553AXA	RF Pentode	0.28	1.25	50	550			22.5	0.42	22.5	0.13	0
CK556AX	Triode, UHF Oscillator for radio use	0.28	1.25	125	1600			135	4.0			-5.0
CK568AX	Triode, UHF Oscillator for radio use	0.28	1.25	70	650			135	1.9			-6.0
CK569AX	RF Pentode	0.28	1.25	50	1100			67.5	1.8	67.5	0.48	0
CK570AX	Electrometer Triode Max. grid current 5×10^{-13} amps.	0.28	0.625	20	125		1.5	12	0.22			-3

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VKN, and WWX are active on 28 Mc. BVA has ARC-3 and ground plane antenna on 144 Mc. BZR is on 3.85-Mc. Mission Trail Net. DYG, SFK, DKN, SRD, and VIH/6 are active on 144 Mc. ADT is working those hard-to-get prefixes with kw. on 14 Mc. The two 3.85-Mc. nets, the "GG Breakfast Club" and the "Old Goats" will hold a joint picnic at San Dimas. YJP, YJL, and ZLS are new calls in this section. QG on 50 Mc. worked a few W7s during recent skip. TIK maintains traffic schedules with Pacific on 28 Mc. BAM is running a kw. on 14 Mc. and working all kinds of DX. DHP, HWJ, and URU are on 3.8-Mc. 'phone. IZ has TR-4 on 144 Mc. and is experimenting with f.m. on 28 Mc. DUP and SKZ have new home-built VFOs. APG requests help from those interested in EC work. GWY works lots of Europeans on 14-Mc. 'phone. DX contenders report the following countries worked: QNM 78, MI 69, NIF 68, LRU 66, YYW 49, BLZ 44. VK3IU and VK3QH visited San Diego and made the rounds of the clubs. KW bought a KP-81. YYM is organizing YLRL and requests all interested YLs to meet her on 7242 kc. any evening. YTH built a mighty fine ham band super. VCD is completing portable-mobile 27- and 28-Mc. set. The SDARC elected the following: KW, pres.; FTT, vice-pres.; YYM, secy.; and WUW, treas. FRX is on 3.5-Mc. c.w. with low power. VEP worked VK on 27 Mc. BGF is a member of the Pioneer net. FMJ is trying to make his ART-13 work. YYW is working FB DX on 14 Mc. and made 22 P/M on last FMT. Traffic: W6LUJ 450, FMJ 14, LRU 13, OBD 12, VCD 10, BGF 9, YTH 8, BAM 6, NDF 5, GC 2, YYW 1.

WEST GULF DIVISION

NORTHERN TEXAS — SCM, N. C. Settle, W5DAS/MNL — Asst. SCM, Joe Bonnett, 5III. SEC: QA. PAM:ECE. RM: CDU. JJF is OBS on 28 Mc. LVR blew three bottles. EDU, ILZ, ASA, and LSN are on 3.5-Mc. c.w. The Wichita Falls gang held a hamfest in April. BBH is on all bands. CHU has a potent ground wave on 28 Mc. EVI is on all bands with power from 50 watts to a kw. CHU's frequency is 50.52 Mc. AJG, QSL Manager, has lots of cards on hand. CJJ sends official bulletins on 3.85 Mc. Sundays. BYX reports CAA Net is on 7040 kc. at 1900 CST. New Waco hams are LYX and DVQ. DZ has VHF-152 and two-element beam on 144 Mc. BYX reports the CAA has two 15-kw. gas-driven generators to be used in an emergency. The Big Spring Amateur Radio Club meets the first Saturday night of each month. Officers are: AW, pres.; ZZF, secy.-treas. FRD, JO, CVA, and COK are on 50 Mc. LTY has a four-element beam on 28 Mc. GVZ has two-element beam, 60 watts, on 50 Mc. CF has BC-610 on 28 and 14 Mc. JFF, BNG, GWD, GVX, LVM, KIJ, and KWC are on 28 Mc. LIV has a beam on 50 Mc. JDL is on 50 and 28 Mc. CVW is talking about a new rig. SH has a BC-610 on 28 Mc. KL is on 28 and 144 Mc. MAG has a BC-610 on 28 Mc. Officers of El Paso Amateur Radio Club are LXK, pres.; JJF, vice-pres.; MDG, secy. Meetings are held the second Friday night of each month. EVJ, ESZ, JOT, EGI, LWP, MCI are on 50 and 144 Mc. CC is on 3.85-Mc. 'phone. KPV has 28-Mc. mobile. AA, Regional EC for the Weather Bureau, did a nice job getting equipment together. New ECs: DYK, PO, DSV, DUZ, GNH, IJQ. If interested in this appointment, write QA. KVM has folded dipole in the kitchen. 6VIM, ex-5GDE, in Los Angeles, is looking for some of the old gang on 14-Mc. 'phone. The Dallas Radio Club is building an emergency transmitter in a two-wheel trailer. Traffic: W5EVI 304, ECE 270, LSN 107, DAS 104, BYX 94, CHU 91, CDU 75, JJF 62, BBH 24, ASA 12, LVR 12, ILZ 11.

OKLAHOMA — SCM, Bert Weidner, W5HXI — Asst. SCM, George Bird, W5HGC. SEC: AHT. OBS: FMB and DRE. OO: EIH and GVS. RM: IGO. PAM. HGC. The Oklahoma section now is very emergency-minded. When the emergency struck there was an acute shortage of emergency transmitters of high-enough power to buck the QRN. We also are short on power equipment. The A. & M. College station, YJ, will have a complete set-up mounted in a trailer with refrigeration. OCARC will have two transmitters with powered generators. AHT now has a complete set-up ready to go. Every amateur in this section gave wonderful coöperation and each was available when needed during the Woodward and Texas City disasters. All are to be complimented on their fine operating abilities. TARC has passed up the state convention so let's all go to the West Gulf Convention

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(Continued from page 88)

at Texarkana. The A & MRC has JFY as president, LGI as vice-president, and LHP as secretary. The club is active on 3.5 and 7 Mc. 7RIM/5 has moved to Childress, Tex. CNK worked 108 stations and 53 countries in 'phone contest. KYB and FMA are Class A. WQ is having trouble with 100THs. HGC has his big cooker on. Traffic: W5IGO 171, EGA 53, FMF 50, GVS 46, JKS 35, CNK 27, AHT 24, HGC 23, ADC 14, IOW 12, ATJ 10, GZU 7, WQ 6, HXU 4, HXG 2.

SOUTHERN TEXAS — SCM, Ted Chastain, W5HIF — SEC: BUV. PAM: EYV. The SEC is having trouble getting out his report, because ECs do not report. Will those who are lax please get reports in by the 1st? 5AXI/MM, on 27, 260, 28, 630 Mc. and 29,014 kc. would like San Antonio contacts. BHO, ON, and KWV are on 144 Mc. in Houston. 144 Mc. tests between Houston and Galveston have been successful. The Brazoria County Amateur Radio Club was organized with BD, pres.; LUN, vice-pres.; GTD, secy.-treas.; HNH, prog. dir.; JCH, tech. adv. Others active are LNE, LWR, ITK, ASM, END, and MRI. GTD and ITK have new e.c.o.s. New calls in San Antonio are MTM, MTB, MTS, and KYJ. The Kelly Field Amateur Radio Club was organized with MTS, ex-9ZZD, pres.; EVK, vice-pres.; KHA, secy.-treas.; and JC, sgt. at arms. The club station, AAF, has transmitters for all bands. The South Texas Emergency Net, c.w. section, drills each Monday at 8:00 P.M. on 3840 kc. and wants outlets in Houston, Galveston, Beaumont, and Port Arthur. LJH is on 14-Mc. c.w. with 75 watts and a BC-348. FH and GMT are new OPS. CCD and MKL are new ORS. HQR is OO Class II and has a new modulator using 100THs. MN schedules 4PL daily at 5:00 A.M. and wants more traffic. Corpus Christi Radio Club elected new officers: CCD, pres.; IFU, vice-pres.; KSS, secy.; HQR, treas. New calls at Naval Air Training Center, Ward Island, are: 6YBQ/5, 3JPF/5, 1PHI/5, 5CD, LXC, MKB, MJY, MVW, MWD, MBA, MSR, and MVQ. LLA has Gon-Set and Clipper in new car. I would appreciate it if all CD appointees would drop me a line giving appointment and date of same. Also would like to see an EC in every community of this section. Preparing for an emergency after it is past, won't get it, gang. Traffic: W5JPC 87, MN 42, CCD 21, MKL 18, EWZ 5, MTB 2.

CANADA
MARITIME DIVISION

MARITIME — SCM, A. M. Crowell, VE1DQ — EC: FQ. RM: EY. Interest in v.h.f. work is picking up with BC, QZ, and SF meeting regularly every Tuesday evening at 7 ADT on 50 Mc. DB now runs 160 watts to the 812. EK piled up a nice score in the W/VE Contest. PB operates 'phone on 28 and 14 Mc. with about 500 watts into the final. QT has new BC-348. The new Truro Club has members' rigs checked by its technical committee. KS, the noted strong advocate of a certain type receiver, now is the proud owner of an HQ-129X. PX has the 350-watt Class B 'phone rig putting out nicely. RR is knocking off the DX with a long wire antenna. DQ has "beam trouble." II sneaks on 3.5 and 7 Mc. when AQ is off. LO ground a few crystals. WP is doing fine on 7 and 3.5 Mc. with 15 watts. TN advises the AFARS net is working smoothly. QS has FB new rotary beam on 28 Mc. PA works 14 Mc. with rest of the dogpatchers. FT was heard on 14 Mc. during the contest. IU has been doing well on 28 Mc. RE got the new rig going and worked 3 VKs the first morning. MQ is a recent signal in Dogpatch on 14 and 7 Mc. PS is working on 14-Mc. c.w. Traffic: VE1LZ 43, HJ 37, QT 25, BC 5, DB 4, PB 4, EK 3.

ONTARIO

ONTARIO — SCM, Davis S. Hutchinson, VE3DU — QK is building 50-Mc. rig. AXQ is on AFARS Net. CAR sends official bulletins Tues. and Thurs. at 8 P.M. on 3545 kc. Tues. at 10 P.M. on 3821-kc. 'phone, Thurs. on 14126-kc. c.w. and 14175-kc. 'phone. AWJ on Beaver Net schedules VE2IA at Sorel. HP schedules BCS and 2II. BDX has new call, JK. EF has new rig using pair 826s in final with 350 watts. AUQ writes the following from St. Kitts: AUR and BJG have new three-element beams on 28 Mc., AGS has BC-348 receiver and BC221 frequency meter, XY has a BC-348, AIN's tower came down, AHF is

Continued on page 98)

KAAR - FIRST with INSTANT HEATING FM

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Kaar instant-heating mobile FM radiotelephones are now available in ALL THREE mobile bands! With Kaar instant-heating, the average power taken from the battery is cut approximately 90%, eliminating the need for special batteries or generators. Kaar 20, 50, and 100 Watt mobile radiotelephones powered by standard 6 volt vehicle batteries give you superior performance and more dependable service, at less cost.

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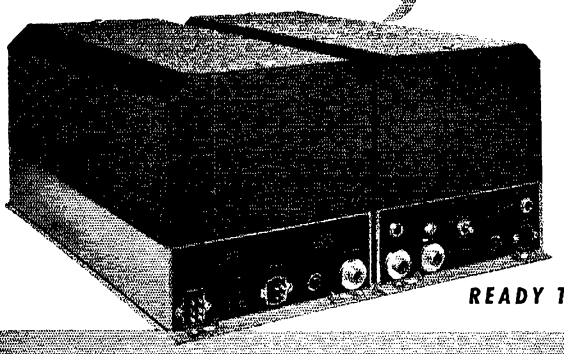
Write to Kaar Engineering Co., 605 Emerson Street, Palo Alto, California, for catalog describing the Kaar instant-heating radiotelephones and specify the equipment in which you are most interested. Write us today!



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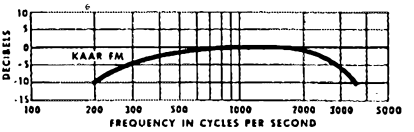

READY TO GO . . . INSTANTLY! KAAR

KAAR ENGINEERING CO.

(*Continued from page 90*)

working on three-element beam and has new SX-28A, TW is back in Port Weller and operating remote controlled, LO has 813 with 200 watts. OX has BC-348 and 28-Mc. converter, BKL has new Gon-Set. BPD is Hart House Ajax Radio Club at Ajax division of the U. of T., on the air with BC-610 transmitter and HQ-129X. BAJ is trying for the 35 w.p.m. sticker. WP, WM, GB, YJ, BMZ, BMI, and ADC are keeping up their activities on 28 Mc. while HI and BEV are busy working DX on 14 Mc. QC finds 50 Mc. very quiet. ACB is doing fine work with 25 to 40 watts input to 807 final on 3.5, 7, and 14 Mc. BGN ex-4GN, is active in Acton. ACO is going great guns on 14-Mc. 'phone. "A" and "B" 'phone nets, now on summer schedule, combine on Mon. and Thurs. nights at 7 P.M. EST. The following qualified in March Code Practice Run: AGP 20 and AWQ 25 w.p.m. certificates, BCS 20, PB 25, and WY 35 w.p.m. stickers. Please keep the reports coming in. QE is a new recruit for the Beaver Net. EF got his WAS after 23 years of ham radio. MB is active on 3.8-Mc. 'phone. WY is having rig trouble. Traffic: (Mar.) VE3BDX 7, EF 27. (Apr.) VE3HP 132, WX 86, XO 83, CP 48, BCS 46, OI 37, CAR 29, TM 24, AWJ 17, QU 10, VD 7, AXQ 3, AXP 2, WK 2, MB 1.

VANALTA DIVISION

ALBERTA — SCM, W. W. Butchart, VE6LQ — AL, well-known Alberta ham and pilot, was lost for 21 days in bush 350 miles north of Edmonton. During his convalescence he was heard on 3.8 and 14 Mc. NF, KI, and HQ are active on 50 Mc. TK talks 144 Mc. CARA discusses antenna pole problem with City Fathers! LA's beam stands the high winds FB. AO will have two rigs complete to cover 14 and 3.8 Mc. EA installed speech clipping. HM worries about spurious radiations. EL uses 50-watt rig on 3.8 Mc. during early evening and goes to 650 watts after BCLs go to bed! EF hit 3.5-Mc. c.w. with 829. LW purchased an ACR-111. 8AO's Gilbert Special 14-Mc. beam with reflector, sand pail, and wheel-barrow attachments help his 50 watts tremendously. 8AG has FB set-up in Whitehorse, Y. T., with "V" beam. EP is new station in Edmonton. UT has trouble building "Micromatch" gadget. IR is trying to tame a pair of 807s. WZ graduated from c.w. to 3.8-Mc. 'phone. PZ built battery super. DY stays on 3.5-Mc. c.w. LQ got a bad burn from 1500-volt transformer. GA has T40s ready for 200-watt rig. CE has 1155 receiver. BW tried QRP rig with 1.8 watts input with excellent results. Traffic: VE6LQ 18, MJ 15.

BRITISH COLUMBIA — SCM, W. W. Storey, VE7WS — 8AC is heard on both 'phone and c.w. 8BC, at Bear Creek, is trying to figure out where the r.f. goes! 8AT is keeping his nightly schedules with 8AO. Members of the Vernon Amateur Radio Club are putting the finishing touches to their rigs. 7SO's work on his 500-watt job was held up for a couple of 300-mil chokes, but he is operating on 3.85-Mc. 'phone with 25 watts. 7VT is rebuilding his rig but will be back on 7 and 14 Mc. soon. 7FT is working on 7 and 3.5 Mc. He has a 6L6 807–810 set-up in his transmitter. 7AHH, working mostly on 3.5 Mc. and some on 14-Mc. 'phone, has a new VFO using a pair of 807s in final. 7AJF is on 3.5-Mc. c.w. with 25 watts and hopes to have 150 watts and new receiver soon. The Vancouver Amateur Radio Club had its Annual Dance on April 24th with an excellent turnout. 7ADF was Master of Art, 7AL saw that things did not go off the deep end, 7PU supervised the setting up of the p.a. system. 7MQ gave the gang a fine performance of magic tricks. 7WS thanks 7AKC for the opportunity of dancing with 7ADO. Mr. Cowan's Cowboy Band gave us some real hillbilly music which was enjoyed by everyone. 7BQ has just weathered another "hail storm." A new club has been formed called the "13" Club. Meetings are held at 7HI's home, 511 Cassier St. The SCM is looking for activity news from all the clubs.

YUKON — SCM, W. R. Williamson, VE8AK — AS has fixed Twin Triplex 8JK and has worked over 20 countries with it. AG helps AO keep Yukon on the map on 3.85-Mc. 'phone. AY is working all bands with p.p. 813s. AK plans all-band front panel switching exciter and all-amphenol 14-Mc. beam. AT and BC are consistent 3.85-Mc. 'phone men in Yukon; AT is on with battery-powered 4 watts. Lots of new VE8 calls have been issued, but activity still is low, except for a faithful few. Let's have a few reports by mail by the first of the month — your SCM finds it hard

(*Continued on page 94*)

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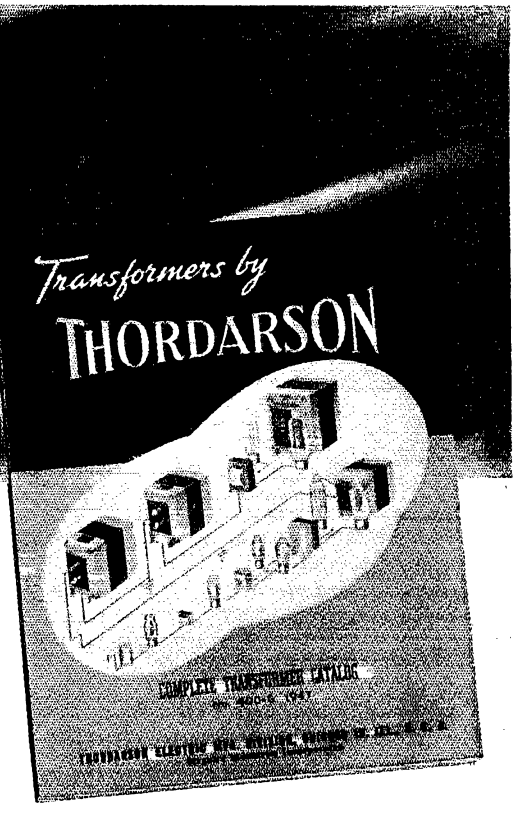

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(*Continued from page 92*)

to fill this column with just hearsay reports on your activity.

PRAIRIE DIVISION

MANITOBA — SCM, A. W. Morley, VE4AM — 14 Mc. continues to hold the spotlight in Winnipeg, newest arrival being SJ. VE3AMK made a schedule for 7 A.M. on April 1st with MC. The joke was on MC. Mr. and Mrs. CN are now in Moncton and will be signing VE1 soon. KK, in Fort Garry, and AW, in Dauphin, have something in common. They both come in on the local church organ; KK, during choir practice and AW during the service. The joys of a 'phone station on 3.8 Mc.! NI was going to bed but the locals said, "No, we're on our way over." NI went to bed hours later. It was some party. XP, at Dauphin, is back on 3.8-Mc. 'phone and had a two-hour-and-35-minute QSO with AM. PA has new AR6. EH, at Berens River, is heard on 7 Mc. occasionally. AI, at Binscarth, has settled down on 3.8-Mc. 'phone. Visitors to Winnipeg included 7MO, 2WT, 4KD, and 4GU. Bootleggers are operating on 3.5, 7, and 50 Mc. and are operating outside the 3.8-Mc. 'phone band, on 'phone, on 3.5 Mc. A licensed amateur who knows the whereabouts of such illegal stations and does not report them is as guilty as the bootlegger. I might add that I know which of you know where these bootleggers are located.

SASKATCHEWAN — SCM, Norman Thompson, VE5CO — The Saskatoon Ham Club, which has been active for the past two years, has the following officers: UC, pres.; OB, rec. secy.; AJ, financial secy. Active hams in the club are: AJ, AN, BF, CJ, DJ, EE, FD, FY, JB, JF, MQ, OB, QI, RC, UC, and UZ. The club meets the 2nd Monday of each month at 8 P.M. in the Oddfellow's Hall, 21st St. All are welcome to attend. The Moose Jaw Club held a very nice meeting at the home of OP. Main topics of discussion were the coming hamfest in Saskatoon and Field Day. DW now is in PA. EM is in Sovereign, and EN is in Kyle. BH is active on 7 Mc. BD is working with Dept. of Transport, in Edmonton. BB, at Morse, works 3.5 and 7 Mc. DF was heard working Europe on 'phone. RA is back on 14-Mc. c.w. If you're interested in 50-Mc. 'phone listen on Wed. 2 P.M. for GH and AR checking cross-band on 3.8 and 50 Mc. CO, AR, and CZ ran tests with fixed stations and CO mobile on 235 Mc. Send in v.h.f. news, fellows. GA and CM are on 3.8 Mc. regularly. MW is returning to 3.5 Mc. His OBS schedule will be Mon. through Sat. 6:30 P.M. CST on 3775 kc. Let's have more news, fellows. Traffic: VE5GH 6, CZ 2, SY 1.

Happenings

(*Continued from page 88*)

plenty of difficulties remain, we regard ourselves as practically current now.

The ARRL practice concerning membership renewals can be illustrated by an example. A certain number of memberships expire in July. About the middle of June we send expiration notices to these members, telling them that their memberships expire July 31st and that the July issue of *QST* is the last one they are due to receive, and soliciting their renewals. If a member makes a prompt response to that notice he now unfailingly gets his next issue of *QST* (August in the case in question) on the usual mailing schedule. A member even in the remotest corner of the country may delay a week in responding and he should still get his *QST* on time. Copies of that issue are reserved for him in the expectation that he will renew. But a response about that prompt is obviously necessary and if the member engages in additional delay it is probable that there will be just that amount of delay (beyond the expected date) before his next copy reaches him. And if he delays too long — a month or so before he answers — we may not have a copy of that

(*Continued on page 96*)

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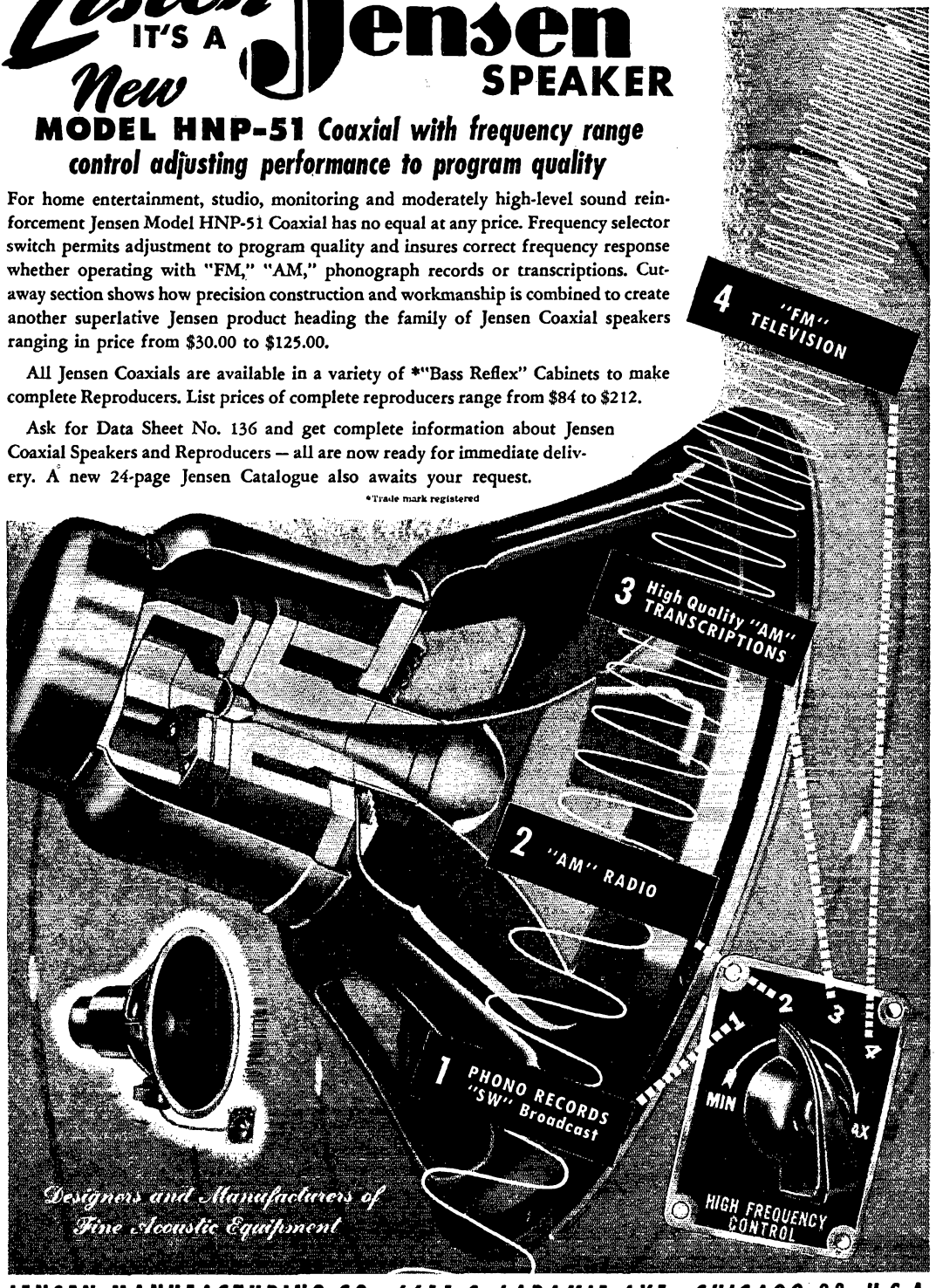

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(Continued from page 94)

issue of *QST* available for him, since paper is in such short supply that we can't print as many copies as we would like. By that time we naturally classify him as a person who probably isn't going to renew his membership and the remaining copies of that issue may have been diverted to the new members who come along each month and who wish to begin with that issue.

The foregoing paragraph relates to the first or official notice of approaching expiration. A month later we send a second notice but it is more of a courtesy, a reminder of failure to renew, than anything else. You can't rely on it to take care of a renewal situation, as already the "next" issue of *QST* is being mailed at that moment. In many cases there will still be time for the expiring member to maintain continuity of membership if he jumps fast by air mail, but already it is too late for him to get the coming *QST* on time and there is some risk that we shall be out of copies, although we'll do our best. Supposing that we can supply it, it is obviously going to be two or three weeks late.

We are pleased to say that we are now back to standard performance on the handling of new membership applications also. They are put through our machinery on a schedule somewhat better than we were able to achieve in prewar days, and that is pretty good. If we are able to start *QST* with the desired issue, it comes forward in a reasonable time. But sometimes, even though we have acted with promptness on entering the membership, we are not able to supply that issue. Sometimes growth is more than we expected and sometimes we can't get sufficient paper, and always of course the renewing member has priority over new applicants. In such cases it is often possible for us to supply the missing issue later, when we get back copies from the newsstands. *QST*'s newsstand circulation has necessarily been reduced to accommodate growth in membership, and it pretty well sells out, but we have a special arrangement whereby some unsold copies are recovered and can then be made available for these needs — considering the special reference value of our magazine. Unhappily it is about four months before such recovered copies are available.

It takes three days to mail an issue of *QST* to the membership. Western copies go out the first day, the central states the second, the close-by states last. All the copies for a given part of the country go to the post office at the same time. If the fellow across the street gets his before yours comes, and you aren't a delayed renewal, it's simply an idiosyncrasy of the postal service over which we have no control. ARRL does not give newsstand distribution of *QST* priority. Quite the contrary, we wish members to get their copies slightly ahead, so newsstand copies are never released until several days after membership copies have been mailed. If the mag ever hits the stands first in your locality, the chances

(Continued on page 100)

Here are THE FACTS for the Radioman Who Cares about Tomorrow:

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"Radio is changing so fast today that without the clear, concise training that CREI provided, I would never be able to look such things in the 'teeth,' as FM, Facsimile and Television."

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"As far back as I can remember in my 'radio' life one eternal question mark has been before me—WHY DOES IT WORK THAT WAY? Many seem content to take another's experience and word as Gospel, but all that did for me was to make me wonder the more. Truthfully, CREI opened many doors, and things which were beyond comprehension to me when I began my Radio Electrician career in the CAA are now not only acceptable without question but fully understood."

—A CAA Radio Electrician — 4-28-47

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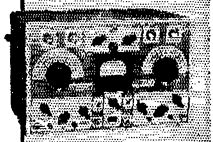

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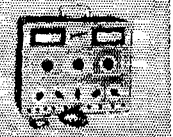

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NC2-40-DT, With Speaker	241.44	48.36	17.06
NC-46, With Speaker	107.40	21.48	7.59
HRO-5TAI, w/Pow. Supply	697 294.71	59.03	20.82
HALLICRAFTERS			
S-40A, Receiver	89.50	17.98	6.32
SX-42, With R42 Speaker	304.50	60.90	21.52
SP-44, Panoramic Adapter	99.50	19.94	7.03
HAMMARLUND			
SPC-400X, w/Speaker in Cab.	347.25	69.45	24.54
HQ-129X, w/Speaker in Cab.	173.25	34.65	12.24
R. M. E.			
UHF-152, Hi. Freq. Conv.	86.60	17.36	6.11
RME-84, Complete	98.70	19.74	6.97
RME-45, Complete	198.70	39.70	14.04
COLLINS			
75A-1, Receiver	530.00	106.04	37.44

TRANSMITTERS

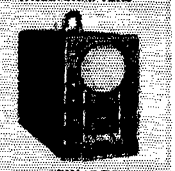
COLLINS			
30K1, Transmitter	1825.00	365.08	128.96
32V1, Transmitter	590.00	118.04	41.69
HALLICRAFTERS			
HT9, 100 Watt Transmitter	350.00	70.00	24.67
TEMPCO			
75GA, 75 Watt Transmitter	495.00	99.00	34.98
500GA, 500 Watt Transmitter	1500.00	300.00	106.00
SUPREME		**JOHN MECK**	
AF-100, 100 W. Xmtr. Comp.	450.00	90.00	31.80
T60-1, 60 Watt Transmitter	150.00	30.00	10.60
SONAR			
VFX-680, All Band Exciter	87.45	17.49	6.17

TEST-EQUIPMENT

Description	Price	Down Paym't.	*Per Mo.
R. C. A.			
155-C, 3" Oscillograph	115.00	23.08	8.11
160-B, 5" Oscillograph	185.00	37.04	13.07
162-C, Channalyst	162.50	32.54	11.48
WV-75A, Voltohmyst	125.00	25.04	8.83
WA54A, Audio Oscillator	152.50	30.58	10.77
SUPREME			
546A, 3" Oscilloscope	87.95	17.63	6.21
561, Oscillator	133.87	26.83	9.46
HICKOK			
191X, Microvolt Generator	145.92	29.28	10.30
305, Oscillograph & Oscil.	145.50	29.10	10.28
288X, Signal Generator	159.06	31.86	11.23
534, Tube & Set Tester	138.30	27.66	9.77
JACKSON			
652, Audio Oscillator	117.00	23.40	8.27
WESTON			
798, Tube Check. & Analyzer	187.09	37.45	13.22
785, Circuit Tester	103.59	20.79	7.32
TRIPLETT			
2432, Signal Generator	86.73	17.37	6.13
1632, Signal Generator	107.80	21.64	7.61
PRECISION			
954P, Port. Tube & Set Tester	97.22	19.46	6.87
DUMONT			
164E, 3" Oscillograph	105.00	21.00	7.42
208B, 5" Oscillograph	235.00	47.08	16.60
274, 5" Oscillograph	115.50	23.10	8.16
SIMPSON			
330, Tube Tester	96.53	19.37	6.81
415, Signal Generator	112.70	22.58	7.96

EMC

HALLICRAFTERS



DUMONT

$5 Deposit with Your Order Now Will Reserve Your Equipment

Shipments F.O.B. N.Y. or Chicago

*Includes 6% carrying charge. Prices subject to change.

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NEWARK ELECTRIC COMPANY, INC.

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TERRIFIC VALUES AT NEWARK

Closeout Bargains!

NEWARK CRYSTALS

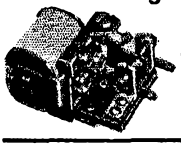
6-11-20-40-80 Meters

Sensational Values! Odd lots of our accurately calibrated crystals that formerly sold at $.88. Limited Quantity available within the following groups. Orders will be filled to within 25 KC of desired frequency. ORDER NOW!

49¢ EA. 3 for $1.25

A—3505-3600
B—3721-4000
C—6250-6840
D—7000-7120
E—7160-7270
F—8411-8700 (Chicago Only)
G—8701-8890
H—9000-9250
J—14010-14325

SIGMA Highly Sensitive RELAY



8,000 ohm, adjustable quality relay for countless applications. Accurate—Dependable SPDT. Operates from .6 to 3 Ma. Contacts carry 1 amp. Only . . . . . **88¢**

Hammarlund F-135-C FREQUENCY STANDARD

Compact, generates marker signals every 100 KC. Very accurate. Freq. adjustment by zero beating with WWV. Complete with low-drift 100 KC crystal, miniature tube, instructions. A "must" for Hams. **$14.25**

OIL-FILLED CONDENSERS

Terrific Buys for PA, Xmtr, Repl. use!
2 Mfd. — 600 WVDC..... .....**39¢**
4 Mfd. — 600 WVDC..... ....**49¢**

McMURDO SILVER RECEIVERS • TRANSMITTERS

Model 700-UHF Xmitter and Voice Modulator. 140/144 and 235/240 Mc. Less 6 Tubes, Mike, Crystal. 9 lbs. **$36.95**

Model 700K—Xmitter Kit. As above, unassembled. Parts and Instr. Less Cab., Tubes, Crystal, Mike. 7 lbs. **$24.95**

Model 701—75 Watt Xmitter. 6 Band, 3.5 to 54 Mc, CW and Voice. Less 4 Tubes, Mike, Key, Crystal. 9 lbs. **$36.95**

Model 701K—Xmitter Kit. As above, unassembled. Parts & Instr. Less Cabinet, Tubes, P. S., Mike, Key, Crystal. 7 lbs.....**$24.95**

Plug-in Coils for 701 Xmitter.....50c

Model 800—UHF Comm. Receiver. 144-240 Mc. Band Spread, Built-in Speaker. Less P. S., 4 Tubes, Coils. 7 lbs. **$36.95**

Model 800K—UHF Receiver Kit. As above, but unassembled. Parts and Instructions. Less Cabinet, Tubes, P. S. 5 lbs.....**$24.95**

Plug-in Coil Pairs for 800 Rec'vr. Per pr. $1.40

Smashing Reductions!

TRANSMITTING AND SPECIAL PURPOSE TUBES

Values Galore to delight every Ham! Take your pick of these Surplus, Top Grade Tubes from our Tremendous Stock, at a fraction of their original cost. Order NOW and SAVE. All New — Guaranteed!

2AP1	$2.25	832A/832	$2.25
CK1005	.75	834	6.00
2C26A	.75	836	1.50
2C40	2.63	837	3.38
2C43	7.50	838	3.75
2C44	1.50	843	.75
2C46	7.50	845W	3.75
2K25/723AB	15.00	865	1.50
2X2/879	.90	872A/872	2.25
3AP1	3.00	874	1.95
3BP1	3.00	884	.75
3B24	3.00	922	.68
3C24/24G	1.20	923	.45
3E29	3.00	931B	1.88
5BP1	6.00	954	.75
5BP4	6.00	955	.75
5FP7	10.50	956	.75
5HP1	10.50	957	.75
6AC7W	.68	958A	.75
7BP7	13.50	959	.75
9GP7/9MP7	30.00	1616	3.00
9LP7	22.50	1619	.75
10Y	.90	1624	.90
12DP7	12.00	1625	.75
HY69	1.65	1626	.60
75TL	2.25	1629	.27
OC3/VR105	.75	1654	.75
OD3/VR150	.75	1851	.95
211	1.13	2051	.90
304TL	3.75	7193	.45
807	.95	8005	3.15
801A/801	1.73	9001	1.05
809	1.50	9002	.90
811	1.95	9003	1.05
813	6.75	9004	.90
814	4.50	9006	.68
826	2.25	38142/45 spec.	.53

UNUSUAL METER BUY! 0-150 MICROAMMETER

2½", Bakelite Case. Superior Quality Meters, Precision-Made by Leading Manufacturers. All Brand New and Perfect! No. S-437 Bargain Priced at only..... **$3.45**

SIGNAL CORPS MICROPHONE

A perfect Carbon Hand Mike. Light Wgt. 200 ohms, single button, press-to-talk switch. 5 ft. rubber cord, plug, dust cover. Brand New.... **99¢**

SIGNAL CORPS HANDSET

Magnetic phone, approx. 1000 ohm imped. Single button, 200 ohm mike. Push-to-talk switch. PL-55 and PL-68 plugs. New—Perfect! Great Value at.....**$3.45**

CERAMIC SOCKETS

Terrific Values!

Made by leading mfr. of quality products. All new — perfect! Superior quality. Stock up at these Terrific Newark Prices!

No. S-426 — Medium Four Pin, Bayonet Base. Mtg. Centers 2 1/16". Porcelain base, bronze side-wiping contacts. .....**39¢**

No. S-427—Steatite Wafer Socket. Standard 4 prong. Mtg. Cntrs. 1 13/32-1 13/32". **9¢**

No. S-428—7 Pin Steatite Wafer Socket for 813 Type Tube. 2 5/8" Sq. Base. **39¢**

No. S-435—7 Pin Steatite Wafer Socket for 826 and 832 Type Tubes. With etched alum. base shield. 2 5/8" square base. **49¢**

8-Prong RS58 Socket

Low loss Octal Socket, Isolantite Insulation. Ideal for H. F. or replacement. Wonderful Value. Each **14¢**
10 for $1.25

Amphenol "807" SOCKET

Excellent quality Socket Assembly. Bakelite insulation. Clamp to hold tube firmly. A Bargain at.....**19¢**

500 Mil CHOKE

For use on 10-20-40-80 Meters. Ceramic Core. Finest Quality. .... **19¢**

HAMMARLUND

FOUR-20 Transmitter — Complete CW Rig for 10-11-20-40-80 Meter Bands. 20 Watts Power Output. Tunes 4 circuits to 4 different frequencies *with one control*. Less crystal. Wgt. 31 lbs. **$120.00**

FOUR-11 Modulator — 11 watts Audio output. Perfect as speech amplifier and modulator for FOUR-20 or any other Xmtr. 41 lbs. Complete **$72.50**

TELEVISION — Complete Stock of RCA Television Components on hand. Stop in for Expert Instructions.

20% DEPOSIT REQUIRED WITH ALL C.O.D. ORDERS
Shipments FOB N.Y. or Chicago
SEND FULL AMOUNT SAVE C.O.D. CHARGES

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CHICAGO 6, ILL.

New York City Stores: 115-17 W. 45th St. & 212 Fulton St

(*Continued from page 98*)

are there has been a delay in the mails; we recall a case recently where every copy of *QST* for a certain state was lost in the mails for weeks and did the gang howl! Carriers, too, give priority to letter mail and sometimes when overburdened will let magazines slide a day or two. When making our newsdealer delivery we always retain a sufficient number of copies here to take care of members who make a prompt response to a notice of coming expiration, and it is only when a member has delayed that we have been obliged to suggest that we can probably supply him a copy of the missing issue when the newsstand returns come back.

We are doing our utmost to give good service. The margins provided by the general state of complexity in American life today are a little less than we would like. It is important for the expiring member to make a prompt renewal. If he will, we'll do our part and there will be no bump in the curve. And, with an occasional exception when we are short of a desired beginning issue, we believe that we are now giving new applicants as good service as they could wish.

CANADA WIDENS 400 MC.

Canadian station licenses for the current licensing year show the 420–430 Mc. band widened to its full contemplated extent of 420–450. Power is still limited to 50-watt peak because the altimeters still operate in this band.

It is expected that the United States will similarly widen this amateur allocation at an early date.

Atlantic City Report

(*Continued from page 31*)

sible that many alternative schemes for analyzing and for negotiating will have to be devised and put to the test before agreement is reached; it could be that the whole of the present subcommittee effort will come to naught and a completely fresh start be necessary. It can only be said that it offers promise and that it has been judged worthy of trying. In any event it is likely to be several weeks longer before a reliable judgment is possible of the chances of this conference for coming to a successful frequency agreement.

It is at this point, with the allocations subcommittee working on the first composite views, that we shall take up the story next month

Strays

A 163-page technical manual on the care, construction and operation of Army SCR-211 frequency meters is obtainable from the Superintendent of Documents, GPO, Washington 25, D.C., for 50 cents (no stamps). The publication should also prove valuable to amateurs who bought the same basic instrument in the Navy LM series In ordering, ask for "T. M. 11-300. Frequency Meter Sets, etc. July 20, 1944, with CH. 1, 2." — *Lt. Cmdr. E. B. Redington, USCGR, W1AM*

NEW IMPROVED HY75A

25% MORE POWER OUTPUT

INCREASED FREQUENCY RANGE

	Max Ratings
2-meter band	100%
1¼-meter band	85%
¾-meter band	60%

SAME LOW PRICE $3.95

COMPARISON HY75A AND HY75
VHF POWER OSCILLATOR/AMPLIFIERS

GENERAL CHARACTERISTICS

	HY75	HY75A	
Type of filament	Thor.	Thor.	
Filament potential	6.3	6.3	v
Filament current	2.6	2.6	amp
Amplification factor	8	9.6	
Transconductance	1700	2400	μmhos
Grid-to-plate capacitance	3.8	2.6	μμf
Grid-to-filament capacitance	1.8	1.8	μμf
Plate-to-filament capacitance	1.	1.	μμf
Max overall length	3⅞	3½	in.
Max diameter	1 7/16	1 7/16	in.
Bulb	T-11	T-11	
Base	Octal	Octal	

ABSOLUTE MAXIMUM CCS RATINGS

D-c plate potential	450	450	v
D-c plate current	80	90	ma
D-c plate input	36	40.5	w
D-c grid potential	−150	−150	v
D-c grid current	25	25	ma
Plate dissipation	15	15	w

USEFUL POWER OUTPUT (CCS)—TYPICAL OPERATION*

Class C unmod.—144 mc#	13	17	w
Class C mod.—144 mc#	11	14	w

CCS = continuous commercial service. *Useful power output to the load is determined by subtracting grid, circuit, and direct radiation losses from total plate power output. #Actual values using tubes in Hytron HY-Q 75 transmitter are shown.

To improve upon the HY75 was not easy. But the new HY75A does the trick. Useful power output as a class C oscillator is up 25%. Maximum plate current is increased to 90 ma. Grid-to-plate capacitance is sharply reduced to 2.6 μμf. Lead inductance is minimized. Proof of the pudding: an HY75A substituted for an HY75 in a 144-mc quarter-wave line oscillator raises the resonant frequency by 20–30 mc.

How was this accomplished? By a shorter mount, smaller elements, special high-voltage processing of the lava insulators, redesigned vertical bar grid, and zirconium-coated graphite anode. All at no extra cost to you.

When replacing the HY75, the HY75A requires only readjustment of the tank circuit and a higher value of grid resistor. For example, the HY75A can be used in the Hytron HY-Q 75 transmitter merely by retuning the shorting bar and installing a 7000-ohm grid resistor. For replacement or new vhf equipment, the rugged, instant-heating HY75A is your logical choice.

SPECIALISTS IN RADIO RECEIVING TUBES SINCE 1921

HYTRON

RADIO AND ELECTRONICS CORP.

MAIN OFFICE: SALEM, MASSACHUSETTS

ARRL-Member Party

(Continued from page 44)

"I liked the party. It seemed to move faster than the SS and had a swell bunch taking part." — W9FKI. "Needless to say, I enjoyed it a lot and made some very nice contacts with the old gang." — W8DAE.

— . . . —

The 1948 ARRL-Member QSO Party is scheduled for the week-end of January 24th–25th. If you enjoy the fun of operating in a snappy contest, don't miss it!

Fifth ARRL QSO Party

(Scores are grouped by Divisions and Sections. . . . The operator of the station first-listed in each Section is winner for that Section. . . . Asterisks denote stations not entered in contest, reporting to assure that stations they worked get credit. . . . Listings show score, number of Sections worked, number of ARRL members worked. . . .)

ATLANTIC DIVISION

E. Pennsylvania

W3BES	52930–67–370
W3BXE	35910–63–260
W3AIZ	12040–43–115
W3RJJ	10660–41–105
W3ELI	3850–25– 52
W3EON	2968–28– 53
W3GMK	2392–23– 52
W3ID	720–10– 11

Md.-Del.-D.C.

W3HUM	22790–53–190
W3HTK	14592–48–152
W3KGI	12672–48–132
W3DKT	11700–45–132
W3MJQ	11138–42–119
W3BXG	7654–43– 89
W3KHJ	7560–36– 80
W3ILD	6074–39– 78
W3ISF	1600–16– 25
W3HBT	1014–13– 14
W3MRM	198– 9– 16

So. New Jersey

W2TNN	16380–45–157
W2ZI	11430–45–102
W2BEI	1386–21– 33
W2QUH	750–15– 25

Western New York

W2PGT	19100–50–191
W2OVT	7676–38– 76
W2KEL	7524–38– 99
W1ACD/2	4960–32– 53
W2DTV	3850–25– 52
W2OYJ	3080–28– 55
W2SKC	900–18– 25
W2QKX	2– 1– 1

W. Pennsylvania

W3KWL	25694–58–221
W3MOT	11492–34–134
W3KWA	3128–23– 43
W3MUE	2438–23– 53
W3NCJ	1792–16– 31
W3YA	1452–22– 33
W3DLG	1428–21– 34
W3UVD	1079–21– 49

CENTRAL DIVISION

Illinois

W9GFF	24584–56–200
W9UTB	23072–56–206
W9GMZ	21280–56–165
W9FOI	19116–54–152
W3NF/9	18924–57–166
W9TH	18868–53–153
W9FKI	17492–57–128
W9WFS	15744–48–164
W9AMP	14352–46–131
W9MUX	12330–45–112
W9PNE	10458–42–100
W9ZAB	10440–45–116
W9ACU	10164–42– 95
W9EBX	7770–35– 86
W9DXL	7020–30– 67
W9YTV	5780–34– 60
W9WJS	2950–25– 59
W9VPD	2856–21– 43
W9ADO	2226–21– 28
W9IBU*	2120–20– 53
W9MRQ	2052–19– 29
W9QLZ	1410–15– 22
W9NON	632– 8– 16
W9JMG	544– 8– 9
W9KMS*	18– 3– 3

Indiana

W9NH	22684–59–168
W9HUV	15275–47–137
W9AMM	10660–41–105
W9NXU	10647–39–112
W9QLW	9675–43– 88
W9GFS	1159–19– 31
W9SFR	728–14– 26

Wisconsin

W9RQM	50820–66–360
W9LFK	16356–49–142
W9HUJ	9690–38–103
W9SZL	5400–30– 65
W9DKH	5238–27– 72
W9OVO	2280–30– 38
W9UIT*	8– 2– 2

DAKOTA DIVISION

North Dakota

WØPDN	8008–44– 91
WØOUH	3025–25– 35

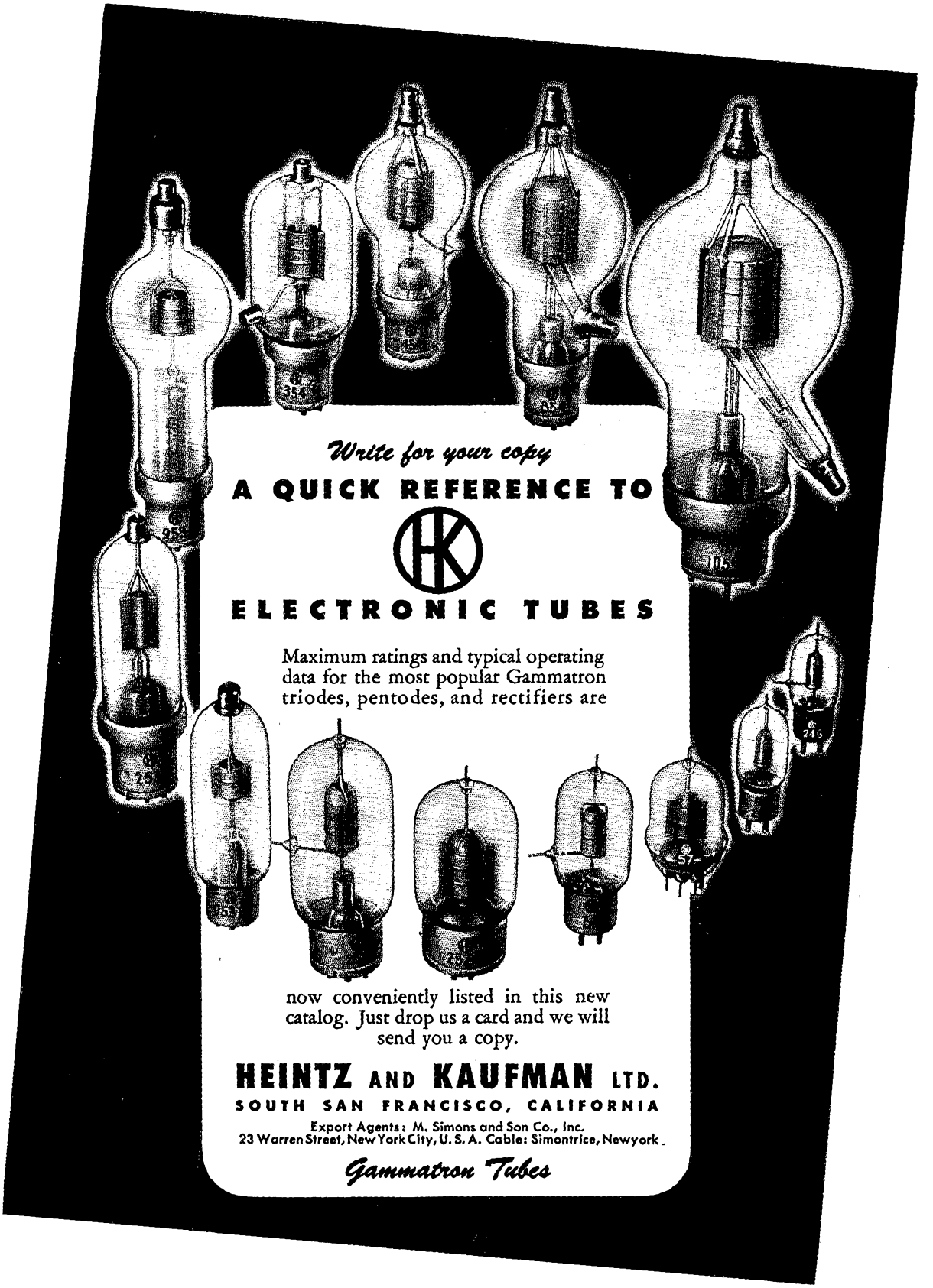
So. Dakota

WØWUU	8064–36– 87
WØOEO	40– 4– 5

Minnesota

WØJRI	33800–65–260
WØPNQ	8442–42–101
WØRJF	5040–30– 59
WØDNY	3120–26– 35
WØKPQ	2223–19– 34

(Continued on page 104)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Maximum ratings and typical operating data for the most popular Gammatron triodes, pentodes, and rectifiers are
now conveniently listed in this new catalog. Just drop us a card and we will send you a copy.
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Gammatron Tubes

(Continued from page 102)

DELTA DIVISION

Arkansas

W5LUY	15030-45-142

Louisana

W5VT	23028-57-177
W5KC	21504-48-194
W5KWY	19396-52-163
W5KUW	2943-27-55
W5BPL	60-5-6

Mississippi

W5WZ	11160-45-99
W5DNS	5670-35-81
W5IGW	4640-29-55

Tennessee

W3TWI/4	24244-58-184
W4LBA	17900-50-154
W4BAQ	3360-24-45

GREAT LAKES DIVISION

Kentucky

W9ZWR	13724-47-121
W4OMW	1836-18-26

Michigan

W8SCW	28050-55-230
W8UJ	12446-49-102
W8DNM	10560-40-132
W8TYE	5780-34-60
W8KPL	4712-31-51
W8MKZ	1968-24-41
W8NQ	836-11-13
W8ZBU	132-4-4

Ohio

W8WZ	47520-66-335
W8RSP	33852-62-274
W8UZJ	33550-61-249
W8ZFA	26564-58-204
W8NZI	21228-58-183
W8DAE	16752-48-150
W8ZAU	15000-28-75
W8LOF	11800-40-118
W8MQR	11481-43-134
W8ZU	10707-43-100
W8OQV	6120-34-90
W8PMJ	5670-35-81
W8BKE	3276-26-38
W8AL	1717-17-26

HUDSON DIVISION

Eastern New York

W2EQD	12900-43-150
W2TDT	3002-19-54
W2PHO	1368-18-26
W2IXK	936-24-39
W2BRS	24-3-4

N. Y. C. & L. I.

W2IOP	43032-66-301
W2KKU	12420-45-114
W2KTF	11248-38-123
W2JAU	9840-41-95
W2KJO	7526-41-93
W2JBP	7210-35-78
W2GP	5580-30-68
W2NCG	5372-34-54
W2TLJ	5040-35-43
W2EGG	4026-33-61
W2IOG	2350-25-47
W2GTL	1280-20-32
W2BO*	18-3-3
W2ETT	8-2-2

Northern New Jersey

W2BBK	23432-58-177
W2EQS	22240-51-195
W2DRV	15400-44-175
W2ANW	14124-44-136
W2GVZ	10528-32-139
W2KHT	9328-44-106
W2CWK	9216-36-103
W2LJR	9036-36-101
W2NIY	9010-34-108
W2BRC	7532-34-86
W2NWA	6360-30-81
W2IAT	4312-28-52
W2LQP	2394-19-38
W2LXI*	128-8-8

MIDWEST DIVISION

Iowa

WØCFB	22400-56-200
WØQVA	9216-36-103
W9ZSM/Ø	40-4-5

Kansas

WØLJK	20488-52-172
WØKEI	10277-43-94
WØVBQ	9288-43-83

Missouri

WØGBJ	22776-52-194
WØENP	21112-56-157
WØARH	9348-41-89
WØGHD	7912-43-92
W9ZZW	4288-32-67
WØKIK	132-6-11

NEW ENGLAND DIVISION

Connecticut

W1BIH	36704-62-271
W1RY	24426-59-208
W1CA	17238-51-144
W1LHE	15040-47-160
W1BHM	7622-37-78
W1JHN	3896-28-71
W1APA	1190-14-17
W1TS[1]	45500-65-271
W1UE[1]	33540-60-255
W1DX[1]	19176-51-163
W1AW[1, 2]	6088-32-80
W1NJM[1]	4888-26-69
W1KKS[1]	4524-29-53
W1LVQ[1]	2088-18-33
W1EH[1]	1530-15-26

Maine

W1GKJ	23900-50-214
W1NXX	19764-54-158
W1MDF	14085-45-133
W1OIL	4128-24-61
W1NKM	3600-24-50

E. Massachusetts

W1LLX	25422-57-200
W1OJM	23509-51-205
W1KMY	2806-23-36
W1PPB	1506-15-27
W1MD*	462-7-8
W1KUA*	32-4-4

W. Massachusetts

W1JYH	29160-54-245
W1EOB	22176-56-173
W1EMG	1500-15-25
W1BVR	1496-17-19
W1BDV	1012-11-21
W1IIP	836-11-13

(Continued on page 108)

[1] Hq. staff member, not eligible for awards. [2] W1JJR, opr.

NOW GIVE THE WORLD A GOOD GOING OVER!

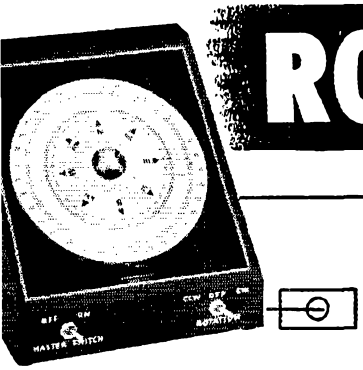
NTINUOUS
OTATION

FOR
AL 10-20λ
BEAMS

★ GET WHAT YOU WANT!
★ WHERE YOU WANT!
★ AND WHEN YOU WANT IT!

That's the Selectivity you get with . . .

ROTO-BEAM ANTENNA ROTATOR



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communication with the
SYNCHRO-ANTEN-A-CATOR
at your finger-tips

With just a flick of a switch the ROTO-BEAM points your antenna to any point on the globe . . . holds it rigidly in position . . . even high winds cannot move it. Constructed to easily handle an 18′ 6″ boom carrying 3-element 20 and 4-element 10 arrays. Continuous rotation with accurate tracking direction indicator. Two separate rf feeds—one for 10; the other for 20. Simplified impedance matching instructions furnished. With the ROTO-BEAM you will have the envied clarity and strength of signals similar to such well-known stations as: w1CPI, w1NWO, w2RID, w2AQK, w3DC, w3FUV, w4JML, w4JXM, w5DSL, w6OHI, w6DSS, w8LAW, w8PDD, w9UZ, w9AAE, wØJED, wØJUZ, xe1SE, k17JF, g4KC, and many others. Available for prompt shipment thru your jobber or direct. Detailed information on the ROTO-BEAM, aluminum boom and elements, and other beam accessories will be sent upon request.

ORDON SPECIALTIES CO., 823 S. WABASH AVE., CHICAGO 5, ILL.

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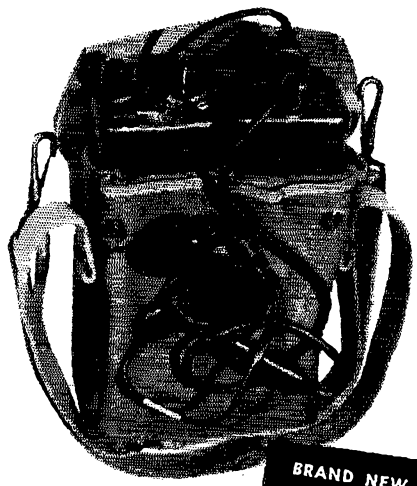
*The one and only original RADIO SHACK is located in Boston and has no branches or affiliates elsewhere.

At Last! A PORTABLE RECEIVER for 5-13 Mc!



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$11.95
KIT OF BATTERIES
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* Only 8"x6"x1⅞"
* Total weight — 5⅜ lbs.
* Extremely sensitive
* Ideal for 40-meter CW and European broadcasts

Built by Emerson for the U.S. Navy, these sturdy, compact receivers in water-tight housings give you sensitivity and convenience at low cost. Receiver and power pack (holding two standard 1½ volt and one 67½ volt batteries) fit in a durable canvas case with adjustable carrying straps. A short piece of bus wire is ample antenna. Furnished with tubes, carrying case, instruction manual, and earphones—

"It Seems to Us"

Reprinted from QST, May 1947

HO FOR 420 MC.!

There's a valuable little number in war surplus now becoming available on the amateur market. It's the IFF set known as the BC-645A. You've probably seen it, or at least pictures of it in *QST* — it's the pretty little thing about the size of a portable typewriter case, full of tubes and relays and miniature long-lines and ending up on the transmitter side with a doorknob. Its value to us lies in the fact that it makes available, at very modest cost and a conversion job not too tough to contemplate (as recently outlined in our pages), a 'phone or i.c.w. transmitter and a superhet receiver for the 420–450 Mc. band. It can thereby give us in ... band a start ...

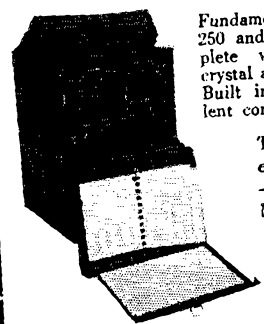
$16.95

houses. With their auxiliaries they cost something over $2,000 apiece. Sixty million for insurance on the shelf.

The 420 band not only affords QRM-free operation but offers an excellent spot for rag-chewing local nets, which can be lots of fun when your conscience doesn't bother you about jamming a busy band with endless smalltalk. The advent of the BC-645A makes it possible for every amateur to contemplate a set for this purpose.

Here's your chance to get a brand-new BC-645-A at less than the cost of the tubes alone. One of the most beautifully made sets we've ever seen, it gives you a "hot" transmitter-receiver for phone or ICW on 420 mc by the easy conversion described in Feb. QST, p. 15. We have these sets, just as supplied by G. E., in stock for immediate shipment — so you can get on 420 right away. At this low price, please send full amount with your order.

BC-221 AK FREQUENCY METER



Fundamental ranges are 125-250 and 2000-4000 kc. Complete with tubes, original crystal and calibration charts. Built in modulation. Excellent condition. Order today!

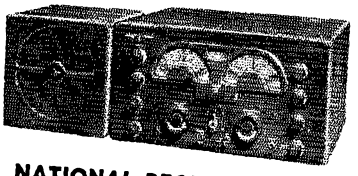
The BC-221 makes an exceptionally fine VFO — W7NU tells how in March QST.

$79.50

Speed delivery and save C. O. D. charges — send full amount with order. 50% deposit required on all C. O. D. orders.

SPECIAL VALUES in REGULAR and SURPLUS GEAR!

LATEST RECEIVERS



NATIONAL RECEIVERS

NC-173	$189.50 complete
NC-240D	241.44
NC-46	107.40
Model 1-10A	67.50

HAMMARLUND RECEIVERS

HQ-129X	$173.25
SP-400X	342.00

R M E RECEIVERS

R M E-84	$98.70
R M E-45	198.70

HALLICRAFTERS RECEIVERS

SX42	$275.00
S40	89.50
S38	47.50

All sets complete with speakers except SX42 and 1-10A.

IMMEDIATE DELIVERY

Time payments available on all standard receivers. $5.00 deposit will hold receiver of your choice.

We also distribute the complete line of Millen equipment, Sonar apparatus, Supreme Xmtrs, Collins receivers and transmitters.
Write us for your every requirement.

Immediate Delivery

FROM STOCK ON BRAND NEW

HALLICRAFTERS HT-9 TRANSMITTERS

Coils available for all bands
10 meters $16.50 40 meters $11.75
20 meters 15.50 80 meters 10.35
Time payments if desired — write for details.

$350.00

Price, complete with tubes, less coils and crystal

HEAVY-DUTY 25-FOOT POWER LINE CORD WITH PLUGS
Handles up to 20 amperes; especially useful with PE-110 power supply. Easily worth $10.00—our low price, only $4.95.

SUPER SPECIAL BRAND NEW 807's
Westinghouse JAN-inspected
70c each
3 for $1.95
6 for 3.75
THE BUY OF A LIFETIME

GOVERNMENT SURPLUS TUBES

Type	Net
2AP1A	$5.25
2C34	1.12
2C40	2.62
2D21	.60
35T	1.95
VR75	.90
VR90	.75
VR105	.75
VR150	.75
3B24	3.00
3C24	1.20
5CP1	6.00
5CP7	9.00
5U4G	.45
5V4G	.85
5Y3GT	.28
5X4G	.55
5W4	.55
6AK5	.90
6C21	13.50
75TL	2.25
250TH	9.00
304TH	$9.95
801	1.72
802	1.57
803	9.00
809	1.79
811	1.95
813	6.75
814	4.50
8 36	1.50
840	2.70
866A	.75
872A	2.25
874	1.95
914	5.62
860	3.00
923	.45
931A	1.87
991	.30
1614	1.50
1619	.75
1624	.90
1625	.75
1626	.60
1651	.75
8005	$3.15
5R4GY	.94
8000	6.00
956	.75
957	.75
958	.75
959	.75
954	.75
955	.75
9001	1.05
9002	.90
9003	1.05
9004	.90
9005	1.05
9006	.60
3B24	3.00
832	2.25
(VT118)	
810	2.62
3C24	1.20
3BP1	3.00
826	2.25
884	.75
(VT222)	
2X2A	.90
815	2.25
(VT287)	
3E29	3.00

XMTG CAPACITORS

Nationally known, high-voltage, oil xmtg capacitors, all in rectangular cases, with stand-off insulators.

Mfd.	Volts d-c	Net Ea.	Mfd.	Volts d-c	Net Ea.
4	600	$0.71	2	1500	$1.20
6	600	.79	4	1500	1.59
8	600	1.19	6	1500	1.79
10	600	1.29	2	2000	2.95
2	1000	.71	8	2000	3.75
4	1000	1.19	2	2500	3.25
8	1000	1.49	2	3000	3.45
10	1000	1.79	4	3000	4.25

BC-404 RECEIVER for 110 volt A-C OPERATION

Here's a sensitive, superheterodyne receiver that offers a big saving for your 2-meter work. A simple conversion job puts it in the 2-meter band — and you don't have to worry about power packs because it's already powered for 110-volts a-c. Complete with tubes and 110-volt a-c power supply . . . $19.95.

The RADIO SHACK *Corp.*

CABLE ADDRESS · RADIOSHACK
167 WASHINGTON ST., BOSTON, MASS., U.S.A.

(*Continued from page 104*)

W1DMS	570–15– 19
W1PLJ	440–11– 20
W1MEG	336–12– 14
W1JGY	168– 7– 12
W1BB	16– 2– 4
New Hampshire	
W1BFT	33822–62–248
Rhode Island	
W1LWA	33804–59–253
NORTHWESTERN DIVISION	
Alaska	
KL7AD	18700–55–170
Idaho	
W7EMT	5994–37– 56
W7IY/7	8– 2– 2
Montana	
W7EPM	642–16– 20
*Oregon	
W7ECI	12384–43–119
K7DIS/7	5928–38– 78
W7HAZ	1800–18– 25
Washington	
W6UTV/7	18360–54–170
W7GEW	10464–48–109
W7CZY	9216–48– 71
W7JHA	340–10– 17
W7CWN	32– 4– 4
PACIFIC DIVISION	
Hawaii	
K6CGK	10920–42–105
Nevada	
W7ONG	20250–54–165
W6JQX	540–15– 18
W7CX	260–10– 13
Santa Clara Valley	
W6RDP	11280–47–122
W6PBV	5474–34– 57
W6HJP	1368–18– 38
East Bay	
W6IPH	12648–51–124
W6OMR	8692–41–106
W6TI	5244–34– 58
W6EY	2438–23– 28
W6EJA	1118–13– 18
San Francisco	
W6BIP	20768–59–151
W6VER	4160–32– 65
Sacramento Valley	
W6TN	10578–43– 98
W6OJW	5376–42– 64
W6MYT	1118–13– 18
W6REB	640–16– 20
San Joaquin Valley	
W6SRU	13038–53–124
W6AFH	7548–37– 77
ROANOKE DIVISION	
North Carolina	
W4FXU	18824–52–181
W4ABT	18142–47–193
W4KJS	6270–33– 70
South Carolina	
W4FNS	918–17– 27
Virginia	
W4KFC	48230–65–346
W4IPC	9648–36–109
W4SU	5040–35– 72
W4BTO	3596–29– 62
W4FF	1972–29– 68
W4IPS	108– 2– 2
West Virginia	
W8JM	11800–50– 93
W8JJA	5600–35– 80
ROCKY MOUNTAIN DIVISION	
Colorado	
W6SJT	5848–34– 61
Utah-Wyoming	
W7JHN	7482–43– 87
W7KIY	2100–21– 25
SOUTHEASTERN DIVISION	
Alabama	
W4BGO	15180–46–140
Eastern Florida	
W4BRB	31842–61–236
W4BYF	11316–41–113
W4AKV	8436–38– 85
W4DQW	6704–36– 82
W4AWS	736–16– 23
W4LAP	544–16– 17
W4BXL	52– 1– 1
Western Florida	
W4AXP	3780–27– 45
Georgia	
W4DXI	12880–46–140
W4FIJ	11562–41–116
W4AGI	8901–43–103
W4IRT	210– 7– 15
W4EYK*	52– 1– 1
West Indies	
KP4KD	1006–12– 17
SOUTHWESTERN DIVISION	
Los Angeles	
W6HZT	45408–66–319
W6JQB	832–26– 32
W6AM*	2– 1– 1
Arizona	
W7QAP	22344–57–197
San Diego	
W6MI	11340–45–101
WEST GULF DIVISION	
Northern Texas	
W6EPZ/5	30056–61–248
W5AWT	20862–57–160
W5FRD	18000–50–180
W5LIU	10340–44–118
W5BYX	8288–39– 81
Oklahoma	
W5AQE	10752–42–103
Southern Texas	
W5EUK	4998–34– 74
CANADA	
Maritime	
VE1HJ	12986–43–126
VE1CU	10092–42–130
VE1JK	3212–22– 48
VE1FB	336–12– 15

(*Continued on page 110*)

REGULATION

§12.136. LOGS. Each licensee of an amateur station shall keep an accurate log of station operation, including the following:

(a) The date and time of each transmission. (The date need only be entered once for each day's operation. The expression "time of each transmission" means the time of making a call and need not be repeated during the sequence of communication which immediately follows; however, an entry shall be made in the log when signing off so as to show the period during which communication was carried on.)

(b) The signature of each licensed operator who manipulates the key of a radiotelegraph transmitter or the signature of each licensed operator who operates a transmitter of any other type and the name of any person not holding an amateur operator license who transmits by voice over a radio-telephone transmitter. The signature of the operator need only be entered once in the log, in those cases when all transmission are made by or under the supervision of the signatory operator, provided a statement to that effect also is entered. The signature of any other operator who operated the station shall be entered in the proper space for that operator's transmission.

(c) Call of the station called. (This entry need not be repeated for calls made to the same station during any sequence of communication, provided the time of signing off is given.)

(d) The input power to the oscillator, or to the final amplifier stage where an oscillator-amplifier transmitter is employed. (This need be entered only once, provided the input power is not changed.)

(e) The frequency band used. (This information need be entered only once in the log for all transmission until there is a change in frequency to another amateur band.)

(f) The type of emission used. (This need be entered only once until there is a change in the type of emission.)

(g) The location of the station (or the approximate geographical location of a mobile station) at the time of each transmission. (This need be entered only once provided the location of the station is not changed. However, suitable entry shall be made in the log upon changing the location. Where operating at other than a fixed location, the type and identity of the vehicle or other mobile unit in which the station is operated shall be shown.)

(h) The message traffic handled. (If record communications are handled in regular message form, a copy of each message sent and received shall be entered in the log or retained on file at the station for at least 1 year.)

(*Continued from page 108*)

Ontario		*Alberta*	
VE3EF	28329-57-224	VE6ZM	6068-41- 74
VE3WY	23856-56-213		
VE3IJ	16072-49-164	*British Columbia*	
VE3APF	11662-49-119	VE7EH	10442-46-114
VE3ACB	10320-40-104	VE7AHP	2465-29- 43
VE3BDX	7998-43- 91		
VE3AMK	4020-30- 67	*Manitoba*	
VE3AHV	3885-35- 56	VE4PK	11500-50-115
VE3JT	2016-24- 42	VE4DG	1755-27- 33
VE3ATR	1485-15- 25		
VE3QK	1016-18- 31	*Saskatchewan*	
Quebec		VE5HB	880-16- 29
VE2SU	4743-31- 77	VE5AT	780-15- 26
VE2OL	3915-27- 48	VE5MW	98- 7- 7

Foreign Notes

(*Continued from page 48*)

EI6F; honorary secretary, A. C. Woods, E13L; honorary treasurer, T. L. Green, EI9N; QSL manager, R. Mooney, E12P; honorary auditors, M. Collins, EI3N, and P. A. Duggan.

The society reports an increase in licensed amateurs. Even though expenses had increased substantially, the society showed a greatly-improved financial condition.

MIDDLE EAST

The War Office at London advises that British military authorities are now issuing calls to duly-qualified servicemen in the Middle East, consisting of prefix followed by not more than 3 letters. Prefixes are alloted as follows: MD1, Cyrenaica; MD2, Tripolotania; MD3, Eritrea; MD4, Somalia and MD5, Suez Canal Zone.

DENMARK

The 1947 *Experimenterende Danske Radioamatorer* summer camp will be held July 6th to July 13th, inclusive. Location is on the south coast of Funen, Denmark's central island. As usual, E.D.R. expects visitors from abroad. OZ amateurs are now permitted the use of the entire 14000–14400-kc. band. Minor extensions of other bands also have been authorized.

JAPAN

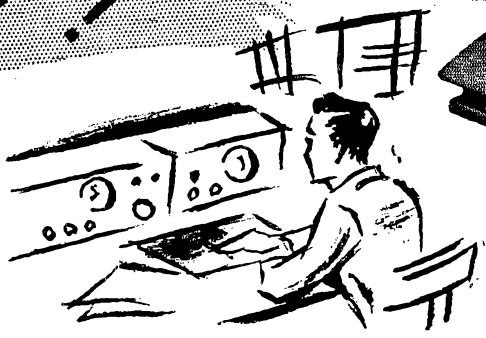
The *Japan Amateur Radio League*, reorganized late last year, has elected Dr. Hidetsugu Yagi, inventor of the Yagi antenna, as its president. At present, Japanese amateurs limit their activities to research and listening to fellow amateurs in other parts of the world. One of the immediate objectives of J.A.R.L. is to obtain licenses for its members to operate stations in event of some national emergencies. Members stated that they could have rendered a great public service during the recent earthquake and tidal-wave disaster had they been permitted to transmit.

Here it is . . .

WEBSTER CHICAGO

WIRE RECORDER

FOUNDATION UNIT



MODEL 79

$90.00 LIST

. . . hook it up yourself

This is it — the wire recorder foundation unit you've been waiting for. Use it as auxiliary equipment for your rig — record messages — relays — programs . . . use it to check your speed and accuracy with the key. Build a complete wire recorder or add this unit to your present system. You can record music or speech up to a full hour on the Webster-Chicago Model 79 Wire Recorder. Wire can be "erased" and recorded again as often as you wish.

Complete unit consists of a wire transporting mechanism, a triple-purpose recording head (records, erases, plays back) oscillator coil, 15-minute spool of wire and necessary connecting wires for easy installation.

Made by the makers of famous Webster-Chicago Record Changers.

SEE YOUR SUPPLIER

WEBSTER CHICAGO

The Choice of Music Lovers

5610 BLOOMINGDALE AVENUE • CHICAGO 39, ILLINOIS

How's DX?

(*Continued from page 51*)

C/o PM, San Francisco, Calif. . . . . Cards for HZ2TG must go through WØZRA and he operates on 14 Mc. nightly, according to W1EZ . . . . . W1KKS sends along: W1PHE/C1, 146–139th Sqdn., AACS, APO 933, C/o PM, San Francisco, Calif. . . . . W6DTY comes through with: VS1BY, Singapore District Signal Regt., Singapore, Malaya; C1AN, Box 409, Shanghai, China; KZ5GD, G. C. Dunlap, Box 28, Balboa Heights, Canal Zone . . . . . From W4BRB: ZC6DD, D. D. Higley, Postal Unit 6, Airborne Division, MELFI, Haifa, Palestine . . . . . A note from W2HHF tells that YI6C will QSL his contacts if a card is sent to F/Sgt. Worthington, J., Nr. 51 M.Q. RAF, Leeming, Yorkshire, England . . . . . W5CXS contributes: HZ2BN, Box No. 4, Safina, Arabia.

Tidbits:

While QSO W3DPA the other night, ZD2K told Jack that burglars had broken into his shack and stolen all his clothes, forcing him to navigate with a barrel. The thieves didn't touch any of the radio gear, fortunately for the DX brethren. KL7CF tells us that he has sent 524 cards and received 143 in return. If we Ws did less griping and more card mailing everyone would be happier . . . . VK2CI, after years of trying, finally worked WAS using 24 watts and a tilted V-beam, the apex being forty feet high and the ends being tied to fence posts . . . . . W6SPQ/J8, Seoul, Korea, is now at home and will acknowledge all QSLs . . . . . Our inquiry on W6TMY/Saipan has only brought out the fact that cards are being received from him, mailed in Myrtle Beach, S. C. Anyone have any concrete info? . . . . . VS7JR informs us that if any W or VE cares to try a shot on 40 c.w. or 'phone let him sing out between 11:30 A.M. and 4:30 P.M. GCT. He can arrange tests and skeds on 28 Mc. if anyone is interested.

Gang, here is a chance to make an old-timer happy. The present VS2AA would be extremely grateful to receive replacements of QSLs which the Japs looted. The two calls concerned are VS2AF and VS1AA, and the operating period is 1934 to 1939. Send the replacements to: J. MacIntosh, Postal Department, Kuala Lumpur, Malaya. Mr. MacIntosh informs us that all VS3s are pirates and that VS1AV, CJ, DA, FB, MU, OM, PK, RI, RS, TU, QB, QC, and VS2AZ, BZ, CK, CO, ER, FP, JH and RM, are all phoneys. Oh, brother, and me with over half of 'em worked! . . . . . G6BY and W1DQ have celebrated their 550th 'phone QSO, amounting to some hundreds of hours since the postwar resumption on 14 Mc. Contacts have been maintained with low power (maximum of 120 watts at G6BY) at least once every 24-hour period, despite conditions . . . . . From ZS6BJ comes word that there might be a DX station on Tristan

(*Continued on page 114*)

SONAR LEADS THE FIELD IN NBFM

SONAR, Originator and leader of NBFM for the Ham, uses an exclusive NBFM† circuit* employing Phase Modulation (giving symmetrical sidebands) and extends to the user the following features . . .

- **POSITIVELY ELIMINATES BCI.**
- **MORE CARRIER POWER OUTPUT WITH SONAR NBFM THAN WITH AMPLITUDE MODULATION.**
- **LESS QRM RESULTING IN BETTER DX.**
- **CAN BE RECEIVED ON ANY AM RECEIVER.**
- **ELIMINATES COSTLY AM MODULATORS AND COMPONENT POWER SUPPLIES.**
- **FREQUENCY STABILITY IS AS GOOD AS THE XTAL OR VFO USED.**

These features of SONAR NBFM have been discussed at length in articles in QST (page 40 Oct. 46–page 11 Jan. 47–page 28 Feb. 47–page 30 Mar. 47) and CQ (page 7 Mar. 46–page 30 Oct. 46–page 9 Apr. 46). Application of this exclusive SONAR circuit, to convert your CW or AM rig to NBFM, depends on your needs.

THE XE-10, first of the SONAR products, was designed to give the Ham a modulation unit for his complete AM rig. The XE-10 will convert any CW rig (regardless of power) to NBFM. Your VFO can be used to regulate the frequency input to the XE-10 or the xtal can be inserted directly into the XE-10.

THE VFX 680 was designed to meet the demands for a stable VFO-xtal exciter and also incorporates the exclusive SONAR NBFM circuit* giving a complete 4 to 6 watt all band exciter, with NBFM phone and/or straight CW. The VFX 680 also has VFX (ruberizes any cut xtal) giving xtal stability with a variable signal. An ideal "pre-stage" for that new rig.

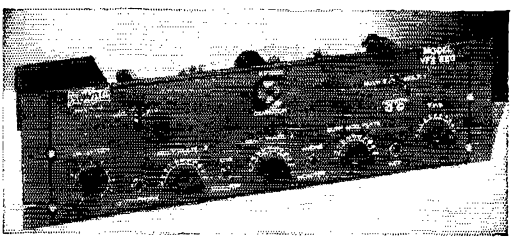
THE MB-611 is another SONAR product incorporating NBFM, designed for mobile or fixed operation, on 6 to 11 mtrs—40 watts input with a pi-network to match any antenna. Further details on this xmitter and other new SONAR developments will be found in future advertisements. The engineering staff at SONAR has many new designs including low, medium, and high power xmitters.

*Pat. Pend.
†NBFM is at present permitted on 10 meters and above 29 megs—in Canada on 27.395 to 27.455 and 29.5 to 29.7 megs.

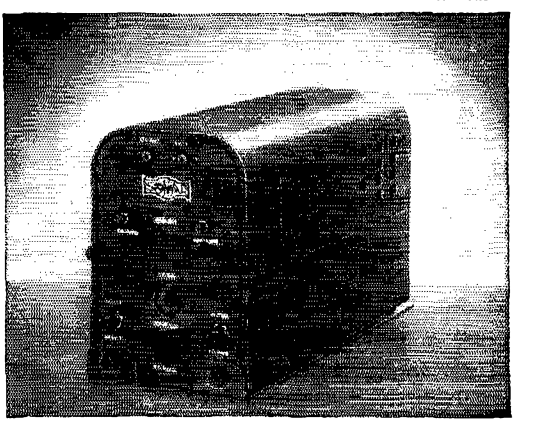
Sonar Representatives in Canada—Frank's Agencies, Alberta—Measurement Engineering, Ltd., Toronto.

SEE THEM AT YOUR DEALERS

XE-10 AMATEUR NET **$39.45** Complete Less Xtal



VFX-680 AMATEUR NET **$87.45** Complete Less Xtal



MB-611 AMATEUR NET **$72.45** Less Pwr Sup. and Xtal

SEE YOUR DEALER OR WRITE US DIRECT

SONAR Radio

SONAR RADIO CORP. Box 445 BKLYN 1, NEW YORK

NARROW BAND FM

(Continued from page 112)

de Cunha Island in the near future. Who will be first? . . . . . CN8ED wants the gang to know that he is in the process of mailing 650 cards to W contacts . . . . . W8OFQ, now in Vienna, says cards from LZ1XX are forthcoming a few every week. That's certainly welcome news to us all.

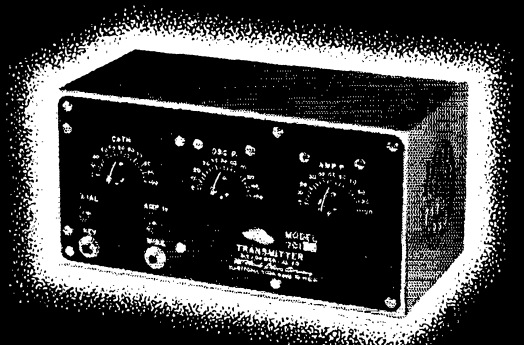
In May we mentioned that a certain VP2's QSLs wouldn't count for DXCC, the reason being they were not properly made out. A QSL card should show whether the contact was 'phone or c.w., because of the two types of WAC, WAS and DXCC certificates available; and showing the band is important too, because many workers for WAS like it all for one band. There is also a special 28-Mc. endorsement for WAC. Signal report is important because some RSGB awards (WBE and BERTA) have a minimum signal requirement — QSA 3. Also, a card should show "worked" so as not to confuse it with a heard-card acknowledgment . . . . . If you have noticed the scarcity of SV stations on the bands lately, it's because the gang over there have gotten together with the government, in an effort to draft legislation making all amateur operation legal. The voluntary QRT took place on April 10th. Here is hoping our SV friends will achieve this long-awaited legalization. This info was received from one of the most prominent SV gang down through the years, who says he has and will QSL every QSO he had. We're withholding his call and name for obvious reasons. A million thanks, OM . . . . . W6DTY sends in a swell suggestion: When purchasing a new *Call Book*, why not send the old one to some DX station, who would rather have an old one than none at all. Good idea! . . . . . We learn via W5ACL that Bernie, W3EKK/VK9, is about to show up in another DX location. How about making that Tibet, OM? . . . . . The gang up around Rochester, N. Y., have started a DX club, patterned after the Northern Calif. club. At present the first qualification is a minimum of 25 countries worked. As W2PUD and W2PUN put it, it's a swell way to swap tales and find out the latest juicy ones getting through. Any others around the country? If so let's have the info . . . . . HZ1AB tells us that the Ws calling them sound like "bricks falling on a tin roof during a thunderstorm" and suggests we spread out. Yeah, *spread out!* . . . . . PAØLR has a novel way of QSLing: a blue card for 10, red for 20, green for 40, and orange for 80. Anyone got 'em all? . . . . . 73 till next month.

Strays

Hams who served as lieutenants or ensigns during the recent conflict can convert their discarded gold and silver bars into handsome, inexpensive call-letter lapel pins, simply by having a jeweler engrave their call thereon.

—*W2TWR*

SILVER *Presents...*

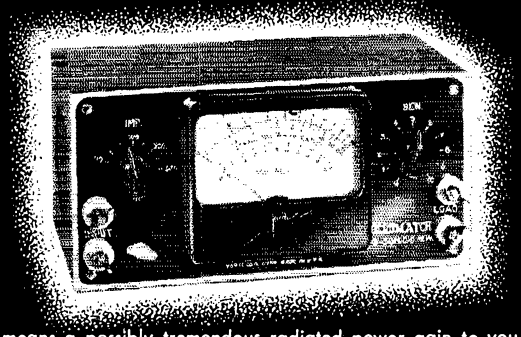


MODEL 701 Transmitter, 80 through 6 meters, crystal controlled, 75 watts CW input, 28 watts 100% modulated AM phone, built-in modulator — yet only $36.95 net ready to go, less four tubes, coils and the power supply you probably have . . .

We think that's quite a value . . . was worth waiting for. We thank you for your patient wait. Today MODEL 701 is here, at your favorite jobber — all ready to get going for you.

Whether you want what we believe is the smallest, most compact — only 5" x 10" x 5¼" standard "ATOM-X" size and construction — transmitter you can buy for portable/mobile operation, or whether you want a miniature "power-house" for your main station, we think you'll fall in love with MODEL 701 when you see it. On 6 meters as on 80, it's a little honey. Run it crystal control, drive it with a v.f.o., use it to drive the biggest final the law allows, MODEL 701 is still an outstanding value.

MODEL 908 "MICROMATCH"



When QST said *"simply astonishing"* to describe the "MICROMATCH" standing-wave-ratio and r.f. power meter in its April, 1946 issue, there could be no doubt that here was something of tremendous value. Already hundreds in use prove it to be probably the greatest transmitter power gainer you can buy. "MICROMATCH" connected in your antenna feeders — in any link coupling lines — lets you measure the standing wave ratio — power your transmitter generates but *isn't putting into your antenna.* With "MICROMATCH" you can tune your antenna to look like a pure resistive load — easily and quickly. This means a possibly tremendous radiated power gain to you — possibly as much as many hundred percent! Yet MODEL 908 "MICROMATCH," licensed and approved by inventor M. C. Jones, is only $29.90 net — at your favorite jobber. In "ATOM-X" size and style, range 50 through 300 ohms impedance, 10 through 1000 watts power, with big, open 4⅝" meter, it will pay its way for you as will no other transmitter investment.

Mail postcard for NEW 16-page, just-released catalog of transmitters, receivers, xtal-controlled v.f.o., test equipment, etc.

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McMurdo Silver Co., Inc.

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Hints and Kinks

(Continued from page 55)

in Fig. 2 was designed for insertion in the transmission line between the final amplifier and the antenna. Circuit values are given for 72- and 300-ohm lines. The filter cannot be used in tuned-feeder systems, but in stations where this method of feed is used, it can be inserted in a link line of suitable impedance between the final amplifier

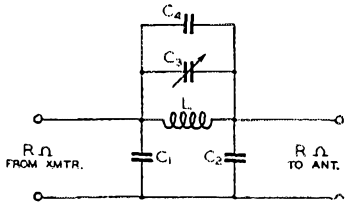


Fig. 2 — A low-pass pi-section filter for attenuation of second-harmonic radiation from 75-meter 'phone transmitters. Two sets of values are given below, one for 72-ohm lines, the other for 300-ohm lines.

For 72-ohm lines:
C_1, C_2 — 400 $\mu\mu$fd., ±5%, mica.
C_3 — 100-$\mu\mu$fd. variable.
C_4 — 50-$\mu\mu$fd. mica.
L — Barker & Williamson "Miniductor" No. 3007 with 2 turns removed. (30 turns, ⅝-inch diam., 2 inches long. Approx. 4.1 μh.)

For 300-ohm lines:
C_1, C_2 — 100 $\mu\mu$fd., ±5%, mica.
C_3 — 50-$\mu\mu$fd. variable.
C_4 — (not used).
L — Barker & Williamson "Miniductor" No. 3008. (64 turns, ⅝-inch diam., 2 inches long. Approx. 18 μh.)

and the antenna tuner. Component values were derived from the formulae contained in *The Radio Engineers' Handbook*,[1] and are selected to provide maximum attenuation at the second harmonic of a 3925-kc. signal. Adjustment over a moderate range either side of this frequency is provided by means of a 100-$\mu\mu$fd. trimmer condenser, C_3.

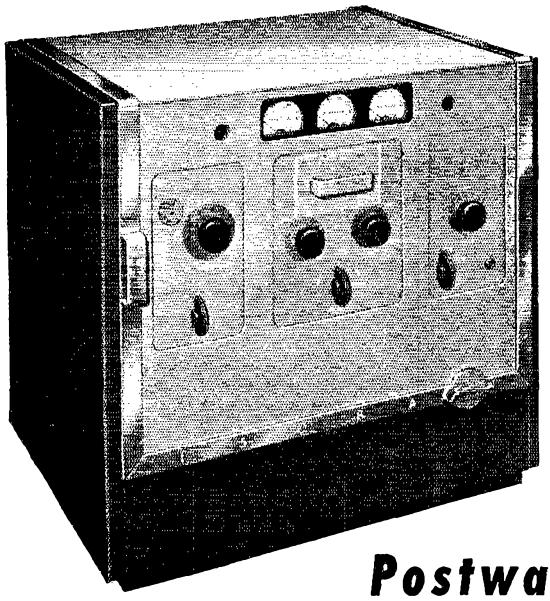
The cut-off frequency of the filter is well above 4 Mc., assuring smooth operation in the 75-80-meter band. In operation, the trimmer C_3 is adjusted to produce minimum response while a receiver is tuned to the second harmonic of the transmitter.

All parts used are commercially available, and construction and adjustment are simple. — *W. E. Behnken, W4ESP, W4HBB*

[1] Terman, *Radio Engineers' Handbook*, 1st edition, 1943, p. 228.

Strays

U.S. amateurs are reminded that the postage on QSL cards mailed to Canada is two cents — not one cent as so many believe. A card carrying insufficient postage is subject to delay at the Canadian end while the mailman goes through the embarrassing formality of collecting the extra postage from the VE addressee.



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NEW
Postwar TRANSMITTER

● How many transmitters have you seen or read about in advertisements that have really embodied a new idea . . . a basic departure from conventional design? And have you ever before heard of a transmitter that was purposely engineered to enable you to keep it up-to-date with every new development in communication engineering without having to discard it and buy an entirely new one?

● We at Temco, who have been Radio Amateurs all our lives, have been wrestling with the problem of equipment obsolescence for over 10 years. Our wartime experience assisted us in evaluating the many engineering, operational and production advantages to be gained from the use of small sectionalized units embodying instantaneous plug-in construction. We have applied this tried and proven principle in the design of series RA Communication Equipment.

● We determined to accomplish two important things in departing from conventional practice. First, we wanted to completely eliminate the factor of obsolescence so that in buying a Temco you would always be able to bring your transmitter up-to-date at a minimum cost without having to discard your entire equipment. By means of plug-in chassis unit construction and standard internal cabinet design we have achieved *this aim*. With each new development in radio communication we will produce additional chassis units engineered to enable you to make the necessary additions and substitutions in your TEMCO so that it will be kept up-to-date . . . and that with a minimum investment. Second, we wanted to reduce costs so that more radio amateurs could own a TEMCO TRANSMITTER . . . but this had to be accomplished without lowering the high standards of Temco Craftsmanship which distinguishes Temco Communication Equipment the world over. That meant unusual production economies *Plug-in chassis provided the answer.*

● To make this possible we isolated the basic sections of a transmitter circuit into the primary units, namely: Oscillators, Wide Band Multipliers, Power Amplifiers, NBFM and AM Modulators, Low Voltage and High Voltage Supplies, each unit carefully designed so that it could function in combination with others to form one of several complete transmitters, as follows:

A. 150 Watt CW
B. 250 Watt CW
C. 150 Watt CW & AM Phone
D. 150 Watt CW & FM Phone
E. 250 Watt CW & AM Phone
F. 250 Watt CW & FM Phone

● Not only will you be able to buy the transmitter tailored to your requirements but your order will be filled *while you wait* at your dealer. As quickly as a cabinet can be removed from its wraps (cabinets are already prewired) and the individual chassis units taken from stock and plugged into the cabinet, that is how quickly your order will be filled. And here is another outstanding advantage in owning a TEMCO RA. Suppose you start off with a 150 or 250 Watt CW Transmitter. Later you want to increase the power or add either NBFM or AM Phone or a VHF Unit. All you have to do is buy the necessary additional chassis units, plug them into position and presto you have your new transmitter. Could anything be simpler . . . more flexible . . . or as versatile?

● The new Series RA Catalog fully describes these Basic Chassis . . . gives complete technical information regarding design and operation, shows how they are combined to make up the 6 Temco RA Transmitters. All units are priced and you can figure the cost of making up the transmitter yourself. See these chassis and completed transmitters on display at your dealers and get your copy of the RA Catalog. Be one of the first amateurs in your district to own and operate the TEMCO RA, the Transmitter that ALWAYS KEEPS YOU UP-TO-DATE.—PROTECTS YOUR INVESTMENT IN AMATEUR TRANSMITTING *EQUIPMENT.*

TEMCO
RADIO COMMUNICATION EQUIPMENT

TRANSMITTER EQUIPMENT MFG. CO., Inc. 345 HUDSON STREET NEW YORK 14, N. Y.

World Above 50 Mc.

(Continued from page 60)

KH6DD is still at it, and W6VDG/KW6 is reported to be on 6 with a 500-watt rig. W7ACS/KH6 is back in the Islands, and KH6DD is taking a portable job along on his various Pacific Island hops. On his last trip to Guam he heard the Hawaiian Islands 'phone circuits on 47 Mc., so it appears that the KH6-KG6 path may be broken down.

In the heat of a sporadic-*E* skip session, most of the gang prefer to use voice, which is quite OK, most of the time, as signals are usually of high level. But there are plenty of borderline openings when c.w. would be a big help, all around. This is particularly true of double-hop openings, when signals are apt to be weak and subject to violent fading. It would be much easier to identify the weak ones, if more of us would use c.w. for calling CQ, and for calling stations, if not for actual QSOs once contact has been established. This is all the more important, now that occupancy on 6 has reached the point where the low end of the band, at least, is packed solid with signals whenever there is a good opening. W6YBP, Los Angeles, says that on May 14th (which was the occasion of a country-wide opening) there were scores of signals heard which could not be identified. Only W5VV and W2BYM were heard on c.w., the latter being a good example of the value of what we are talking about — transcontinental reception, because the signal was identifiable.

Mountains certainly don't help, but their presence in between two locations separated by 100 miles or more is no proof that the path between is not workable on 50 Mc. The Cascade Mountains lie near the middle of the 140-mile path between Toppenish and Woodinsville, Washington, yet W7HEA and W7DMN have worked on 50 Mc. W7DMN has also worked W7ERA, Milwaukee, Oregon, a 160-mile hop which is believed to be the first instance of v.h.f. work between the Seattle and Portland areas. W7DYD, Bothell, and W7DF, Everett, Wash., also joined in to make this a 4-way.

W7QAP, Tucson, Ariz., wants to know what's happened to the skip to the East. Bud has a fixed 8-element array (4 halfwaves in phase, with reflectors) aimed East, and now all the skip seems to be north and south, or to the west. He has another gripe — he missed a contact with a W6 recently because the W6's receiver wouldn't tune as high as 50.9 Mc. Bud thinks that this is carrying this low-end business a bit too far! He is another of the boys who plead for more use of c.w. in calling and signing, at least.

Preliminary Report — First Postwar V.H.F. Relay

The weather over most of the country during the week-end of May 17th and 18th was not such as to encourage portable operation, nor was there much in the way of unusual propagation to spur things along, but the first postwar V.H.F. Relay

(Continued on page 120)

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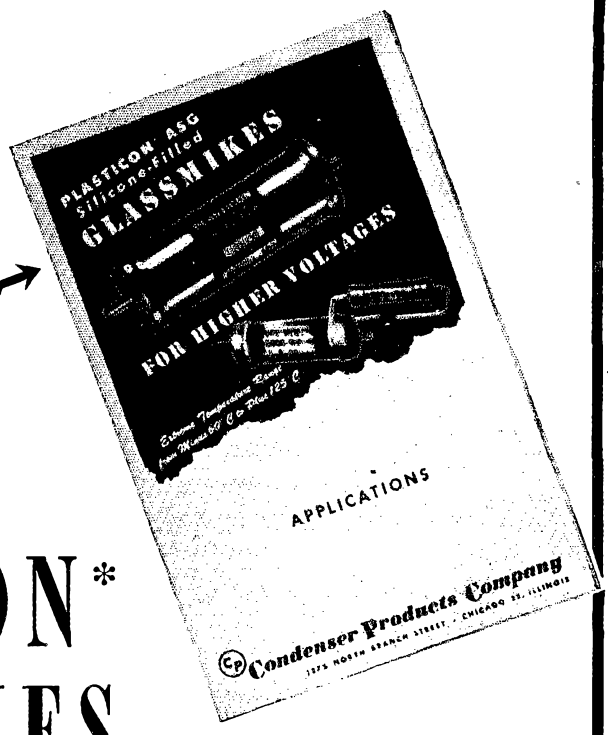

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(Continued from page 118)

and QSO Party managed to stir up more than the usual amount of week-end activity. A surprising number of fellows seemed unaware that any contest was scheduled for that date, despite the announcements in *QST* and the talk over the air, but many got into the spirit of the thing as the contest period progressed. There was less in the way of long-distance relaying of messages than used to result in our prewar contests, but a lot of fun was had by all, and many new contacts were made. Numerous requests have come in for another party at an early date, and this time it will be given more publicity in advance. Details will be put out on W1AW, and bulletins will be sent to affiliated clubs, in the hope of developing more widespread competition.

Who's Where on Six?

W1COX	Lowell, Mass.	50.1 Mc.
W1HIL	Wakefield, Mass.	50.96
W1JCI	Waltham, Mass.	52.3
W1JPI	Norwood, Mass.	51.6
W1LJ	Lowell, Mass.	51.2
W3QVC/1	Cambridge, Mass.	50.4
W2RND	Margate City, N. J.	50.47
W4FQI	Oak Ridge, Tenn.	50.22
W5IOP	Shreveport, La.	50.0
W5KXO	Shreveport, La.	50.2
W5LET	Mansfield, La.	50.8
W5ML	Oil City, La.	51.0
W5ZS	Shreveport, La.	50.45
W6RRH	(Mobile)	50.47
W7ACD	Shelley, Idaho	50.4
W7TXM	Tucson, Ariz.	51.17
WØINI	Pleasant Hill, Mo.	50.22
WØVIK	Denver, Colo.	51.0
WØWYX/Ø	Colorado	51.6
WØTKX/MM	S.S. Ft. Winnebago	50.07
VE1QZ	Halifax, N. S.	50.1
VE1QY	Yarmouth, N. S.	50.55
VE2GT	Valois, Quebec	50.96
VE2KH	Valois, Quebec	50.53

Reports of participation have been received from W1, 2, 3, 6, 9 and Ø thus far, the highest score thus far being that posted by W3MHW/3. Operating from Salamander Fire Tower, near Frederick, Md., W3MHW/3, with W3MSK and W4KKZ as helpers, worked 45 stations on 144 Mc., for a total score of 488 points. Using converted surplus gear powered by a 350-watt gas-engine driven generator, they made contacts in Pennsylvania, Maryland, Virginia, and New Jersey, the best DX being W4FJ, Richmond, Va., a distance of more than 140 miles. Another high score was that of 400 points claimed by W3LZD/3, who operated portable in the Pocono Mountains, working 29 stations, 14 of which were 75 or more miles distant.

W9PK caught a 50-Mc. DX opening and worked W5BUV, San Antonio, Texas, the only skip contact thus far reported for the contest period. Your conductor managed to work 24 stations on 50 Mc. and 6 on 144, for a score of 244 points.

There was plenty of activity in Eastern New England on 144 Mc. In Fall River, Mass., W1DHX worked 79 different stations, the largest total reported, for a score of 229 points. W1PCJ,

(Continued on page 124)

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THE AMERICAN RADIO RELAY LEAGUE, INC.

WEST HARTFORD 7, CONNECTICUT

(Continued from page 120)

Needham, Mass., had 38 contacts on 144 Mc., for a score of 216. In East Freetown, Mass., W1PIV worked 46 stations for 168 points. A more complete summary will appear in an early issue of *QST*.

144-Mc. DX Passes 400-Mile Mark!

A year ago this month we were hailing a new 144-Mc. DX record of 200 miles, a distance which has been covered by hundreds of stations since. To show how 2-meter technique has improved in one short year, 200-mile contacts are made with ease on almost any night in warm weather, and we don't get too excited until the distance gets up to 300 miles or better. When, last September, W3HWN, Mechanicsburg, Pa., and W1MNF, of East Orleans, Mass., worked over a path close to 400 miles long, we felt that this was still not the top, by a long shot. That 400-mile mark would be passed, come spring in 1947!

With the best conditions of the year yet to arrive, the record has fallen again, this time to W3KUX, Washington, D. C., who made the grade with W1MNF, a distance of 425 miles. It all started during the evening of May 15th, when W3KUX started working up into W2, making a string of contacts at distances up to about 200 miles. At about 1:15 A.M. W1MNF was heard, in a three-way with W1PEN and a W2. W3KUX started calling W1MNF, continuing for 15 minutes, until W1SF, at Branford, Conn., was raised. Harry passed the word to W1MNF to look for Wally, and at 2 A.M. contact was finally established. The signal of W1MNF was running S6 to 7 at Washington, while W3KUX was S5 to 6 out on Cape Cod.

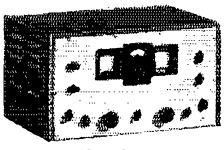
The transmitter at W3KUX is crystal-controlled, with an 829 in the final, running at 55 watts input. The antenna system is a 4-element array, employing two half-waves in phase, side by side, with reflectors. The receiver is a converted BC-624-A, with 6AK5s in the r.f. and mixer stages. The r.f. section of the receiver can be fed into the regular i.f. channel, or it may be used as a converter to feed into a communications receiver at 12 Mc., when the stability of the received signal permits. W1MNF uses an ARC-5 as an exciter to drive a pair of 24Gs, running 175 watts input. The receiver is a converted BC-406, with 6AK5 mixer and 6C4 oscillator. The antenna is a 10-element array.

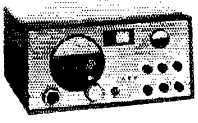
The W1SF-W3KUX contact, which made the new record possible, should not be overlooked, as it represents a hop of about 290 miles. W1SF was using his newly-completed 32-element array, with which he hopes to work into the 4th call area before the summer is over. W4s: watch 144,036 for W1SF!

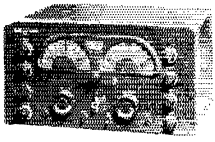
It has been the continuing experience of the 2-meter DX gang that the best conditions arrive at an hour when any normal individual would have long since gone to bed. All the really long-haul work has been done after midnight, and

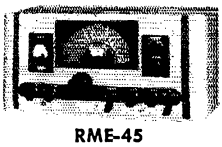
(Continued on page 126)

With a Modern Communications Receiver!


Hammarlund HQ-129X


Hallicrafters SX-42


National NC-173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RME-45, with speaker	198.70
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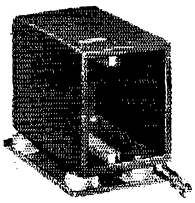

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(Continued from page 124)

V.H.F. MARATHON

Contacts Through May 15th
(Incomplete)

Call	50 Mc.	144 Mc.	235 Mc.	Score	States Worked 50 Mc.	144 Mc.	50-Mc. WAS
W1AF	76			366	6		6
W1BCT/1		114	5	542		3	
W1CGY	37			359	12		12
W1CLS	108			694	17		27
W1EH •		31		136		3	
W1FRK		26		142		2	
W1HDQ •	81	23		724	15	3	29
W1KLR		81		362		3	
W1LLL	68			678	15		30
W1LMU		51		204		1	
W1PEN		62		468		4	
W1PLQ		66		227		1	
W1PYM		16		54		1	
W2AMJ	87			623	15		25
W2BYM	81			660	15		25
W2CBB		67		208		4	
W2COT	41	105		474	6	3	7
W2DZA		93	9	452		4	
W2NLY••		171		1004		6	
W2QVH	82	65		659	11	3	11
W2RLV	34			510	18		21
W2RPO		14		74		2	
W2RSO		79		720		4	
W2ZD		168		830		3	
W3AWS		15		78		3	
W3CGV	44	20		425	7	4	9
W3GKP	4	46		358	1	4	
W3HWN		107		915		5	
W3MHW		66		500		5	
W3MNA		67		400		5	
W3RUE	29	44		752	15	2	21
W1KMZ/3	42			356	9		19
W4FJ	21	8		404	12	2	12
W4HVV	32	2		337	10	2	16
W4LNG	6	26		175	2	1	
W4WMI	19			177	8		8
W5LIU	9			49	3		
W5JLY	12			126	7		
W6BWG	78			304	3		3
W6HZ	86	116	1	809	5	1	6
W6OVK	10	98		679	2	1	6
W6PBV	9			48	2		
W6WNN	42	5		377	5	1	5
W6YBP	11			64	2		
W7ACS/KH6	6			123	0		
W7QAP	18			192	7		12
W8QQS	33			409	10		10
W8RFW	16			167	5		
W8TDJ	11	1		162	10	1	10
W9AB	28	6		262	9	1	12
W9AGV		29		113		2	
W9ALU	19	8		297	8	1	13
W9JMS	49	2		634	11	1	11
W9MBL	13			140	3		3
W9PK	79	19		1017	22	1	28
W9ZHB							32
W9ZHL	62	4		786	17		17
WØQIN	45			643	13		21
WØJHS							19
WØTQK							20
WØYUQ							29
WØZJB							29

•Not eligible for award.
••Fourth-period winner: 288 points.

about 2 A.M. seems to be the witching hour. All of which makes it tough for the boys who have to work for a living — and now comes W2DOG, Riverhead, L. I., with the suggestion that DX aspirants concentrate on the period between

(Continued on page 130)

TERMINAL has VALUES $ $ $ $ $ $ YOU Save Plenty!

Terminal IS YOUR Best Bet FOR Better Buys

NEW YORK'S LEADING RADIO SUPPLY HOUSE

Whether radio is your business or your hobby, you'll find everything you need at TERMINAL! You'll like our friendly service, high quality and low prices! Your first order will convince you!

Blank ALUMINUM CHASSIS

Our rugged aluminum chassis bases are made from one piece of 1/16" thick aluminum, and all corners are spot welded. All four sides are folded over at the bottom for additional strength and to permit bottom plates to be attached, if desired. You'll like the ease with which these chassis can be cut and drilled.

7"x7"x2".....	.87	7"x17"x3"..	1.32
7"x9"x2".....	.95	8"x17"x3"..	1.47
7"x11"x2"...	1.03	10"x17"x3"	1.61
7"x12"x3"...	1.17	11"x17"x3"	1.99
7"x13"x2"..	1.11	13"x17"x3"	2.50

FILAMENT TRANSFORMER

6.3 Volts — 1.2 Amps.

Compact, measures only 1⅝"x 2 13/16"x1½", mtg. centers 2⅜". 115 volt 50/60 cy. primary. Ideal for filaments, pilot lamps, relays, etc. You pay twice as much for this transformer elsewhere, so stock up now! Your cost only .....each **69¢**

TRANSMITTING TUBES!

BRAND NEW! JAN APPROVED! GUARANTEED!

802	1.58	866A	.75
803	9.00	872A	2.25
805	3.75	2APl	2.25
807	1.05	2X2	.90
809	1.50	3BPl	3.00
811	1.95	5R4GY	.95
813	6.75	24G	1.95
814	4.50	75TL	2.25
815	2.25	VR90	.75
816	.60	VR105	.75
826	2.25	VR150	.75
829B	3.00	304TL	3.75
832A	4.05	1616	3.00
836	1.50	8016	.53

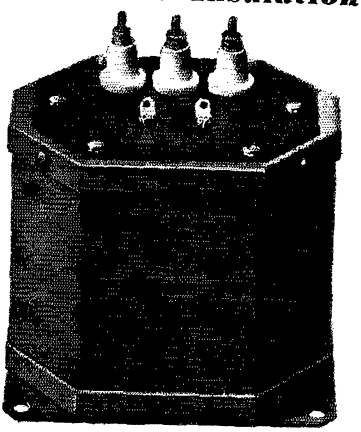
PRECISION RESISTORS

1% accuracy, non-inductive wire-wound.

50,000 ohms.....	.45
100,000 ohms.....	.59
250,000 ohms.....	.59
400,000 ohms.....	.59
500,000 ohms.....	.75
1.0 megohm	.95

An Exclusive Terminal Scoop! You profit by this fortunate purchase from the U.S. Gov't!

2½ Volts CT @ 10 Amps 9,000 Volts Insulation



BRAND NEW!

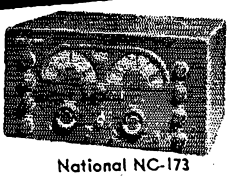
Signal Corps Type 2C 2270/5T

This is the husky filament transformer your power supply is crying for!

Priced by Terminal at a fraction of its original cost, these transformers—*all brand new*—are fully shielded and designed for continuous heavy duty! 115 volts AC 50/60 cycle primary; 2½ volts @ 10 amperes secondary. High voltage insulation (9,000 volts) makes this transformer ideal for use with 866's, etc. Net wt. 4½ lbs., shipping wt. 6 lbs. Your cost, only.....each 3.95

CHOOSE YOUR NEW RECEIVER FROM OUR LARGE STOCK! IMMEDIATE DELIVERY!

Hallicrafters S-40A



National NC-173

HALLICRAFTERS

SX-42, less speaker.....	275.00
R-42 speaker	29.50
S-40A, complete	87.50
S-38, complete	47.50

HAMMARLUND

HQ-129X, complete.....	173.25
SP-400-X, complete	342.00

SUPREME AF-100 TRANSMITTER

100 watts phone/CW, AM-FM, VFO, XTAL, all bands, complete—nothing else to buy! **$450.00**

NATIONAL

NC-173, complete	189.50
NC-240D, complete	241.44
HRO-5AI, complete	306.74
1-10-A, tubes & coils.....	67.50
MCS spkr. for 1-10-A....	12.00
5886 pwr. supply 1-10-A	22.43
NC-46, less speaker.....	97.50
NC-46TS PM speaker....	9.90

TEMCO 75-GA TRANSMITTER

75 watts phone/100 watts CW, VFO, XTAL, all bands, complete, ready for operation. **$495.00**

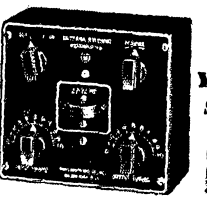
MILLEN

90800 — 50 watt all-band transmitter/exciter, uses 6L6 and 807. Complete with 10-11 meter coils..... **42.50**

90700 — ECO Frequency Shifter complete with tubes..... **42.50**

90881—500 watt RF power amplifier, uses 812's, T-40's, 35T's, etc. With coils for one band, less tubes..... **89.50**

MILLEN R-9'er



PEP UP YOUR SET!

92101—Automatically boosts any impedance antenna up to 30 db. Broad band r.f. amplifier for additional 30 db. gain. Complete with 10 meter coil, less tube..... **24.75**

6 meter or 20 meter coils each..... **3.15**

6AK5 tube..... **.90**

MEISSNER DeLuxe SIGNAL SHIFTER

New model covers 10, 15, 20, 40 and 80 meters. 6 watts output all bands. Complete, ready for operation..... **99.50**

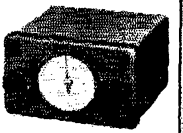
Micro Match

The indispensable instrument for measuring standing waves and R.F. power. Gives positive readings for accurate impedance matching and quick adjustment of your rig for peak performance..... **29.50**

SONAR VFX-680

Crystal exciter, VFO, VFX, FM phone on all bands, CW and phone monitor, dual tuning eye—all in one, complete with tubes and coils..... **87.45**

GON-SET CONVERTERS



Now available for 20, 10-11 or 6 Meters. Complete with tubes and connecting cables. Each..... **39.95**

Please specify band desired.

VISIT OUR HAM SHACK — 2nd floor

All receivers & transmitters on display!

WARRANTY — No change in our policy. Every item we sell is fully guaranteed, regardless of its low price.

If unable to visit our store, send us your mail orders with 25% deposit. Remit in full all orders under $5.00. Prices are F.O.B. New York.

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I offer you — QUICKER DELIVERY
at LOWEST PRICES and HIGHEST TRADE-IN ALLOWANCES

together with my sincere desire to be of friendly, helpful SERVICE

For over twenty years I have been taking care of the requirements of Hams in all parts of the world. If you are not already one of my friends, I would appreciate the opportunity of proving the pleasure and profit of dealing with me.

Send me your orders — or write to me for literature and information on any equipment in which you are interested. My promise of full cooperation guarantees your complete satisfaction with every transaction.

Tnx es 73, *Bil Harrison*, W2AVA

FM

If your taste runs to quality audio reproduction — Harrison has the equipment you want!

Tuners (Browning FM-AM, Meissner, Hallicrafters, Edwards, etc.), Parts (IF's, dials, tubes, etc.), High-Fi Amplifiers (Cardwell, Thordarson, Bogen, Eastern, W.E., etc.), Extended range Speakers (Jensen, Western Electric, Cinaudagraph, etc.), Dipole and beam antennae and coaxial and ribbon lead-in, etc.

Visit our newly enlarged store, or write us about your desires.

Shure "VERSATEX"

New, high output crystal mike in unique "Snakehead" case which stands on desk, fits in hand, or screws on floor stand. Internal RF suppressor. —53 db. 60 to 8000 cycles. Complete with 7' cable. **$5.88**

DC PACKS

Operate your surplus gear right from 110 volt AC lines. Selenium rectifiers, brute force filtered, protected by fuse and circuit breaker, all in neat metal cabinet.

12 Volt:
4 Amp. $16.50
12 Amp. $32.50
24–28 Volt:
4 Amp. $34.50
10 Amp. $47.50
20 Amp $77.50

INTERCOMMUNICATION

Talk-A-Phone DeLuxe System —

Master, in polished walnut cabinet, can select up to ten remote stations, or page all simultaneously. Excellent voice reproduction. Ideal for offices and homes (shack, nursery, etc.) 115 volts AC or DC. $29.98

Remote Stations, in compact metal cabinet. Can call master at will. Works over 2500 feet. Requires no power. Only 3 wires to connect. $8.17

(3 wire cable — 5½¢ ft.)

ALUMINUM CHASSIS

Bright, new, full gauge. Solidly constructed with folded edges and bottom. Regular stock — but just look at the prices!

5½x10x3,	$1.04	7x12x3,	$1.27	7x13x2,	$1.19
7x7x2,	.93	7x15x3	1.46	10x12x3	1.69
7x9x2,	1.08	7x17x3		10x14x3	2.79
7x11x2,	1.13	8x12x3		13x17x3,	

FREQ. METERS

Compact, absorption type. Invaluable around the lab or shack.

MILLEN:

150 to 350 Kc 350 to 1000 Kc 2 to 6 Mc 5.5 to 10 Mc	Any range with neon indicator **$15.00**
3 to 10 Mc 9 to 23 Mc 23 to 60 Mc 50 to 140 Mc	Any range **$4.50**
105 to 150 Mc 130 to 170 Mc 160 to 210 Mc	Any range **$6.00**

SILVER: *Model 903*

Complete with full coverage inductors 1.6 to 300 Mc. **$7.20**

(400 to 500 Mc Inductor — 75¢)

BUD: "GIMIX"

Five bands, 10 thru 80, with switch. Can also be used as phone monitor, field strength meter, etc.

Complete... **$8.30**

ROTARY BEAMS

NEW! Amphenol (MIMS) "Signal Squirters" for 10, or 20, or dual.

Ask for details

Also Gordon, Workshop, Direct-O-Beam, Johnson!

For the finest in VHF reception —

27.8 to 210 Mc Hallicrafters S-36A and S-37 mounted with matching speaker in a DeLuxe table rack cabinet. $909.25

CONDENSER SALE

Dykanol filled, rectangular case, ceramic insulators, .5 Mfd capacitors. From our regular stock! New, perfect, guaranteed. At a fraction of their cost. Complete with hardware.

2000 Volt working. List $6.75. . . . . $1.69

3000 Volt working. List $15.25. . . . . $1.98

1N34. . . . . $1.50

1N35 (Matched pair of 1N34's). $3.95

SURPLUS? If it's good quality, if it's really usable gear — if it's priced right, then it's HSS (Harrison Select Surplus)!

If you're looking for *real* bargains it will pay you to visit the separate HSS section in our newly enlarged store — or carefully read all our ads (even the previous ones).

HAM HEADQUARTERS *Since... 1925!*

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PHONE—BArclay 7-9854 · EXPORT DEPT.—CABLE—"HARRISORAD"

[JAMAICA BRANCH—172-31 Hillside Ave.—REpublic 9-4102]

(Continued from page 126)

6:30 and 7:30 A.M. EDST. Wickizer, whose business is concerned with such matters, points out that the best hour of the 24 is that period when the sun begins to heat the air aloft, while that close to the earth's surface is still cool and of high relative humidity. The earth temperature is then at its lowest diurnal point, making for stability, and a very pronounced temperature and humidity gradient exists, until the earth's surface and the air close to it begin to heat. The observations and recordings made by Ross Hull bear this out: the early-morning hours are tops. How about making an effort to be on 144 Mc. before leaving for work during July and August, particularly on mornings which follow clear calm nights, when the barometer is high? W2DOG feels that this is a fine time to attempt the Great-Lakes-to-the-sea relay. He will be glad to keep the schedule with any interested parties. This might be the way for the fellows inland to compete with the stations which are fortunately situated along the coastline, where they catch the full benefit of the shoreline inversions which are an almost nightly occurrence during the summer months.

The stations out across Pennsylvania and Ohio should not be counted out, when DX possibilities are being considered. Several of these fellows have extended their *reliable* coverage out to 150 miles, through the use of exceptionally sensitive receivers, high-gain horizontal arrays, and crystal-controlled transmitters. In Erie, Penna., for instance, there are about a dozen crystal rigs, according to W3QKI. The 150-mile path between W3QKI and W8WXV is being covered quite regularly, mainly because of the caliber of the receivers used at both ends. Both these fellows insist that the one way to get in the weak ones is to use high gain, *plus* the narrowest possible bandwidth. W3QKI put a 12-Mc. crystal filter into his 522 receiver, and W8WXV uses a 455-kc. i.f. channel, with crystal filter. He advocates the use of audio filters, and suggests that the fellows who use tone modulation set it at 440 cycles (check with WWV) so that filters can be designed for that frequency. Such arrangements would be useful on c.w. as well.

The receiver used at W8WXV, Shiloh, Ohio, is really something. He employs two 6J4 grounded-grid r.f. stages, a conventional 6AK5 stage, a 6AK5 mixer. The oscillator section uses a 14-Mc. crystal, with a 6V6 and an 1852 providing the injection voltage at 126 Mc. This feeds into a 7G7, 7J7 i.f. and mixer, tunable from 18 to 22 Mc., which in turn works into a 2-stage 455-kc. i.f. which has all the conventional communications-receiver accessories. The crystal-controlled high-frequency oscillator provides rock-solid c.w. signals, and tuning the 18–22-Mc. i.f. instead of the high-frequency circuits gives the whole set-up a stability and ease of control comparable to that of the best low-frequency receivers. There is no room for modulated oscillators, or even MOPA

(Continued on page 132)

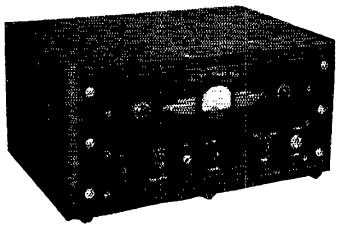
Amateurs! LEO OFFERS YOU MORE

Leo Checking The New 200 Watt XMTR

Our new 200 watt transmitter kit is just the thing you fellows have been waiting for! It contains all high quality parts at a very low cost. I have tried the experimental model shown at the left—and really, fellows, it works swell. I hope to have a quantity ready for delivery about July 1st at an approximate cost of $350.00 (wired). This new transmitter kit is the result of the enthusiastic success of our Globe Trotter and the many requests for a rig of higher power.

LOWEST TIME PAYMENTS—LIBERAL TRADE-INS

Round The World Performance



W2QIE reports 12 foreign countries reached. — One Mexico ham reports 5 foreign countries and all U.S. districts in one week.

W.R.L. Globe Trotter XMTR Kits

Amateurs the nation over are praising the performance of this high quality low cost rig. It's a 40 watt input kit including all parts, chassis, panel and stream lined cabinet.

Cat. No. 70-300 Less tubes..... $69.95
Cat. No. 70-312 Same as above, wired..... $79.50
1 set coils, meters, tubes, extra..... 17.15

Good News, Fellows!

The delivery situation is nearly back to prewar days. We have a good stock of all ham gear including receivers and transmitters as listed at the right. This large stock enables us to give you that famous W.R.L. 24 hour service.

Get that new equipment from Leo now on the lowest time payment plan—trade in that old equipment. All inquiries answered same day.

All prices are domestic, write for export prices.

HAM GEAR — we have it!

GET FAST DELIVERY FROM LEO!

Item	Cash Price	Down Payment
Hallicrafters 838	$ 47.50	$ 9.50
Hallicrafters S40A	89.50	17.90
Hallicrafters SP44	99.50	19.90
Hallicrafters SX42	275.00	55.00
Hallicrafters HT-9	350.00	70.00
RME VHF-152	86.60	17.32
RME-84	98.70	19.74
RME-45	198.70	39.74
Hammarlund HQ129X	161.40	32.28
Hammarlund SPC400X	334.05	66.81
National NC46	97.50	19.50
National 1-10A	67.50	13.50
National NC173	179.50	35.90
National NC240DT or NC240DR	225.00	45.00
National HRO-5TAL or HRO-5RA	274.35	54.87
Pierson KP-81	367.65	73.53
Gon-Set Converters	39.95	7.99
Collins 70E-8	40.00	8.00
Bud VFO-21	52.50	10.50
Meissner Signal Shifter	120.00	24.00
Abbott TR-4B Special	45.00	9.00
New Micro-Match Unit	29.50	5.90
Millen R-9er	24.75	4.95
BB-27 10 meter converter F.B. for 348	27.50	5.50
Sonar Mobile MB-611 transmitter	72.45	14.49
MB-611 with power supply	81.45	16.29
WRL exciter unit wired	23.95	4.79
Millen 90800 exciter	37.50	7.50
Sonar XE-10 transmitter	39.45	7.89
Sonar VFX-680 transmitter	87.45	17.49
Workshop 28 megacyle beam 3 element	39.50	7.90
Workshop 6 element 28 megacycle type	100.00	20.00
Workshop 20 meter beam 3 element	120.00	24.00
Gordon Rotary Beam	225.00	45.00
Direct-O-Beam	117.00	23.40
New ECO	32.50	7.50

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- ☐ Send more data on the Globe Trotter

Send more data on above equipment .....

Name..... Call letters.....

Address .....

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

(Continued from page 130)

rigs, in this picture, however! Such receivers, plus the willingness to stay up all night, or perhaps get up an hour earlier in the morning, may yet move the 144-Mc. DX record away from the Atlantic Seaboard!

Recent DX worked by W8WXV includes W2RJH, Westfield, N. Y., 190 miles, W8LYI, North Kingsville, Ohio, 115 miles, W2GBK, Sherman, N. Y., 185 miles, several stations around Detroit, about 100 miles, and W2ACK, Jamestown, N. Y., more than 200 miles. W2ACK was running only 10 watts input to a tripler stage, and using a 2-element array only 15 feet above ground! His signal was too weak for consistent voice reception, but on c.w. he was solid copy at W8WXV. During the V.H.F. Relay Contest on May 17th, W3QKI/3 220 miles distant was heard, and W2UHI, near Buffalo, 240 miles, has been copied on several occasions.

A change to horizontal polarization netted a big improvement in coverage for W2QAG, Buffalo, N. Y. recently, though this may be partly because of the use of horizontal arrays at the outstanding stations in the DX range from Buffalo. The 6-element array described in November, 1946, *QST* had been in use for some time with good results, but the erection of a 5-element horizontal brought a contact with W8WJC, near Cleveland, Ohio, a distance of 185 miles, the first night. Work with W3QKI and W8NBV at Erie, about 85 miles, is now consistent. W2UHI at Tonowanda, N. Y., with 150 watts and an 8-element horizontal, is another consistent station at Erie.

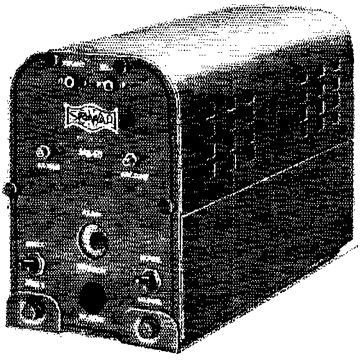
The night of May 24th, and the early hours of the following morning, were good along the Atlantic Seaboard. Reports are not complete at this writing, but one from W2OHE, Brooklyn, N. Y., shows what was up. Using a 100-watt crystal rig, a 6-element vertical array, and a 12-tube superhet receiver, W2OHE worked 7 W1s and 2s at distances of about 100 miles, a group of W3s near Philadelphia, W3JDP, Hillsboro, Md., W3EIM, Baltimore, 180 miles, and W3ENZ, Washington, D. C., 200 miles. W4FJ, Richmond, Va., 300 miles, was heard but not worked.

All this talk of high-gain beams is apt to be pretty depressing to the fellow who must sneak a folded dipole up on the roof when the landlord isn't looking. For the fellow who must use indoor antennas, W1OJT offers a bright idea: a 2-section W8JK array, made of hook-up wire thumbtacked to a closet door. With a bidirectional system, the 180 degrees of "rotation" so provided is quite OK. You can't keep a good ham down!

Some of us try for DX; others build super receivers, or 48-element arrays, but W2IRU, Williamsville, N. Y., has another claim to fame: he gets up to 144 Mc. from the lowest starting frequency. Using 2-Mc. crystals, he multiplies by 72, with a quadrupler, a doubler, and two triplers, ending up with an 829 in the final. He

(Continued on page 136)

HARVEY FOR SUMMER GEAR



SONAR PORTABLE-MOBILE XMITTR

Here's that compact rig for portable-mobile work on 6 or 10-11 meters. 22.5 watts into the antenna, and it works into any type of antenna having impedance from 30 to 600 ohms. Uses 40 meter xtal and features that Sonar Narrow Band FM. New 2E26 in final. Built-in tuning and deviation indicator. Any type power supply can be used; requires 100 mils, 250-600 volts. Built-in antenna and control relay. Complete with tubes and coil for either band, less power supply and xtal.....**$72.45**

HARVEY'S HITS OF THE MONTH

Harvey has 20 meter crystals for a buck! Mounted in holder with ½" pin spacing. Also 40 and 80 meter and 6 and 13 mc. bands at the same low price.....**$1.00**

Special 8 mc. xtals for 2 meter xtal control, only.....**$1.50**

Also in stock complete line of Billey AX-2 xtals.
Include 10¢ postage with your crystal order.

HARVEY'S HAMFESTIVAL OF VALUES

Carter Genemotor. A natural for portable operation. 6 volts in; 350 v. at 150 mils out.....**$14.94**

Shure T17B Hand Mike. With push-to-talk switch, 5 ft. cord and plug.....**$1.49**

Abbott TR4B. Completely redesigned. Uses 955 as detector.....**$52.00**

Kit of tubes inc. HY75, 6L6, 7F7, 955..... **9.39**

Handy-Talky HT-144. Many valuable features make this a top job for the 2-meter band. Antenna telescopes, batteries self-contained, one hand control. 45-75 hrs. battery life. 6C4 and 1S4 tubes. Weighs 4 pounds....**$34.50** Tubes, $2.49 set; A batt. 50c; B batt. $1.75

Gon-Set Converters for 6 or 10-11 meter bands **$39.95**

Supreme AF-100 Xmittr for all bands 10 to 80; VFO or xtal; 100 watts output on phone or CW. Complete with tubes, coils and antenna relay.....**$450.00**

Broad Band Converters, C.M.L. model BB-27 for 10-11, BB-50 for 6, BB-144 for 2 meters. Takes power from receiver.....**$27.50**

Power supply for above.....**$19.50**

W20DL Rotary Support and drive. Built to stand the gaff. Takes up to 4-element, 20 meter beam, beam tips for adjustment. Selsyn indicator indicates exact direction. Less cable.....**$240.00**

Receivers:

Collins 75A $530.00
Hallicrafters S38 complete. $47.50
Hallicrafters S40A..... $89.50
Hallicrafters SX 42.....$275.00
Hammarlund HQ129X and speaker $173.25
Hammarlund SP-400-X and speaker $347.25
National NC173 complete..$187.50
National NC-2-40D (complete with speaker).....$240.00
National HRO-5TAI complete $306.71
National NC-46 complete $107.40
National 1-10A with tubes and coils..... $67.50
RME-45 complete.....$198.70
Hallicrafter panadapter complete $99.50
Meck 60T transmitters....$150.00
Millen 90700 ECO..... $42.50
Millen 90800 exciter..... $42.50
Millen 90281 power supply $84.50
Millen 90902 scope..... $42.50

Gordon, Abbott and other rotary beams and rotators

Note: All prices are net, F.O.B. NYC and are subject to change without notice.

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You'll be amazed at Walter Ashe's extra-liberal allowances. Here's your chance to exchange for brand new, big-name merchandise at a fraction of its value. Save money. Take advantage of this opportunity now. Don't put it off. Wire, write or 'phone today. Prompt service always!

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National HRO (less power supply and speaker)	$274.35
National NC-240D (less speaker)	225.00
National NC-46 (less speaker)	97.50
National NC-173	179.50
NC-173 Speaker	10.00
RME-45 (with speaker)	198.70
RME-84	98.70
Hammarlund HQ-129X (with speaker)	173.25
Hammarlund SPC-400X	342.00
Hallicrafters SX-42	275.00
Hallicrafters S-40	89.50
Hallicrafters S-38	47.50
Pierson KP81	367.65
RMA VHF-152	86.60

Prices subject to possible change

BARGAIN SPECIAL!

RCA 1 KW Modulation Xformer

Heavy Duty modulation xformer, 10,000 ohm pri. plate to plate. Dual secondary, No. 1 450 MA for plate. No. 2 80 MA for screens of beam power tubes..... **$14.95**

SURPLUS FILTER CONDENSERS

2 Mfd. X 5000 V. Dykanol. Mounting bracket and husky standoffs. Regular price $29.63. Now.... **$7.51**

2 Mfd. X 4000 V. Oil filled. Metal case with standoffs and brackets. Regular price $25.44. Now.... **$4.50**

SIGNAL SHIFTERS IN STOCK!!!

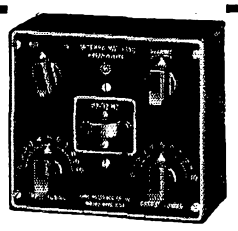
Millen 90700	$42.50
Millen 90701	42.50
Bud VFO-21	52.50
Meissner 9-1090	120.00

SUPER BARGAIN

SURPLUS CHOKE 4.5 Hy. 150 MA filter choke. 70 ohms DC res. 3" x 3¼" x 4" Metal case with standoffs. Moisture proof. Very conservatively rated for military use..... **$1.29**

MICROMATCH MODEL MM1

A necessary instrument for determining standing wave ratio on transmission lines and measuring RF power. May be connected at any point in a 70 to 300 ohm line. 3 to 30 MC frequency range. Can be used on power up to 1 KW..... **$29.50**



MILLEN "R-9'er"

An electronic impedance matching device and a broad-band preamplifier in a single unit. Results in approximately 30 db gain when used ahead of a communication receiver. Complete with 10–11 meter coil and connecting plugs, but less tube. **$24.75**
6 or 20 meter coil for above... **$3.15**
6AK5 tube for above..... **90¢**

HAND MIKES, Brand New !!!

Shure T-17, S.B. Carbon. Sturdy, efficient..... **$1.49**

NEW SHIPMENT !!!

Surplus throat mikes, 200 ohm button. Compare and save!..... **$ .34**

NEW W9SWL

CALL LETTER PINS

Make your Ham call known. Wear a call pin, or any 10 letter name. Durable chrome letters on blue, black or red background. Maximum of ten letters per line.

1 line pin..... $1.25
2 line pin..... $1.75

"D-L" NBFM ADAPTER

Use your present communication receiver to receive narrow band FM. Tunes to any I.F. frequency between 425 and 475 KC. Easily attached. Complete with tubes..... **$15.45**

ARMY SURPLUS HEADPHONES

Type HS-23. 8000 ohms impedance. Adjustable leather headband. Rubber cushions. Brand new in original box. **$1.29**

NEW DUAL FILTER CHOKES

Dual 12 Henry 200 MA smoothing chokes. May be used singly or in parallel as 6 Hy. 400 MA choke. 150 ohms DC resistance each. Very conservatively rated for military service. Shielded metal case with standoffs..... **$4.95**

SONAR "MB-611" MOBILE TRANSMITTER

For use as mobile, boat or fixed transmitter. Covers 6 to 11 meters, will match any antenna. 40 watts input, less xtal and power supply..... **$72.45**

TRIPLETT 3256 FREQUENCY METER

A band switching, tuned absorption type freq. meter. Covers 5 Amateur bands. Uses the new germanium crystal and a DC Milliammeter for resonance indication. Audio jack for monitoring phone signals. Direct calibration on dial in megacycles. **$14.75**

RG-8/U BRAND NEW SURPLUS 51 OHM COAX

Under 100 ft..... $.06 per ft.
Over 100 ft..... $.05 per ft.
1000 ft. or over..... $.045 per ft.

SONAR "VFX-680" EXCITER

Now available from our stock, this versatile all band exciter will fill your requirements for that contemplated rig. Complete with tubes and power supply.... **$87.45**

SYLVANIA MODULATION METER

Conform with F.C.C. requirements, check your modulation with this handy, easy to use MODMETER. Complete with installation instructions and directions for use..... **$34.75**

SURPLUS FILAMENT TRANSFORMERS

5.25 volts @ 25 Amps. 110 VAC pri. open mtg..... **$6.15**

SUPREME AF-100 TRANSMITTER IN STOCK

6 band 100 watts amateur transmitter. AM, FM, CW and ICW. VFO or Xtal operation. Ganged tuned exciter and buffer. All controls on front panel. Simple to operate. Complete with tubes and coils for all bands, but less key and mike.. **$450.00**

THORDARSON HD BROADCAST PLATE TRANSFORMER

3020 VCT @ 500 MA tapped at 2660 CT and 2460 CT. Pri. 115 or 230 V..... **$39.50**

W⌀GTF W⌀JWD W⌀WTM W⌀PGI W⌀ULH W9NRF W⌀QDF W⌀IYD

Walter Ashe RADIO CO.

1125 PINE ST. • ST. LOUIS, MO.

(Continued from page 132)

is not alone, however, as the same multiplication is used by W2NLY. It's a nice way to get either wide or narrow-band f.m. without distortion.

Not all the fun is being had with complex rigs and high power, however. Up in Haverhill, Mass., W1KB is up to 237 stations worked on 144 Mc., while running 3.5 watts input to a lighthouse oscillator, feeding a 6-element indoor array.

Doings on the Microwaves

A 2C40 lighthouse tube performs on 1275 Mc. as nicely as ordinary tubes do on the v.h.f. bands, according to W1BBM, North Harwich, Mass. Using a 30-inch parabola on the receiver, Bates can hear clicks when a half-wave antenna (4½ inches long) is touched with a nail file, out to 300 feet in front of the dish. On transmitting, the 2C40 runs at 20 ma. with 210 volts on the plate and the output will light a pilot lamp in the center of a half-wave pick-up antenna to full brilliancy. This amount of power puts his 1-ma. meter off scale at 150 feet in front of the dish.

CORRESPONDENCE

(Continued from page 61)

for me and helped me in any way that they could. I found out what a fine bunch of fellows hams really are. Then to my surprise, W2OUW won a brand new receiver at the hamfest and donated it to me for my own personal use. He and W2PKI got together and established a fund in my name to pay my transportation to a warm and dryer climate to relieve my arthritis, from which I have been suffering for the past 12 years. . . . I am grateful to all amateurs who contributed and helped so I may recover and be able to some day walk again.

— *Charles Holstein, W2PNM*

19 Spring Hill, Norwalk, Conn.

Editor, *QST:*

Did you know that there are a large number of blind amateurs in this country? By "blind" I mean they lack sufficient sight to read inkprint even with optical aids. Now, these men get a great deal of enjoyment from their hamming. I know this for I, too, am blind. But there is one barrier to our complete enjoyment of radio, and that is the fact that we have to rely on other people to read our meters for us. Tuning up involves the assistance of a friend who is not always available or accurate in his reporting.

Why don't you publish in *QST* constructional details of a device which would enable us blind hams to tune up completely independent of sighted help?

— *John M. Dascenzo, W1DAZ*

[EDITOR'S NOTE: What say, gang — who has data on how this problem has been solved for others?]

SUBHARMONICS

P.O. Box 173, Lee, Mass.

Editor, *QST:*

One thing which a good many amateurs apparently do not realize is the possibility of radiating a signal on the old 160-meter band from an 80-meter transmitter using a 160-meter crystal or ECO. I have logged several signals, both 'phone and c.w., on this band — some of them S6 or 7. Any of the fellows who have such rigs would do well to check for possible low-frequency radiation.

Incidentally, tell the six-meter gang that they'll have a new addition to their ranks in a couple of months. I'm just an SWL now, but I'm working for my ticket.

— *Paul A. Moore, jr.*

NATION WIDE SERVICE

FOR AMERICA'S HAMS

Universal's satisfying service and quality are now available—nationwide.

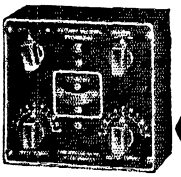
One dependable source for *all* of your needs. Prices always "right," quality considered. Every transaction backed by a money-back warranty. Prompt shipments—trade-ins, time payments.

Universal service has been proved by years of servicing the Mid-West. Place your order with confidence—you'll be satisfied!

Hallicrafter R-42 Speaker.	$ 29.50
Hammarlund SP-400-X and Speaker	347.25
RME VHF-152 Converter..	86.60
Gonset Converters 10-11 or 6 mx.	39.95
Collins 7 OF8VFO ...	40.00
Collins 75A-1 Receiver ...	375.00
Collins 32V-1 Transmitter .	475.00
Collins 30-K Transmitter	1,250.00
Gordon Roto Mounts ..	225.00

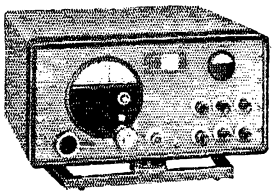
• SPECIAL •

VT-127A Transmitting Tube, net. $ 2.25



MODEL SX-42—One of the finest receivers ever developed. Greatest continuous frequency coverage of any communications receiver—from 540 KC to 110 MC, in six bands. FM-AM-CW. Fifteen tubes. Matching speakers available.

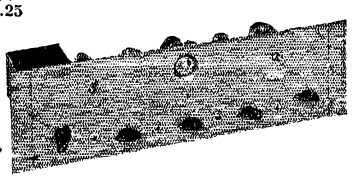
MILLEN NO. 92101—Engineered by General Electric and the James Millen Manufacturing Co. With 10-11 meter inductor, less tube, $24.75. Prompt delivery.



WARRANTY—Universal policy is a simple formula for doing business and we guarantee: (1) Every article to be exactly as advertised; (2) Every article the best buy, quality and service considered, on today's market; and (3) If the buyer is not perfectly satisfied, return the article—your money will be refunded by return mail.

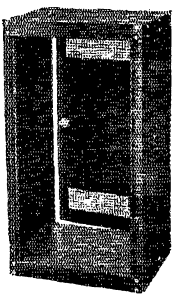
FS-135-C—Here is a quality product for the Ham—the Hammarlund FS-135-C frequency standard. $14.25

SONAR EXCITER — In one complete unit — NBFM phone all bands, CW on all bands. 2-band operation. VFX, VFO or XTAL. CW Monitor, phone monitor. 7 watts, R. F. output. To the amateur for only $87.45.



Hallicrafter S-38 .....$	47.50
Hallicrafter S-40A ...	89.50
National NC-173	179.50
Hammarlund HQ-129-X and Speaker	173.25
RME-45 Complete ...	198.70
RME-84 Complete ...	98.70
Panaramic Panadaptor.	99.75
Millen 90700 ECO....	42.50
Millen 90800 Exciter..	42.50
Bud VFO	52.50
Meissner Signal Shifter	120.00

SAVE MORE THAN $10.00



PAR-METAL ER-213 ENCLOSED RELAY RACK

$18.25 net
(Regular List $47.50)

Cabinet—16½" x 22" x 42"
Panel Space—19" x 36¾"
Front Side—17⅝"
Rear Side—19"
Clear Inside Depth—14¼"
Shipped knocked-down.
The money-saving ER-213 is easily assembled.

SEND MAIL ORDERS WITH 20% DEPOSIT—PRICES SUBJECT TO CHANGE
All Prices F.O.B. Louisville

Universal Radio Supply Co.

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TIME PAYMENTS — TRADE-INS

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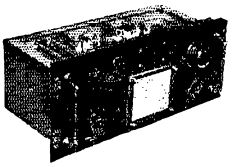
"IN THE HEART OF AMERICA, SERVING AMERICA"

SUN RADIO OF WASHINGTON, D. C.

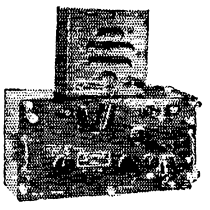
WAR SURPLUS EQUIPMENT

At A Fraction of Original Gov't Cost



R.F. TUNING UNITS

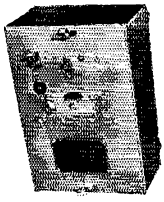
Still the best buy on surplus . . . Beautiful black crackled aluminum cabinet with two variable transmitting condensers and two vernier dials, one heavy duty ceramic four position wafer switch, mica condensers. 2,500 working volts and coils wound on porcelain ribbed forms. Available TU5B (1500–3000 kc), TU7B (4500–6200 kc), TU8B (6200–7700 kc) and TU10B (10000–12500 kc). Please specify model... **$3.89**



LOW FREQUENCY RECEIVER BC-344

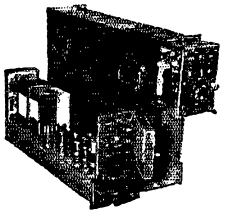
Just a very few left... Brand new, operates on 110v AC complete with 10 tubes, ...tunes 150–1500 kc... Your last chance to get one of these "hot" low frequency receivers at this spectacularly low price.... **$69.95**

Speaker.....$6.95



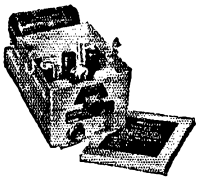
V.H.F. TRANSMITTER

Here is one of the greatest offerings in war surplus! Hundreds sold at 20% and now closed out at an amazingly low price. Brand new. Battery operated (67½v B and 1½v A.) Frequency 80 to 105 mc. Complete with 2–1G4 tubes and full instruction manual. Ready to go on the air. Less batts.... **$6.95**



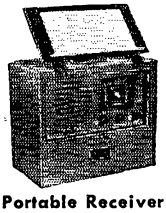
WAVEMETER

Tunes from 150–210 mc and which contain a high quality resonant cavity wavemeter, oscillator, heterodyne amplifier, electric tuning eye, complete with 19 tubes, 110v AC power supply. The tubes alone far exceed your close-out cost of only..... **$17.95**



Interphone Amplifier

Comes in an aluminum cabinet 9¾ x 4¾ x 5½ inches with two 12J5GT tubes and two 12A6 also General Electric Dynamotor 28DC Volt input and 250 VDC output at 60 MA. Complete instructions and diagram for high fidelity phonograph or speech for 110 Volt operation. This is the greatest offering made in War Surplus Electronics. Yours for only..... **$8.95**



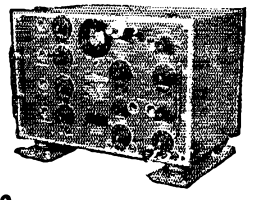
Portable Receiver

Built to rigid specifications of armed forces. 5 tube superhot covering std. bdcst. and 5.8–18.3 mc shortwave. High sensitivity proven by war use overseas. Complete with longlife 91½v pack and instruction-maintenance manual. Brand new in sealed cartons... **$29.95**

Above set also available with built-in whip antenna for added sensitivity.....$34.95

SUN'S GREATEST OFFERS!

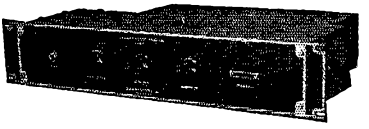
While They Last!



100 WATT BENDIX TRANSMITTER TA12-B

CHECK THESE VALUES... Three 807 tubes. Four 12SK711. One 2 inch 5 amp. RF meter. Four separate Master Oscillators. (These can be easily changed to cover 20–40–80 meters and by using crystal for the 10 meter band you will have a complete coverage transmitter.)

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 35¼ lbs. Complete, simple instructions for conversion furnished. Complete with tubes..... **$49.95**



SUPERHETERODYNE RECEIVER. This crystal fixed frequency receiver comes with full conversion instructions for variable tuning of all ham bands and broadcast. A highly selective superheterodyne receiver, 110 V. A.C. power supply built in. Using the following tubes: 6K7 RF Amplifier; 6K8 Mixer and Oscillator; 6K7 I.F. Amplifier; 6F7; Detector and A.V.C.; 6C8 Output and Noise Suppressor; 80 Rectifier. Dimensions: 3½ x 19 x 11½ inches. Comes complete brand new, with one set of coils and two sets of tubes..... **$16.95**

Extra set of coils.....$2.95

TUNING CONDENSERS

Brand new . . . 5 gang, 365 mmfd. per section . . . a truly precision built condenser with ceramic insulation. A $13.50 value in the greatest offering ever made in tuning condensers for only .. **$2.95**

D.C. MILLIAMMETER

Brand new General Electric 2" round panel meters 0–300 ..... **$2.97**

RHOMBIC RECEIVING ANTENNAE

Complete accessories including 2200 feet of No. 14 copper weld wire, 50 feet of heavy twin X lead 72 ohm good up to 2 kw insulators, pulleys, neon lightning arrestors, ground rods, everything to erect, less poles..... **$24.95**

● All items F.O.B. Washington, D. C. Orders $30.00 or less, cash with order. Above $30.00, 25 per cent with order, balance C.O.D.

SUN RADIO

OF WASHINGTON, D. C.

938 F STREET, N.W. WASH. 4, D. C.

HAM-ADS

(1) Advertising shall pertain to radio and shall be of nature of interest to radio amateurs or experimenters in their pursuit of the art.

(2) No display of any character will be accepted, nor can any special typographical arrangement, such as all or part capital letters be used which would tend to make one advertisement stand out from the others.

(3) The Ham-Ad rate is 30¢ per word, except as noted in paragraph (6) below.

(4) Remittance in full must accompany copy. No cash or contract discount or agency commission will be allowed.

(5) Closing date for Ham-Ads is the 25th of the second month preceding publication date.

(6) A special rate of 7¢ per word will apply to advertising which, in our judgment, is obviously non-commercial in nature and is placed and signed by a member of the American Radio Relay League. Thus, advertising of bona fide surplus equipment owned, used and for sale by an individual or apparatus offered for exchange or advertising inquiring for special equipment, if by a member of the American Radio Relay League takes the 7¢ rate. An attempt to deal in apparatus in quantity for profit, even if by an individual, is commercial and all advertising by him takes the 30¢ rate. Provisions of paragraphs (1), (2), (4) and (5), apply to all advertising in this column regardless of which rate may apply.

(7) Because error is more easily avoided, it is requested signature and address be printed plainly.

(8) No advertiser may use more than 75 words in any one issue.

Having made no investigation of the advertisers in the classified columns, the publishers of QST are unable to vouch for their integrity or for the grade or character of the products or services advertised

QUARTZ — Direct importers from Brazil of best quality pure quartz suitable for making piezo-electric crystals. Diamond Drill Carbon Co., 719 World Bldg., New York City.

QSLs in colors. Stamp for samples. Glenn Griffeth, W3FSW, 1042 Pine Heights Ave., Baltimore 29, Md.

DEKA-XTAL. New compact 10-crystal unit for standard 5-prong socket. Looks and operates like a dial-knob. Just plug it in and turn to any of 10 frequencies, your selection. Ask your dealer or write us. Also other low TC ham crystals in FT cases to fit octal sockets. 80 and 40 ± 1 kc. $2.65; 20 ± 4 kc., $3.50. Scientific Radio Products Co., 738½ W. Broadway, Council Bluffs, Iowa.

IN Stock: new and used Hallicrafters, Hammarlund, National, RCA, Meck, Harvey, Millen, Pierson, RME, Collins, Temco, other rcvrs and xmtrs. All other amateur parts. Trade-in accepted. Terms financed by me. Write: Henry Radio, Butler, Mo. and Los Angeles 25, Calif.

AMATEURS, experimenters, industrials and export accounts. Write for catalog and monthly bulletins. Buy the "TB" guaranteed way and save. TAB. Dept. Z, 6 Church St., New York 6, N. Y.

AMATEUR radio licenses. Complete code or theory preparations for passing amateur radio examinations. Home study and resident courses. American Radio Institute, 101 West 63rd Street, New York City.

COMMERCIAL radio operators examination, questions-and-answers. One dollar per element. G. C. Waller, W5ATV, 6540 E. Washington Blvd., Tulsa 15, Okla.

DON'S QSLs. "Leaders in the field." Samples. 2138 So. 16th Ave., Maywood, Ill.

SURPLUS bargain catalog. Send for the bargain ham catalog everyone is talking about. Surplus Radio, Inc., 30 Munson St., Port Washington, N. Y.

QSLs, samples, Albertson, W4HUD, 705 So. Hamilton, High Point, N. C.

CHASSES: all sizes. Write for price list. John Heim, 713 W. Third, Williamsport, Penn.

EIGHT new light steel antenna masts. Telescope construction; length telescoped appro. 9', erected height 40'. Guy rings. Easily raised by one man. Pictures. A strong practical factory-built mast. $50. each f.o.b. John Rugar, W7KCB, 304 E. Charleston Blvd., Las Vegas, Nev.

BEAM antenna, all aluminum. High efficiency with minimum weight and torque. 2-20 meters. Write for information. Housekeeper, W2KMQ, 956 Paulding St., Peekskill, N. Y.

COMPLETE issues QST, 1934 thru 1946, '34-'39 in binders. Also several issues of Radio; CQ, April 1946 to date. Best offer over $35. W2HVR.

CATHODE-ray oscillograph, RCA Model 155A, 3" tube. Used but in good condition. With an extra tube. First $60 takes it. Chas. Franklin, 17 West Keller St., Mechanicsburg, Pa.

PROCEEDINGS of IRE back copies wanted. Premium cash price or swap parts (no junk) for January 1937 part 2 and March 1946. W. Smith, W6BCX, 201 E. Morrison, Santa Maria, Calif.

Phono-changer for sale; Seeburg 2-post movement Inc. Astatic crystal pickup, without amplifier or cabinet, $20. W8VWC, C. Carpantier, 102 So. Kilmer St., Dayton 7, O.

SUPER-PRO: prewar, 540 Kc. to 20 Mc., good condx, $150 f.o.b., H. T. Sterling, 70 Morningside Dr., New York 27, N. Y.

QSLs. Samples free. Quick service. Sunland Print, Box 662, Hialeha, Fla.

TOWERS for your rotary beam. Full latticework, spruce construction. Priced for the amateur. Write for Bulletin T-101. Sky-Lane Products, Ironwood, Mich.

HAMMARLUND Super-pro rack-mounted 2.5 to 20 Mc. 100-200 200-400 Kc. 3-tube power supply and speaker, $175. W3BEN, Box 161, Hagerstown, Md.

SALE: S-38 receiver. Strite, 31 No. Grant, Waynesboro, Penna.

WANTED: Several 12 V. DC motors, about ¼ hp. Rm. 200, 4725 Malden, Chicago 40, Ill.

WANTED: BC683 receiver. F. M. Morgan, Glen Ellyn, Ill.

SELL UTC 1800, 1500, 1250; 300 Ma supply prewar, used 2 months $35. Thordarson 7H 330 Ma ccs, $6; UTC CM 16, never used, $4; pair surplus 813 with Natl. sockets, $11; Bud 1624 40/40 MMF, $6; TMC, 100D, $4. WØQMA, Ashland, Nebr.

SELL: SW3 complete 4 sets bandspread coils, power supply. Best offer over $25. W3HC, 113 Westmont Ave., Silvlew, Newport, Del.

COMPLETE 10-meter mobile rig, 30-watt xmtr, Gonset converter, cables, control head and mike. First $100 takes it. Stancor 110 CM xmtr, 100 watts fone and CW with coils for 10, 20, 40, 80: $75. W4JOT, 4900 Riverside Dr., Richmond, Va.

QSLS, SWLS, Meade. WØKXL, 1507 Central Ave., Kansas City, Kans.

SELL SX28A, like new, with speaker, $180. William Goodell, 132 E. Fifth Ave., Roselle, N. J., Roselle: 4-5905

FOR Sale: SX28A with speaker and manual. Perfect condition, $175. W4LEB, Ward Lantis, 2228 Sherwood Rd, Kingsport, Tenn.

WILL sell brand new gasoline driven generator for portable use. John F. Young, 700 Murphy Ave., SW, C-15, Atlanta, Ga.

METERS: DC volt, MA, amps, thermo coupled galvanometer, 3" and 2½" round and triangular, Weston, Jewell, $1.50 to $4.50. Dr. C. R. Crosby, Framingham, Mass.

SELL 1946 DB-20. Used 10 hrs. A-1. Best offer. L. Strandenaes, WØJWY, Box 1405, Jamestown, No. Dak.

SELL: One of two fone xmtrs, spare parts, modulation xfrmrs, tubes, meters, etc. WØUFD, 1123 So. 50th, Omaha, Nebr.

QSLs. Thanks, fellows, for swell comments on work. Assure you quality workmanship always. C. Fritz, 1213 Briargate, Joliet, Ill.

SELL: 600 watt phone xmtr. Class B modulation, in Parmetal deluxe cabinet, speech amplifier. ECO 10,20,80 meter coils. Write for photo and particulars. W8SOX, Box 157, Roscommon, Mich.

ICONOSCOPE practically new guaranteed RCA 4½" electromagnetic deflection complete with RCA yoke horizontal and vertical deflection xfrmrs and full schematics instructions. Sell or trade all for quality reflex or miniature camera. W2RWP, 1221 Glencove Road South, Syracuse, N. Y.

BC348 for 110 V. with broadcast converter, $180. BC375, $25. John C. Harvey, 2324 Broadway, Lubbock, Texas.

FOR Sale: 600 watt xmtr, PP 813s, mod. with TZ 40's. Complete with speech ampf. and new HQ-129-X rcvr. Also Sky Buddy and Howard rcvrs. Best offer takes them. W8TRY, 13207 Livernois, Detroit, Mich.

OSCILLOGRAPH RCA 155C $50; Hemlett-Packard audio oscillator 200C $50; RCA Voltohmyst, $40; Simpson VOM $25; RCP multitester 492 $40; Nat'l 100X $60. Kirchhuber 73 Harrison St., Franklin Square, L. I. N. Y.

QSLs: postpaid. Samples for stamp. W1HJI, P.O. Box 132, Manchester, N. H.

BOSTON Hamfest again! 10th Annual, Oct. 18, 1947. Remember the date! SCM F. Baker, jr., 91 Atlantic, No. Quincy, Mass.

FREQUENCY meter for sale. Lampkin Type 105. Temperature calibrated crystal. AC-DC power supply. 0.1 to 56 Mc. W3AHZ, J. A. Beaver, Boswell, Pa.

LINEMEN'S belts, $4, fabric, $5.50, safety straps, $3.50, climbers, $2, climbers' straps, $2.50 per set. All new. Electrical Service, P.O. Box 371, East Chicago, Ind.

260 foot vertical! Real DX! Nine foot circumference balloon, $3. Five, $10. Stelco, Pasadena, Calif.

RECEIVER, BC-348-Q, adapted for 110v AC, $40. J. W. Hazell, Holworthy 3, Harvard, Cambridge 38, Mass.

SELL: HRO receiver, 5-TA-1 with coils, speaker, and power supply. Also Stancor tranamitter, Model 60P, with coils, crystals, tubes. Will sell separately. W2MNR, 7814 Narrows Ave., Brooklyn 9, N. Y.

IONOSPHERE predictions analyzed professionally for your station. Know best frequencies, hours, antenna directions, angles of arrival for good DX. July data and basic theory, 50c. Postcard brings free newspaper, "Ham-Session." Propagation Analysts, 1030 Woodward Building, Wash., D. C.

SELL: FB7X 40, 80 coils, pwr supply, speaker. SW3, all coils, no pwr supply. Best offer. W3IND, 241 So. 21st, Philadelphia, Penna.

WANTED: HT-9 or similar transmitter. Cash. Lawrence W. Benjamin, W8IIS, South Lyon, Mich.

HRO: late relay rack model in perfect condition, comp. with pwr supp. and coils. First $225 cash takes it. J. G. Stradling, W4KRD, 441 Peachtree St., Atlanta, Ga.

WANTED: Coto type 700 band-switch in coil assembly and associated coils for 807 band-switching exciter. WØIZF, 2341 Wallace St., Clinton, Iowa.

FOR Sale: new NC2-40D, complete. Used less than 50 hrs. Best offer over $225.00. QST Oct. 1940 to date. W4YCC, J. Durham, Richmond, Ky.

SELL: 802 VFO, 807 all band transmitter-exciter. Coils, tubes, meters. $35, less power supply. Goodhines, W2NWB, 838 2nd Ave., No. Troy, N. Y.

COMPLETE 40 watt c.w. station, nothing else to buy. 1100 AC, receiver superhet, tuned RF. Iron core IFs, band-spread 40 and 80, commercially built. Complete with xtal, $155. WØAEV/2, 232-16 Seward Ave., Queens Village, N. Y.

25-28 volt transformer to operate surplus equipment from 115 VAC or convert ART-13. 200 watts, $12.50. 35 volts, 300 watts, $17.50. J. E. Reidel, W2CRB, 1523 41st St., Brooklyn 18, N. Y.

CUSTOM-building of ham equipment, your specifications. Medium power xmtrs. VFO's etc. Inquire Chatel, W2RSC, ex W1DIF 235 Duffield St., Brooklyn, N. Y.

BRAND new ART-13, Collins Autotone xmtr, comp. with tubes, plugs and remote control box. Best offer takes. W7CHZ, P.O. Box 1126, Everett, Wash.

STORAGE battery, 24 v, new. Aluminum shielding. 34 amp.-hr. ideal for portable rigs or ART-13. W6YHK, 1036 Mariposa Ave., Berkeley 7, Calif.

SELSYNS: 110 volt, $3.25 pair postpaid. Box 14, Packers Sta. Kansas City, Kans.

TELEPLEX wanted: only improved Master, latest model with tapes, A1 condition, considered. Details, price, etc. H. Stauch, Rt. 7, Box 5195, Sacramento, Calif.

SELL back QSTs by volumes only, 1927 to date. Write for prices. Harold Graves, Glenfield, N. Y.

SELL HRO completely overhauled, aligned, power supp., spkr, complete set of band-spread and long-wave coils. Limiter, $225. W1JOW, 519 Walnut St., Newtonville, Mass.

SUPER-PRO, Army model, rack mounting, perfect condition with power supply, less speaker. Best offer. Lavole 105S precision microwave, frequency meter, 375–725 megs, new, $75. W2OXR, 71 Crosshill St., Staten Island, N. Y.

FOR Sale: QSTs, 1932–1942, 25¢ ea., $2.00 year postpaid. W3EEH, 6117 Webster St., Phila., Pa.

RADIO interference and key click filters, 2 chokes, 4 by-pass conds. sealed metal case, will pass 1 amp., 60¢, 2 for $1. Wound slug tuned coils on ceramic forms specified for R9ER, 4 for $1. See April Hamads. Add 15¢ shipping chgrs. above items. Minimum order $1. Deflection and focus coils, television & cathode ray tube use. Write Ed Doherr, W3CIR/1, 96 Highland St., Hyde Park, Boston, Mass.

6AK5s, new, 90¢. H. Boggie, W6TFV, 725 Dale Ave., Glendale, Calif.

PANORAMIC adaptors, type AN/APA-10 companion units for AN/ARR-7 and AN/ARR-5 rcvrs, 110 volt, 60 cycle operation. Brand new in original cases. Price $97.50, f.o.b. N. Y. Electronicraft, Inc., 5 Waverly Pl., Tuckahoe 7, N. Y.

METER repair. Braden Engineering, 3317 Kenmore, Dayton, O.

TRADE 875 watt pwr supp., all Thordarson, Cornell, Standard relay, grey, 2000–2500 DC from primary switch, for best receiver offered before July 15th. WØUJO, Hutchinson, Kansas.

QSLs? SWLs? One-day service! No cheap trash! Samples, 10¢. W8DED (Sakkers). Holland, Mich. Bliley crystals? VHF-152? RME-45?

AMATEUR licenses. Have your license incased in plastic for durability and permanence. Send ticket and 50¢ to S. C. Houston, W6ZM, 3164 Bona Street, Oakland 1, Calif.

DISCONTINUING the manufacture of signal shifter coils when our present stock of parts is exhausted. Pass the word along. Now ready 10–11 meters on one set. Write for details. Rodgers & Harris, 727 Main St., Mount Carmel, Ill.

HALLICRAFTERS HT-6 with coils for 10, 20, 40, 80 meters, $100. RME-45 rcvr, $130. Elincor 400 BA 2 element beam antenna, $10. Stanley J. Misorski, W1NUE, 18 Clark St., New Britain, Conn.

SELL: NC-81X rcvr, $45 or best offer. E. Maslinski, W8YHT, 211 E. 26th St., Lorain, Ohio.

HRO-W complete, with 9 sets coils, 2 power supplies, etc. New. Make offer. W9HOI, 342 No. Oakcrest, Decatur, Ill.

LATE radio-television courses, $50, commercial radio ops sample questions, 10 sets, $10. Corrected. Used radio, math books, reasonable. W6VTC, Box 1298, Hollywood, Calif.

WANTED: band-spread coils for HRO-5 or HRO-W. Will sell or trade general coverage. W1OIA, 17 Whittier, Pittsfield, Mass.

FOR Sale: Hammarlund Super-pro, brand new, Army BC794B, 1250 Kc to 40 Mc, 18 tubes, built to A/N specs. Rack mounting, but complete with new desk cabinet, extra heavy duty power supply with dust cover, instruction manual. Never used. Best offer over $250. fob Burlington, Ky. W4KVX.

FOR Sale: complete station inc. BC-610, HRO, BC-221, frequency meter, Turner dynamic mike, National 1' oscilloscope and preselector. Contact W9PSL, K. E. Fuller, 100 Latham St., Lincoln, Ill.

SWAP or sell: BC-375 xmtr for signal shifter. Instructograph for sale for $15, complete. W4LRE, Box 371, Lawrenceburg, Tenn.

PAOUB swaps exclusive, original QSL design or Dutch poststamps (used or mint) for needed tubes or meters. Write for samples or stamps wanted. H. M. E. Linse, 22 Ketelstraat, Delft, Holland.

SELL: Collins 32RA xmtr, $150. E. Harris, 6748 N. Ashland, Chicago 26, Ill.

BRAND new S-36A Hallicrafters for sale. Reasonable. Cinemart, 565 Fifth Avenue, N. Y. 17, N. Y.

TRANSFORMERS: Filament 110v. primary secondary 6.3 v at 10 amps, 6.4 volts at .7 amps, 2500 volts insulation, potted and hermetically sealed, complete with mounting lugs. Dimensions 2¼ x 4½ x 5¼. Price: $2.95. J. Viola, 1936 Hobart, Bronx, N. Y.

GRADUATE engineer or physicist for design and development of electronic instruments is required by a large research laboratory. At least three years' experience in the field, familiarity with pulse technique and broad band amplifier design is essential. Living accommodation arranged. Address: National Research Council, Chalk River, Ont.

HRO recvr for sale, comp. with rack, pwr supply, spkr, and 1 coil. Good working condition. $115. W5FTA, 1310 Terrace Blvd, New Hyde Park, N. Y.

WATERPROOF your 300 ohm line with flexible plastic tubing. Slips on. Impedance unaffected by rain. 4¢ per ft. postpaid. Ellis Hanna Co., Lombard, Ill.

FOR Sale: Hallicrafters SX-32, HT-7 Freq. Std. & Weston 774 checkmaster. Crede, Box 46, Youngstown, Pa.

QSLs on kromekote cards. Dauphinee, W1KMP, P.O. Box 219, Cambridge, Mass.

NATIONAL rcvr 101X. Latest model, xtal filter, noise limiter, R-meter, new tubes, grey finish, excellent condition. Comp. with spkr and cabinet. Best offer above $90 takes it. WØCVU, P.O. Box 224, Cedar Rapids, Iowa.

LATEST model Natl. HRO-5TA1 rcvr, comp. with spkr, pwr supp and 4 std. coils. Used 2 mos. Will sell for $245. Will ship exp. collect. Satisfaction guaranteed or your money refunded. M. C. Alford, Rt. No. 1, Box 538-A, Dallas 8, Texas.

BEAM elements, 10–11 meter. 1½" duraluminum tubing, light weight, yet extremely rigid. Telescoping ends. Ready to install, three elements $14.50. Also RME-69 comp. overhauled. Make offer. W2SVG, 375 Oak Pl., Mineola, L. I., N. Y.

BT Xtals, low drift. Stocked 4,500 to 7,500 Kc, 8,000 to 9,700 Kc. Calibrated plus or minus 1 Kc. Mounted in 5 pin or octal holder, 75¢. Unmounted, 30¢. Holders, 40¢. Money back guarantee. James McCarty, 7301 Ibsen St., Chicago 31, Ill.

SELL: Hallic. S-20 rcvr. 70-watt CW xmtr. Best offer. W5GJG. 1400-B Washington, Amarillo, Texas.

SELL: NC-101X. Perfect, $100. Bowdon, 99 S. Union, Akron, Ohio.

FOR Sale: New NC 2-40D comp. with spkr, Cost $241.44. Best offer over $225. Used less than 50 hrs. For sale: QSTs, Oct. 1940 to date J. Durham, 255 So. Collins, Richmond, Ky.

SELL: Two unused Gen. Electric 2" meters 0–1 Ma. movement $5.95 for both. BC-1072A VHF xmtr with 0–5 Kilovolt G. E. meter, $20; metal spkr, cab. 12" sq. x 4", $5. Shure desk type xtal mike, $7. J. White, 7512 Chalfonte, Detroit 21, Mich.

SELL: One BC-312 rcvr, new, xtal filter, AC supp. Spkr. Excellent buy. Make an offer. H. C. Snyder, WØNVE, K.O.R.N., Fremont, Nebr.

INSTRUMENTS and meters repaired, corres. invited. Universal Electronics, Dept. N, Box 7754, Kansas City 3, Mo.

FOR Sale: Mark II tank xmtr-rcvr, with 12 v. dynamotor pwr supply, mike, fones, key and antenna variometer. Used one month. Just built new xmtr. Price $30. Louis Umbach, YMCA, Youngstown, O.

SELL: 80–40–20–10 meter, 3-stage xmtr, 250-watt fone, 350 CW, 6 power supplies, separate 3-stage ECO. 6AK5 pre-selector, Natl, NC-200 rcvr, A-1 condx. Want to sell as unit. Write for details. R. W. Evans, W8PKZ, 509 S. Metcalf, Lima, O.

SALE: Instructograph code machine, 5 tapes plus oscillator, $14.95 postpaid. Geo. Lund, 34 Chelton Rd., Havertown, Pa.

WANTED: 851 modulator. State make, condition, price. Also Harvey UHX-10 Transmitter. W1BB.

FOR Sale: S-20R rcvr. Had approximately 6 Mo. light use, $55. G. F. Wright, W2PEK, 228 Caroline, Saratoga Springs, N. Y.

ATTENTION CW ops! Special pad prevents any "bug" from walking across tabletop. Long lasting, highly endorsed. Two postpaid 50¢. Howard Severeid, 2924 Station, Indianapolis, Ind.

SELL, trade Lafayette professional 9 comm. rcvr, excellent condition. Billings, 2114 Albemarle Rd., Brooklyn 26, N. Y.

CRYSTAL kit: includes 4 finished, highly active "BT" xtals; state preferred freq. in 3,500 to 8,500 kc range; 2 holders, abrasive, instructions, treatise, $1. Breon Labs, Williamsport, Pa.

SELL 25-watt Sound Products xtal police mobile xmtr, 6 volt shock mounted revamped for 10 complete with mike, remote control, all cables. Like new, $150. Peckham, 89 State, Auburn, N. Y.

FOR Sale: Super-pro, latest model, $300. Wanted: power and modulation xfrmr for BC-610 xmtr. G. L. Hight, Rome, Ga.

QSLs, highest quality, samples free. VVS Print, 1704 Hale Avenue, Ft. Wayne 6, Ind.

CRYSTALS: Where quality and not price is the main consideration, demand Eidson xtals. Fine commercial units for Aircraft, Police, Marine, Geophysical and other services; xtal regrinding. Also broadcast station monitor service. Over decade of satisfaction and fast service! Try us first. Eidson Electronic Co., Temple, Texas.

SELL Brand new Millen exciter, 20-meter coils, tubes and pwr supp., comp., $75. Elrod, 4722 Hudson, Suitland, Md.

WANTED: HRO broadcast-band coils, types E, F. W1LLF, 48 Treat Rd., Wethersfield, Conn.

QSLs for 3¢ stamp. Harrison, 8001 Piney Branch Rd., Silver Spring, Md.

W8EWC ex-W6EWC, 1579 Girard St., Akron, Ohio.

FOR Sale: Globe Trotter, comp. Want hi-pwr CW rig or what have you? Write W8WSC, Box 516, Stryker, Ohio.

SELL: BC-348Q rcvr with 110 v. power supply and 10-meter coils. Like new, $55. W2HFM, Merrick, N. Y.

SWAP or sell Reiner Model 556 scope, three 833A tubes, Ballantine Model 300 and Model 220 AC voltmeter and AMP, two T-200s, two 100THs, beam rotating unit with selsyns, National TMA 100DC xmtr. Cond., Hewlett Packard Model 500A freq. meter. Write W5LXP, 2113 Somerset Pl., Oklahoma City 6, Okla.

HQ-129-X, $150. M. Gorski, Box 135, Ballston Lake, N. Y.

FOR Sale: complete station, Temco 75GA xmtr, SX-28A rcvr, 10-meter 3-element beam, with amplex motor and direction indicator, Sonar FM exciter, Astatic DID4, 30-watt mobile xmtr. The whole works for first reasonable offer. F. Karlin, W1PBP, 167 Farmington Ave., Waterbury, Conn.

FOR Sale: two rack mounting pwr supplies which formerly powered a 750-watt xmtr. Also, Natl. 6 volt pwr supply kit and magnetic pickup. Reasonable. Details sent. George Kravitz, 7919 20th Ave., Brooklyn, N. Y.

SELL Hallicrafters S-36A rcvr, like new, perfect condition, $200. Complete P. A. system indoor-outdoor, $350. W3IQB, Amos Stanley, Middletown, Del.

SALE: Factory new BC-610 xmtr, used 25 hours, Sonar FM, never used, 8 Bliley xtals, comp. set of coils, 2 new extra 250TH tubes. Original cost over $850. Perfect condition, spotless. Best offer takes all. Pick up at Howard Rabe, 1011 Varney, Port Huron, Mich. W8MUH.

FOR Sale: Abbott TR-4 transceiver, 2-meters. With tubes, $30. W6NCT/2, 166 Sylvan Ave., Leonia, N. J.

HANDY Talkies, 2, $30 each. Both for $50. Comp. with tubes and batteries. 144–148 Mcs. W2LQJ, 1785 Central Ave., Albany 5, N. Y.

ONE beautifully constructed 10 meter rig using only hi-quality components, cabinet size, 50 watts output, $100. f.o.b. Denver, R. Welley, 1549 Boston St., Aurora, Colo. WØHBU.

FOR Sale or trade: Instructograph and 10 tapes, oscillatone and key. Perfect condition. Sell $25 or trade for small multimeter or what have you. H. E. Moore, 13 So. Dubuque, Iowa City, Iowa.

BEAM control cable 8 conductors, weatherproof, shielded 10¢ ft. Associated Industries, 6639 S. Aberdeen, Chi., Ill.

TRANSFORMERS, PPI units, cathode Ray, xmttg tubes. Write for bargain bulletins. Ham and experimental surplus. Unbelievable prices. Lectronic Research. Howell & Hegerman Sts., Phila., Pa.

TEMCO 75GA xmtr, new. W. Humphrey, 734 Roanoke, Riverhead, N. Y.

SELL: 200-watt fone/cw xmtr, 813 final TZ40 modulators. Has dual power supplies, 80–40–20–10 coils. Rack and panel four sides. $160 W7HZ, Puyallup, Wash.

Index of Advertisers

ADD TWO, SIX, TEN AND ELEVEN METERS TO YOUR OPERATING SCHEDULE

BE PREPARED FOR THE INCREASED ACTIVITY ON TWO AND SIX METERS

SPRING and SUMMER will provide a new high in VHF interest and activity —and a VHF 152 Converter will enable you to get on these bands efficiently and economically. Six meters will be good for "Sporatic E" this Summer. In the Fall F2, long distance skip, will also prevail.

Because many are going to crystal control on 144 mc., the VHF 152 is a must. It employs the extremely efficient double detection system when used with any communications receiver—at a low price and with high efficiency.

What's more, amateurs are discovering that two and six meter bands are best for local rag chews—eliminating QRM on the crowded bands when they are open for DX.

In order that imageless operation on the eleven meter band can also be enjoyed, the VHF 152 has now been redesigned to include this band also. Features include a regulated power supply and provision for four separate antennas.

Yes, the VHF 152 will greatly improve reception on the high frequencies, and it's an especially vital adjunct to those receivers that tune only to 18 MC.

ILLUSTRATED FOLDER ON REQUEST

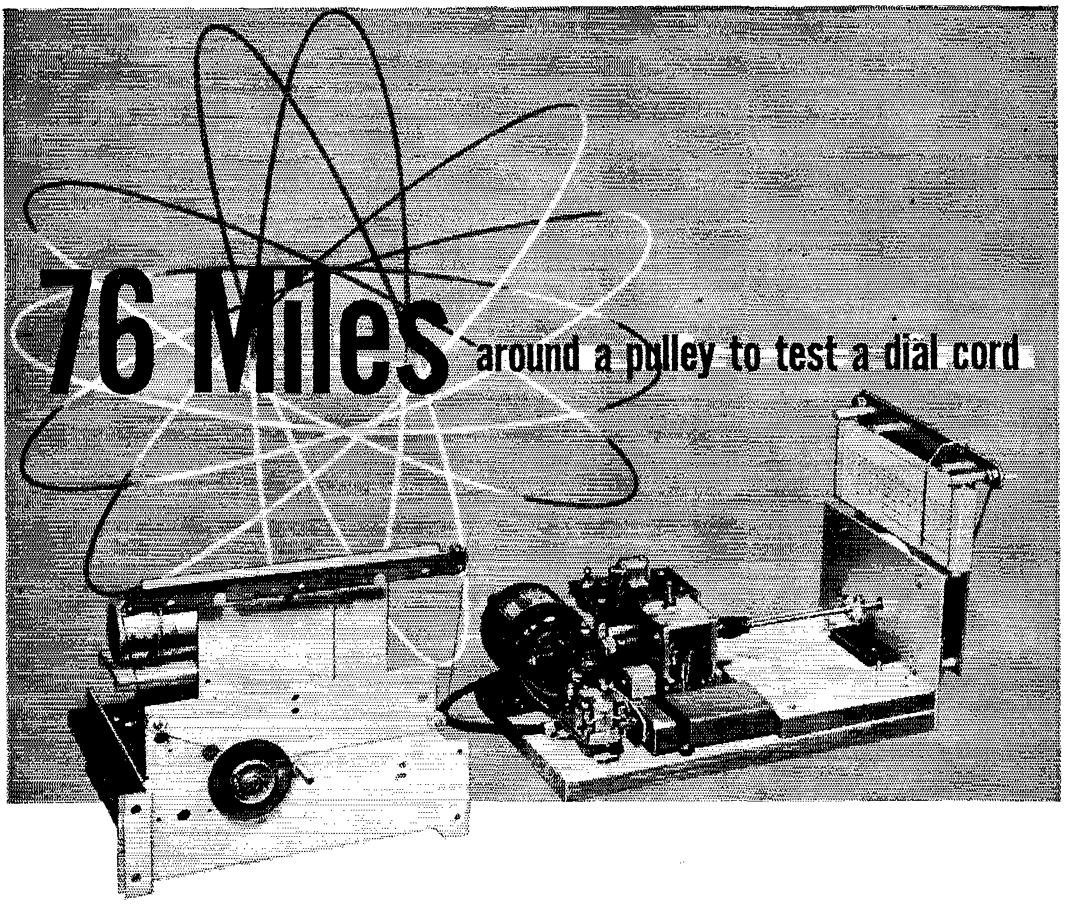
TIME WILL TELL

RME

FINE COMMUNICATIONS EQUIPMENT

RADIO MFG. ENGINEERS, INC.

Peoria 6, Illinois U. S. A.



Seventy-six miles—that's how far the dial cords have travelled in each of the two life tests shown in the photograph. Over 400,000 feet, reversing direction over 800,000 times, pulling, turning, twisting—but they'll take it. These dial cords are used with the Collins band-lighted dials on equipment for amateur radio. *To equal this performance, the tuning knob would have to make more than 6,420,000 revolutions!*

This is one of many different kinds of tests that are given the various components, sub-assemblies, and assemblies in Collins equipment. Tests like this represent years of actual service. They are a contribution to the years of satisfactory service that you can confidently expect from Collins ham gear.

Ask for illustrated bulletins describing our radio equipment for amateurs. Here's the list:

30K 500 watt transmitter, PTO control.
32V 150 watt transmitter, PTO control.
70E-8 Permeability Tuned Oscillator.
75A double conversion receiver.
310B 15 watt all band exciter, PTO control.
310C-1 PTO frequency control.
310C-2 PTO frequency control.

These are all post-war units. Write today for details.

FOR BEST RESULTS IN AMATEUR RADIO, IT'S . . . COLLINS

COLLINS RADIO COMPANY, Cedar Rapids, Iowa

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

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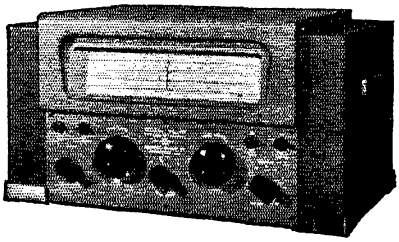
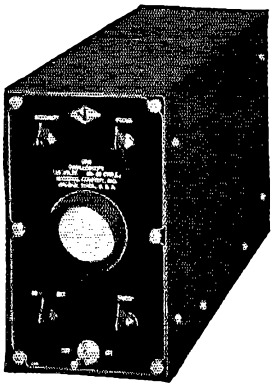
There's PRIDE of OWNERSHIP in a product of PROVEN VALUE

HRO-5A1
This famous receiver has recently had a number of refinements added to it, including a highly efficient noise limiter and a redesigned flexible crystal filter. Frequency range is normally from 1.7 to 30.0 mc. Additional Coil Sets can also be obtained to cover the bands from 50 to 2050 KC (except for 430 to 480 KC).
Amateur Net.....$274.35
(with tubes and A,B,C,D Coils)

NC-46
In the more inexpensive class, the NC-46 is one of the best buys on the market. This is a 105 to 130 Volt AC-DC receiver, providing 3 watts of audio output. The frequency range extends from 540 to 30,000 KC covering four bands.
Amateur Net.....$97.50
Matching Speaker..... 9.90



CRU Oscilloscope
The CRU is a compact, inexpensive 2" scope especially designed for transmitter modulation checking. Circuit incorporates a self-contained power supply, controls for brilliancy and focus, a potentiometer for controlling the amplitude of the horizontal deflection, as well as a built-in 60 cycle sweep.
Amateur Net (Table Model)....$39.90
Amateur Net (Rack Model)..... 42.75



National
EST 1914

● There's nothing that will turn a buddy who's a BCL or an SWL into a real ham so quickly as watching you operate a really good receiver which picks up sigs from all over the world.

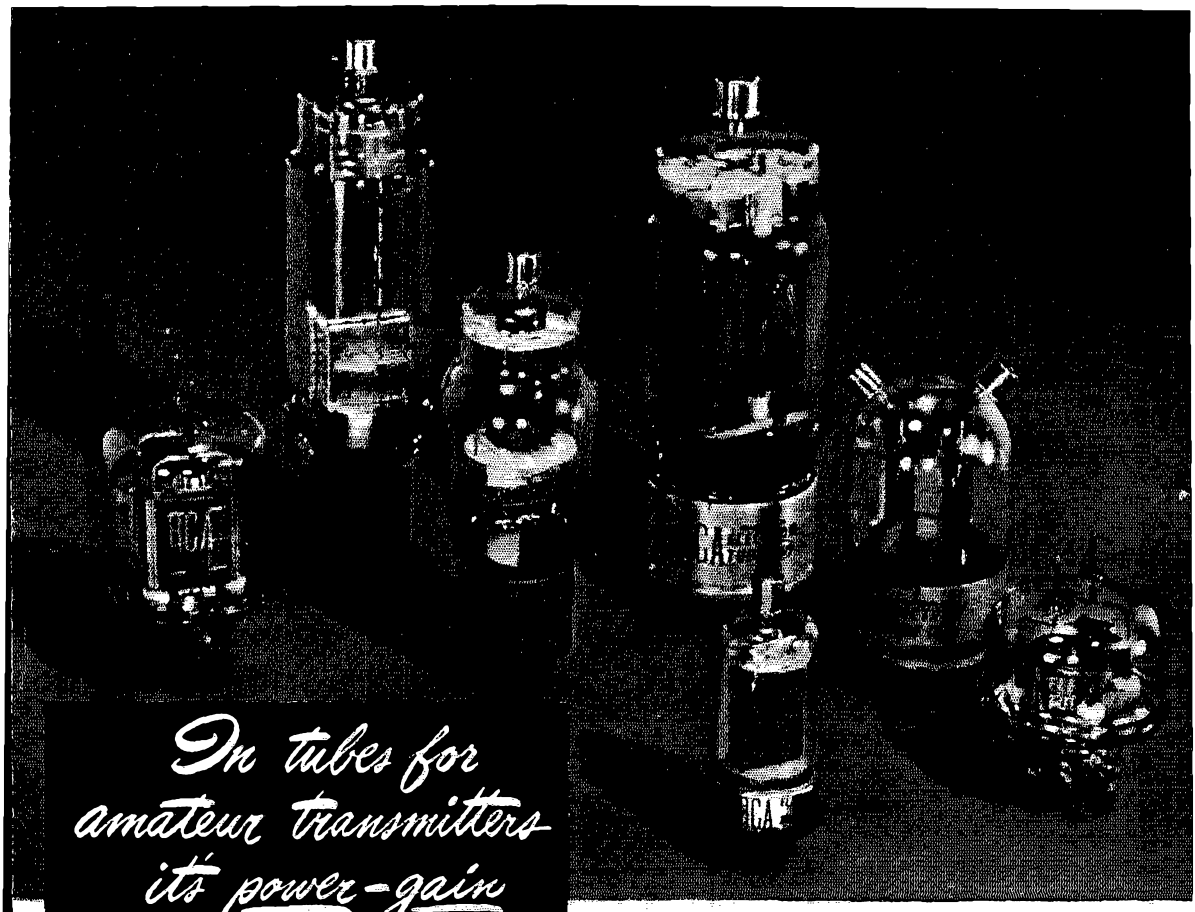
You know the thrill that comes from working DX for the first time and if you can get that friend or that YL to spend an evening with you watching a good OP and a good rig at work, you'll soon have a new ticket-holder on a favorite band to chew the rag with.

National equipment will not only increase your traffic, but will make you proud to show off your station to friends.

National Company, Inc.
Malden, Mass.

Please write to Department 8 National Company, for further information.

MAKERS OF LIFETIME RADIO EQUIPMENT



In tubes for amateur transmitters it's power-gain that counts . . .

. . . and RCA beam tubes have plenty of i

YOUR CHOICE OF RCA BEAM TUBES FOR TRANSMITTER SERVICE					
Type No.	Approx. grid drive (watts)	Max. d-c plate input (watts)	Max. d-c plate volts	Max. freq. at Max. ratings (Mc)	Amateur net price
2E26	0.2	40	600	125	$3.50
807	0.2	75	750	60	2.30
813	4	500	2250	30	14.50
815	0.2	75	500	125	6.25
828	2.2	270	1500	30	12.50
829-B	0.8	150	750	200	14.75
832-A	0.2	36	750	200	10.60

NOTE: *Class C telegraphy (ICAS) ratings are* shown except for 832-A which are CCS.

The Fountainhead of Modern Tube Development is RCA

WITH POWER GAINS ranging up to 100 to 1 or mo it's incredible . . . almost, how little grid excitati you need to drive an RCA beam power tube to full pl input. Receiving tubes do it easily.

What are the transmitter design benefits? Plenty. RC beam tubes make it practical to use fewer stages . . . few components . . . fewer tuning controls . . . smaller, less e pensive drivers. They provide true circuit stability f *frequency-shifting.* They need no neutralizing in we designed circuits. And a beam tube transmitter takes le power.

Pioneered by RCA engineers . . . and continually i proved, it is natural that beam tubes are our special For more information, ask your distributor for a copy "RCA Headliners for Hams" or write RCA, Commerc Engineering, Section M54G Harrison, New Jersey.

BIG CIRCUIT STORY ON THE 807 BEAM TUBE . . . in the May-June issue of RCA Ham Tips. Get your copy at your local RCA Tube Distributor.

TUBE DEPARTMENT

RADIO CORPORATION of AMERICA

HARRISON, N. J.