december, 1937
25 cents

QST

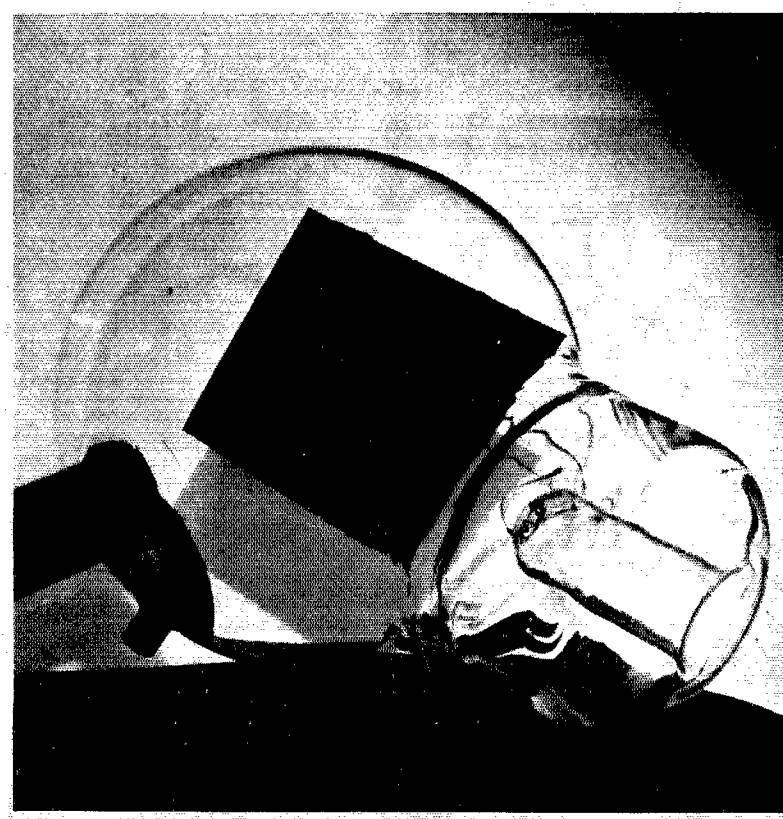
devoted entirely to

amateur radio

n this Issue—

A New Series
n Modern
Television

mproved
Diversity
Reception



A KILOWATT AT 5 METER

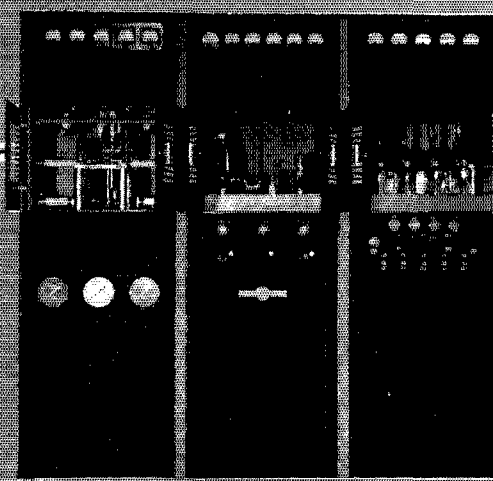
It is customary to think of a hundred watts as being rather high power at ultra-high frequencies, and a full kilowatt was not dreamed of a few years ago.

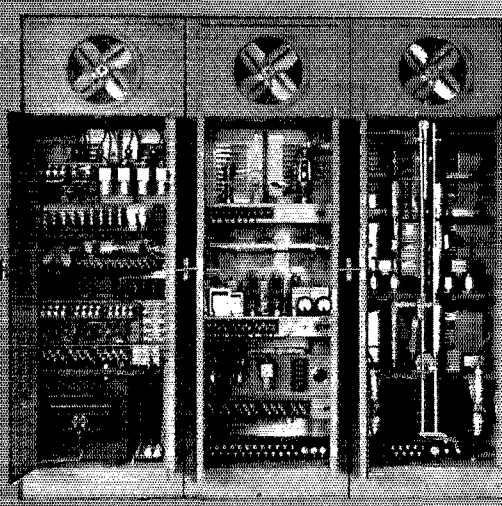
The special 201FU Transmitter illustrated is an engineering project recently completed for Farnsworth Television Incorporated of Penna. It is of real interest, not so much as a curiosity, but as an example of how a new development can be taken out of the "hay-wire," laboratory stage and be made neat, business-like and commercially usable.

The 201FU design is adapted to frequencies between 35mc. and 70mc. This particular transmitter delivers an output of 1000 watts fully modulated at 66 mc. The water-cooled tubes in the output stage are mounted in water jackets which themselves form the output transmission line tank circuit. Parallel and concentric lines are used elsewhere as tank circuits, impedance transformers and as by-passing elements.

An interesting fact is that with these components properly proportioned the entire equipment is as stable, neutralizes as completely, and functions as efficiently as if it were a conventional transmitter on much lower frequencies.

The 201FU is advertised, not as a piece of apparatus which you may want to buy, because there are few applications at present for such sets, but as an illustration of the ability of Collins Radio Company to handle difficult engineering commissions.



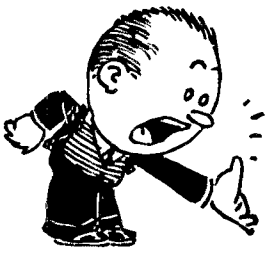


COLLINS RADIO COMPANY

CEDAR RAPIDS, IOWA — NEW YORK, N. Y. — 11 WEST 42 ST.

QST *devoted entirely to* AMATEUR RADIO

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



DECEMBER
1937

Volume XXI
Number 12

★

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The Contents

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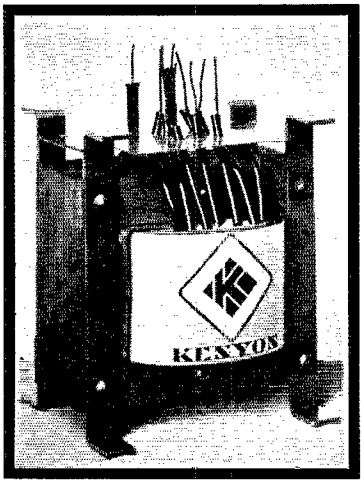

Kandid Ken-O-Talk, No. 1

THE Kenyon Transformer Co., Inc., takes pleasure in presenting to the users of its products a few of the inside details and manufacturing processes that assure them of the best product obtainable.

Let us first consider how and why our T-Line, and better grade units, are sealed and supported in their housings.

All units which develop heat of their own accord, such as plate and filament transformers, are supported on heavy cold rolled steel brackets. These brackets support the transformer rigidly so it cannot move in the case due to the cold flow characteristics of all pouring compounds. This precaution eliminates the most common causes of failure in potted transformers. When a transformer is supported in this way, it makes it impossible to shift and ground to the case, put tension on and snap leads, or settle on and short circuit leads. This detail of construction is one of the results of our thirteen years' experience in transformer manufacturing.

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All leads are brought through a false terminal board directly under the main terminal board to eliminate shorts between leads and to insure a neat wiring job.

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After the baking process is finished the case is filled one third full of compound and the transformer is set in it. Then compound is poured in until it flows over the top of the false terminal board.

The pouring compound used is a special type possessing excellent heat transfer characteristics to prevent "hot spots" in the winding. It also has chemically inert and non-hygroscopic properties. Thus the coil is completely sealed to make it impervious to moisture and adverse climatic conditions.

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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 non-commercial 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. Correspondence should be addressed to the Secretary.

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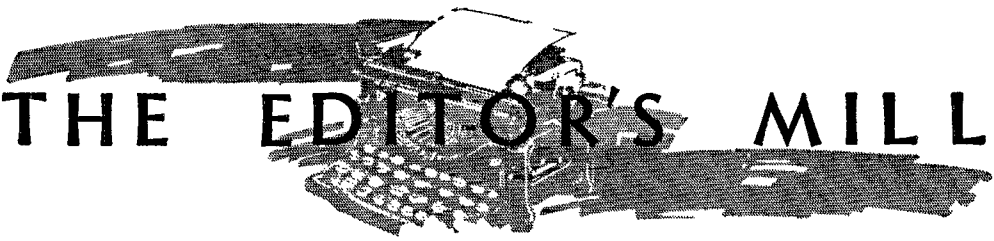


THE big news of the moment is about the ultra-high frequencies. As we write, the Federal Communications Commission has just issued its orders announcing the long-awaited service allocations of the frequencies from 30 to 300 Mc. Amateurs will remember the extensive hearings of June of last year which called into being our famous "Presentation for the Amateur Service." The intervening months have largely been filled with interdepartment government conferences designed to reconcile the conflicting demands for frequencies. The present result, two orders and a new text for Rule 229, makes radio history, for much of the future of our art is going to be written in the u.h.f.

What you fellows want to know, of course, is how amateur radio came out in the new deal. The news is all good. Our 56–60 Mc. (5-meter) band is reaffirmed as exclusively amateur. Our neighbor on the low-frequency side is to be the television service while, on the high-frequency side, it is government services. Then we have two new exclusive bands, from 112 to 118 Mc. (2½ meters) and from 224 to 230 Mc. (1¼ meters), our neighbors on both sides of both of these bands being government services. Thus in the new deal we have gained for ourselves two new bands of ultra-highs, each of 6 Mc. width, continuing our harmonic family as far up into the spectrum as allocation has been carried.

These new allocations are not yet effective. It will first be necessary for the F.C.C. to amend our Rule 374 and it hasn't got around to that yet. When it does, we shall probably also obtain a joint right to continue experimental work on all frequencies above 300 Mc. Meanwhile we may operate at will anywhere above 110 Mc.

The great hue and cry about u.h.f. of course has been on behalf of the impending arrival of television, still around several corners but getting closer. The new order assigns for this service seven main channels, not all contiguous, between 44 and 108 Mc., and twelve additional channels above 156 Mc., although at this stage there isn't much interest in the latter. The seven main channels, each of 6-Mc. width, are as follows, the figures being in megacycles: 44–50, 50–56, 66–72, 78–84, 84–90, 96–102, 102–108. The Commission's press release contains the interesting comment that "The investigations and determinations of the Commission justify the statement that there does not appear to be an immediate outlook for the recognition of television service on a commercial basis. The Commission believes that the general public is entitled to this information for its own protection. The Commission will inform the public from time to time with respect to further developments in television."

There was a time when amateur radio had plenty of reason to worry about television's effect on our 56-Mc. band. It threatened to surround and squeeze it. With eventual pressure from the public, who would resent "one tooth out" of their tuning range in the shape of our band, it threatened in the long run to engulf our band. But now the fact that it is not to have a continuous assignment, that it is broken into four ranges, that our neighbors are chiefly government services—these things dissipate the fear of the old squeeze. "Five" now sits just as pretty as possible. With one exception that we'll mention below.

We have mentioned before that u.h.f. allocation proved an exceedingly arduous task. There weren't nearly so many channels as folks had imagined, and allotments were asked by every service, present and postulated, that man's mind could conceive. The end result seems to us to be about as good a job as anybody could expect. We did not receive the full width of bands to which we aspired, but neither did any other service, and the result ought to be generally satisfying to us.

So now all God's chillun's got megacycles, and the one remaining job is to equip them with radio gear and commence going places. You hams who have not yet investigated the u.h.f. are passing by one of the most fascinating fields in this grand old game. Two new bands, fellows—deserving more ham occupancy than they now enjoy!

We intimated above that there was one cloud on our 5-meter horizon. (Neat, wot?) There is. It's out-of-band operation and how we'll get-it-in-the-neck unless. It has constantly been the history of amateur radio that, following our pioneering in new territory, commercial users come in and occupy frequencies adjoining ours, and we go through a period of grief from interference complaints until we finally learn how to keep ourselves inside our new fences. That was notably true of 7, of 14 and of 28 Mc. For the last several years it hasn't been tremendously important whether we stayed between 56 and 60 or

not; there wasn't much of anybody else there. Now repeating history is bringing us neighbors in that band, people who also have the right to operate there and who are entitled to do it without QRM from us. The time has been reached in the progress of the new art when we must clean up this band. Two examples will illustrate: (1) Experimental television service is under way. Columbia Broadcast System in New York has the 50–56 channel immediately *below* our band and they've been surveying. During the past summer, listening only briefly during daylight hours, they logged scores of amateurs between 54 and 56 Mc., prefectly good W2 stations for the most part. You can imagine what it must be like on a typical winter evening. (2) Some of the government services are putting in gear to use frequencies just *above* our band for keying circuits, to control transmitters on lower frequencies. Won't some ham identify himself unfavorably in high quarters when he overrides the control signal and takes over the keying of a high-powered government transmitter!

In other words, boys and gals, the day is upon us when we must immediately clean house, take steps to insure that our signals stay between 56 and 60, and generally apply to that band the same scrupulous care that we necessarily devote to staying on-frequency in the lower bands. *QST*'s technical staff is preparing practical helpful information on the subject. Let's take this to heart right now, people, and govern our 5-meter operation in such a way as to avoid complaints from our important new neighbors.

K. B. W.

Radio Amateurs in the Television Picture

Announcing a Planned Program of Technical Coöperation

By James J. Lamb*

RADIO history repeats itself. The experimental activities of licensed amateurs in radiotelephony supplied the initial impetus and acceleration for sound broadcasting in the early 1920's. Now, over 15 years later, we radio amateurs have immediately before us the same opportunity to aid the progress of modern television development and perform an important public service in traditional amateur fashion. That this should come about was inevitable. Amateur radio provides the logical experimental proving ground for new developments between their laboratory stage and their attainment of widespread practical utility. In performing this service we have not only benefited ourselves as amateurs, but we have also earned recognition for experimental contributions no less important than the appreciation amateur radio has merited for emergency and other communication activities. For a time, it appeared that those concerned with the technical and economic problems of television development would do without experimental amateur aid. According to plan, television would come out of the laboratory, pass through a period of field trials conducted by a few restricted groups, and then be presented as a fully standardized and "perfected" public service—all under strictly commercial auspices. Participation of independent amateur experimenters in the intermediate stage of this program was not contemplated. Of course not everyone engaged in the commercial development of television thought that this would actually work out. And neither did we. Behind this lies a story.

*Technical Editor.

THE AMATEUR BACKGROUND

One responsibility of A.R.R.L. headquarters is to be on the alert for technical trends which may affect amateur radio; to judge, to the best of our ability, the possibilities of new developments as aids or hindrances to the progress of amateur radio; and on the basis of this judgment to do our best, by practical action, not only to adapt developments to our own needs but also to coöperate in their evolution so that progress may be maintained.

We have actively followed this policy with regard to television since the time of those early experiments with mechanical systems some ten years ago. For television is pretty much an old story in amateur radio. This magazine devoted considerable space to experimental television systems during 1928. In fact, there were more articles on television listed in the index for that year than articles on radiotelephony, the score being 6 for television to 4 for 'phone. General Electric, in Schenectady, and the late Dr. C. Francis Jenkins, in Washington, D. C., were the principal sponsors of transmissions on the medium high-frequency bands with pictures of 24 and 48 lines —exceedingly crude by present-day standards and even too crude to do more than demonstrate

principles at that time. The television content of *QST* tapered off to three articles in 1929 (and telephony scored four). Two of these three articles were distinctly of a debunking nature—in the January issue, "Rotten Television," by The Old Man, whom we now know to have been our late president, Hiram Percy Maxim; and, in the March issue, "What Price Television," by M. B. Sleeper. These two stories pretty definitely wrote *"finis"* to the amateur's further expenditure of money and effort on experimental reception with mechanical systems.

But this did not mean that the prospect of experimental television was hopelessly ended for us. In one of the 1928 articles, "Radiovision," in the September issue, Thornton P. Dewhirst had pointed the way and outlined the basis of what has become the modern technique in television reception. He said:

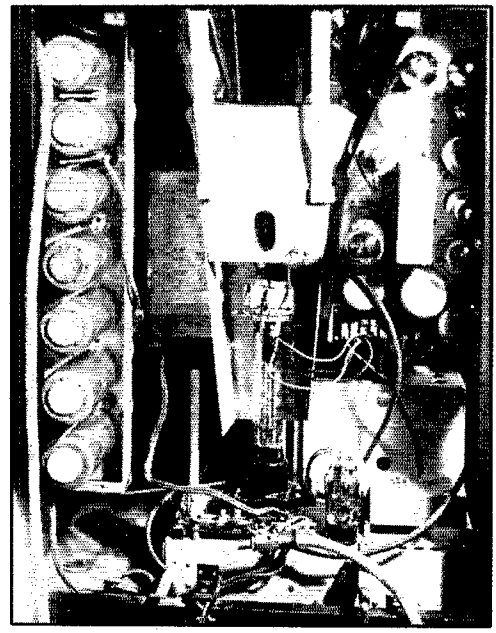
"The use of the cathode-ray tube for the receiver is worthy of consideration since it opens up the possibility of real radiovision. In this tube, a stream of electrons may be moved in two directions at right angles to each other by means of either an electric field or a magnetic field. The window of the tube is covered with a fluorescent material and the electrons upon striking it cause it to glow. By means of proper values of current or voltage and frequency, the small spot of light can be made to cover completely the window. For radiovision work, the use of a material for coating the window that was not only fluorescent (emits light when exposed to certain rays) but also continued to glow for a short period after the ray has been removed would be of material assistance. This will help in causing the vision to persist and thus give the effect of greater illumination as far as this characteristic is concerned."

In this same article, the author also outlined general requirements for satisfactory picture reproduction which still apply—and which are not yet completely solved. Quoting his words:

". . . When the elementary area used to build up our picture bears the same proportion to the whole picture that the individual particle of the (film) emulsion of the moving picture bears to the total number of particles in the exposure, and (when) some method of transmitting each of the individual parts with ease and the problem of synchronism have been completely and simply solved, radiovision will be ready for the public."

Now we must remember that in 1928 the cathode-ray tube was not the familiarly-known tool for routine amateur use that it is today. It was then a relatively rare, expensive and somewhat temperamental device restricted to the realm of the laboratory of the advanced physicist. But it soon became our conviction that television reception ultimately would employ the cathode-ray tube, and that until the c.r. tube technique was sufficiently developed, further amateur activity in experimental television would be practically futile.

We continued to keep an eye on the ball, but could not discern anything sufficiently significant to warrant further *QST* space until 1931. But in the middle months of that year the television pot began to boil sufficiently to give off some steam and evidence of the beginning of the cathode-ray era became visible. In the early fall of 1931 Associate Editor Ross Hull and this writer made an inspection trip to several of the representative television camps to learn first-hand just how much fire there might be under the pot. The results of this survey were reported by Hull in the article, "Television—What About It?" in the Nov., 1931, issue of *QST*. The sum and substance was that the cathode-ray technique promised results, that higher definition was in sight with "perhaps 240 lines to the picture," that transmission on ultra-high frequencies above 40,000 kc. was proposed—but that television still was in the laboratory stage.



INSIDE A MODERN TELEVISION RECEIVER

THE PRESENT SITUATION

It was not until about a year ago, in the Fall of 1936, that television had reached a stage where we became convinced that our active experimental participation would not be much longer delayed. Technique in the art had reached the state where refinement rather than new basic developments had become the ruling order. Experimental field tests with fairly high-power trans-

mitters were started. Under the auspices of the Radio Manufacturers Association, a set of proposed standards was promulgated. So we started to look for a way into the modern television picture.

But several questions of utmost importance had to be answered first. Was there reasonable assurance that transmission would, in general, conform to the proposed standards and that such changes as might be made would be in detail rather than drastically sweeping? Even though there were no transmitters using these standards operating on anything like fixed daily schedules, would there be at least sufficiently frequent transmissions suitable for experimental purposes in several centers with large amateur populations? (It was our aim then, as it is our firm purpose now, not to encourage the building of receivers by people solely interested in being entertained by television shows, but rather to present practical technical information to encourage experimenting amateurs to attack the problems of television in a constructive way.) Could we secure adequate practical technical information, with design data and constructional information on television receivers of proved performance which would be suitable for amateur experimental work? Would the operators of the experimental television transmitting stations coöperate in keeping us posted on their current activities and, possibly, their future plans? Would the necessary special cathode-ray tubes and other essential components be made available? And, finally, did a sufficient number of amateurs want *QST* articles on television?

Throughout the past year we have worked to get the answers to these questions. And we report here and now that the answer to every one of them is a resounding, "Yes!"

Taking the last question first, a decidedly positive answer was given by A.R.R.L. members returning the questionnaire sent out with membership certificates and cards. *An average of the replies for six months shows that over one-third (37%, to be exact) of the membership want articles on the theory and practice of television.*

The answer to the question of design data and constructional dope on practical television receivers was given by Marshall P. Wilder, W2KJL, who is not only a real amateur but also one of the most experienced and competent workers in the cathode-ray television field that we know of. We were fortunate to have secured the promise of his coöperation nearly a year ago, when, while he was doing independent research on television tubes, we worked out a plan for just such a series of articles as he begins in this issue. He also has been instrumental in coöperating with us to have made available to amateurs essential components, especially tubes, for construction of experimental receivers.

Promises from several manufacturers assure diversified sources of essential television components, including several types of cathode-ray tubes and their associated components. An encouraging feature with respect to the c.r. tube situation is that the prices are to be considerably less than ordinary oscilloscope types of the same screen sizes—even though the construction of the television tubes is more expensive.

Conferences with executives of leading experimental television transmitting stations have brought promises of full coöperation in keeping us advised on times and types of transmission so that we can pass this information along to interested experimenters. We also have been informed that more frequent transmissions are contemplated after the first of the year. No changes in standards are contemplated, other than the variations in polarity of modulation and method of transmitting the brightness component described in W2KJL's article elsewhere in this issue—which the receiver, to be presented subsequently in *QST*, is designed to accommodate.

THE PROSPECT

One tangible result of all the cumulative effort that has gone into this planning is the inauguration of the series of articles on practical television reception by Marshall P. Wilder, W2KJL, in this issue. These articles will progress in logical order through the design, construction and adjustment of a cathode-ray type receiver incorporating the latest circuit developments. It will be capable of delivering a good picture. But its construction just should not be attempted by anyone less capable than the amateur who is well grounded in the fundamentals of circuit operation, who has had experience with the building and successful adjustment of fairly complicated equipment such as a multi-stage transmitter or superheterodyne receiver. He also should be familiar with the operating principles of cathode-ray tubes. In fact, he must have a cathode-ray oscilloscope available for the adjustment of the television receiver circuits before any attempt to operate the complete set is made. Experience with ultra-high-frequency apparatus and familiarity with the peculiarities of u.h.f. communication, while not so necessary, will stand him in good stead. The television receiver is not a simple thing to get going. But there are hundreds of amateurs who have the required ability and who will find it just the kind of venture to satisfy their desire for a good technical job to take on.

It must be distinctly understood that the construction of a television receiver is not to be undertaken by the non-technical "home set builder" who doesn't know a saw-tooth wave from a megacycle, no matter how alluring a kit advertisement may seem and no matter how simple a "picture diagram" may make the job look. Most of the real work (and it's head work) is in

(Continued on page 66)

Introduction to Modern Cathode-Ray Television Reception

Fundamentals of Scanning and the Make-Up of the Television Signal

By Marshall P. Wilder,* W2KJL

IT IS timely that we take a serious interest in modern television as a certain future activity in amateur radio. In this, the first of a series of technical articles on practical television, the general background will be presented.

The purpose of this series is not just to present purely theoretical television receiver design. On the contrary, straightforward practical data will be given, dope that can be used not only to give an understanding of the principles but also to make possible the construction and adjustment of a cathode-ray television receiver that works. But before tackling the working circuits it is necessary that a great deal concerning the make-up of the television signal and what goes on in television reception must be thoroughly understood, so that when the images (or beginnings of images) appear on the screen, it will be possible, by looking at the tube, to tell what adjustments need be made and where further effort should be expended to improve the quality. Only by a thorough understanding of the fundamentals, coupled with actual experience with a working television receiver, will it be possible for the amateur to participate usefully in the development of this new art.

SCANNING

No picture or scene is properly intelligible to the human eye unless it can be perceived instantaneously as a complete whole. Unfortunately, no practical electrical communication system is capable of handling more than one element of information at any instant. The inability of electrical communication systems to transmit a picture as a whole makes it necessary to dissect the picture into a large number of small elemental areas—to transmit them one by one, and to reassemble them in their appropriate positions at the receiver, in order that the observer may view the scene as a whole. If this process of dissection and reconstruction is performed a sufficient number of times per second, the eye receives the impression of a complete picture as a result of the phenomenon of "persistence of vision." This dissection of the picture into small elemental areas is known as *scanning*.

Although scanning may be performed in several ways, it is usual to scan the picture in lines from left to right and to proceed line by line from top to bottom, in much the same way as one's eye scans in reading the pages of this magazine. This system, with a modification known as *interlacing*, has been adopted in modern practice.

Interlaced scanning requires that one line of the subject be scanned, then a line skipped, then another line scanned, and so on, until the whole scene has been covered, in alternate lines, from top to bottom. Then the scene is scanned again, getting those intervening lines that were not scanned previously. Interlaced scanning has the distinct advantage that the number of views per second presented to the eye is double the number with straight scanning; and, although the number of picture elements transmitted is no greater than in straight scanning, the rate at which flicker occurs is twice as fast and above the rate at which flicker is annoying to the eye.

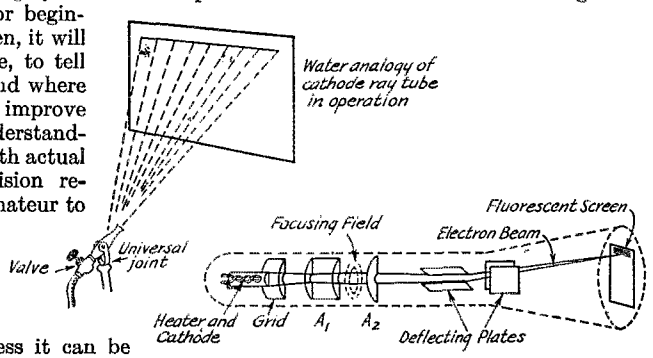


FIG. 1—ILLUSTRATING THE PICTURE-REPRODUCING ACTION OF THE CATHODE-RAY TUBE

Television to-day is received on a cathode-ray tube. Referring to Fig. 1, we have a tube consisting of a source from which a beam of electrons is projected onto a screen, a means of deflecting this beam so it will terminate at any desired spot on the screen, and a means of controlling the number of electrons in the beam. Let us study each part separately, and thereby properly understand the action of the whole.

A simple analogy of the cathode-ray tube is difficult to find, but if we consider a fine jet of water as a stream coming from a nozzle, which can be moved backward and forward, or up and down, we can more easily understand the action

* National Union Radio Corp., 57 State St., Newark, N. J.

taking place. If, as in Fig. 1, a nozzle were set up before a screen and then moved from left to right it would draw a line of a width equal to the diameter of the stream. If we jerk this stream back to the left very many times faster than we moved it over from left to right, only a comparatively few drops of water will strike the screen during the return trip; and if we return from right to left in a slightly downward direction, the jet will be ready to start again from left to right and draw a second line, and so on to the bottom of the screen, where a quick jerk up to the top would set the process to begin again. To carry the analogy further, we might control the density of this stream by manipulating a valve. If we vary the amount of water projected, the result will be some sort of an image consisting of varying values of wetness; and if the valve were controlled in some proper sequence, a picture might be produced.

Of course it would not be possible to make such a piece of apparatus work as a television receiver because of the inertia of its moving parts. But, in a cathode-ray tube the stream is an inertialess electron beam. Since electrons are invisible, only the effect of their impact on the screen can be seen. This impact is visible when electrons strike certain salts, notably zinc and cadmium sulphide or their silicates. A coating of one of these materials is applied to the inside of the bulb in a thin, even layer so that the beam striking any part will show up at the point where it impinges as a more or less bright spot of light.

The intensity of this light can be controlled by varying the density of the electron beam. This control action is similar to that employed in an amplifying vacuum tube, the flow of electrons from the cathode being controlled or modulated by varying the voltage on a grid in familiar fashion. After this control or modulation, the emitted electrons getting past the grid are assembled by a focussing field which bundles them into a narrow beam and urges them in a forward direction between two deflecting fields, one horizontal and the other vertical. The two fields may be either electro-static or electro-magnetic.

The strength of these crossed fields is varied in the proper sequence by local oscillators controlled by synchronizing impulses derived from the received television signal. Thus the modulated beam is made to move across the fluorescent screen horizontally in practically straight lines, and vertically from line to line, in a manner similar to that outlined in the water analogy, so that a picture of varying light intensity can be obtained.

Before considering further the actual details of how a television picture is produced in a modern cathode-ray receiver, it is well to summarize the six essential requirements which must be satisfied.

First, a beam of electrons of very small cross-section must be produced and made to strike a screen of special material which will reveal the beam's incidence at the point of contact as a spot of light.

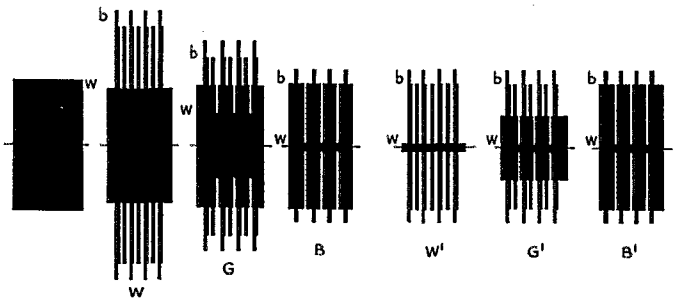


FIG 2

FIG 3

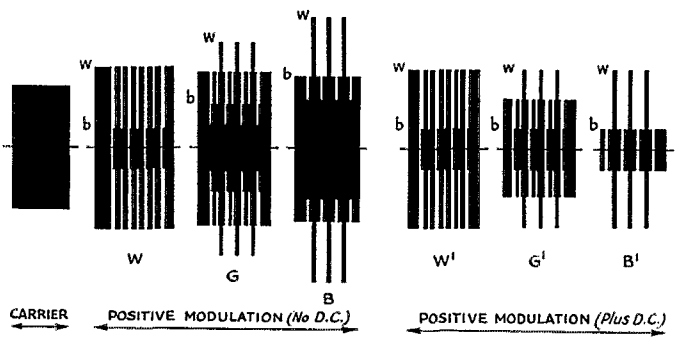


FIG 4

FIG. 5

FIGS. 2, 3, 4 AND 5—FOUR TYPES OF TELEVISION SIGNAL R.F. WAVES REPRESENTING SCANNING OF SIMPLE IMAGES

In each figure, W and W' correspond to a black vertical bar on a white background, G and G' to a white vertical bar and a black vertical bar on a gray background, B and B' to a white vertical bar on a black background. The small letters b and w on the diagrams indicate the voltage corresponding to black and white, respectively. The average amplitude and the voltage difference between b and w are intended to be the same for each condition. The synchronizing signals are the maximum parts of the wave amplitude with negative modulation, and the minimum parts with positive modulation. Without d.c. modulation, the carrier amplitude is constant and the peak amplitude varies in accordance with pedestal height. With d.c. modulation the carrier amplitude varies but the peak amplitude remains constant.

Second, the beam must be made to scan a given area in a proper sequence.

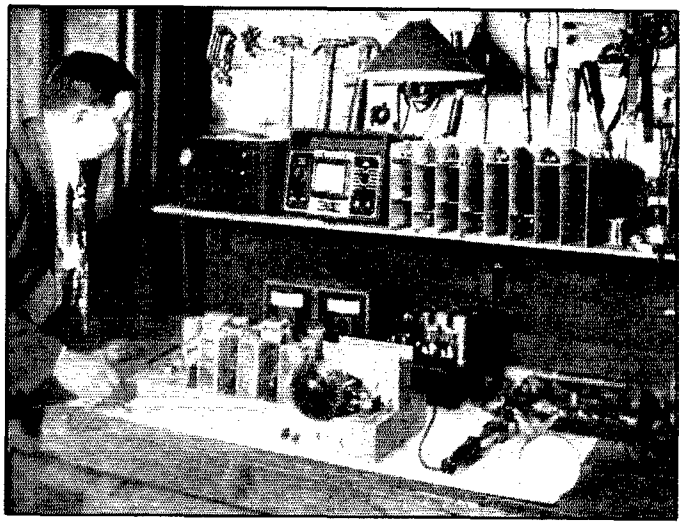
Third, the density of the beam must be capable of variation by the received impulses from the television transmitter.

Fourth, the speed of travel of the beam on the receiving tube screen must be the same as that of the scanning beam at the transmitter. This is accomplished by setting the oscillator which generates the deflecting field to run at approximately the correct rate and then applying correcting impulses at the completion of each line and at the completion of each half-frame or field. These correcting impulses are extracted from the signal received from the transmitter and are known as *synchronizing impulses.*

Fifth, *blanking impulses,* also from the transmitter, must be extracted from the received signal and applied to the beam during the retrace of each line and during the fly-back to the top of each half-frame so the beam will not have sufficient intensity to show up as light during the return trace.

Sixth, and finally, the average brightness of the picture must be transcribed from the incoming signal. Since the average brightness is of a relatively fixed nature, only varying occasionally as when the scene shifts from a dimly lighted room into a bright one, the average brightness variation must be considered as of very low frequency —or practically d.c.

There is now nearly general agreement on the technicalities for meeting these six requirements in practice— except on the method of transmitting the average brightness level and on the polarity of modulation which should be employed. With regard to transmission of information giving the average brightness or background, two methods are being used experimentally at the present time. One method employs modulation of the transmitted r.f. signal by d.c. which varies in accordance with the average brightness of the scene televised. The other method utilizes the variation in the amplitude of what is known as the *pedestal* component of the complete signal to control the average brightness of the received picture, as will be described later. The second unsettled point is whether the polarity of modulation should be negative or positive. With modulation of negative polarity, maximum amplitude of the modulated wave corresponds to black and minimum amplitude to white; while with positive modulation, maximum amplitude of the wave corresponds to white and minimum amplitude to black. The differences between television waves of positive and negative polarity, with and without d.c. modulation, are illustrated [1] in Figs. 2, 3, 4 and 5, which will be discussed later.



THE AUTHOR TESTING AN EXPERIMENTAL SUPERHETERODYNE TYPE TELEVISION RECEIVER, ONE OF THE MODELS DEVELOPED BY HIM IN PREPARATION FOR THE SERIES OF ARTICLES OF WHICH THIS IS THE FIRST

While these two technicalities affect the design of the television receiver, an experimental receiver employing electronic scanning can be readily adapted to receive any one of the types of transmission now in use.

The current American system employs 441 lines. These 441 lines are broken up into two half-frames of 220½ lines each. Approximately 20½ lines of each half-frame are employed for transmitting the field-frequency synchronizing impulse, as well as for blocking out the frame return trace. At the end of each line is a synchronizing impulse consisting of a pulse riding on a pedestal. The pedestal voltage is rectified and the resulting d.c. voltage determines the average brightness of the received image in accordance with that of the scene transmitted. These pedestals are used also to block the grid of the cathode ray tube to remove the return trace during the fly-back of the spot at the end of each line. To do this, the pedestal component is separated from the signal and rectified. The resulting d.c. voltage is automatically applied to bias the grid of the cathode-ray tube during each line, the video-frequency voltage being superimposed on this bias.

Meanwhile, the grid, under control of the *video*

[1] Reproduced by permission of the author and publishers from the article, "Standards in Television," by H. M. Lewis (Hazeltine Service Corp.), *Electronics,* July, 1937.

(picture element) modulation portion of the signal, determines the instantaneous brightness of the spot. In other words, the pedestal at the end of each line sets the d.c. grid bias and the video signal in between pedestals changes the intensity along each line. This is continued line by line to make up one half-frame. There are two half-frames interlaced to form one frame or picture. Thirty such completed pictures are transmitted in one second; that is, the frame or picture frequency is 30 per second, and the half-frame or *field* frequency is 60 per second.

In Fig. 2, a typical signal with negative modulation is represented. With the signal of Fig. 2-W a black bar on a white background would appear. The second picture, Fig. 2-G, corresponds to a white bar and a black vertical bar on a gray background, and Fig. 2-B to a white vertical bar on a black background. Figs. 3, 4 and 5 are for the same patterns with other types of modulation, which will be discussed later.

ANALYZING A TELEVISION SIGNAL

Fig. 6 represents a part of two half-frames with their line- and frame-synchronizing pulses, for a television signal wave with negative modulation. The pulses appear on the leading edge at the top of a pedestal. The width of the pedestal is equal to 1/10th of a line length. The pedestal voltage is used to bias the grid of the cathode-ray tube beyond cut-off during the retrace of the spot and to transmit the background brightness component, as previously explained. The drawing shows where the video signal stops and the synchronizing and blanking signal begins. Note that the video signal amplitude extends only part way up to the maximum amplitude of the complex signal. All signals in the region above this limit will automatically bias the grid of the picture receiving tube black. This region is therefore known as the "blacker-than-black" region, and in it all synchronizing impulses can be transmitted without appearing in the pattern of the received picture.

With negative polarity and no d.c. modulation, the average voltage of the video modulation is constant, but the height of the pedestal varies. As previously discussed, this changing pedestal amplitude conveys the average picture brightness. In Fig. 2-W the height of the pedestal is a maximum, and the picture background is white. In Fig. 2-G the pedestal is one-half the height it was in Fig. 2-W and, in this case, the background is gray; that is, half-way between black and white. In Fig. 2-B, where the pedestal height is zero, the background is black. Thus, we find our transmitted signal consisting of three major parts—

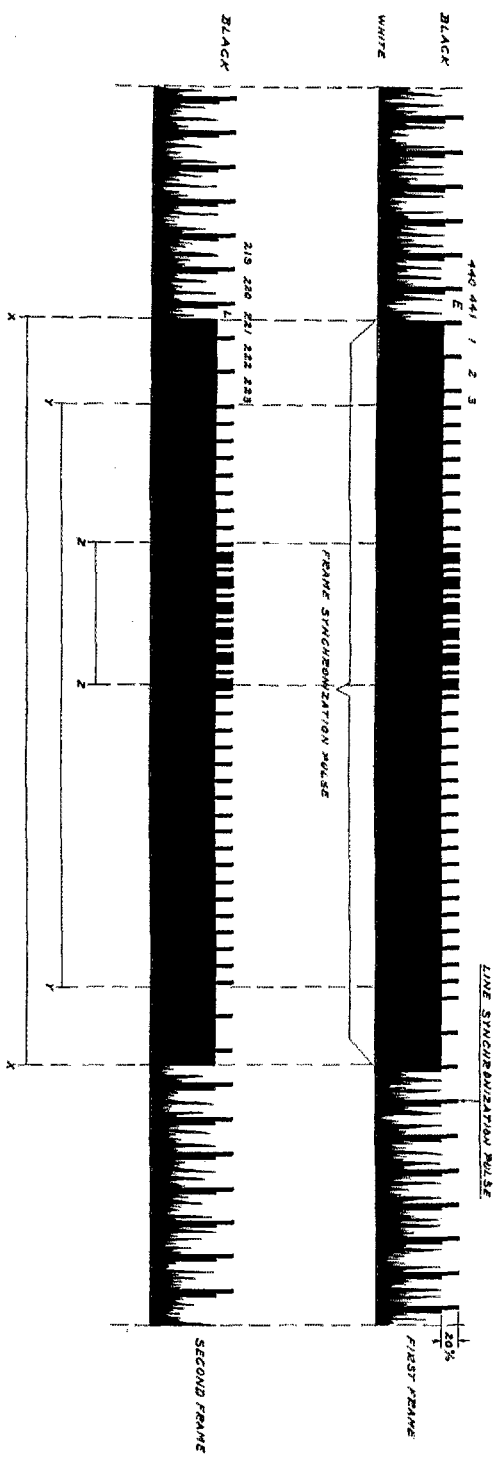


FIG. 6—CORRESPONDING SECTIONS OF TWO INTERLACED HALF-FRAMES OF A TELEVISION SIGNAL, SHOWING THE RELATION BETWEEN LINE-FREQUENCY AND FRAME-FREQUENCY SYNCHRONIZING PULSES

video signal, synchronizing pulse and pedestal.

If we return now to Fig. 6, and study the line and frame synchronizing pulses, we see the line pulse occurring in proper phase relation at the end of each line. A frame-frequency pulse occurs during a 20½-line interval every sixtieth of a second and consists of a group of serrations, from "X" to "X" on the diagram. Now it might appear simpler to transmit one long 60-cycle impulse for frame synchronization; but during such a long pulse, the line-frequency sweep generator would get out of synchronization. Therefore, it is necessary to transmit the line impulses *during* the frame impulse to keep the line-sweep generator constantly in step.

In the section called the frame or vertical synchronizing impulse region, extra impulses of a frequency which is a multiple of the line pulse frequency are inserted. These pulses will not disturb the line synchronization but will make the synchronizing impulses identical in phase and number in the region "Y-Y." Hence, integration of the frame impulse "Z-Z" can be accomplished in an *RC* circuit with less critical adjustment of the line- and frame-impulse separation circuit, allowing the low-frequency sweep generator to return the spot to the top of the screen ready to start the second half-frame without interrupting the line synchronization.

Interlacing of the lines of each frame is controlled by the phasing of the line-synchronizing impulse. These impulses are evenly spaced during the half-frame. They begin one-half line earlier on the first half-frame, as at "E" in Fig. 6. They begin a little later on the second half-frame, as at "L" in Fig. 6. Each time a half-frame of 220½ lines is drawn, the line placement will shift (up or down) a line-width on the cathode-ray tube screen. During the second half-frame, for instance, as the first impulse "L" is purposely delayed a half-line, the top line will be just one line-width lower down. This second half-frame of lines will fill in between the lines drawn during the first half-frame to complete one complete frame or picture.

The system which has been described in detail is that employing negative polarity without d.c. modulation to correspond with changes in average brightness. Although this system has been principally used for experimental transmission in this country up to the present time, it must be emphasized that there is no definite assurance that it will be the one used ultimately by the broadcasting stations. As previously mentioned, at least three other combinations are possible. That represented by the wave diagrams of Fig. 5, employing positive polarity with d.c. modulation, is preferred by a considerable number of engineers, for instance.[1,2] This is the type of signal transmitted by England's television station.

[2] H. M. Lewis and A. V. Loughren, "Television in Great Britain," *Electronics*, Oct., 1937.

Both systems have certain desirable characteristics for the particular service in which they are employed.

All four systems can be received on the same experimental television receiver, provided a suitable circuit is incorporated to restore the d.c. component and provision is made for reception of

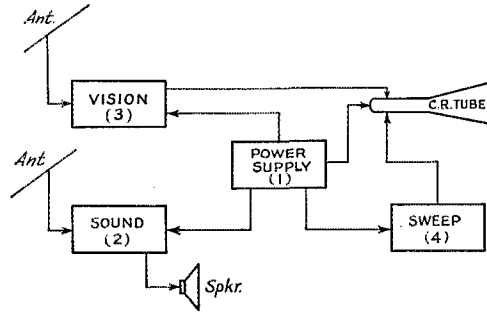


FIG. 7—BLOCK DIAGRAM OF THE UNITS OF A TELEVISION RECEIVER

signals with either positive or negative modulation. A special circuit will restore the d.c. regardless of the manner in which it is transmitted, while a simple switching arrangement can be used to change the detected signal polarity to accommodate either position or negative modulation.

It has been decided recently that a series of tests will be run by television broadcasters to determine which of these methods will be the most acceptable under actual operating conditions and will make the manufacture of television receivers the easiest. A receiver designed to be instantly adaptable to any one of the four types of signals will place the amateur in an especially effective position, since he will then be able to coöperate in the tests and furnish valuable information as to which method gives the best signal-to-noise ratio, which method causes the least difficulty in synchronization, and produces the best picture.

The receiver which will be described in subsequent issues of *QST* has been designed to have this desirable adaptability.

A WORD ABOUT STANDARDS

The tentative standards which are in use by the experimental transmitters on the air at the time of this writing, are as follows:

1. Frequency allocation, 42 megacycles to 90 megacycles, excepting the amateur 56- to 60-Mc. band; also an experimental band starting at 120 megacycles.[3]

(*Continued on page 68*)

[3] New orders of the Federal Communications Commission change this allocation set-up, establishing the following channels for television: 44–50 Mc., 50–56 Mc., 66–72 Mc., 78–84 Mc., 84–90 Mc., 96–102 Mc., 102–108 Mc., and 12 additional channels above 156 Mc. This allocation does not become finally effective until Oct., 1938, however, and modification is possible before that time. See "The Editor's Mill," elsewhere in this issue.—EDITOR.

A.R.R.L. Copying Bee—December 10th

ABILITY to copy code accurately and exactly is the special pride of the earnest amateur, the mark of technique that sets him apart and makes him an amateur. This is the annual opportunity to have an interesting hour checking up on ourselves to note our progress above the mere license requirement. The winner or *as many as submit perfect copies* will receive a striking bronze medallion award from A.R.R.L. Like the previous Bees this will give hams a chance to try copying some unusual word combinations, figure groups, and simple punctuation. There may be trick words, or misspelled words and plain language groups sent in no particular sequence. It's an excellent opportunity to check up on our personal operating ability. Are we as good at the basic business of knowing our code stuff as we think we are? A feature of genuine interest to every participant: The League will return all papers (except winners) with a copy of the transmitted texts to each participant with a *confidential rating*. This report on standings will be made as soon as feasible after the closing date for mailing of copies. Transmissions will all be 60 words in length. The sending will be by tape at about 25 words per minute. It will be a test to *copy what you hear*.

The following stations, all using "automatic" equipment, have been selected in the different time zones. Care will be taken to make all messages equally difficult by different words, word order, errors, etc. It will be worse than useless to try to correct or compare messages. However we urge everybody that knows the code *at all* to take part. Send in *whatever you get*, however little that may be. Check on your own proficiency and have some good fun at the same time.

In addition to the confidential rating you will receive you have a chance to win, and *all* participants will be mentioned in the report in *QST*. The schedule of transmissions for Friday night, December 10th is shown below:

The rules for taking part in the copying bee:

(1) Any amateur operator, not having access to the tape or transmission copies, and copying wholly by ear, is eligible.

(2) Mark one copy as your "best"; only this one copy shall count, but report all the above stations that you can hear to us. Keep copies other than your "best" to check yourself when we mail out the official texts to you.

(3) Print your name, call signal, and address plainly on each entry.

(4) Send in *original* copies. Re-copying messages *invariably* introduces errors and detracts from credits.

(5) Copies must be mailed bearing a postmark in the year 1937 to be counted. Mail at once or within five days to make sure.

(6) Every contestant must certify he has not been employed as a commercial or government radio, Morse or cable operator in the last year. This is strictly an amateur contest. The following exceptions, however, shall be eligible: (a) Holders of commercial licenses without experience under same. (b) Such holders ('phone licensees or technical attendants) whose duties have not been telegraph operating within one year.

The transmitting stations will each send V's and identify themselves for ten minutes before scheduled times above. All amateurs are requested to note the frequencies listed and try to coöperate by keeping silence on these channels during copying bee transmissions, which start at the time indicated. Here's luck in the copying bee, and remember, write down *just what you hear*. If the transmission or what you can get is fragmentary, send it in just the same, so you receive credit, and we can send you the official texts for your examination.

—*F. E. H.*

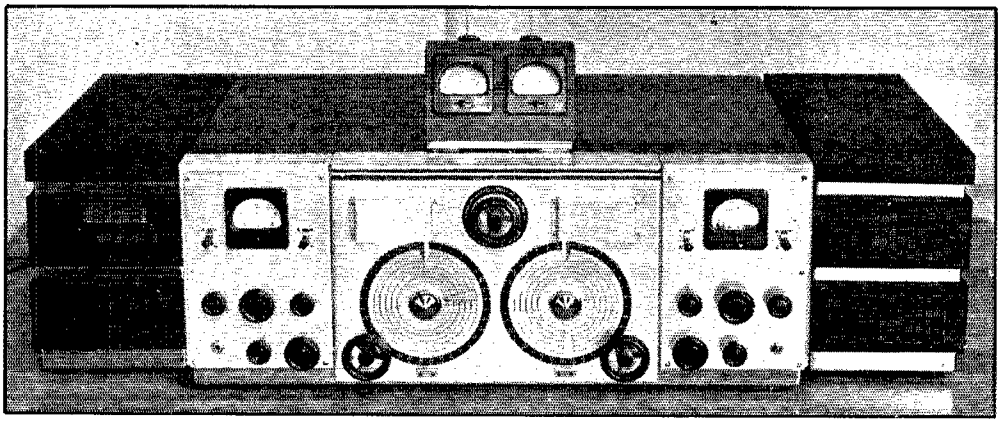
Station	*Frequency*	*E.S.T.*	*C.S.T.*	*M.S.T.*	*P.S.T.*
W1AW (W. Hartford)	3825/7150 kcs.	9:15 P.M.	8:15 P.M.	7:15 P.M.	6:15 P.M.
W2AYN (New York)	7290 kcs.	9:15 P.M.	8:15 P.M.	7:15 P.M.	6:15 P.M.
W9UZ (Chicago)	7003 kcs.	10:15 P.M.	9:15 P.M.	8:15 P.M.	7:15 P.M.
W9BAZ (Louisville)	3810 kcs.	10:15 P.M.	9:15 P.M.	8:15 P.M.	7:15 P.M.
W6AM (Long Beach)	7250 kcs.	11:15 P.M.	10:15 P.M.	9:15 P.M.	8:15 P.M.

An Improved Dual-Diversity Receiver for High-Quality 'Phone Reception

By J. L. A. McLaughlin* and Karl W. Miles*

THE original single-control dual-diversity receiver,[1] employing the automatic synchronizing circuit devised by J. J. Lamb and built by the first of the authors of the present article, has been in operation for nearly two years at XE1G, the station of Dr. James M. B. Hard, at Cuernavaca, Morelos, Mexico, and has satisfactorily completed over 5000 hours of trouble-free service. It has conclusively demonstrated the practicability and the desirability of diversity reception for amateur and experimental communications work. Even with two antennas spaced but 50 feet apart, good diversity action has been obtained, especially on the 14-Mc. band. Dr. Hard reports that many times when fading conditions and heterodyne interference become so bad as to make his other single receivers useless, the dual-diversity still brings in an intelligible signal. From the experience gained in the building of Dr. Hard's receiver, plus additional work through the past spring and summer, the new design described in this article has been completed.

Improvements have been mainly in simplifying the mechanical design and improving the i.f. amplifier, with the consequence that the new model is more compact, with an improved layout. The infinite-rejection i.f. system [2] has been incorporated, giving improved selectivity characteristics with means for the elimination of adjacent-channel interference. A simpler and more rapid coil-switching system is employed. The frequency range is from 36 megacycles to 545 kilocycles, divided into five bands. (We have included the standard broadcast band, not because any large improvement in broadcast reception is obtained by using diversity, but because we like to listen to the programs once in a while.) Electro-mechanical band spread is used so that the band-spread dial can be calibrated for each of the four amateur high-frequency bands (28, 14, 7 and 3.5 Mc.). A pointer above each dial indicates the proper scale for each setting of the band-change switch.



THE IMPROVED DUAL-DIVERSITY RECEIVER IS DESIGNED TO GIVE BAND-SPREAD TUNING AS WELL AS GENERAL COVERAGE FROM 545 KC. TO 35 MC. IN FIVE RANGES

The matching auxiliary unit at the left is the power supply for the main receiver. That at the right contains the push-pull 6L6 output amplifier with its own power supply. The diversity meter unit on top connects by plug and cable to the voltmeter tubes in the receiver. Operating controls are identified in the text.

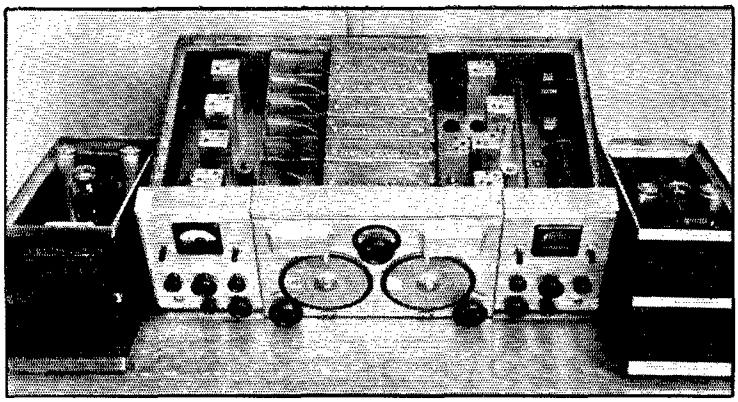
PRINCIPLES OF DIVERSITY RECEPTION

Before describing this new receiver in more detail, it might be well to digress for a moment and review briefly the principles of diversity reception and the benefits as compared to the best single-receiver methods. The principal improvement is, of course, in the reduction of fading

* The Hallicrafters, Inc., 2611 Indiana Ave., Chicago, Ill.

[1] J. J. Lamb and J. L. A. McLaughlin, "Dual-Diversity 'Phone Reception with Single-Control Tuning," *QST*, May, 1936.

[2] K. W. Miles and J. L. A. McLaughlin, "New I.F. Amplifier System with Infinite Off-Frequency Rejection," *QST*, Nov., 1937.



THE TOP VIEW OF THE COMPLETE RECEIVER WITH COVERS REMOVED SHOWS THE SEPARATE I.F. ASSEMBLIES EITHER SIDE OF THE HIGH-FREQUENCY CIRCUITS IN THE CENTER

The coil assemblies for the h.f. stages are separately shielded.

effects. Fading is the result of several waves from the same transmitter arriving at the receiver over different paths. The signal delivered at the output of the receiver is the resultant of these several waves, which arrive over paths differing in direction and length, and which are of varying amplitude and phase. The most vicious fading at high frequencies is experienced when two or more of these waves are of approximately equal amplitude. The phase angle between the waves arriving over varying paths is continuously rotating and when the amplitude is the same in two waves and the signs are opposite, the resultant is zero or "no signal." This is what may take place when a good signal suddenly takes a dive below the noise level. For a pretty good picture of just what diversity offers, let us refer to the original article in May 1936 *QST*, particularly the following:

"The lead to a method of solution (of fading) lies in the happy fact that a signal does not fade identically in two antenna locations at the same instant, even when the two antennas are spaced only a relatively small distance apart, or when they are near to each other and in different planes of polarization. In other words, there is considerable diversification in the fading of a radio signal, not only as regards space but also as regards polarization. Diversity reception is the method which takes advantage of this vulnerable spot in fading's armor.

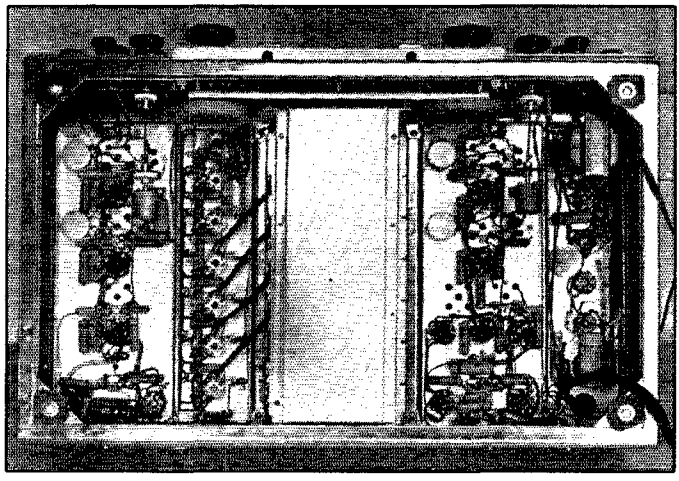
"The basic idea is to pick up the signal waves on two or more different antenna systems and then combine the signals in a common receiver circuit. While it might seem possible to accomplish the result by coupling the several antennas to a single receiver in such fashion that the signal amplitudes are added at r.f., this simple method is impracticable. An input coupling arrangement for several antennas might be phased to give addition of the r.f. amplitudes under constant signal phase conditions; but constant r.f. phase conditions just do not exist. Variation in phase conditions is inevitable in the phenomenon of fading. The combining operation must take place in some part of the receiver circuit where unpredictable radio-frequency phase differences are no longer of consequence. It is only in the output of the final detector, where we have the rectified envelope of the signal to work with, that the combining operation becomes practicable."

The latest commercial space-diversity receiving system uses three antennas spaced about 1000 feet apart and generally located at the corners of either a right-angle or an isosceles triangle. Three separate and individually tuned receivers are used, each connected to one of the three antennas. Detector outputs of the three receivers are tied together across a common load. Combining the signals after rectification results in audio output which will be the average of the several signals. By virtue of common a.v.c., the receiver with greater signal input takes control of the gain of all three receivers and supplies practically the total output. The gain of the other receivers, at that instant of time, is so reduced that the noise they would otherwise contribute is made negligible. This gives a signal-to-noise ratio approaching that of the particular receiver in control at this instant and results in a considerably higher *average* signal-to-noise ratio than can be obtained with the single-receiver method of reception.

While the type of system with separate tuning of each receiver is ideal for commercial communication work, where a diversity unit is used to receive from only one or but a few transmitting stations and on one frequency for hours at a time, it is, nevertheless, hardly adaptable for use in amateur communication work. As was pointed out in the previous *QST* article,[1] separate tuning still left the operation complicated and too time-consuming for practical amateur work. (Just tune in a signal on the crowded 4-Mc. 'phone band some busy evening on one receiver, and then try to tune a second receiver to the same signal—and find out how much time it takes. And as for simultaneously tuning both receivers across the band looking for the answer to a CQ —!)

The single-control dual-diversity system differs from the commercial diversity system in that instead of using separately tuned receivers with individual high-frequency oscillators, a common

oscillator is used which feeds the first detectors of two receivers. The tuning condensers of the r.f. circuits of the two receivers and the common oscillator are ganged together. Besides the virtue of simpler tuning, the dual-diversity method with its common oscillator is, we believe, an improvement over the commercial practice of using separate oscillators with each receiver. Ignoring the tuning complications of operating two or more receivers on the same signal, the common oscillator system eliminates the need of the expensive precautions found necessary in the commercial type to prevent the high-frequency heterodyne oscillator of one receiver from feeding into one of the other antennas or input circuits. With separate oscillators it is, of course, practically impossible to obtain perfect synchronism for any appreciable length of time. Hence, in the commercial system, it has been found necessary to keep stray oscillator leakage from one receiver as much as 140 db below the signal level in the input circuits of the other receivers.[3]



ORDERLY WIRING AND PLACEMENT OF COMPONENTS PREVAILS BELOW DECK

CIRCUIT ARRANGEMENT

The single-control dual-diversity receiving system consists of two complete r.f., i.f. and second-detector circuits with a common r.f. heterodyne oscillator, common a.v.c. and one audio amplifier. Two stages of r.f. are used ahead of the mixer stage of each channel. The five coils for each stage, together with the necessary trimmer and padding condensers, are housed in a separate shielded box. Referring to the top view, the first box toward the back of the set is the first r.f. stage for receiver "A." The second box is the first r.f. stage for receiver "B." The third box is the second r.f. stage for receiver "A," the fourth box is the second r.f. stage for receiver "B," and so on to the last box (larger than the others) which contains the coil assembly of the common r.f. heterodyne oscillator. A seven-gang variable condenser with double rotors (one for band-set dial the other for band-spread) is mounted below the coil boxes in a separate shielded compartment.

Each box contains the necessary switches to shift from one band to another, a long shaft through all the boxes shifting the switches together in proper sequence.

A shield will be noted between the tubes in the r.f. section. This is employed not so much to keep down coupling between tubes of the same receiver circuit but rather to reduce cross coupling between tubes of the two receiver circuits, "A" and "B." Fairly good isolation between the two circuits must be maintained to prevent cross-talk from impairing good diversity action. In the present set-up the isolation between circuits "A" and "B" is approximately 40 db, which proves to be sufficient, and most of the residual coupling is between the 6L7 mixers in the injection circuit.

The i.f. amplifier for each channel uses three stages with iron-core transformers tuned to 465 kc. in the infinite rejection system described in November *QST*.[2] This is a radical departure from previous systems in that two of the i.f. coupling circuits of each receiver are in themselves infinitely selective in rejecting off-frequency interference at a particular frequency. As used in this receiver, the first rejector in circuit "A" is fixed at 5 kc. off-resonance on the high-frequency side and the second (variable) rejector is normally set at minus 5 kc. In circuit "B" the first rejector is fixed at 5 kc. off-resonance on the low-frequency side and the second (variable) rejector is normally at plus 5 kc. The variable rejectors can be swung 5 kc. either side of resonance for the purpose of wiping out a particular interfering signal.

It has been found in practice that when the rejectors are set close to the resonance frequency (within 1 kc., for instance), the power-factor corrector resistor (R_1 of Fig. 2 in the Nov. *QST* article) becomes quite critical for infinite rejection; so a variable 1000-ohm resistor in series with the proper fixed resistor is used in each circuit as a vernier to permit close adjustment for maximum rejection under such conditions.

[3] J. B. Moore, "Recent Developments in Diversity Receiving Equipment," *R.C.A. Review*, July, 1937.

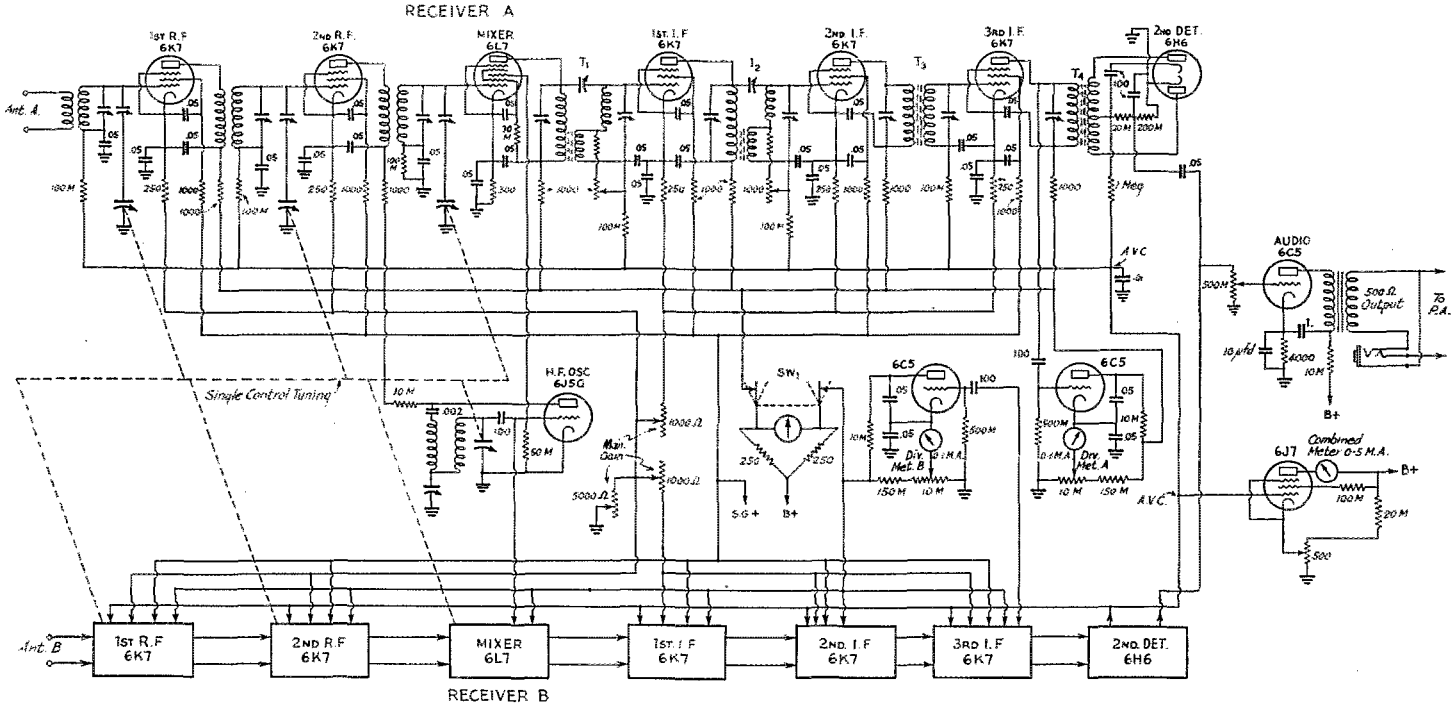


FIG. 1—SIMPLIFIED FUNCTIONAL DIAGRAM OF THE IMPROVED DUAL-DIVERSITY RECEIVER CIRCUIT

To avoid confusion, the seven-gang band-spread tuning condenser is not indicated in this schematic. Each of its seven sections is simply connected in parallel with the corresponding section of the seven-gang band-set condenser shown. For the same reason, the full complement of 35 coils is not indicated, but one coil set being shown in each stage. Note that adjustable series condensers as well as parallel trimmers are used in the r.f. circuits for better full-range tracking. The output of the common h.f. oscillator, which is the feature insuring automatic synchronous tuning of the two receivers, is applied to the injection grids of the two 6L7 first detectors. The oscillator is the high-mutual triode type 6J5G, chosen because of its good output and reliability at very high frequencies. There is little mutual coupling between the first detectors because of the good screening which isolates the injection grids from the signal input circuits. The i.f. amplifier system of each receiver is a duplicate of the infinite-rejection unit described in Nov. QST. Receiver "B" is not shown in schematic form because it duplicates the circuits of Receiver "A" throughout. The meter connected in the bridge circuit, near the center of the diagram, indicates the gain balance of the two receivers. Immediately above this meter is SW1, the three-position diversity switch which cuts in either receiver alone, or both in diversity. Decimal capacitance values are μfd., whole-number values are μμfd. Resistance values are indicated in ohms, "M" meaning thousands.

CONSTRUCTIONAL FEATURES

The mechanical construction is quite unique. A conventional chassis is not used. A heavy steel frame of U-shaped angle construction is the main support of the various units. This frame is mounted between two larger frames of similar construction which form the sides of the cabinet. Another U-shaped angle frame with reinforced corners is bolted to the bottom. The cover, instead of being just a flat piece of sheet metal, is a solid box-shaped unit. The front panel follows the same general design of reinforced construction. The two side pieces are box-shaped and give good support for the main center panel. The whole makes for a very rigid assembly, strictly functional in design and pleasing in appearance.

The front panels are aluminum finished with "alumilite." (A heavy aluminum oxide is deposited on the surface of the aluminum by electrolysis, which gives it a tough permanent finish.) The main dials are similarly treated. To insure good frequency stability, excessive heat is kept out of the receiver by building the power supply and power audio amplifier in separate boxes of similar construction to that of the receiver. These units are placed at the sides of the main receiver and conform to give unified appearance.

A few words about the mechanics of the tuning mechanism. Both rotors of the 7-gang variable condenser are fitted with split worm-gear drives. Both of the large 6-inch dials are direct reading in frequency, a separate scale being used for each range. This is a great help in tuning, in setting and re-setting the different frequency ranges without reference to calibration charts or tables. The band-set dial calibrations hold true providing the band-spread dial is set to zero. The band-spread dial calibrations for each of the ham bands are effective when the band-set dial is set to the high-frequency end of the particular ham band being used. This dial is directly connected to the worm shaft and requires 35 complete revolutions for one complete span of its associated main dial. The outer rim of each of the main dials carries a scale having 35 equal divisions. One revolution of the micrometer dial (behind the panel) moves the main dial one division. Since the micrometer dial on the worm shaft is calibrated with 100 divisions, the dial setting can be read with an accuracy of one part in 3500. This auxiliary micrometer calibration is for use when greater calibration accuracy is needed than that supplied by the direct frequency calibrations on the particular scale being used. This micrometer calibration arrangement allows a scale length equivalent to approximately 35 feet. The scheme is not entirely original with us, as it has been used for some time by several of the well-known laboratory instrument manufacturers for applications in which precise calibration is highly desirable.

(Continued on page 76)

Low-Power Contest Results

THE August Low-Power Contest (for stations using 25 watts or less) turned out in some respects to be a miniature Field Day. Some 60 per cent of the 137 operators participating did so from portable stations "in the field." 54 operators manned 46 stations at home locations, 83 operators manned 26 field stations. Comments from participants bring out the fact that low power gets results. The fellows to whom low power was a new experience, marveled at the results obtained even though the meters were not banging over onto the pins. The regular low power men justly demand, "Chalk up one for our side!"

Scoring was simplified as much as possible. Each contact counted one point. An extra credit of 10 points could be claimed for sending a message to A.R.R.L. HQ's reporting transmitter tube line-up and power supply equipment. The sum of claimed points were multiplied by 1.5, if either the receiver or transmitter was self-powered, and by 2, if both transmitter and receiver were supplied from a source independent of the public mains; 25 watts input to the final stage of the transmitter could not be exceeded in any case. But one transmitter and one receiver were permitted to be used at any one time at any station.

The leader in this first exclusively low power contest was W2DKJ-2, operated in the tower at 40 Wall Street, New York City, by Arthur H. Lynch, W2DKJ, A. J. Haynes, W2JHV, and P. A. Denonn, W2IGK. These men worked 107 different stations for a score of 234. And now for the surprise—all work was with about 8 watts input on 56-Mc.! W2DKJ has always been an enthusiastic participant in field day operations, making a new record for 56-Mc. F.D. work in the June affair. The experience gained in previous doings certainly paid dividends! FB, DKJ, JHV and IGK!!

The three-man crew of the Central Colorado Radio Association's entry, W9PWU-9, came in second with 172 points. . . . 76 QSO's, self-power being used throughout. Operation was from Flagstaff Mountain, Colo., 'phone and c.w. being used on 1.75, 14 and 56 Mc. Power was obtained from a gas driven generator.

Third in line was W8IFD-8 at Camp Aharah (Y.M.C.A. camp), about 140 miles north of Kalamazoo, Mich. The three operators here (W8OBP, W8QQE and W8IFD) emerged from the battle with 160 points from 70 QSO's. 3.5, 7- and 14-Mc. c.w. and 3.9-Mc. 'phone were used. Storage battery and "B" batteries for the receiver, storage battery and genemotor for the transmitters, constituted the power source.

So close behind W8IFD-8 that you can hardly notice the difference is VE3GT . . . 159 points

(Continued on page 80)

• What the League Is Doing •

League Activities, Washington Notes, Board Actions—For Your Information

Conferences Preparations for the American regional conference at Habana and for the world conference at Cairo are substantially complete at this writing. In fact, by the time these words appear in print the Habana conference will be about over. Our aims at the latter conference are to see all the amateur bands confirmed as exclusively amateur within the American region, to prevent the overrunning of the 7-Mc. band by 'phone, to obtain region-wide authority for the handling of third-party friendly messages by amateurs, and to effect amateur participation in the Pan-American Radio Technical Union. We should have some preliminary reports on the outcome in next *QST*.

At Cairo the United States will stand for the preservation of all of our bands. She believes that the 1.7- and 3.5-Mc. bands should continue in their present status, shared with fixed and mobile in the international table, so that their whole widths may be available on this side of the water as now, and so that European nations may continue to give their amateurs as much of these bands as they need. Rejecting both the proposals to widen and to narrow our 7-Mc. band, the U. S. will support our present width. The 14-Mc. band will be similarly defended against the proposals to reduce it, and the 28- and 56-Mc. bands sponsored as exclusively amateur. Our government wants each nation to continue free to set the power of amateur stations, opposing the Japanese proposal to cut us to 50 watts in the antenna. Similarly favorable decisions have been reached on numerous minor points which are not of great interest at this stage.

Even the ultra-high frequencies will come in for some consideration at these international conferences. Further information on developments in this field will be found in this month's editorial.

R.M.A. The A.R.R.L. Board at its last meeting petitioned the Radio Manufacturers Association to establish higher standards in the design of midget broadcast receivers to preclude the pick-up of interference from other services operating in accordance with good engineering practices. The R.M.A. seems to have pitched right into the subject and have been to see us to obtain data on the exact nature of the interference and on the damages suffered by amateur radio as a result thereof. Our technical editor has given them extensive data on the principal types of interference experienced and on the technical deficiencies of the affected receivers which are responsible for the trouble. There is room to hope for some real progress in this matter, certainly for a much clearer realization of the deficiencies of these cheap sets.

New C.S.O. On October 1st Colonel Joseph O. Mauborgne became Chief Signal Officer of the Army with the rank of Major General, succeeding Major General James B. Allison, who has retired.

Because the Signal Corps deals with many forms of communication, it is interesting to know that General Mauborgne is primarily a radio man. In 1912, as a lieutenant at Fort Riley, Kansas, he installed a quenched-spark radio set of his own devising in an airplane and provided the first air-to-ground radio communication in history, and two years later accomplished two-way radio communication between plane and ground for the first time. In his long career he has of course had many important assignments. His last previous one was as director of the aircraft laboratory at Wright Field, Dayton, before which he was Signal Officer at the Presidio of San Francisco. During the 1927 Washington conference General Mauborgne, then a lieutenant-colonel, was a warm defender of amateur radio and worked actively in our behalf, as was reported in *QST* at the time. In fact it is interesting to note the recent promotions of the two service men who were most instrumental in our aid at that time: Lieutenant-Commander T. A. M. Craven, U.S.N., retired, has recently been appointed an F.C.C. commissioner; while General Mauborgne now heads his branch. Indicative of the latter's continued interest in us is the following letter he recently wrote to the Editor:

Dear Warner:

I was delighted to receive your letter of October 6, 1937, extending the congratulations of yourself and the American Radio Relay League upon my appointment as Chief Signal Officer. May I extend my most sincere thanks to both yourself and the League for your congratulation and good wishes?

Having started as a "ham" many, many years ago, it is but natural that my sympathies for the American radio amateur should always be of the warmest nature, as I believe you personally have witnessed during my many contacts with you in connection with the work of radio conferences in the past. You may be assured that I shall continue to have a very strong interest in the operations of the American Radio Relay League. 73.

(Continued on page 43)

Applying Inverse Feedback to the Universal Speech Amplifier

Modifications to Improve Frequency Response and Increase Power Output

By George Grammer*

MOST 'phone operators are distinctly "quality-conscious," to judge by the important place the word occupies in most air conversations. Yet few seem to have taken advantage of one of the easiest methods of improving speech-equipment frequency response and reducing distortion, the two most important ingredients of "quality." Although the advantages to be gained by the use of inverse feedback have been dwelt upon several times in *QST*,[1] it may be that any sort of feedback is an anathema to builders of speech equipment and consequently is no dodging the fact that practically every amateur who takes pride in his equipment wants that extra something which makes for good speech quality, even though the additional trouble and expense may not be justified from the purely utilitarian standpoint. Therefore, any reasonably simple and inexpensive means of increasing frequency response should be of interest.

Simply to see what could be done by such methods, we decided to "operate" on the speech amplifier described in October *QST*.[2] As originally built, this unit incorporated components

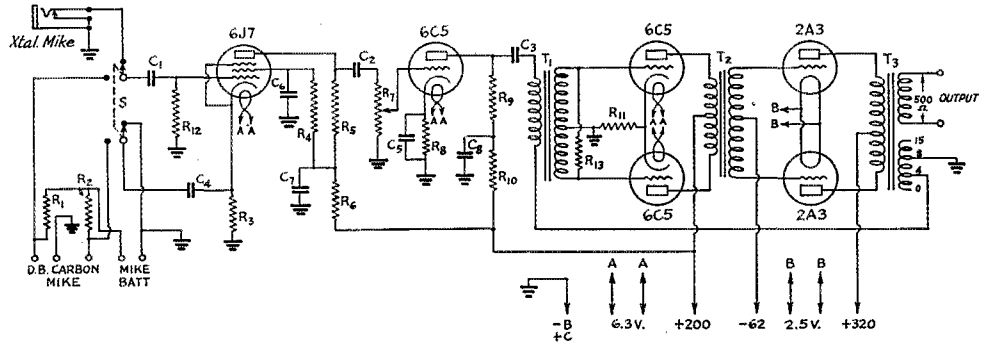


FIG. 1—REVISED CIRCUIT DIAGRAM OF THE UNIVERSAL SPEECH AMPLIFIER, INCLUDING INVERSE FEEDBACK

Constants are the same as given in Fig. 1, page 16, November, 1937, QST, with the following exceptions: C_4, 15-μfd., 25-volt electrolytic; C_6, 4-μfd. electrolytic, 200-volt; R_{13}, 250,000 ohms, ½-watt.

is left severely alone by those who stand to gain a good deal from its use. Actually, it's not such a formidable thing to apply.

It is well known that the transmission of intelligible speech does not impose very rigorous demands on the frequency characteristic of the speech system. For all practical purposes, a frequency characteristic fairly uniform between about 200 and 3000 cycles is adequate for good reproduction of speech; the addition of lower and higher frequencies does not add materially to the intelligibility. For amateur communication, more than good intelligibility is not required, but there and circuit constants designed for speech reproduction, with cut-offs near 100 and 5000 cycles. The transformer-coupled stages were naturally suspected of introducing most of the frequency discrimination at the low and high ends; however, the constants of the first two stages, the 6J7 and 6C5, had been selected for 100-cycle cut-off, so the first step was actually to measure the performance of these two stages from the frequency standpoint. To do this the first transformer, T_1 was disconnected from the 6C5 plate circuit and an oscilloscope connected through C_3. With variable-frequency constant-amplitude input to the 6J7 grid, the output of the two stages was down perceptibly at 100 cycles, although perfectly flat from about 200 cycles up to 15,000, the limit of the audio signal generator range.

* Assistant Technical Editor.

[1] "Some Practical Inverse Feedback Circuits for Audio Power Amplifiers," *QST*, January, 1937; Carter, "Inverse Feedback Applied to the Speech Amplifier of the Amateur 'Phone Transmitter," *QST*, April, 1937; "Note on Reduction of Distortion and Noise with Inverse Feedback," *QST*, July, 1937.

[2] "A 10-Watt Speech Amplifier with Voltage-Regulated Plate Supply," *QST*, November, 1937.

Now it is generally possible to use feedback over two stages without running into oscillation difficulties but somewhat dangerous over three, especially when some of the stages are transformer-coupled, because phase shifts in the transformers can cause oscillation at the high or low ends. Therefore we had decided to confine the

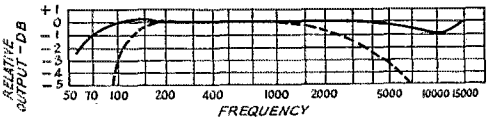


FIG. 2—FREQUENCY RESPONSE CURVES WITH AND WITHOUT INVERSE FEEDBACK

Solid line, with negative feedback applied; dotted line, without feedback. Reference frequency, 400 cycles. Output level approximately 9 watts.

feedback to the last two stages only, thereby including all the transformers. Negative feedback, however, cannot correct for frequency discrimination in stages preceding those treated unless special frequency-correcting measures are taken in the feedback circuit itself. We felt that it would be simpler to straighten out the front end insofar as possible, and thus avoid the special equipment needed for accurate frequency correction in the feedback circuit.

The low end of a resistance-coupled amplifier can be boosted readily by the use of sufficiently large by-pass and coupling condensers. Trial of several condenser values at various points resulted in flattening out these two stages to the extent that the amplification was uniform from 70 cycles up to 15,000, the low-frequency drop becoming perceptible at about 50 cycles. The new condenser values are given in Fig. 1, the resistors remaining unchanged. The changes, in brief, consisted of making C_4 a 15-μfd. instead of 5 (a 10-μfd. electrolytic shunted across the original 5-μfd. unit), and C a 4-μfd. electrolytic instead of the 0.1-μfd. paper originally specified. Increasing other condenser values made no noticeable difference in performance, hence these were left alone. A recheck of the frequency characteristic of the entire amplifier after the changes were made showed no difference in the final output, thus confirming the original suspicion that most of the discrimination was in the last two stages.

ADDING NEGATIVE FEEDBACK

Several methods are available for applying feedback. Many of these use resistance-capacity combinations, which, however, are not always suitable in the case of transformer-coupled amplifiers. In this case we wanted to introduce the feedback in the primary of T_1 and thus compensate for all the transformers in the speech amplifier. Introduction of feedback in the secondary circuit would not correct for frequency discrimination in the primary, and besides would have been difficult to apply to a push-pull transformer without separate secondary windings or without special taps.

The first scheme tried used a resistance-capacity network from the plate of one 2A3 to the primary of T_1, the feedback voltage being developed across a resistor of a few thousand ohms connected between the lower end of the primary and ground. This was fairly satisfactory at the high-frequency end, but did not give any particular improvement at the low, although the values of R and C were varied over quite a wide range. This was probably the result of different orders of phase shifts in the transformer and feedback network. A better arrangement—the one finally adopted—used transformer coupling in the feedback circuit. The means for introducing feedback were right at hand, since the output transformer, T_3, was provided with a speaker voice-coil winding. Taking some of the voltage

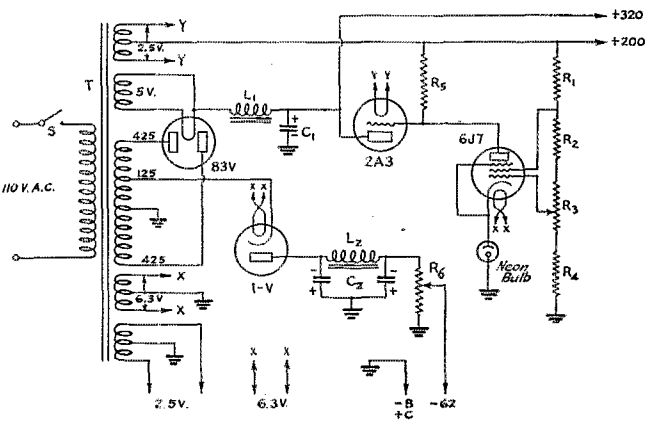


FIG. 3—REVISED POWER SUPPLY DIAGRAM, WITH BIAS SUPPLY INCLUDED

Constants are the same as given in Fig. 2, page 17, November, 1937, QST, with the following exceptions: R_6, 12,000-ohm semi-variable resistor (25-watt slider type); L_2, midget filter choke; C_2, double 8-μfd. 250-volt electrolytic. L_1 and C_1 are the same as L and C in November QST, with the two sections of C_1 in parallel.

developed across this winding and inserting it in series with the primary of T_1 gave much better performance and required not a single extra component. The method of connection is shown in Fig. 1. The voice-coil winding is tapped for 4, 8 and 15 ohms; in our case proper phasing and about the right feedback voltage were secured when the 8-ohm tap was grounded and the 4-ohm tap connected in series with the primary of T_1. Reversing the voice-coil winding connections

(Continued on page 84)

A Rotary Spider-Web Loop Antenna With Reflector

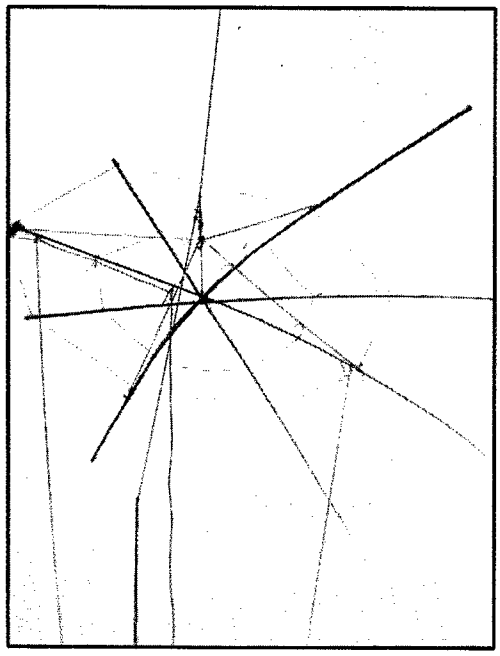
An Inexpensive Horizontal Array of Good Directivity

By Charles W. Lugar,* W8MRR

IT has not only been the desire of the writer to find a solution for the problem of present congestion of our allotted amateur bands but also find a means for hearing and working DX. Quite naturally the above sounds like a large order to undertake; but, nevertheless, it is a task which is growing in importance by virtue of the fact that our ranks continue to increase.

Briefly, let us state that more power does not solve the problem. Granted, our percentage of stations worked may increase in the face of QRM; but it is also granted that, as first one of us and then many add watts to the final, the conclusion is bedlam! The situation is certainly not improved by such a trend.

Where, then, can we start to find a solution? At least one trail seems worth following; namely, the antenna. Many are on the way and the results achieved to date are well worth additional study and experimentation. Let's pause a moment and size up the antenna situation from a general viewpoint. We can divide the various systems into two classes, generally speaking, from the standpoint of mechanical construction; those capable of mechanical change of their orientation at the will of the operator, and those maintained in a fixed position. Each class has its advantages and disadvantages over the other—gain, size, ease of construction, space required, labor, cost, frequency flexibility. All these factors should be given consideration if we are to design an antenna that can be utilized by the majority and that, consequently, will be a step forward in the solution of our problem. We may not all have a forty-acre field or even a complete kit of tools, not to mention the size of the proverbial pocket book. This latter sometimes supplies a certain amount of braking action to our enthusiasm.



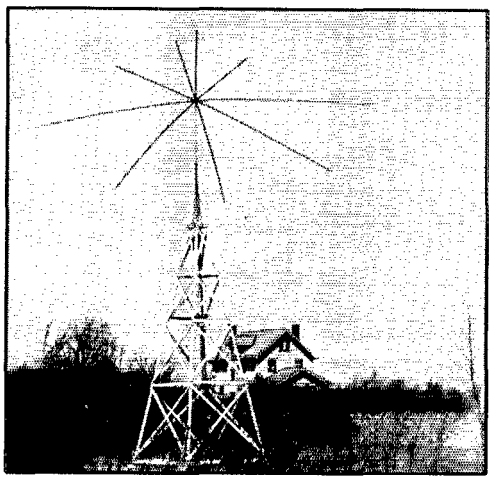
THE WEB SUPPORTED BY HALYARDS BETWEEN THE REGULAR ANTENNA POLES AT W8MRR

In view of all the above, just where do we get off? It has been our experience not to get excited over working in any one particular direction. Rather, we like to communicate with the boys whether they be east, west, north, or south. Likewise, when we are carrying on a QSO to the east, for instance, we do not like competition from other directions. Therefore, in answering the above we decided that some form of rotary antenna with the greatest possible pick-up and transmission in one direction was desired, plus the fact that ease of construction and low cost were to be given every consideration.

All our thoughts and schemes seemed to be rather complicated affairs; lattice-work masts, electric rotating drive mechanisms, thrust bearings, remote control, and various designs of complicated arrays. All of these ideas were very fine and possibly of value—but not altogether necessary. At any rate, they can be added at any time if desired. But this was not even the start; how about the antenna itself? We noticed that others had obtained a gain in one direction by twisting a half-wave dipole in the form of a circle,[1] thereby getting with one stone the two birds, small space and good directivity. Then the idea took the form of a new question. How about adding a reflector to this

* 302 Ferndale Drive, R.F.D. No. 4, Youngstown, Ohio.

[1] J. L. Reinartz, "Half-Wave Loop Antennas," *QST*, Oct., 1937.



A RIGID TOWER EQUIPPED WITH A ROTATING MECHANISM SUPPORTS THE WEB ASSEMBLY AT W8MJM

design? From there we were off in a cloud of dust. (Although it happened to be wet at the time!) Copper tubing was a little heavy, as we had decided to utilize a couple of poles already in position. We would make a framework of bamboo and hoist it into place, as we would any other antenna, between said poles. Ordinary wire, No. 14 or No. 12 copper, seemed logical from this angle. However, we realized that a circle could not be formed with such material; therefore, the octagonal shape was decided on, since we could get this with five 20-foot bamboo or cane fishing poles.

After looking around we located the poles and proceeded to bring five of them home. They were laid out in the backyard and lashed together, as shown schematically in the accompanying diagram of Fig. 1. Next, a piece of string was made fast to the center or pole intersection and a length of 5 feet 8 inches was measured off on the string. Using this as a radius, each pole was marked this distance from the center. Next a length of 11 feet 6 inches was measured off and this was also marked off near each end of the double cross pole (A-A') and the small ends of the other three center poles (B'-C'-D'). This distance finally became 11 feet 2 inches after some work with a signal strength meter.

Ordinary porcelain cleats or insulators were made fast to the poles, as suggested by the detail in Fig. 1, and the radiator and reflector wires were fastened to the other ends of the cleats. Airplane-type strain insulators, large size, can also be used here. A few feet of sash cord served for making a bridle and the entire array was secured to rope halyards from each of the two masts. It was then a simple matter to hoist it in place approximately one-half wave off ground. It is interesting to note that we did the hoisting in less than two hours after assembling the necessary materials—and most of them came from the junk box, at that.

By adjustment of the bridle ropes any tilt angle desired can be obtained. Two other ropes were attached, one toward the front and the other near the rear. By proper manipulation the array can then be rotated for orientation in any direction. Other schemes for rotation can undoubtedly be thought up that would be superior to this means. In fact, several such rotation designs have already been presented in *QST*.[2] The above method of rotation, although having distinct disadvantages, can be made to work and happens to be very inexpensive.

In Fig. 1, showing the schematic plan view of the array, A-A' consists of two 20-foot bamboo

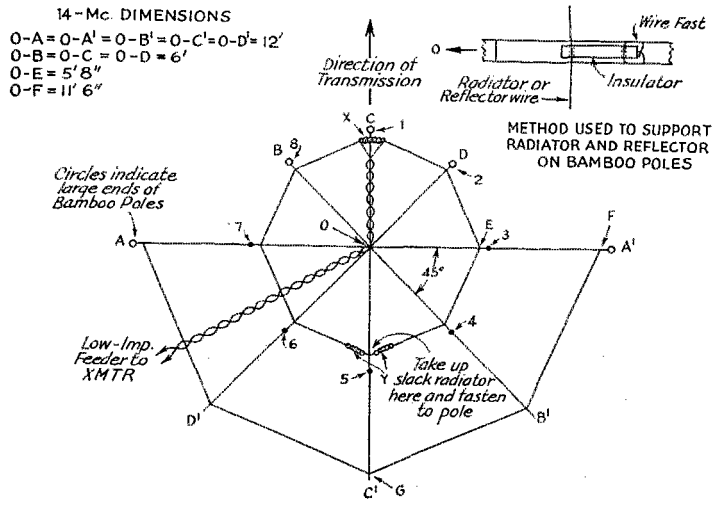


FIG. 1—SCHEMATIC PLAN OF THE ANTENNA AND REFLECTOR ASSEMBLY FOR 14-MC. OPERATION

fishing poles, so lapped that a total length of 24 feet is obtained, the poles being lashed together large ends out. B-B', C-C', and D-D' are 20-foot single bamboo fishing poles with their small ends trimmed off slightly after the array has been as-

(Continued on page 90)

[2] M. P. Mims, "All-Around Signal Squirter," *QST*, Dec., 1935; F. G. Southworth, "Antenna Rotating Device," p. 39, *QST*, June, 1936; B. T. Simpson, "Square 'Signal Squirter,'" *QST*, Oct., 1937.

. . . 78° North, 72° West

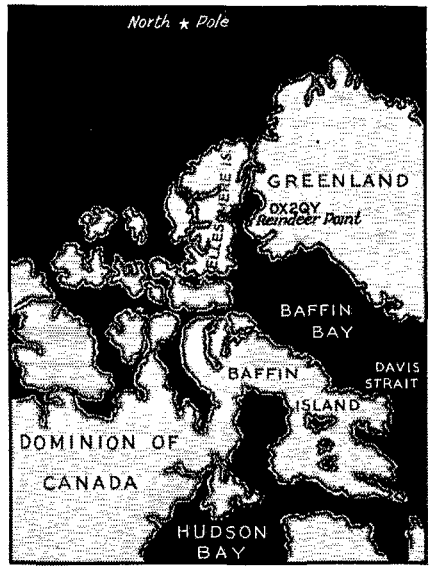
MacGregor Expedition Wintering in Greenland

By A. G. Sayre, W2QY-OX2QY

Contact with far-flung expeditions has always been a fascinating part of amateur radio. Since 1923, when Don Mix operated WNP on 220 meters, amateurs have provided communication for explorers at all corners of the earth. Amateurs followed Byrd on the Chantier, KEGK, to Spitzbergen and later to Little America. Adventurers in the Brazilian jungle, Central America, Africa and Tibet have found amateurs of inestimable help. Capt. Bob Bartlett and his Morrissey rely on amateur operators on each trip to the northern latitudes. Now we find Capt. C. J. MacGregor and his followers frozen in for the winter at Reindeer Point, northern Greenland. Gerry Sayre, W2QY, operates OX2QY and puts a remarkable signal into the States at all times of the day on both 'phone and c.w. The following story was taken at W1EH in about 45 minutes with Gerry doing the talking and one of the Hq. stenos doing the work. — EDITOR

THRILLS, adventure, exploration, research vacation, hard work—these may all be the fruits of the radio operator's job on many present-day expeditions. Thrills? Yes! When a bowsprit carries away in a storm . . . when a fire breaks out immediately below decks with several thousands of gallons of gasoline forward . . . when someone is overcome by fumes from an exhaust-pipe leak: those are the moments. Hard work? Yes! Schedules at odd hours often calling for all hands to turn to and try to start the cussed engine, stiff with cold oil and grease . . . and then, when you get all fired up, ready to go, moisture condensed on radio-frequency gear is so heavy that there are flare-ups and you have to get going in easy stages. . . . Troubles arising just as you are about to go on an N.B.C. program . . . signals dropping out in the middle due to magnetic storms and everybody putting you on the spot because of it. . . . All in all, it makes you wonder if things will ever get back on an even keel.

Adventure, exploration, research? Yes—all of these, too. The various things which come up at a moment's notice—unexpected, exciting, demanding all of one's fund of knowledge to cope with changing conditions—really invite one to enter upon such a trip as this. Put yourself in my shoes and figure out just how much of a kick you'd get out of it. Yes, indeed, there is never a dull moment on such a venture. I'm mighty glad I had the opportunity to go.



LOCATION OF OX2QY

Seven weeks before sailing date of the MacGregor Arctic Expedition I was notified that the radio job was mine. Manufacturers were immediately contacted, but I found they would not meet our sailing date. So it was up to me to obtain the parts for the complete transmitter.

This resulted in fourteen-hour days as a routine job in preparation. I first contacted several amateurs who had operated on other expeditions to get their opinions as to what I should expect and what preparations I should make. With their suggestions I came to the following conclusions: the transmitter should have approximately 500 watts input to the final stage; all material should be the best available and worked within their ratings; it must be very sturdily constructed to withstand the rigorous usage it had to go through; it must be able to cover a broad range of frequencies from 6 Mc. to 15 Mc. and possibly more; it must be capable of full one hundred per cent modulation on any of these frequencies and should rely on plug-in coils instead of band switching. All materials used for insulation must be as near non-hygroscopic as possible, and the transformers be very well impregnated and filled with suitable compounds thereby keeping moisture out of the windings. The rig would need to allow easy servicing and be constructed with the idea of taking it ashore upon our arrival at our base camp. From all these ideas a layout was decided upon and work started.

THE COMPLETE TRANSMITTER IN TWO CABINETS

All-band exciter, driver, a final and antenna coupling units comprise the r.f. unit at the left. All power supplies and audio gear are in the right-hand cabinet.

A. G. (GERRY) SAYRE

On such a trip spare parts of every kind must be carried, for one never knows when some accident will destroy some part of your rig. By spare parts I refer to every little detail down to lock washers, solder, lugs, hook-up wire, sockets, condensers, resistors, transformers, tubes, bolts and nuts, bakelite and aluminum for construction work; insulators and wire for the antenna, feed wire as well as spare parts for the engine, such as plenty of plugs, condensers, points, fanbelts, bearings, pistons, rings, relays, etc.

The engine will run more in radio service as we are using it than your car engine will run in about two years of hard usage, so you can all understand why I mention the bag of parts. Too much emphasis cannot be made on these spare parts, for otherwise we might find ourselves off the air because of lack of suitable essential spares. It entails more than just throwing together a few essential things and trusting to good luck that you maintain your broadcast, ship and amateur schedules.

At this point I want to say that I have always greatly appreciated the amateur spirit of coöperation. But the Newburgh radio amateurs really helped in countless ways with their aid and their suggestions. John Smith, W2BCR, helped me at all times. He worked his regular job during the daytime and then would come over and work a good share of the night assisting me until late. He left work for four days at the end to assist me. To him and to all the others I have a huge "Thanks a million" for their untiring efforts. This spirit I find daily in contacts over the air assisting us in relaying traffic and getting schedules arranged from up here in the Arctic. It was just the same at Lunenburg, Nova Scotia, and Sydney, which were ports of call. At those ports I was certainly glad I was an amateur. The other hands of the expedition found it hard to understand why these strangers should so suddenly become interested in my problems and could not understand how I seemingly had located a long lost friend when meeting a new amateur. I greatly appreciate all you boys did for me up there. To VE1GH, VE1CD, VE1GC and VE1CR goes another huge vote of thanks for their hospitality and assistance. I assure you it was greatly appreciated.

Ship antennas supposedly work out well. Our ship is a three-masted schooner rig and with plenty of steel cable. We found it very hard to get up a stable antenna. A Marconi antenna partly vertical and partly horizontal was tried. But the first time the sails were hoisted it was carried away by the main sheet gaff. Finally a doublet fed with Bassett cable was installed between the

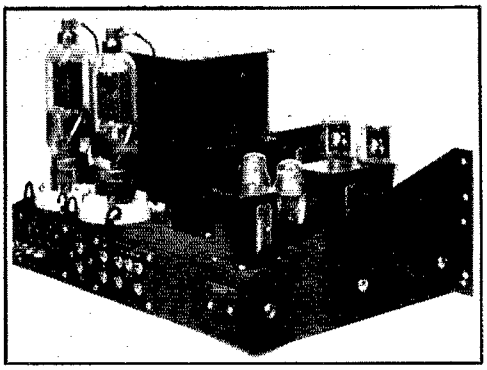
CAPT. C. J. MACGREGOR

forward and main masts and worked out very well. Another vertical antenna running up outside of the shrouds mizzentop was tried and found to work well. We had installed a large copper plate on the hull to get a good ground. The antennas were completely remodeled in Nova Scotia during other repairs to the ship. Pyrex insulation was used throughout.

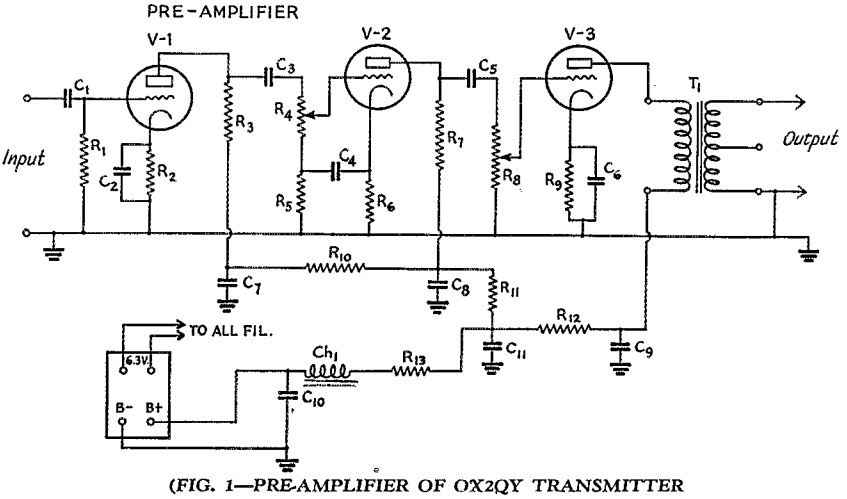
Antennas ashore are always a major problem on expeditions of this type. No timber being present, we were forced to bring our own masts, and all equipment that is needed for antenna supports. Work is extremely hard due to the rough, rocky, steep slopes. We do not have suitable room for separate antennas for such frequency coverage. So we had to fall back on the antenna that could be operated covering more than a two-to-one frequency range and which was not in harmonic relationship. Finally we decided upon a diamond or rhombic antenna as large and high as possible. We found one spot that was 500 by 200 feet where we could get a line approximately two degrees west of true south, aiming at New York, with the north end about 50 feet or more above the lower end of the antenna off the beach, or south, end. A high cliff arose 1000 feet immediately in back, to the north. To the south, fortunately, we have an open way about one and one-half miles wide before it comes to the steep banks of the shore. Across the fjord this bank rises about 1000 feet also. On the eastern leg the pole had to be set on the further side of a ravine with rocks piled around it to keep washouts from bringing it down during freshets.

All this makes the ground appear very irregular when viewed from the antenna. This may distort the calculated radiation pattern of a good rhombic. Reports indicate that this is true, for we get similar reports from most parts of the States. The antenna is 275 feet on each leg, with side angles of about 62½ degrees. The height is about 35 feet, making the 580-ohm feed line about 350 feet long. We installed an 800-ohm Ward Leonard plaque resistor.

A little cut and try on the best side angle has been done to get the best signal into New York City to maintain our NBC and other commercial schedules, also to get our best signal on the higher frequencies. Enough contacts have not been made to formulate any real conclusions except to let us know that it has a good coverage and ample for our needs. We also use it on standard broadcast receiver, boosting those signals perceptibly.

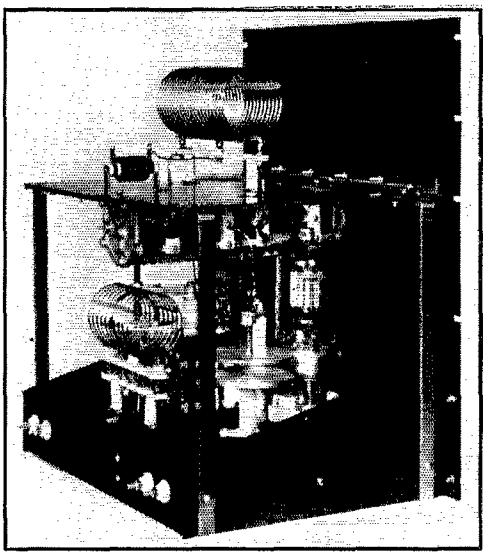


THE DRIVER AND MODULATOR



(FIG. 1—PRE-AMPLIFIER OF OX2QY TRANSMITTER

C1—0.006-μfd. (Cornell Dubilier).
C2, C7—1 μfd. (Cornell Dubilier).
C3, C5—0.05 μfd. (Cornell Dubilier).
C4, C6, C8—0.5 μfd. (Cornell Dubilier).
Can type PE-4-6888.
R1, R3, R7—250,000-ohm, 1-watt (IRC).
R2—8000-ohm, 1-watt (IRC).
R4, R8—250,000-ohm v.c., 1-watt (IRC).
R5—50,000-ohm, ½-watt (IRC).
R6—4000-ohm, 1-watt (IRC).
R9—1000-ohm, 2-watt (IRC).
R10—50,000-ohm, 2-watt (IRC).
R11—25,000-ohm, 1-watt (IRC).
R12, R13—2500-ohm, 2-watt (IRC).
CH1—Type T-156 (Kenyon).
T1—Type T-101 (Kenyon).
V1, V2—6F5G (Sylvania).
V3—6C5G (Sylvania).
All chassis, panels, and racks are Par-Metal products.



THE FINAL AMPLIFIER AT OX2QY

Standard units were used throughout. The high-power final shows compact, neat construction. The grid circuit and neutralizating condensers are on the level of the tube sockets. The plate circuit is over head as the plates of the tube are brought out at the top.

Possibly a little discussion of the hardest job we encountered on the whole trip would be of interest to some of you fellows. It was the erection of the antenna. Poles about 40 feet long and 6 to 8 inches in diameter were stowed aboard in Nova Scotia. These were thrown over the side of the ship, towed ashore at high tide by use of row boats. Four members of the expedition now shouldered a single pole and carried it up a steep butte about 30 feet high, then about 500 to 1000 fee from their first position. If you can visualize one man standing up over a rock, another over a hole between rocks and possibly slipping down helping the others to carry their share, you will then understand the two solid days we spent at this work. Then came the blasting of holes with dynamite, placing guy wires, cutting holes for the dead-man anchors which we made of 2 by 8's, four feet long, buried. The poles were finally hoisted and stood on end in their holes. Securing the guys to the dead-man anchors and piling stones about four feet high around the base of each pole was the next operation. The leaning back brace is one-quarter inch cable wire; the other two are No. 10 wire split up with insulators. Three 2 by 4 braces were also installed about fifteen feet above the ground to check any slipping of the pole. We used No. 10 copper clad steel wire for all antenna, feed line and guy wires. The antenna is one piece from the south end up to the north end, down the feed line and into the shack, thereby doing away with corrosion joints which sea water makes worse. The feed line is mounted on seven pieces of 2 by 4 stuck up in the rocks and stones piled around them. Cross beams are nailed on these and pyrex insulators are used to keep the feed line uniformly placed between poles.

Ice, sleet and snow have all been encountered to date and the antenna seems to be able to take it. You may doubt that we have high winds up here so I will just mention one little instance to show you what happens. Our schooner was

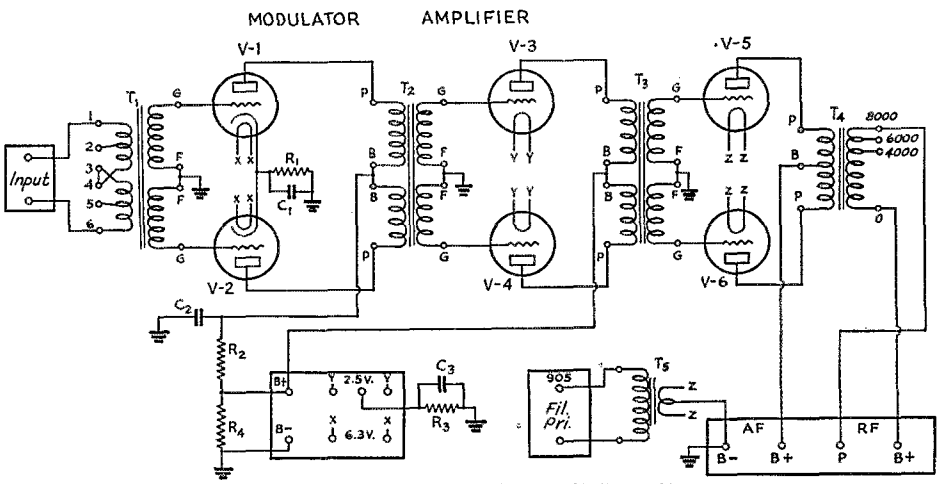


FIG. 2—AUDIO DRIVER AND MODULATOR

C1—0.5-μfd. (Cornell Dubilier DA-4050).
C2, C3—2-μfd. (Cornell Dubilier DA-4200).
R1—600-ohm, 1-watt (IRC).
R2—10,000-ohm, 2-watt (IRC).
R3—500-ohm, 100-watt (Ward Leonard WL-507-215).
R4—20,000-ohm, 50-watt (IRC-PF4).
T1—Type T-3 (Kenyon).
T2—Type T-54 (Kenyon).
T3—Type T-259 (Kenyon).
T4—T-470 (Kenyon).
T5—T-361 (Kenyon).
V1, V2—6C5G (Sylvania).
V3, V4—2A3 (Sylvania).
V5, V6—905 (United).

anchored here in harbor with two anchors out and a ten-inch hawser ashore. We had not been ashore when this occurred and fortunately for us. One of these gales came up and snapped the hawser, broke one anchor chain, and we started to drift rapidly on to the beach. It was necessary for us to put out to sea for our motors would not hold us against the breeze. When it subsided in thirty-six hours we were able to get back in again. These winds seem to come up very rapidly and reach about 75 miles an hour gale force.

Power is obtained from a U. S. Motors four-cylinder four-cycle gasoline engine which is directly coupled to a 5-kw. 110-volt a.c. generator. It uses nearly a gallon of gasoline per hour to operate the complete rig and receiver. Suitable by-passing on the generator cut out was imperative. By-passing on the generator armature and field exciter armature and field were found absolutely essential to good receiver operation.

The engine and generator were too heavy to move ashore in one unit as they were too bulky. They were lowered separately overboard into smaller boats and hauled ashore. Here all hands had to use 2 by 4 pieces over their shoulders to lift them out of the boat and up the ledge to the deserted Eskimo igloo which we use for our shack and power house. All of this was much more hard work than you may think, down there where everything is provided for human ease. The essential extra gear included a battery stand-by receiver—radio analyzer, signal generator, spares of all kinds, code practice oscillators for the crew, thereby getting practice for their work of exploration next spring when the sunlight returns to us. I find that they are very much interested in learning the code, which will come in handy when they get out on the trail. To date the only failures have been composition feed-through insulators, condensers and tubes. Moisture and temperature changes have accounted for most of these.

Other things I brought with good reason were a torch of the alcohol variety, materials for grinding crystals from blanks and wire of all varieties. I had thought I had enough wire to last indefinitely but the supply is getting low already.

There is no dull or idle moment to date on this trip so far as I am concerned. There are always any number of things still to be done before a complete darkness sets in on us for the winter. Then we will need preparations for the trail parties such as camp duties to which all of us are subject, of course.

To date most all of my listening and work has been on frequencies between 18 and 8 Mc., mainly commercial broadcast and ship's band work and news which is handled by the *New York Times*. I wish we had more time and found it possible to use enough gasoline to work more amateurs during some of the evenings. Those we have had have been very pleasant and fine contacts. So far no

(Continued on page 94)

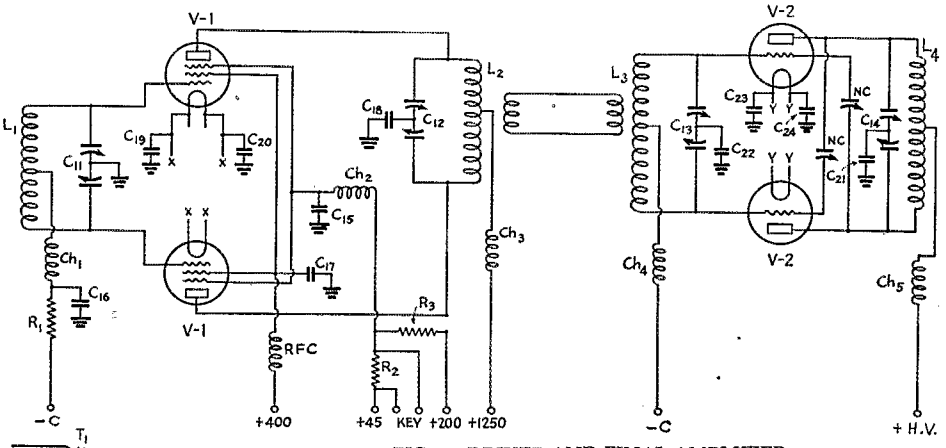


FIG. 3—DRIVER AND FINAL AMPLIFIER

L1, L2—UR13 National coil assembly.
L3—BTL Coto-coil inductor.
L4—BT Coto-coil inductor.
C11—MCD100M (Hammarlund).
C12—MTCD100B (Hammarlund).
C13—TCD 100X (Hammarlund).
C14—TCD 100A (Hammarlund).
C15—0.004-μfd. 5000 v. test Type 9 (Cornell Dubilier).
C16—0.002-μfd. 1000 v. test Type 9 (Cornell Dubilier).
C17—0.002-μfd. 5000 v. test Type 9 (Cornell Dubilier).
C18—0.01-μfd. 5000 v. test Type 9 (Cornell Dubilier).
C19, C20—0.01-μfd. 1000 v. Type 9 (Cornell Dubilier).
C21, C22, C23, C24—0.01-μfd. 5000 v. (Cornell Dubilier).
R1—7500-ohm (Ward Leonard 507-223).
R2, R3—50,000-ohm, 20-watt (IRC).
Ch1, Ch2—CHX RFC (Hammarlund).
Ch3, Ch5—CH500 RFC (Hammarlund).
Ch4—CI-21 RFC (Coto-coil).
T1—Type T-359 (Kenyon).
T2—Type T-358 (Kenyon).
NC—National Type 150
V1—RK-20.
V2—HK-354.

• ARMY-AMATEUR RADIO SYSTEM ACTIVITIES •

Code Speed Contest

ON Monday, December 6, 1937, WLM/W3CXL will broadcast a speed contest. All amateurs, whether A.A.R.S. members or not, are invited to participate. The contest will start at 10:00 P.M. E.S.T. WLM/W3CXL will use automatic equipment and sufficient power to reach most states. The frequencies 6990 and 3497.5 kc. will be keyed simultaneously.

Speeds will vary from 20 to 60 w.p.m. in jumps of five words per minute. Clear text will be transmitted for five minutes at each speed. Each speed will have different text, and words will be counted on the basis of five letters to the word. The contest will be run according to the following rules:

1. Anyone having a valid amateur license is eligible.

2. Only one report can be turned in by each participant. Pick out the speed which you are sure is correct.

3. Solid copy for one minute anywhere in the five-minute transmission will determine qualification.

4. A.A.R.S. members should send their copies to their Corps Area Signal Officer.

5. Non-members should send their copies to the nearest Corps Area Signal Officer. List of addresses and states comprising each Corps Area was published in November *QST*.

A.R.R.L. will give letters of commendation to League Members who stand highest in each Corps Area.

A.A.R.S. MESSAGE FORM

The following description gives the message form used by the A.A.R.S., and hints for copying the same on a typewriter:

43 WLMA V 19
STATECOLLEGE PENNA 400P OCT 22 1937
MISS LUCILLE MOORE
EIGHT NEWCUMBERLAND PLACE
NEWYORK NY
LETTER RECEIVED FROM MARY WHO IS IN NEWYORK STOP FAMILY JOIN WITH ME IN WISHING YOU A HAPPY BIRTHDAY
FRANCES
WLMA 504P 22

First line: write the number, station of origin, operator's sign and check.

Third line: place of origin, filing time (if any), and date.

Fifth line: the name of the addressee.

Seventh line: one space after the last word of the addressee's name, the address, giving number and street.

Eighth line: name of the city immediately under street and number.

The body of the message starts at the left on the tenth line. Copy ten words to the line. At the end of the fifth, fifteenth, twenty-fifth, etc., word, a double space should be left to aid in counting the check. New York is written NEWYORK, as are all names of places, and counted one word.

Two lines under the last word of the body appears the signature. If the last word of the body is too far to the right, start the signature two lines down and in the center of the blank. The message is serviced by the receiving operator by placing the call letters of the transmitting station two lines under the signature, followed by the time of receipt and day of the month.

As the message is being copied between the fifth and tenth lines, a new blank may be placed in the typewriter so that upon the removal of the completed message the new blank appears in approximately the right position for the next message. If carbon copies are made, considerable practice is required to get the new blanks in at the proper time.

A service message is shown below. It does not have a check and the place of origin and date are shown after the signature. Service messages should contain only data relating to traffic schedules or operation.

64 WLM SVC
WLMA STATECOLLEGE PENNA
YOUR FORTY THREE OCTOBER TWENTY SECOND PLEASE REPEAT ADDRESS
WLM WASHINGTON DC OCT 23

ZCB CONTEST RESULTS

Final scores of ZCB (QSO) Contest held September 13, 1937, are shown below. The contest lasted from 5:00 P.M. to 1:00 A.M. local standard time. Five minutes were required to elapse from the beginning of one contact to the beginning of the next. Stations exchanged their locations. Each contact counted one point.

The scores, by Corps Areas, and the scores of the individual stations having high score follow:

C.A.	*Points*	*Handicap Factor*	*Total*	*High Station*	*Points*
I	118	2.4	283.2	W1JMY	33
II	390	1.2	460.0	W2DBQ	38
III	1085	1.9	2061.4	W8GMZ	75
IV	145	3.4	493.0	W4AWO	19
V	366	2.1	768.6	W8LII	35
VI	211	1.5	295.4	W8ONK	35
VII	715	1.9	1358.5	W9BNT	53
VIII	416	3.4	1314.2	W6KFC	53
IX	2267	1.0	2267.0	W6CVL	56

(*Continued on page 98*)

Designing the First Stage of the Speech Amplifier

A Pentode Circuit for Low Hum and R.F. Pickup

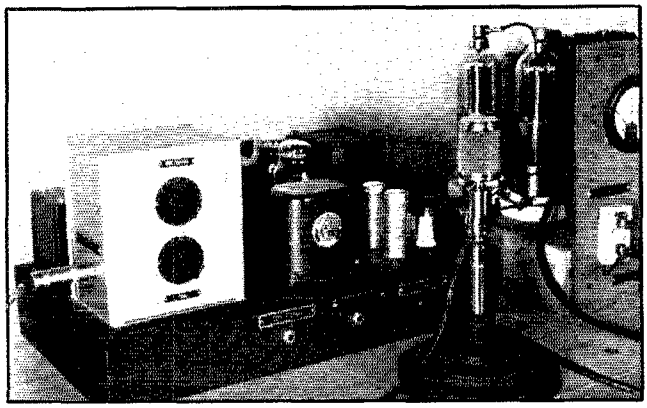
By Thomas A. Gross,* W1JZM, VE1IN

THE input stage of a speech amplifier largely determines the performance of the whole amplifier. So much can be done by intelligent design of this stage to reduce r.f. pickup, "motor-boating" and hum that it is worth while to study their design.

Most amateurs start out with two strikes against them in their efforts to obtain good amplifier performance by using a triode in the input stage. The pentode embodies many advantages which greatly outweigh their slightly increased cost. Changing a triode over to the pentode circuit will result in extended high frequency response, higher gain, and greatly reduced r.f. pickup.

The increased gain may be expected, but many are not aware of the other two advantages made possible by the pentode. The reduction of radio frequency is a result of the improved isolation afforded by the pentode circuit. The shielding of the screen grid has a similar effect to the neutralization of a triode speech amplifier tube. Indeed, triode speech amplifiers in broadcasting stations are usually neutralized.

The high frequency response can be extended when using a pentode because of its lower capacities. The pentode can work into a higher load impedance for a given high frequency attenuation than is possible with a triode. When a triode is used with a high loading resistance, as is necessary with the high-mu tubes, the higher speech frequencies suffer attenuation. On the other hand, pentode amplifiers can give reasonable gain even at frequencies used in television amplifiers.



THE PENTODE INPUT STAGE ELIMINATED R.F. PICKUP IN THIS SPEECH AMPLIFIER UNIT BUILT BY THE AUTHOR FOR THE BOWDOIN EXPEDITION STATION, VE1IN

In the accompanying diagram of Fig. 1 is the circuit of a simple but very effective speech input amplifier, combined with the coupling network to the following stage. It is not intended that the circuit be copied exactly as shown. The amateur should make changes necessary to accommodate his requirements for frequency response, available supply voltages, etc.

Most of the pentode tubes can be used in this circuit without changing the circuit constants. The 6J7 tube is suggested because it is small, self-shielded and is of the sharp cut-off type. Sharp cut-off tubes have higher gain and lower plate current than the variable-mu tubes. The last point is important because lower values must be used for the decoupling resistor R_6 and the plate loading resistor R_5. Representative of the sharp cut-off types are the 57, 6C6, 6J7, and the 954. The last tube, one of the acorn types, can be used to advantage in very small amplifiers.

Many prefer to use a bias cell in place of the cathode-resistor bias system shown in the diagram. This practice is desirable when a large condenser for C_2 cannot be obtained. The bias battery might cause trouble, however, when strong r.f. fields are present and there is grid rectification of the r.f. voltage.

The recommended values for the circuit constants are given in the diagram. Some of these constants may be altered to adapt the amplifier for the amateur's particular needs. For instance, R_5 and R_6 should be reduced from the indicated values when the available supply voltage is less than 250 volts. They may be replaced by high-impedance audio chokes to keep the gain up to a satisfactory level. The chokes have a lower d.c. resistance with high impedance at audio frequencies, which permits high gain with low supply

* Bowdoin College, Brunswick, Maine.

voltages. However, chokes should not be used except under special conditions because they tend toward hum and frequency distortion.

The combination of the gain control, R_7, and the grid leak for the second stage, together with the coupling condenser, C_5, is capable of frequency discrimination. An increase in either C_5 or R_7, or both, will bring up the bass response. With the values indicated in the diagram cut-off will begin at approximately 150 cycles, which is satisfactory for most amateur applications. If it is desired to attenuate the low frequencies further, to improve intelligibility or reduce hum, the condenser C_5 can be reduced in size. This practice is limited because of the phase distortion which develops when very great attenuation is attempted. The dialogue equalizer or the more complicated high-pass filter provide splendid means to attenuate the bass response of the amplifier. The high-pass filter has the advantage of a very sharp cut-off characteristic while in other equalizers the attenuation obtained bears a fixed relation to the frequency.

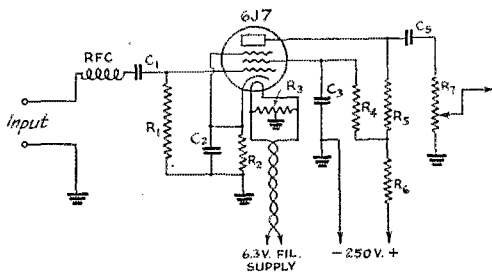


FIG. 1—THE SPEECH INPUT CIRCUIT UNDER DISCUSSION

C_1—0.1 μfd.
C_2—10 μfd. or larger.
C_3—0.1 μfd. or larger.
C_4—0.5 μfd. (see text).
C_5—0.006 μfd. (see text).
R_1—4-megohm grid-coupling resistor.
R_2—3000-ohm cathode resistor.
R_3—20- to 50-ohm filament center-tap resistor.
R_4—1-megohm screen-voltage dropping resistor.
R_5—0.25-megohm plate resistor.
R_6—50,000-ohm (see text).
R_7—0.5-megohm volume control (see text).

It is important that the condenser C_5 and the resistor R_7 be adjusted not to pass more of the low frequencies than actually needed. If this rule is not followed the possibilities of "motor-boating" and high hum level is increased. The flat response required of program amplifiers in broadcasting stations is actually undesirable for amateur service. The frequencies below 200 cycles are practically useless from the standpoint of intelligibility, yet it is these frequencies which contain the bulk of the speech energy. A high-pass filter designed to cut off at 250 cycles will eliminate all of the hum (up to a fourth harmonic at 240 cycles) developed in the previous stages and, at the same time, add greatly to the effectiveness of the signal.

When selecting condenser C_5 choose only one of the very best quality. If the resistance of the condenser is below 500 megohms, the bias on the following tube will be affected. Use a mica condenser if possible.

The cathode resistor by-pass condenser should be as large as is consistent with cost. It has been a practice to use a condenser as small as is needed for satisfactory bass response. It may seem logical to attenuate the low frequencies by reducing its value and thus cause degeneration at those frequencies. However, if this condenser is smaller than 10 μfd. the hum level will increase. A very pronounced hum will result if the heater leads are not balanced to ground with a center-tapped resistor or filament transformer secondary. I have noticed that this hum will develop even when d.c. is used on the filament unless the leads are center-tapped or at least one side connected to ground.

A very common mistake that is made, even in many published circuits, is to use decoupling in the grid circuit of any resistance- or impedance-coupled amplifier. Do not attempt to isolate the "cold" end of either R_1 or R_7 with a decoupling resistor. A decoupling network at R_1 will place the case of the microphone above ground, which will encourage hum pickup. If decoupling is used at R_7 the cathode resistor will not be by-passed and degeneration will result. However, should a transformer be used in either grid circuit, decoupling is then very desirable.

The decoupling network consisting of R_6 and C_4 should always be used, providing that the supply voltage is adequate. The network will cause a drop in the d.c. voltage on the plate of the tube but will reduce the tendency toward "motor-boating" and will iron out the ripple of the supply voltage. To function properly, the resistance of R_6 should be at least 25 times the capacitative reactance of C_4 at the lowest frequency which must be filtered.

It is desirable to locate the gain control R_7 at least one stage from the input circuit. It is then able to reduce hum and other noise which has developed in the preceding stages. Only when the magnitude of the signal voltage is great enough to overload the input tube should the volume control be situated in the input circuit.

The hum level will increase if multiple grounds are used to ground the metal braid on shielded leads. If shielded wire is used it is important that the braid have a good ground—but at only one place.

The two best tubes to use in the following stage are the 6J5 and the 6C5. The former has a lower plate impedance than the 6C5 and it is the more desirable of the two when the second stage is called upon to deliver small amounts to power. The 6C5, however, has better insulation and should be used when only voltage amplification

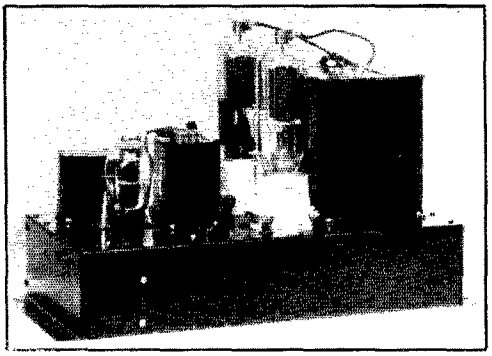
(Continued on page 98)

Cathode-Coupled Driver for Class-B Modulators

By R. B. Shimer*

WITH the exception of negative feedback, which has been described in these pages recently, the fundamental design of audio power systems has experienced little improvement beyond the usual absorption of the newer tubes. Of course, new innovations or circuit designs which do not lower cost or materially improve the overall frequency response, while often interesting to the amateur or experimenter, do not find favor and are obviously soon forgotten. However, when a circuit appears which is really an actual improvement over existing designs and which, furthermore, lowers the cost, then it is at least worthy of consideration.

Recently there has come to the audio field a new innovation in the way of drivers. These are called "cathode drivers," since the driver transformer, instead of being in the plate circuit of the driver tube or tubes, is in the cathode circuit. This is a degenerative type of amplifier, and possesses inherently better characteristics than the plate-coupled type for certain applications. In the circuit here discussed, it permits driving a 250-watt audio output stage with only a single receiving-type tube. Moreover, the driver tube operates Class-A, and thus may be fed directly from a comparatively low-level stage.



THE CATHODE-DRIVER CLASS-B ASSEMBLY MAKES A COMPACT UNIT

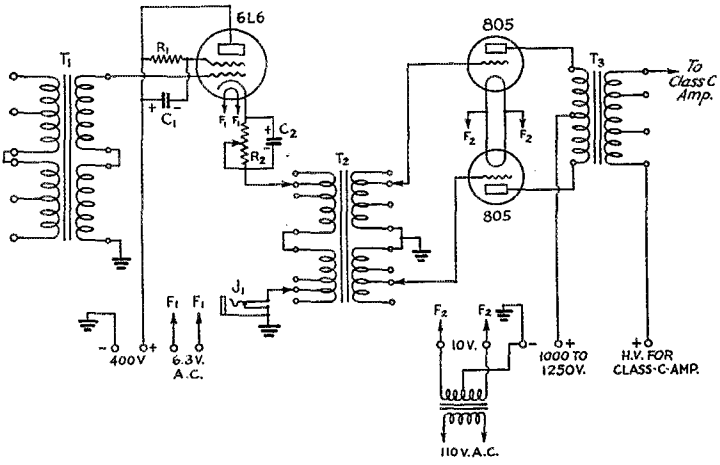


FIG. 1—CIRCUIT OF THE 250-WATT CLASS-B MODULATOR WITH CATHODE DRIVER

*C*1—2-μfd. 450-v. electrolytic.
*C*2—25-μfd. 50-v. electrolytic.
*C*3—4-μfd. 2000-v. paper.
*C*4, *C*5, *C*6—8-μfd. 450-v. paper.
*R*1—50,000-ohm 2-watt.
*R*2—1000-ohm pot., 5-watt (wire wound).
*T*1—Input transformer (Kenyon Type T-2).
*T*2—Driver transformer (Kenyon Type T-264).
*J*1—Single-circuit shorting jack.

This method of driving a Class-B output stage is highly recommended whenever it is necessary to obtain maximum efficiency with lower distortion. One of the inherent faults with existing plate drivers is that often the tube is operated Class-AB or Class-B, which necessitates the use of a driver transformer for the grids of these tubes. Aside from this, tubes that draw considerable grid current usually are characterized by inherent distortion, and when fed into the Class-B final output stage are often responsible for the poor quality so often encountered in inefficiently designed Class-B audio amplifiers or modulators.

While the above advantages of cathode drive are highly desirable, the main advantage is its ease of operation. This particular modulator will deliver full output with an input to the driver tube of only + 14 db—the output of a typical

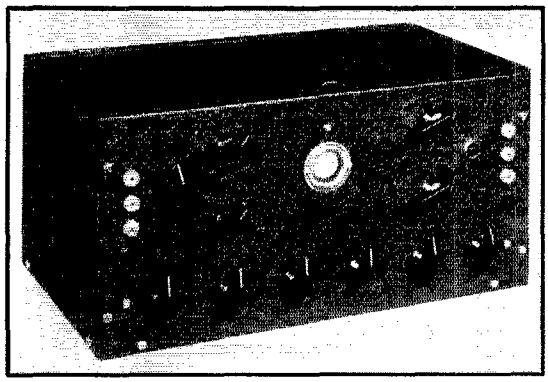
(Continued on page 100)

*Kenyon Transformer Company, 840 Barry St., New York City.

A Complete Oscilloscope with I.F. Input Amplifier

By Earl I. Anderson,* W8UD

UNFORTUNATELY a cathode-ray tube is a comparatively insensitive device. Little or no power is necessary for deflection, but the voltages required are fairly high. In the case of the 913 tube about 100 to 150 volts must be applied to the deflection plates if the picture is to be as large as possible. Because the 913 screen is quite small it is necessary that full or almost full deflection be obtained or the pattern will be difficult to read. This means that unless the oscilloscope is equipped with amplifiers it may be used for observing voltages which are comparatively high but that it will not be usable for low voltages. Most units which have been described for amateur construction and those which are offered to amateurs at a low price are of this type. If no linear sweep is included their use from an amateur application standpoint is limited almost entirely to the trapezoidal pattern for observing final r.f. amplifier and modulator performance. The 60-cycle sweep usually incorporated is less usable than a linear sweep but it is inexpensive and will serve for some purposes. Even so, this simplest type of unit is well worth while and should be a part of every 'phone station's equipment.



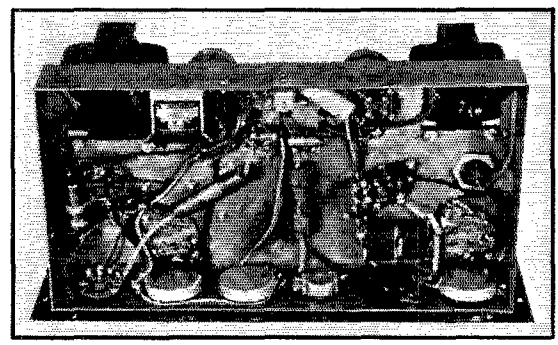
THIS 913 OSCILLOSCOPE UNIT IS COMPLETE WITH INPUT AMPLIFIERS FOR BOTH HORIZONTAL AND VERTICAL DEFLECTION, INCLUDING AN I.F. STAGE FOR RECEIVER APPLICATIONS

The controls, grouped about the 'scope tube in the center, are as follows: Bottom row, left to right—sweep sync. input, R_1; fine sweep adj., R_4; horizontal input switch, S_3; horizontal amp. gain, R_{11}; vertical amp. gain, R_{16}; vertical input switch, S_4. Below tube at left, coarse sweep adjustment, S_1; below tube at right, i.f. gain control, R_{12}. Above tube, at left, intensity control, R_{20}; above tube, at right, focus control, R_{19}. The control at the extreme left is the linear-external-60 cycle sweep selector switch, S_2. The input and output terminals at the left and right sides of the panels have the same corresponding positions as in the diagram of Fig. 1.

However, as one becomes familiar with the capabilities of the cathode-ray tube and the multitude of interesting and useful purposes it will serve, it is extremely doubtful that the user will long be satisfied with the 'scope in its simplest form. He will almost certainly desire to connect the oscilloscope to his receiver and observe incoming signals, as well as to make observations at lower amplification levels in tracing and eliminating distortion in his speech input equipment.

The foregoing considerations were the factors which resulted in the development of the unit now in use at W8UD. The completed job contains all the necessary features available in expensive commercial jobs and in addition contains an i.f. amplifier, thus making connection to the superhet receiver simple and effective. Usually such amplifiers are built separately and are not as convenient to use for that reason.

The total cost of the unit at amateur prices will be about $30.00, including all tubes and the cabinet. However, if that cost is high enough to be prohibitive at the moment, a most excellent start can be made for $15 to $16 by purchasing the cabinet and chassis, the 913 tube, 80 tube, T_1, R_{19}, R_{20}, R_{18}, R_8, R_5, C_1, C_8 and C_9. This comprises the simplest form of oscilloscope and



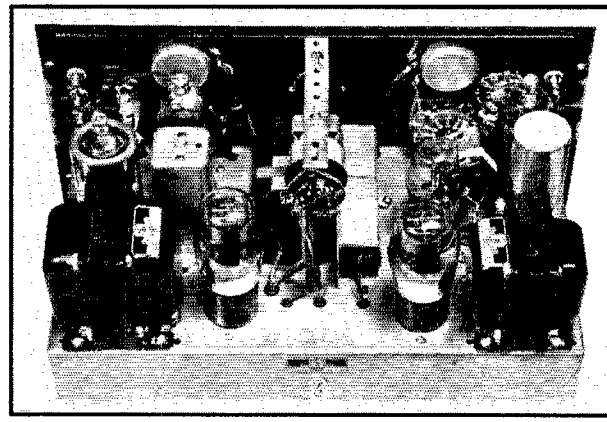
UNDERNEATH THE CHASSIS PARTS ARE PLACED ACCORDING TO THE RULE OF CONVENIENCE AND DIRECT CONNECTION

* Douglas, Michigan.

may be used to obtain the trapezoidal pattern. As finances permit, the additional parts may be added, beginning with the other power supply, 885 linear sweep circuit and horizontal amplifier. Either or both of the vertical amplifiers, i.f. and low-frequency, may be added next —and the unit will be complete.

The cabinet is a standard unit measuring 8 by 14 by 7 inches and is designed to accommodate the chassis, which measures 7 by 13 by 2 inches. There is plenty of room for all of the components and no difficulty should be experienced in getting them all in. The exact layout is not particularly important but the one shown has proven entirely satisfactory and should be followed as closely as possible. The power transformers are placed as far from the 913 tube as possible. Placed as shown, their fields do not influence the operation of the tube. Several different 913 tubes were tried and with each of them the beam centered properly so apparently no beam centering controls are necessary with this tube and none are shown. Originally ordinary midget receiver transformers were used for T_1 and T_2. Their operation was satisfactory except that the heat developed was excessive and the voltage on the 913 was too high using the entire secondary for the half-wave rectifier and too low using half the secondary. The entire secondary was used with a series resistor to reduce the voltage across the voltage divider network to 550 volts. Price is perhaps the most important factor in the design of midget receiver transformers and accordingly they operate at extremely high copper and steel densities. Because of this it was impossible to operate the scope in the cabinet for any length of time without developing excessive heat which resulted in the failure of several condensers, despite the fact that large holes were cut in the bottom and top of the back with a socket-hole punch. The Standard Transformer Corporation offered to develop the special and more conservatively designed units which

(Continued on page 108)



THE ABOVE-DECK COMPONENTS ARE NOT UNDULY CROWDED. THE PRINCIPAL PARTS ARE IDENTIFIED IN FIG. 2

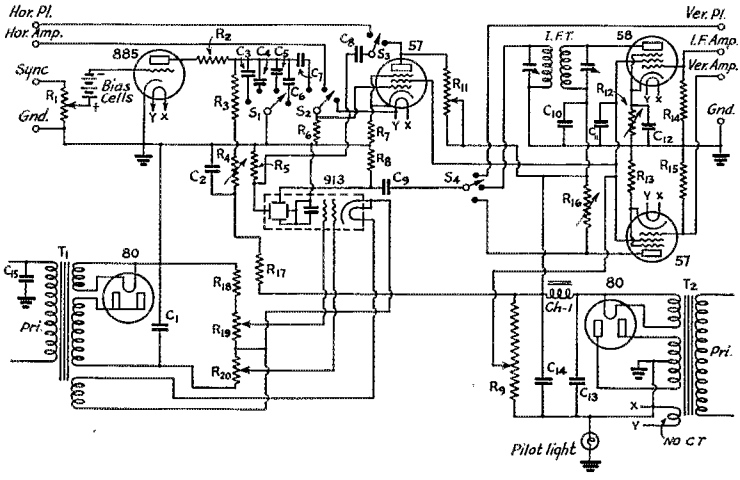


FIG. 1—THE ALL-INCLUSIVE CIRCUIT

R_1—*15,000-ohm variable.*
R_2—*400-ohm ¼-watt.*
R_3—*100,000-ohm ¼-watt.*
R_4—*1-megohm variable.*
R_5, R_6, R_8, R_{14}, R_{15}—*2-meg-ohm ¼-watt.*
R_7, R_{13}—*1000-ohm ¼-watt.*
R_9—*25,000-ohm 20-watt semi-variable.*
R_{10}—*Not used.*
R_{11}, R_{12}, R_{16}, R_{19}—*75,000-ohm variable.*
R_{17}—*50,000-ohm ¼-watt.*
R_{18}—*150,000-ohm 1-watt.*
R_{20}—*25,000-ohm variable.*
C_1—*4-μfd. 600-volt paper.*
C_2—*8-μfd. 450-volt electrolytic.*
C_3—*1-μfd. 400-volt paper.*
C_4—*0.25-μfd. 400-volt paper.*
C_5—*0.05-μfd. 400-volt paper.*
C_6—*0.005-μfd. mica.*
C_7, C_8, C_9, C_{10}—*0.1-μfd. 400-volt paper.*
C_{11}, C_{12}—*0.1-μfd. 200-volt paper.*
C_{13}, C_{14}—*8-8-μfd. 450-volt electrolytic.*
C_{15}—*0.006-μfd. 200-volt paper.*
S_1—*Single-circuit 4-position switch.*
S_2—*Single circuit 3 position switch.*
S_3—*S.p.d.t. toggle switch.*
S_4—*Single circuit 3 position switch.*
I.F.T.—*I.f. coupling transformer. (See text.)*
T_1—*450-volt at 10 ma., 6.3-volt at 0.9 amp., 5-volt at 2 amp. (Stancor P4027).*
T_2—*250-0-250-volt at 30 ma., 2.5-volt at 4.5 amp., 5-volt at 2 amp. (Stancor P4028).*
CH_1—*30-henry 50-ma. choke (Stancor C1003).*
Bias cells—Three 1-½-volt penlight cells.

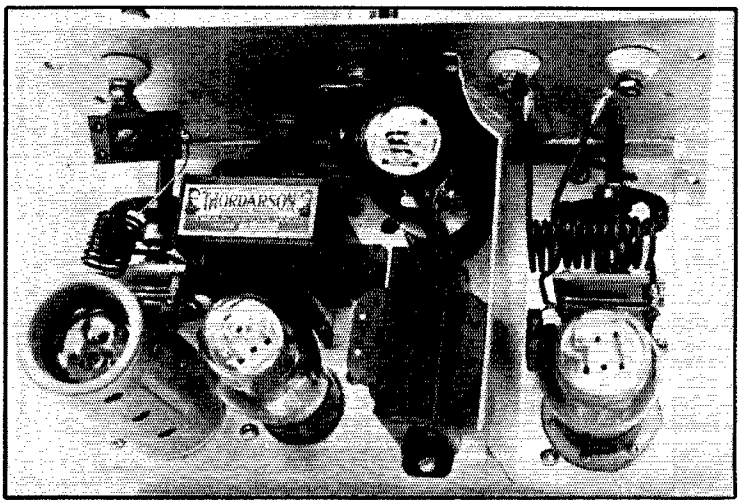
A Compact 56-Mc. Portable-Mobile Transmitter-Receiver

By Howard C. Lawrence, Jr.,* W2IUP

PANEL VIEW OF THE 56-MC. TRANSMITTER-RECEIVER WITH CONTROLS FOR SIMPLEX OR DUPLEX OPERATION

AT W2IUP a rig was wanted that could be used for portable and portable-mobile work. Since this rig would not be installed in any one location for more than a short period of time, the complete station had to be as compact as possible, with a minimum of extras to be carted along when setting up. A summer's work with a transceiver showed that a separate transmitter and receiver were desirable, and that duplex operation is a convenience. The power consumption had to be low so that the battery drain would not be too great when operating off a storage battery and so that the power supply used for mobile work would not be too expensive.

Convenience in operation dictated that there be no vernier dials, so that the band could be covered rapidly; that the transmitter be tuned by a single control so that it would be easy to QSY to avoid QRM or to find a frequency suitable for duplex work; that the change from send to receive be made with a single switch; and that the rig be provided with a small bulb to illuminate the control panel and provide sufficient light to write up the log at night. All wires and controls



THIS REAR VIEW SHOWS THE OSCILLATOR AT THE RIGHT OF THE SHIELD PARTITION, RECEIVER AND AUDIO SECTION AT THE LEFT

*381 Highland Ave., Upper Montclair, N. J.

were brought out on the control panel so that the rig could be easily shoved against the wall or into a corner where it would not take up too much space. To keep the rig dry when operating in an open boat or in an unexpected rain storm, a box with no openings in it was needed. With all these requirements in mind the rig described in this article was designed and built.

The transmitter is a 76 Hartley oscillator modulated by a 41. The receiver is a 76 "Minute-Man" super-regenerative detector, transformer coupled to a 76 first audio. For simplex operation the 41 modulator acts as a second stage of audio driving a loud speaker. Only the first stage of audio is used for duplex operation.

The entire transmitter and receiver are built in a black crackle finished box 9 inches long by 6 inches high by 5 inches deep. The panel and chassis are $\frac{1}{16}$-inch aluminum while the shield partitions are $\frac{1}{64}$-inch aluminum. The aluminum work was given a dull finish by dipping it in a solution of lye and water for a few minutes (and then rinsing in clean water) after all drilling and cutting was finished. The small bowl-shaped dent in the top front of the shield was hammered out with a ball-peen hammer to make room for one of the transmitting antenna feed-through insulators. All bolts were equipped with lock-washers to keep them from shaking loose.

Starting in the upper left-hand corner of the front panel, and reading to the right, are the two transmitting antenna feed-through insulators, the panel light, and the receiving antenna feed-through insulator. Fahnestock clips were installed on the antenna insulators. At the left end of the second row is the transmitter tuning control, followed by the switch which turns the whole rig on and off when working from a storage battery and turns just the microphone battery on when working from an a.c. supply; the rotary send-receive switch which turns off the receiver, turns on the transmitter, and connects the 41 as a modulator when going from receive to send; the duplex switch which turns the receiver back on for duplex; and, on the far right, the receiver tuning control.

On the left-hand end of the bottom row are four binding posts. The 50-ma. 250-volt Genemotor input is connected to the upper two terminals and the storage battery to the lower two terminals. When working from the a.c. power supply a microphone battery of three dry cells is connected to the lower two terminals and the upper two are not used. The plus side of the battery and Genemotor are grounded to the chassis. It is important that this polarity should not be mixed, since the Genemotor will not run and the electrolytic condenser in the microphone circuit filter will burn out if the polarity is backwards. For this reason different type binding posts were used for plus and minus connections; one post takes a forked lug and the other a straight end of wire.

On the right of these binding posts is the receiver audio volume control. Next come two red tip-jacks for the microphone, two black jacks for

(Continued on page 112)

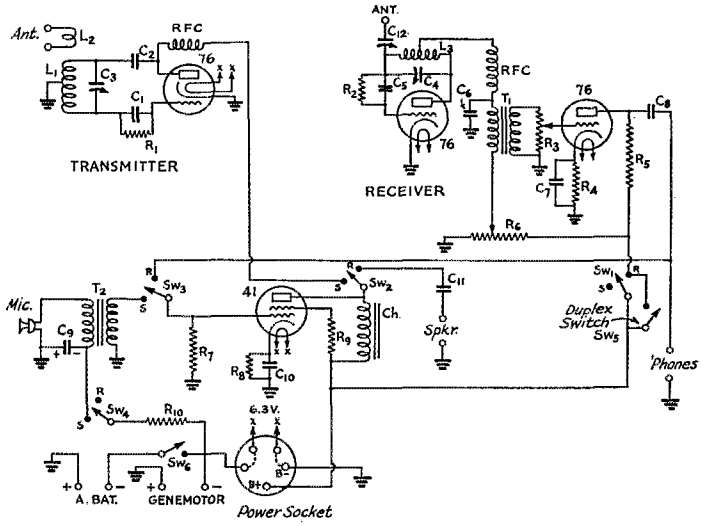


FIG. 1—CIRCUIT OF THE 56-MC. TRANSMITTER-RECEIVER

L_1, L_3—8 turns ½-inch dia., No. 12 enameled wire, tapped at center.
L_2—3 turns ½-inch dia., No. 12 enameled wire.
C_1—100-μμfd.
C_2—0.002-μfd.
C_3, C_4—15-μμfd. (Cardwell Trim-Air.)
C_5—100-μμfd.
C_6—0.002-μfd.
C_7, C_{10}—10-μfd. 25-volt electrolytic.
C_8, C_{11}—0.01-μfd. 400-volt paper.
C_9—25-μfd. 25-volt electrolytic.
C_{12}—35-μμfd. midget trimmer condenser (Hammarlund EC-35).
R_1—10,000-ohm ½-watt resistor.
R_2—10-meg. ½-watt.
R_3, R_6—500,000-ohm midget pot.
R_4—1500-ohm 2-watt.
R_5—100,000-ohm 1-watt.
R_7—½-meg. ½-watt.
R_8—500-ohm 5-watt.
R_9—1000-ohm ½-watt.
R_{10}—200-ohm 1-watt.
RFC—75 turns No. 30 d.c.c. wire, ¼ inch diameter.
T_1—3:1 audio transformer (Thordarson Type R-260).
T_2—Single-button microphone transformer (Kenyon Type KR-79M).
Ch—42-h. 15-ma. choke (Thordarson T-7430).
SW_1, SW_2, SW_3, SW_4—4 p.d.t. rotary switch (Yaxley).
SW_5, SW_6—S.p.s.t. toggle switches.
Dotted lines on power socket indicate connections made by Genemotor power plug.

How Would You Do It?

Suggestion for Weather-Proof Lead-Ins

ALTHOUGH responses to Problem Number Ten did not reveal anything startling or revolutionary in schemes for bringing the antenna or transmission line into the station (we hardly expected they would), nevertheless, the solutions submitted do give a good idea of the various means employed under different circumstances. A brief summary of these should be of assistance not only to those confronted by the problem for the first time, but also probably to many who find their present arrangements unsatisfactory for one reason or another.

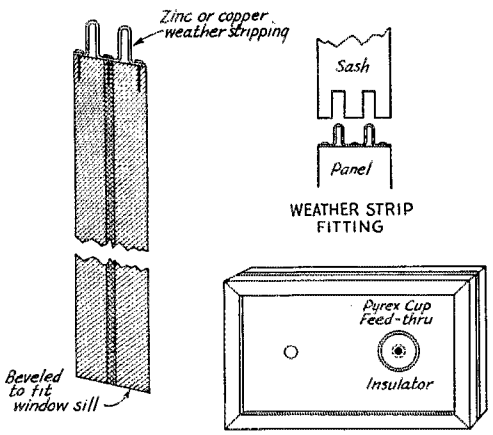


FIG. 1—WEATHER STRIP ALONG THE TOP EDGE OF THE LEAD-IN PANEL MAKES A TIGHT JOINT

It is realized, of course, that it is difficult to label any single type of installation "best," because few schemes can be made to serve to complete satisfaction under all circumstances. Therefore, more weight than heretofore has been given to quality of write-up in selecting prize-winners.

Several made suggestions which included cutting holes directly through the walls of the building. Where the property is one's own, or where a special "shack" is provided for the rig, this is undoubtedly the best solution, for the job can be done without great difficulty and can provide greater mechanical permanence than other schemes. It involves no interference to screening or storm windows. Probably the best place to go through the walls, from the standpoint of appearance, is at the trimming board at the top or bottom of the window frame as suggested by W1ALJ and Alexander Marshall of Kearny, N. J. The trimming boards inside and outside provide flat surfaces for tightening lead-in insulators. Cement or rubber gaskets may be used to weather-proof the exposed joints.

Unfortunately for many amateurs, such extensive surgical operations will not be tolerated and, for these, the window usually offers the best opportunity. If necessary, the window itself may be altered considerably without permanent injury to the property because it may be replaced at little expense. The chief problems encountered in bringing the transmission line through the window are those of weather-proofing and arriving at an arrangement which will interfere as little as possible with the normal functioning of the window. We have seen no scheme which solves these difficulties better than a sufficient number of holes drilled in the glass near the top of the upper pane. The only restriction which this imposes is that the lower sash cannot be raised to its full limit, but this is of minor importance. Stops should be provided at the proper heights to prevent accidental damage by raising the lower sash too far.

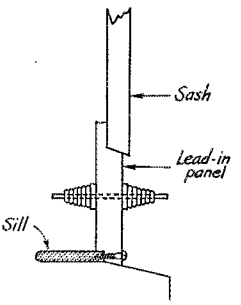


FIG. 2—ANOTHER METHOD OF WEATHER-PROOFING

The single thick board could be replaced by two thin boards fastened together.

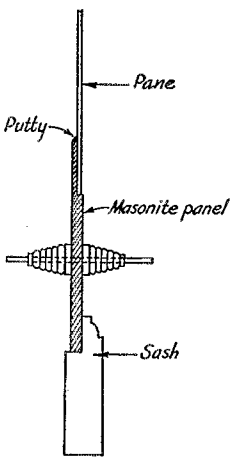


FIG. 3—A METHOD WHICH AVOIDS DRILLING HOLES IN GLASS

W1AUN offers the advice that much trouble will be saved if the entire upper pane is replaced

(Continued on page 118)

HAMDOM

THERE are two ways this piece might begin: A glance in the Call Book will show you that the only way you can add the country of Reunion Island to your list is by working FR8VX, for he is the only ham there.

That's the DX angle—and it may be all that matters. But if you, too, like to go behind the signals you hear and learn of the personalities back of them, then harken to a brief page from history.

In the year 1428, following a series of long and sanguinary wars extending back to the third century B.C. when the Kingdom of Annam became subject to Chinese control, that country, which then comprised most of what is now French Indo-China, became autonomous under Chinese suzerainty. In 1789, with the aid of the French government, it freed itself entirely from Chinese control.

But it was not long before France, the erstwhile ally, became an aggressor. In 1858 Napoleon III attacked Annam, acquiring successively Cochin China and Tongking, and in 1886 what remained of the Kingdom of Annam became a French protectorate. Although technically a monarchy, ruled by the King with the aid of the Secret Council of six, it is actually governed by the French Resident-Superior and his staff.

What has all this to do with ham radio? These are the historical moves underlying the creation of a most unusual ham. But first, a little more background.

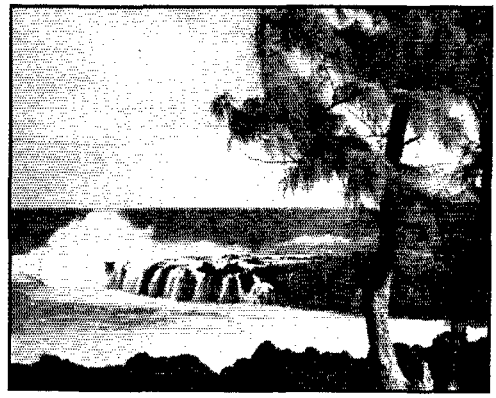
When the French took over the Kingdom of Annam they deposed the existing ruler and, in 1889, placed 13-year-old Prince Bun Lan on the throne as King Than Thai. As he grew older they found they didn't like him very well, however, and in 1907 he was forced to abdicate.

Now Than Thai had two sons, the eldest named Vinh San and the second Duy Tan. In selecting his successor the French authorities overlooked the claims of the eldest son and placed Duy Tan on the throne at the age of 7. Vinh San continued to live in Hué, the capital of Annam until 1916, however. In that year a further upset occurred, and Khai Dinh succeeded to the throne.

FR8VX

At the same time Vinh San was exiled to Reunion Island.

There's not much fun in the life of an exiled prince, but Vinh San was the sort to make the best of his predicament. Naturally of a scientific bent, he took up electricity and wireless as his primary interests in life. In 1917 he erected the first antenna on Reunion, using a galena crystal detector, to make weather and storm observations. During three years of operation this equipment—entirely home-made, for shipments from outside are very difficult owing to the remoteness of Reunion's rockbound coast from world waterways—enabled the observance of much interesting natural phenomena. In 1919 the Prince undertook the study of earth currents, in connection with Reunion's living volcano, *Piton de la Fournaise.* His other more abstruse scientific activities include the correlation of radio conditions with cyclone formation, succeeding in 1930 in the "determination of cyclonic centers and their translation."



BEGINNING OF A STORM ON REUNION ISLAND

It was in 1920 that Prince Vinh San started in the transmitting end of radio, with a Rhumkorff coil which covered 18 miles, the first wireless transmission on Reunion. In 1924 he graduated to vacuum tubes, acquiring a small triode.

Two years later saw the start of a long agitation by him in the local press for the erection of a radio broadcasting station. From 1926 to 1930 he busied himself with a 40-watt broadcaster on 180 meters. In its early days he even built up a hundred or more receivers himself for his friends, to popularize the innovation. The station was

heard as far away as Mauritius, the call used being 04XV. Finally an official station was installed, and this activity necessarily ceased.

It was 1933 when the Prince's ham career actually began. On October 12th he had his first QSO on 40 meters, with ZS2A. The call then was FB8VX, which he used until November, 1935, when he changed to the present FR8VX. In short order he worked all continents, using both 7 and 14 Mc.

In December, 1935, he had the idea of observing radio conditions at the top of *Piton des Neiges*, an extinct volcano which is the highest point on the island (3069 meters high). Together with Paul Bunderwoet, formerly a radio officer with the French commercial navy, he camped for 12 days in a natural cavern near the top. With a portable transmitter using flashlight cells and operating with less than 2 watts many QSO's were made with Australia and South Africa. A commentary on the normal climate of Reunion is the Prince's emphasis on the weather conditions at the peak, where there was "such a cold that wooden fire was needed from sunset to next morning."

Now FR8VX—as no real DX man needs to be told—works regularly on 14,340 or 14,430 (approximately) kc. or the 28-Mc. harmonics of these frequencies. His first W contact was W8MAH. The first in each of the other U.S.A. call-letter areas were W1FOZ, W2HPL, W3CHG, W4EF, W5EBT, W6CNX, and W9NBM. He has no W7 yet!

The normal power is 20 watts, with no more than 40 at any time. The Prince finds W's hard to work, the only good time being 2300 G.T., but then static and QRM are both bad. He often hears five or six W's on the same channel—so when he reports QRM you can be sure he really means it.

His regular operating periods are from 1800 to 2200 GT (10 P.M. to 2 A.M. his time). The first two hours are usually spent on 14,340, while during the last two he moves to the edge of the band to avoid W QRM.

All in all, FR8VX is still another remarkable example of the inscrutable ways of Fate. But it is an interesting reflection to note that one who might have been the ruler of five million people finds an all-absorbing interest in our common hobby of amateur radio. Pretty good, at that, isn't it?

—*C. B. D.*

The Northwestern Division Convention

WHEN, in spite of a registration fee of only $1.00, 233 hams and their wives vote the resulting convention just about the most enjoyable affair they ever attended, that is news! That, however, is precisely what happened this year on the occasion of the Northwestern Division's convention August 28th and 29th at Sunrise Park, on the slopes of Mt. Rainier and the reaction can be attributed to three things: First, intelligent planning by a thoroughly competent committee; second, a convention site of unsurpassed beauty, affording numerous opportunities for hiking, fishing and photography, and third, the unusual amount of visiting and friendly hamming directly attributable to the "cabin life" of the gang during their stay.

The gang started assembling anywhere from several days to — in at least one case — a whole week before the convention (and it may be said that those who didn't, wished they had!). Accommodations at Sunrise are provided by cabins and this was responsible for an unusually friendly atmosphere. Many of the gang brought along their wives, and housekeeping on a small scale was started up all over the place. Not only housekeeping was started, however — so was ham radio! We won't say there's never been a convention with as many portable rigs in active operation but we will say that if there has, we don't know about it. From the moment the gang got settled in their respective cabins hams were crawling all over the place putting up temporary masts and stringing antennas. Long before the evening of the first day rigs were operating in c.w. and 'phone on every band except 160 (and only the loss of a couple of tubes prevented at least one rig being on that band!). And what conditions! . . . signals rolled in from everywhere and, judging by reports, rolled out similarly.

If the reactions of most of those attending mean anything, the affair would have been just as successful whether there'd been a program or not. In justice to the committee and guest speakers, however, it is to be recorded that there was an excellent program, just right in length, comprising two technical sessions on Saturday and Sunday, a League meeting, a hugely successful dance in the big Park lodge on Saturday night (music thanks to W7MD) and a final picnic on Sunday afternoon where various merchandise prizes were distributed in addition to three cash prizes of $30, $20 and $10 donated from the surplus funds of the convention (we *still* don't know how it was all done for $1.00!—W1JFN). In between all this, the convention committee had wisely left plenty of time for mountain climbing, hiking on the many splendid trails nearby, fishing, photography (we've come to the conclusion that most hams are also pretty keen about photography), and plain hamming. There was plenty of each.

Speaking for ourselves (W1JFN), anytime the NW Division gang holds another convention at Mt. Rainier, we'll break both legs as many times as may be necessary to get there. However, we'll do three things we didn't do this time: first, we'll

get there earlier; second, we'll take along plenty of camping gear so we can cook our meals in our cabin, and third, we'll positively have *our* portable rig along, too!

—*W7DXF + W1JFN*

The 1937 West Gulf Division Convention

THE Eleventh Annual West Gulf Division Convention was held in Houston, August 20th and 21st. It was a huge success, having a larger attendance than any previous West Gulf Division convention—265 hams. Numerous prizes were donated by the manufacturers, and nearly everyone went home with one. Among the distinguished guests present were President E. C. Woodruff, representing A.R.R.L., Dr. J. S. Waters of Rice Institute and Mr. and Mrs. John L. Reinartz.

Every item on the convention program went off exactly on schedule, and a great deal of credit is due the Houston Amateur Radio Club for their excellent management. Through the sale of advertising space they were able to provide $4.50 worth of entertainment for each $3.50 registration.

Next year's convention is scheduled to be held in Carlsbad, New Mexico.

—*W5BKW*

Strays

"Have you ever mounted a shield can on a metal chassis and found it hard to mark the holes for drilling?," asks W8KQZ. He supplies a kink to make it easy. Place a small piece of adhesive tape on the chassis at the approximate location of each hole, place the shield can in exact position, and with a long pencil mark on the tape where the holes are to be drilled. Remove the shield, and twist a sharp knife point through the marks and tape into the metal. Drill through the tape; it will prevent the drill from creeping sidewise.

What the League Is Doing

(*Continued from page 22*)

No More A-2 On "10"

Type A-2 emission, even of a nature not involving frequency modulation, is no longer permitted in our 28- to 30-Mc. band. On October 5th, the F.C.C. amended our Rule 375, stating the frequency bands on which A-2 may be used, so as to limit it to the frequencies above 56 Mc. Thus the 28- to 30-band is now governed by precisely the same regulations applying to our lower-frequency bands as concerns the quality and types of output.

DIXIE JONES' OWL JUICE

EVER sense I been a ham I been readin' pieces in QST about why don't us rabble make more deliveries and stop scrunching up nice little hamgrams in a wad and chunking 'em into the wastebasket and anybody that does that should oughto have his mojulator busted over his head. Wells'r, I agree. So he ought, and the chances are he oughto have it done anyway for sumpn else, but what gits my nanny is to have some egg I never heard of deliver the same message I do. There is sucha thing as overdoin' this delivery business. For instance, I git a message that I can't do nothin' with but mail it so I write it up and I lick a nice shiny stamp and stick on it and then on account of I done a good deed and upheld the integrity of amateur hammery or sumpn I set down quiet and lay my ears back and purr at myself, and purty soon what happens? Wye in about a week in comes a letter from this bloke which says: "dear w4ir, I thank you very kindly for mailing me the message but I done got it sooner from W11XYZ and once was enough." I sware, I wish hams would deliver their own dang messages and leave mine alone.

—*W4IR of the "Dixie Squinch Owl"*

The Cover

AS THE key symbolizes c.w. transmission and the microphone radiotelephony, so the Iconoscope—the television eye—may be considered to symbolize television transmission. What could be more appropriate, therefore, than a picture of this gadget for the cover of the issue in which we dive into the television field? Our thanks to William Haussler, NBC and to RCA for the photograph.

Circulation Statement

PUBLISHER'S STATEMENT OF CIRCULATION AS GIVEN TO STANDARD RATE AND DATA SERVICE

This is to certify that the average circulation per issue of *QST* for the six months' period January 1st to and including June 30, 1937, was as follows:

Copies sold	43,045
Copies distributed free	420
Total	43,465

K. B. Warner, Business Manager
D. H. Houghton, Circulation Manager

Subscribed to and sworn before me on this 28th day of September, 1937
Alice V. Scanlan, Notary Public

HINTS and KINKS for the Experimenter

Combining the Frequency Meter, 'Phone Monitor, and Keying Oscillator

By Stan Comach, VE2EE

ONE of the most indispensable items of the well-dressed and operated ham station is the monitor, and no law-abiding amateur should think of doing without one even in these days of extensive crystal control. The best of crystals act up at times and the best of transmitters cannot always, therefore, be depended upon to perk merrily along right where it belongs; the only safe thing to do is consistently to check its operation to make sure that the signal is all in one lump, all in one place. The writer speaks from experience, remembering very vividly the expenditure of a brand-new five spot for a crystal guaranteed to hold the signal of VE2EE on a frequency of 14,398 kc.; the itch to ride the edge was upon me. Two A.R.R.L. Official Observers checked the signal at 14,403 kc. and sent me QSL's. Was my face red! At that time the station sported a monitor of the single tube type which up to that time had been considered sufficiently reliable, but with trouble sneaking up on me so unsuspectingly I decided to build something that could be trusted.

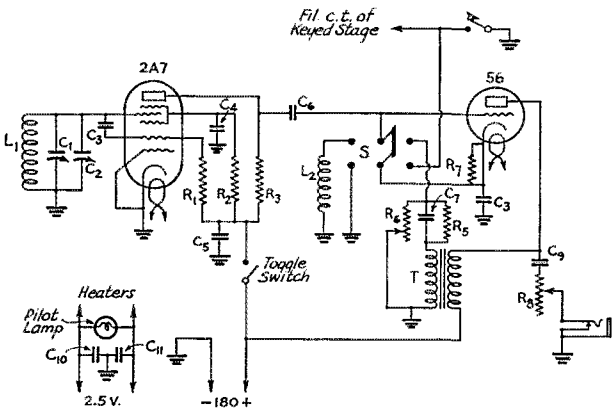


FIG. 1—COMBINED FREQMETER, MONITOR, AUDIO OSCILLATOR

C_1—25-μμfd. variable (bandspread).
C_2—50-μμfd. variable.
C_3—0.002 μfd.
C_4—0.1 μfd.
C_5—0.5 μfd.
C_6—0.01 μfd.
C_7—250 μμfd.
C_8—0.5 μfd.
C_9—0.1 μfd.
C_{10}, C_{11}—0.004 μfd.
R_1—40,000-ohm.
R_2—100,000-ohm.
R_3—10,000-ohm.
R_4, R_5—0.5-megohm.
R_6—100,000-ohm variable.
R_7—15,000-ohm.
R_8—0.25-megohm.
L_1—Inductance adjusted for frequency band desired.
T—Audio transformer.

A search through *QST* brought to light an article entitled "Combining the Frequency Meter and Monitor," and working along these lines I started in to build a reliable piece of equipment. The question of stability is naturally of prime importance and after talking the matter over with some of the boys the 2A7 was chosen for the oscillator with the 56 to function as the detector. The unit was constructed and its performance exceeded all my expectations. The 2A7, after being allowed to settle, held the calibration error on the 14-Mc. band down to close to 1 kc., which is tol'able good. Along about April, 1934, someone brought out an improvement which, while not affecting the oscillator, afforded a cleaner keying signal; this was the tuned grid circuit on the detector.

Quite recently another article appeared in *QST* entitled "Audio Oscillator Keying Monitor Without Relays." Upon reading this an idea was born and is here presented as an improvement for the shack, with apologies to the fellows who provided the basic ideas.

It seemed to me that the 56, while doing a mighty fine job as a detector, could still be called upon to perform another duty, so by rearranging the grid circuit it is made to function as an audio oscillator which provides a beautiful signal for listening to that bug. For those who already have built and operated the frequency meter-monitor already referred to the changes, shown in Fig. 1, are simple and inexpensive. A d.p.d.t. switch, an old audio transformer, a volume control, couple of resistors and the change is completed. Following through the d.p.d.t. switch it will be seen that on one side the cathode resistor is grounded while the grid is connected to L_2. The coil L_2 consists of 5 turns of No. 20 on a tube base, and without any tuning condenser resonates at around 14 Mc. well enough to provide an S9 'phone signal with the switch in the oscillator plate in the "Off" position; *Voila*, the Phone Monitor!

With the oscillator plate switch closed, the carrier or keyed transmitter signal can be tuned

in, by means of C_1. *Ici* . . . the Frequency Meter! With the d.p.d.t. switch in the other direction the grid of the 56 is connected through the grid leak and condenser, R_5C_7, and the audio transformer secondary to ground, while the cathode is connected through one wire to the center-tap of the keyed stage on the transmitter, above ground until the key or keying relay contacts are closed. The audio oscillator is thus keyed simultaneously with the transmitter. R_6 is front panel control of audio tone, and the pitch of the note can be varied for different ears between 300 and 5000 cycles. The volume control R_8 provides a means of controlling the volume of the oscillator without affecting the frequency; this is an essential as the level of the audio oscillator is up about 15 db over the output of the frequency meter. The toggle switch in the plate circuit of the 2A7 is necessary to prevent the r.f. oscillator signal from killing the audio oscillator, since C_6 is always in the circuit.

The 2A7 functions as a negative-resistance oscillator of the retarding-field type, with electron coupling to the output circuit. Its use was suggested to the writer by J. C. E. Mitchell, VE2LO. In the circuit shown, the No. 2 grid functions as a screen, the Nos. 3 and 5 grids together as a plate, and the No. 4 grid as a suppressor. The screen and suppressor are at the same r.f. potential, and when the potentials of both vary together, increasing screen potential will be accompanied by decreasing screen current and vice versa, thus giving the negative-resistance effect.[1] The No. 1 grid is connected to the cathode. The circuit is simple to use, since no feedback tap or coil is needed.

—···—

Another Harmonic-Reducing Circuit

NOTICED much discussion in *QST* lately re harmonic radiation—or rather its elimination—and would like to chip in a few cents' worth as per the diagram of Fig. 2. Have found this circuit very effective with either self-excited or oscillator-amplifier rigs.

Circuit L_1C_1 is the regular tank circuit. L_2C_2 is tuned to the second harmonic, placed in lead from plate to L_1C_1. It is essential that the coupling between L_1 and L_2 can be varied.

The rig is cranked up on the regular frequency and L_2 coupled fairly closely. C_2 is varied while listening to the second harmonic of the signal in the receiver. When the point of minimum signal is observed, leave C_2 at that setting and vary the coupling between L_1 and L_2. This should still further reduce the strength of the harmonic when the proper degree of coupling is obtained. The antenna may be coupled by any of the usual methods; if an antenna tank is used, it should be coupled to the side of the tank circuit opposite L_2. L_2, incidentally, probably works best coupled to the plate end of L_1. I have reduced an S9 second harmonic to S3 by this method with no trouble to speak of. L_2 could be left fixed over a

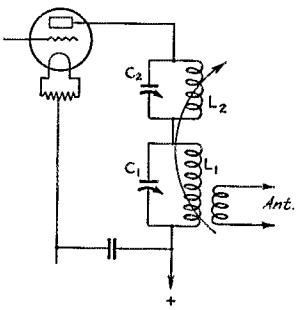


FIG. 2—COMBINED TRAP AND BUCKING CIRCUIT FOR HARMONIC REDUCTION

band once the optimum setting is found, but it would of course be necessary to retune C_2 for each change of frequency as its adjustment is quite critical.

—Fred C. Allen, VE3SA

—···—

Inexpensive Stage Switching

THE idea shown in Fig. 3 comes from Dr. W. R. Jaffrey, VE3DC, of Hamilton, Ont. Applied to the exciter unit described in October *QST*,[2] it substitutes a 6-prong tube socket for the switch, and utilizes old tube bases with appropri-

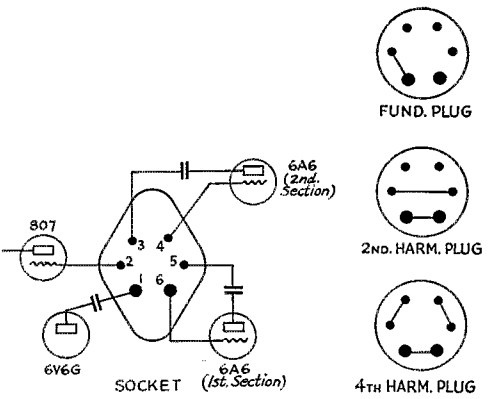


FIG. 3—STAGE-SWITCHING SYSTEM USING A TUBE SOCKET AND TUBE-BASE PLUGS

ate jumpers between the pins to make the proper connections between stages for output on various bands. The socket may be mounted on the front of the unit, in case relay-rack construction is used, so that it is readily accessible. Other pin

[1] "A New Type of Two-Terminal Oscillator Circuit," *QST*, April, 1935.

[2] Grammer, "A Semi-Universal Exciter with Stage Switching and Plug-In Coils," *QST*, October, 1937.

connection arrangements can of course be used provided the necessary interconnections are made with the three plugs.

With the 6-prong socket shown, the grids of the idle stages are not grounded as in the original switching arrangement. Grounds can readily be provided, however, by using a 7-prong socket and plugs, using the seventh prong as a ground with appropriate connections in the plugs.

VE3DC also recommends using a 0.01-μfd. 600-volt condenser connected between oscillator cathode and ground if the oscillator is keyed in the cathode circuit. A choke between key and ground is also helpful in preventing chirp with oscillator keying.

Replacing Magnetic Speaker with D.C. Dynamic

FIG. 4 shows a simple method of replacing the old magnetic speaker with a dynamic without adding a field supply or without modifying the receiver in any way. The field is simply connected

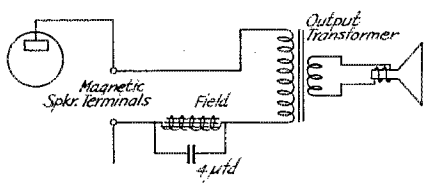


FIG. 4—USING A D.C. FIELD TYPE DYNAMIC SPEAKER ON SETS BUILT FOR MAGNETIC SPEAKERS

in series with the primary of the output transformer and by-passed with a 4-μfd. condenser, thus using the plate current to the output tube of the receiver to excite the field.

—*C. W. Leeds, Jr., W8AIU*

Regenerative Doubler

THE output of the 46 doubler in the 47-46-10 low-power transmitter, shown in August, 1936, *QST* and the Fourteenth Edition of the *Handbook*, can be materially increased by the use of the regenerative circuit shown in Fig. 5. All that is required is a trimmer condenser and a few turns of small wire. The use of a separate neutralizing coil connected as shown permits the use of a cheap trimmer condenser instead of a more expensive variable which would be necessary if the plate voltage appeared across it. In some cases an increase of 100% has been obtained in the grid current of the 10 when used as a doubler. At the same time the plate current of the 46 was lowered by one third. The addition of the neutralizing coil requires no changes in any existing connections. L_n has the same number of turns as L_2, and is wound one-eighth inch away from the low-potential end of L_2. No. 30 wire is plenty

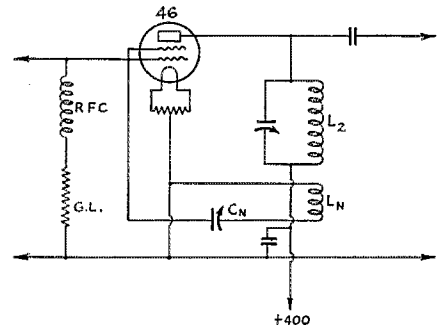


FIG. 5—ADDING REGENERATION (NEUTRALIZATION) TO A DOUBLER STAGE

large enough. The circuit is neutralized in the usual way.

—*H. E. Preston, W8CSE*

Mounting Trimmer Condensers

WHILE rebuilding recently, I decided to mount the grid tuning condensers inside the coil forms (link-coupled circuits) to save space. To eliminate loose wires inside the coils I ran across this very helpful kink which saves plenty of time and trouble.

Instead of using the usual 4- or 5-prong coil form, I purchased the six-prong type (some of

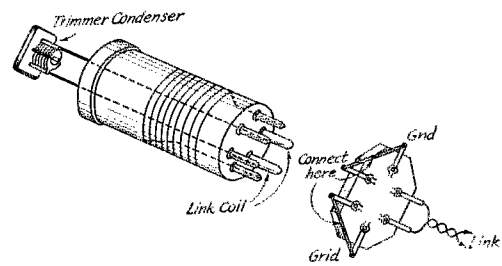
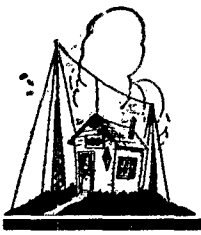


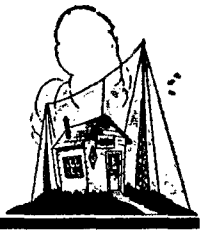
FIG. 6—WIRING ARRANGEMENT FOR EASY REMOVAL OF TRIMMER CONDENSERS MOUNTED IN COIL FORM

these have a mounting shoulder for mica or air trimmers). Hook the twisted pair for the link to the large terminals, and the ends of the grid coil winding to plate and cathode prongs. This leaves the two top prongs free for connection to the tuning condenser. The connections may be pulled tight and cut off, as indicated in Fig. 6. This permits easy removal or installation of the tuning condenser. Connections between the condenser and the two sides of the grid coil are made on socket. Don't forget these!

—*R. N. "Bob" Eubank, W3WS (W3AAJ)*



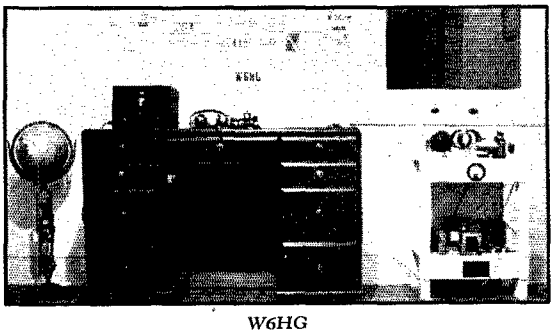
Amateur Radio STATIONS



W6HG, Inglewood, Calif.

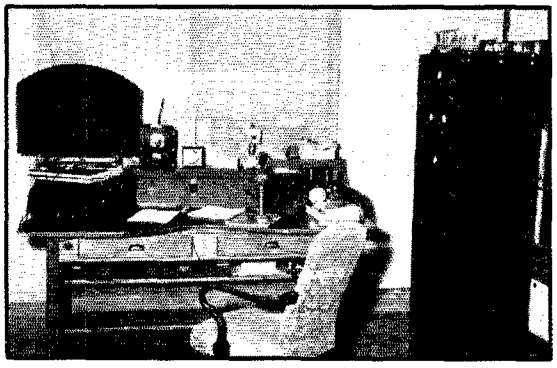
NOT all West Coasters employ "California kilowatts." In twelve years' operation George Dery, W6HG, ex-6CHT, has used single-210 transmitters. (Before the 210 it was a single 202.) The photo of W6HG shows how ultra-simple an amateur station can be, yet it can be just as effective as it is simple. With the 210 Hartley, running only 40 watts input, WAC has been made on 14 Mc., and all continents except Europe have been worked on 7 Mc. The receiver is an SW-3. Crystal control was used for a period of about a year, but eventually was discarded in favor of the greater flexibility of the self-excited rig. Favorite antennas are a 67-foot horizontal Zepp for 7 Mc. and a 31-foot vertical for 14 Mc.

The operator, an ex-seagoing brass-pounder, gets his fun working DX and handling traffic with foreign stations. Despite the low power, W6HG is a member of the Trans-Pacific Traffic Association.



W6HG

The tube line-up in the transmitter consists of a 6L6 crystal oscillator, doubling, an RK-39 buffer and second-doubler, and the aforementioned T-20's. The input has now been increased to 90 watts. The final is modulated by a pair of Class-B 46's. The microphone is a Shure 70S crystal. A three-halves wave antenna, fed through "Q" bars, is used. It is 55 feet high.



W5FIY

A Lincoln R-9 communications-type receiver is used. Other equipment on the operating table includes a Peak pre-selector, control panel and speech amplifier, monitor, and a frequency-meter.

W5FIY was formerly W4DPI in Tennessee, where he secured his first license in 1935. At the present location, nearly all operation has been on 20-meter 'phone, although 75 is used occasionally.

W5FIY, Okemah, Okla.

W5FIY, John F. Stanbery, of Okemah, Okla., specializes in low-power 'phone DX, the 14-Mc. band being his principal hunting ground. After an eight-months' wait to get Africa WAC was finally made in June, all contacts being made with a pair of 841's running only 60 watts input. Since then the 841's have been replaced by T-20's.

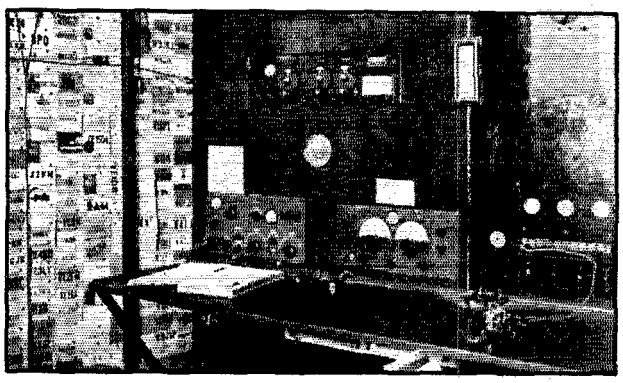
K5AA, Fort Amador, Canal Zone

THE inhabitants of the c.w. portion of the 14-Mc. band between 14,250 and 14,400 kc. can recognize after a dot or two that signal near 14,300. There's something about the note and the operating which makes K5AA one of the most easily-spotted stations on the band.

The photograph shows most of the equipment that is visible from the operating position. Everything is behind a series of plywood panels, totalling 8 by 10 feet, from which a shelf extends out to serve as the operating desk. Even the receivers are

set flush, as the photograph shows. A small shelf under the table holds the log and callbook.

The transmitter is operated on 14,310 kc. only. Starting out from an 80-meter crystal, the tube line-up includes a 59 Tri-tet oscillator, a pair of 10's, a 211 doubler-buffer, and push-pull 860's in the final amplifier. Grid keying is used, with 42's as the keyer tubes. Power switches are on the



K5AA

control panel at the right in the photograph.

For ham work, the receiver used is an RME-69. The receiver to the left of the 69 is a late-model army set, while a second army receiver of older vintage is mounted up above.

There are seven operators at K5AA: Turcotte (Eddie); Templin (Dick); Laird; Winters (Ed); Atwill (Bill); Weir (Chas.), and Klami. Schedules are maintained with several W stations, and the whole gang likes rag-chewing. And they have a signal with which they can put it over.

K7EVM, Fort Yukon, Alaska

WHEN you're out in the far-away places, amateur radio assumes greater importance than simply a hobby, important though our hobbies may be to us. In such a case, a little thing like lack of power may be an annoyance, but it is not a major obstacle.

K7EVM, owned by Ray Randall, Deputy U. S. Marshall and Deputy Collector of Customs at Fort Yukon, Alaska, is such a station. First take a look at the picture which shows the location, and then read the following letter:

"The shelves which hold the transmitters are mounted on the outside wall, which is of logs. This is fairly solid. In the upper right-hand corner there is a single 42 crystal transmitter connected Tri-tet. I usually use this on 80 meters, though have tried it out on 40 and 20. The greatest DX on 20 with this rig has been a contact with F8EO.

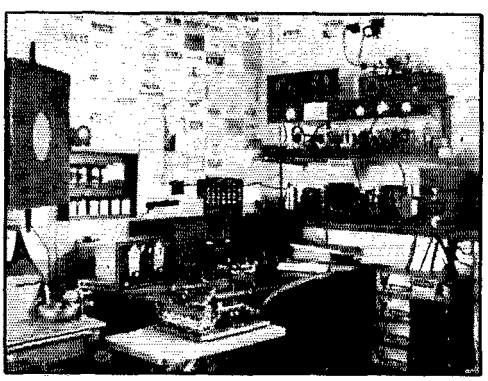
"On the upper shelf along with this rig there is also a Collins type pi-filter. Notwithstanding all the adverse criticism of the filters I find it very satisfactory and so far have had no ticket for harmonic interference, nor any heard cards on 10 meters!

"Below, the 47-46-p.p. 46's are spread out, and on the bottom shelf are the power supplies. There are three, 300 volts for the oscillator, 400 volts for the doubler and 550 volts for the final. Condenser input on the low supply and choke input on the others. Rectifiers are an 80, 5Z3 and an 83.

"The receiver at the left of the crystal Comet Pro is a home-built t.r.f. using 2-volt tubes. The frame and some of the parts are from an old Pilot Wasp. The coils are an old set of Nationals from a converter. The Comet is a 6-volt job with four Edison batteries for filament supply. These are located in a small lean-to addition at the rear of the house with a pair of wires running around the outside to the receiver.

"The stack of 'B' batteries to the right are for the 42 transmitter and are mostly old ones that have been used on the Comet until the voltage drops to about 35. The current drain on the 42 is low so I get long life from them. The neighbors give me their old batteries, which helps out a lot.

"I have a single-cylinder air-cooled engine



K7EVM

which drives a 32-volt generator to recharge the Edisons, charging in series and discharging in parallel. The engine also drives an a.c. generator made from an old Dodge generator. The generators are arranged so that either can be used. The engine is mounted on heavy timbers set on the ground, which is not very solid in the summer but in the winter I pour a little water around and it stays frozen all winter with the rigidity of con-

(Continued on page 116)

• I. A. R. U. NEWS •

Devoted to the interests and activities of the

INTERNATIONAL AMATEUR RADIO UNION

Headquarters Society: THE AMERICAN RADIO RELAY LEAGUE, West Hartford, Conn.

Conducted by Byron Goodman

Regulations:

The right to use 'phone on 14 Mc. has at last been granted ZL stations, according to information received from ZL4AO through W6ITH.

The new regulations provide for a band from 14,150 to 14,250 kc. for 'phone, to be used between midnight and 7 A.M. New Zealand time. Crystal control must be used, with a buffer stage between oscillator and final. Equipment to indicate overmodulation, a monitor and a frequency meter must be included. All testing must be done with a dummy antenna. Applications for the use of 14-Mc. 'phone must be passed by both the N.Z.A.R.T. and the Postmaster General's office.

In Australia a circular letter has been sent to all licensed "experimenters" (i.e., amateurs), notifying them that because of abuses in operating practices, especially on 'phone and notably in connection with music testing, regulations were being placed in effect which (1) prohibit music transmission on 7 and 14 Mc., except during daytime between 8:00 A.M. and 5:00 P.M., (2) impose technical requirements concerning oscillator stability and modulation efficiency on the operation of 'phone stations, (3) limit 'phone transmitters to 25 watts input power, (4) institute a probationary period of six months in which c.w. operation with power under 25 watts only is permitted, and (5) announce that vigilance committees are being appointed in each state to assist in securing enforcement of regulations.

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QSL:

As most readers will have realized, the Australian QSL Bureau listing in the October issue was in error. The address given applies to Austria. The Australian address is: W.I.A., QSL Bureau, Ray Jones, 23 Landale St., Boxhill, Victoria.

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WAC:

The following WAC certificates were issued during the period from January 1 through June 30, 1937:

Dorothy D. Hall, W2IXY ('phone); Francois Peret, F8II ('phone); S. C. Pleass, ZT6K; Perce Cronin, ZL20Q; J. W. Mavis, ZE1JE; J. P. R. Friedenthal, ZS6AJ; Kristian Mathiesen, LA3H; Ernst Schamann, D3CFH; R. T. Dealey, G6DT; Harushige Nakano, J3FT; Erling Karlsen Klevfos, LA5B; Andreas Giske, LA5Q; Wilh. Ingart, LA4R; F. E. A. A. Koopmans, PAØTSK; Frank A. Robb, GI6TK; D. H. Wijkman, PAØIDW; Victor Bollart, ON4DOA; Leonard E. Drossel, W6CDX; Wladimir de Carvalho, PY2BX; E. R. Roderick, W8MWL; E. V. Carpenter, W8KSF; Dr. H. G. Wyer, W1ICI; W. L. King, W7ETK; Fred J. Follett, W7NS; H. M. Grant, W9HHQ; Maury Kingman, W3FGG; Wm. L. Opdyke, W3VB; R. C. H. Taylor, ZT6T; L. Adalberto Brito. R., CE4AD; Arthur B. Smyly, W9GIZ; C. M. Fockler, VE3KF; Wenceslao Séré, CX1AA; San Jose State Radio Club, Harry Engwicht, Trustee, W6YL; Donald J. Simpson, W3EYF; Walter J. Smith, Jr., W2DXO; Norman P. Jessup, W5EHR; Richard F. Barrett, W6CFK; Roy W. McCarty, W9BA; Mrs. Mary Roth, W9TSV; Murray J. Douglas, W6CUG; Theodore J. Zuk, W1GUL; David B. Stout, W3UX; George D. Heitzman, W7AHX; Kiyoshi Yamachika, W6NGO; Raymond C. Lowery, W1AFB; Elmer Rahmes, W8JFC; *Andrew C.*

Thompson, W8DQN ('phone); George W. Korper, Jr., W2HMD ('phone); O. A. F. Spindler, VU7FY ('phone); F. Moureaux, ON4DM ('phone); Reber M. Bell, W8JVF ('phone); C. C. Brown, W7EXK ('phone); Franklin H. Huyette, W7ALZ ('phone); Leonard B. Fox, CO7CX ('phone); R. P. Nick, W3LN ('phone); T. J. Morgavi, W5FMO; E. Valentin Granqvist, OH3NP; A. S. Wood, G5WT; J. Paine, G6PR; Friedrich Boch, D4BFU; F. B. English, G6AZ; John Oxley, G6QP; R. P. Walker-Alexander, VS7RA; Lars R. Heyerdahl, LA6A; Sven Conning, SM6SS; Ernst Kammeyer, D4KRJ; Emil Rostgaard, OZ5R; J. J. Berthelsen, OZ8JB; William M. Wood, W9MLF; B. H. Stevenson, W2BXA; William F. Sanders, W7DAA; Thomas O. Tyner, Jr., W4BWZ; Lloyd J. Perper, W2HSD; Hugh H. Waesche, K6MXM; Thomas P. Robertson, W4TJ; Archibald W. Paull, Jr., W8FVU; Henry E. Wagner, W3FIA; Lewis L. Wilhelm, W6NGD; John F. De Jonge, W2GOM; Leonard J. Nole, W2FKL; Hayes Acton, W6NIK; Ellis R. Curry, W4BSJ; Don McVicar, VE4PH; Archie McCallister, W8IQB; Percy H. Foley, VE3ADM; Dr. I. Antalfy, HAF4H; E. A. Andress, W6KUT; Lieut. Clarence Herbert, W1HJ; Marcus M. Sullivan, W8BIX; Peter Wiltjer, W8MTF; Robert W. Stark, VE4FT; Leif Johnson, W7EUY; William G. Streater, W7BMT; Dwight B. Sprow, W9ULJ; Paul M. Lawman, W8MZD; William E. Lucey, W9SQL; Edmund C. Harry, W8LYQ; William L. May, W3APJ; Jesse D. Meadath, W3GMS; R. Christianson, SM7YA; *J. P. R. Friedenthal, ZA6AJ ('phone); Henry B. Lockwood, W2HFS ('phone); Carroll D. Kentner, W3ZX ('phone); Dr. John T. Porter, W5AKZ ('phone); Clarke Paige, W1CGY ('phone); Oliver W. Ford, W1FVO ('phone); Fred H. Hartley, W3MD ('phone); Hansford D. Scott, W9NGZ ('phone); Harold G. Palin, W9YGC ('phone); George Moens, SU1RO ('phone); Fenton F. Priest, Jr., W3EMM ('phone); Lew I. Stoner, W8IMS ('phone); Pippo Fontana, I1TKM ('phone);* Pippo Fontana, I1AY; Fausto Luise, I1BS; Harold Smith, W2GKE; D. H. Duff, VK3EO; R. Weeden, VK2PN; R. Tandy, VK3KX; K. Heitsch, VK3HK; R. E. Sankey, VK3XP; D. C. Dunn, VK2EG; B. L. Dimmock, VK2OW; L. G. Young, VK3JN; G. A. Greenhill, VK4LE; L. C. Meyers, VK2KS; A. H. Mackenzie, VK4GK; H. C. Dicks, ZU6AF; T. F. Starck, ZT6AY; Reginald George Henwick, ZT2Q; Florian Bossel, HB9BN; Heinrich Degler, HB9A; E. A. Bultemann, D4QNM; G. de Borchgrave, ON4ID; J. Leblanc, ON4JO; A. Berthet, ON4RAY; F. W. Baptista, ON4AS; Bohumil Zeman, OK1ZB; Oldrich Pospisil, OK2PN; Adolf Klemes, OK1KA; Frantisek Dolezilek, OK2DF; E. Ingleton, G5IL; A. E. Lambourne, G5AO; George Curran, G2KY; C. W. Thayne, G2UT; H. J. Merriman, G6GM; W. H. Van der Meulen, PAØMG; H. A. Touw, PAØZB; J. J. v.d. Hoek, PAØJV; Andre Caillot, F8QY; Henri Didier, F8FK; R. E. Robinson, ZL4AC; W. E. F. Mickelborough, ZL1BC; Julian W. Scrivener, W3EXI; Sergt. Frank W. Skinner, SU1FS; Charles A. Pine, W9CWW; Carl W. Krueger, W8NKU; John M. Seidel, Jr., W8OMQ; Malcolm J. Stevens, W8IWG; Frederick Weyerhaeuser, W9YPQ; M. A. Webb, W5FIO; Bennett R. Adams, Jr., W4APU; Italo Corsi Lazzeri, PY2CW; Leo M. Schrader, W8IOT; Eladio L. Licauco, KA1EL; Harold J. Klaiss, W4QN; N. F. McCarthy, W1CUO; Richard J. Lawton, W6MVQ; Walter S. Ellis, W6CVW; Francois C. B. Jordan, W3FIU; C. B. Dowden, VE1HK; Mrs. E. C. Hamilton, W9OWQ; James A. Wilson, K5AY; William W. Lamb, W8CXR; William E. Leeder, W8MFB; Edward J. Delaney, W2FGG; Melvin Z. Vickers, W8IUS; H. Bernhardtas, LY1HB; Dr. Felipe Santiviago, ZP2AC; Susano Jalmada, CX1BG; Woodrow W. Guile, W1EBO; J. Harold Humbrock, W6BUO; John W. Russell, W5ACD; Edward Hazen, W6MZH; C. P. Sweeny, W2DXX; Vicent I. Kraft, W7EHL; *Hector Soula, LU8EN ('phone);* Roland Guy, F8YG; *Roland Guy, F8YG ('phone); Heinrich Degler, HB9A ('phone); V. Plascott, G5PT ('phone); E. D. Kellogg, W7MD ('phone); Clarence C. Margerum, W1AQM ('phone); Don C. Wallace, W6AM ('phone); D. M. Heath, W4BMR ('phone); Frank H. Altdoerffer, W3APO ('phone); Dr. Elmer G. King, W6CQG ('phone); Thomas A. Archer, VP6YB ('phone); J. Butcher, G5XG ('phone); H. A. M. Whyte, G6WY ('phone); W. Vuyk, PAØWV ('phone);* G. Brockmann, D3ANK; Archduke Anton Habsburg, OE3AH; H. H. Hemminga, PAØHC; R. W. Rogers, G6YR; D. J. van Straaten, PAØEC; Emil Linscheid, D3GRH; I. C. van Sonsbeek, PAØKV; E. R. Martin, G6MN; Bertil Arvidson, SM5RH; Malcolm Shaw, G6OF; I. S. Doktorits, HA8D; S. Partington, G2GQ; R. Van Steenkiste, ON4SK; Dr. Maurice Polain, ON4CM; Fernand Delbrouck, ON4LB; Ulrich Jaeckh, D3IQH; Werner Bretschneider, D3DBN; Lawrence Nelson, W9MCC; Cecil T. Marshall, W5FDD; A. G. Brewer, VE3DA; Robert H. Meyer, W6LPC; William Tinsley, W9VDD; Jacob W. Schott, W8FGX; P. W. Lister, W8ISC; John T. Chambers, W6NLZ; Bill Case, W5FNA; Edward S. Onouye, K6HZI; John C. Hays, K5AC; Carl L. Hansen, W9CUH; Hugon Gildner, SP1DU; Clifford Cavanaugh, W7ACF; Bernard J. Bisciotti, W3FLH; George C. Wallace, W8ENA; Raymond F. Rinaudo, W6KEV; Hunley E. Thomas, W7FEZ; William J. North, W8NP; Harry R. Whiting, W2JXH; Marceli Jerzy Fluhr, SP1FL; Piotr Sliwiak, SP1AH; Eugene T. Butt, W5BSF; Bruno Staffen, W9HFK; DeAlva C. Summerford, W9AYH; Arthur F. Hasbrook, W5BWM; Frank F. Griffin, VE4KF; L. B. Farvour, W9TJI; Blair Benson, W1IGR; *Bill Orr, W2HCE ('phone); Norman L. H. Platt, G5PB*

(Continued on page 124)

OPERATING NEWS

Conducted by the Communications Department

F. E. Handy, Communications Manager **E. L. Battey, Asst. Communications Manager**

For *A.R.R.L.'s Tenth International DX Competition* tentative dates are announced: Radiotelegraph contest, March 5th to 13th. Radiotelephone contest, March 19th to 27th.

Any changes in our DX Contest rules? But two out of many suggestions seem to meet general approval. (1) "Operating time" recorded as the summation of the difference between "time on" and "time off" will probably be required reported in units of *full hours* covering full quarter-hour segments rather than making up total time as the sum of many shorter periods. Five minutes' work or fifty-five minutes' or sixty minutes' work will all count as an hour. Work may be planned to permit periods on and off the air to suit vocational schedules, but dipping in and out of the fray for just quarter-hour periods may prove unprofitable. (2) A group of radiotelephone amateurs request change in 'phone rules to bar counting any contacts by 'phone with telegraph stations . . . requiring all work reported to be "voice to voice." That's OK with us if the gang really want it that way, and unless strong opposition is voiced at an early date that's the way the rules will appear. It may limit scores slightly, but, like all rules, they are equally fair to all comers. There are a few foreign countries where telegraph stations can be worked, but few or no voice stations. It was our idea to give everybody a crack at these—but the factor is unimportant as long as the rules are the same for everybody. So expect it to be a 100% voice-only telephone competition. (3) Remember the disqualifications made last March for off-frequency operation, improperly modulated notes, and the like? Violations of government regulations will again be penalized. There must be no repercussions about poor amateur operating at Cairo! Official Observers will be asked to hew to the line, reporting all violations to the contest committee. Special coöperation is being requested of the F.C.C. itself. We shall ask the monitoring stations to give the DX bands redoubled attention. Any stations known to have been logged in violations by the F.C.C. during the contest will also be disqualified automatically. The interest of *all* amateurs requires strict observance of frequencies, d.c. power supply regulations, etc.

A.R.R.L. Member Party Coming!! A number of A.R.R.L. activities are open to all radio amateurs, whether members of the League or not. Appointments by S.C.M.s are, in accordance with the League's By-Laws, open *only* to *bona fide* members of the League. Appointees have special tests at regular intervals. January 8th–9th week-end has been proposed for a special activity, A QSO PARTY FOR A.R.R.L. MEMBERS O N L Y. For maximum enjoyment for our members, rules will be of the simplest—no restrictions to certain bands—nor to 'phone or telegraphy. Either or both may be used. A worthwhile prize will be given by A.R.R.L. to the MEMBER in each Section who can chat with most other members in the allotted hours. It will be something designed for the individual member himself. Details next month. Set aside the dates. Polish up the station. Any persons who are League Members on January 15th will be eligible to the fun and benefits—but not other amateurs.

Friday, December 10th—A.R.R.L. Copying Bee. Let us check your copy and return to you for your confidential information. See announcement on page 16.

—*F. E. H.*

Official 'Phone Station and Official Relay Station appointees have entered on another all-season competition which runs to May 15, 1938. In each group, amateur work performed *between* the dates of the quarterly station tests that keep these stations and operators at peak efficiency, will count an important part in the results of all the stations. This season not only national standings but section comparisons will net points to participants. Experimental and constructional activity is emphasized in the radiotelephone group, and traffic handling in the O.R.S. group. These key appointments stand for the best in amateur operating. The submitted performance records will enable the judges to select the best all-around O.P.S. and O.R.S. for the seven-month period ending next May. Ten awards will be made in each group.

Regular Headquarters bulletins to these organized 'phone and telegraph groups convey full details on rules and prizes. Any League member-amateur who can qualify by consistent activity, proper procedure and operating ethics, a good

station and monthly proof of doing things with it, is eligible for appointment as O.R.S. or O.P.S. Drop Hq. a line stating whether you are interested in voice or telegraph appointment and let us send you information about the qualifications. The appointments are not made by Headquarters but by the Section Communications Manager elected by League members in each Section. Your S.C.M. is listed on page 4 of this issue and he will send ORS/OPS application blanks on request.

The exclusive DX Century Club membership is growing. 75-country men are in a scramble to secure the elusive written proof and make the full membership. Others are working for 75 countries! It would be trite to say that DX is "popular as ever" this year. DX tales have acquired about the reputation of "fish stories." Now we have a club with certified members, all of whom successfully meet the dual challenge of the I.A.R.U. country list, and the hurdle that comes in getting the written confirmations which is a legitimate requirement. Our membership list is no empty list of fishermen who *say* what they have done, but a list of those who have *proved* their right! Hats off to the "centurions."

The A.R.R.L. Trunk Lines (each of the fourteen lines supervised by one of its members) set our pace in organization performance this year. Functioning with snap and precision these lines have outlets and inlets for handling traffic to and from an increasing number of A.R.R.L. Section Nets. Official appointment to posts of responsibility in the system arranged above is effected by certificate. The certificates are striking and to the point. The definite performance for amateur radio is likewise much in point. We want to say that every amateur, whether he takes part in this worthwhile relaying work or not can be proud of the work Official Relay Stations and nets are doing. The men who hold certificates have earned them well. They invite all amateurs (and others) to route traffic over their routes. To reach the friend who is beyond immediate range of transmitter, or unavailable at convenient hours, to schedule us the intelligent way is to use amateur message facilities.

—*F. E. H.*

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Brief

In regard to the letter in the correspondence section of October *QST* concerning special telephone directory listings for amateur radio stations, additional information has been received. Directory listings are not determined by the A.T. & T. but rather by the local telephone company which furnishes the service and publishes the directory. Most local companies charge a nominal sum (usually 25¢ or 50¢) for additional directory listings. The West Virginia company mentioned in October *QST* is an exception, offering free listings for amateur stations. If you desire your station to be listed in your directory, get in touch with your local telephone office for information on the cost, etc.

PRIZES FOR BEST ARTICLES

The article by Mr. Joseph A. Hoffmann, W2DIJ, wins the C.D. article contest prize this month. Each month we print the most interesting and valuable article received marked "for the C.D. contest." Contributions may be on any phase of amateur operating or communication activity (DX, 'phone, traffic, rag-chewing, clubs, fraternalism, etc.) which adds constructively to amateur organization work. Prize winners may select a 1938 bound *Handbook*, *QST* Binder and League Emblem, six logs, eight pads radiogram blanks, DX Map and three pads, or any other combination of A.R.R.L. supplies of equivalent value. Try your luck. Send your contribution to-day!

Effective Use of CQ

By Joseph A. Hoffmann, W2DIJ*

CQ calls are an important part of amateur operating, and probably the most misused part. It is essential that every amateur acquaint himself with and make use of the correct CQ practices in order to obtain more and better QSO's.

Many operators having only a little time to spend on the air will turn on the rig, and after a quick tune-up and check-up on the meters while the key is "locked" will turn on the receiver and proceed with a CQ, continuing it long enough for the receiver to get thoroughly warmed up. When they start listening for an answer they will be surprised at the number of CQ's and other QRM on the band. Such foolish operating just adds its bit to the unnecessary QRM.

Before calling CQ we should tune over the band thoroughly to see if any CQ's are being sent, and if there are, why not answer one of them? Our own CQ will probably be answered by one of those same stations anyway. While listening over the band we may run across some good DX. If no DX is heard and conditions seem unfavorable for DX, there is no reason for calling CQ DX as is often heard called at the most inopportune times. During our listening periods prior to calling CQ we may hear only "locals," and if we are looking for QSO's with stations somewhat remote, it is useless to call CQ at this time as is also the case when skip prevents us from hearing "locals" when we want such QSO's. Better results are usually obtained by listening for certain places than by calling directional CQ's. A good listener can sometimes distinguish DX and certain sections of the country by the tone of the signals and the type of sending. If we still persist in CQing after doing these things, we should first listen on our own frequency to ascertain whether it is free from CQ's and also wait for QRM to abate somewhat to insure being heard.

At times we will notice several stations on the band all calling the same fellow. A good time to CQ is right after they stop calling that fellow, as probably all of them except the lucky one will be back listening for more CQ's. Many times a fellow calling CQ is answered by several stations, but due to an obsolete or faulty receiver he hears not one of them and calls CQ a second and third time with the same lack of results. Not giving his receiver a thought he tries returning the rig for the next few minutes causing awful QRM. He then tries CQing again with no luck, decides conditions are against him and QRT's. If your receiver is N.G., refrain from CQing, and call only those you are able to hear.

CQ, CQ, 21, 22, 23, and we turn our dial to another frequency in disgust. It is nothing unusual to hear twenty or more consecutive CQ's before an interruption is made by slurring in the call letters once or twice, and then this whole procedure repeated a few times before the CQ is finished up with almost anything but K to indicate that the operator is ready to listen over the band. Incidentally it has been men-

*57 Grandview Ave., White Plains, N. Y.

tioned numerous times that three CQ's followed by the call letters once or twice, and this procedure repeated three to five times followed by the signing of the call letters several times and then sending K is sufficient for obtaining excellent results. It is of extreme importance to sign the call letters several times at the end before signing K, as the CQ is easily identified through QRM and may be heard at some distant point, whereas the unfamiliar call letters need several repeats if you want to be identified correctly. It is very helpful to the listener if you indicate which part of the band you are tuning from by sending QHM, QML, etc., at the end of your CQ. (QLM: low freq. to middle; QML: middle to low freq.; QHM: high freq. to middle; QMH: middle to high freq.)

Remember, the faster you send, the smaller the group becomes that will be able to receive you. Avoid causing guesswork on the part of the listener by sending your call letters distinctly and free from any peculiar keying rhythm known as a certain kind of swing. The listener usually forms an opinion of a fellow's sending by the CQ he hears. Since this is true, many operators send a snappy, errorless CQ to impress those listening and thereby hope to receive more answers. Many times this impression lasts but momentarily, as the CQer breaks down into his usual sloppy fist in the second transmission, and the answerer is greatly disappointed.

When answering a CQ it is necessary to know the condition of the band regarding QRM. A quick look over the band now and then while operating will suffice. Some fellows make the mistake of calling stations the same length of time in the daytime as in the evening when the band is very crowded. It takes quite a while longer to tune over a crowded band, so make the calls according to conditions, and of course they will vary in length dependent upon the part of the band the CQer is tuning from. Stations located on the edge of the band should give a short call, sign, and then listen, and if the CQer fails to answer, continue with a longer call now as the CQer is probably looking over the band for other calls, one of which he will pick out for a QSO. Break-in should also be used when answering CQ's.

A fellow with an r.a.c. note occupying 75 kilocycles of amateur band was heard rag chewing the other day. When a fellow with a bad note is heard CQing, it is our immediate duty to call him and tell him to change it or keep it off the air until it is fixed. The same thing applies when we are called by a bad note. It is hoped that the practices suggested in this article will be conspicuous by their greater and constant use on the air rather than by the space they take up on this page.

Let's improve our operating by the effective use of CQ.

56-Mc. International Contest

THE Radio Society of Great Britain announces a 56-Mc. International Contest.

The rules are as follows:

1. The Contest starts January 1, 1938, and concludes December 31, 1938.

2. The Contest is open to any radio amateur licensed to operate in the 56–60 Mc. band.

3. The winner will be the operator of the station scoring the most points based on the following system:

1 Point for each contact over a distance between 200 and 1000 Miles; 5 Points between 1001 and 2000 Miles; 10 Points between 2001 and 3000 Miles; 15 Points between 3001 and 4000 Miles; 20 Points between 4001 and 5000 Miles; and so on, at the rate of 5 extra points for each additional 1000 Miles or part thereof. All distances to be calculated by Great Circle. To count for points the Readability, Strength and Tone (both incoming and outgoing), must be logged, together with Date, Time and Call Sign.

4. In addition, and in order to collect current data, each contestant must send to the Radio Society of Great Britain, a monthly report of stations heard and/or worked, together with notes concerning conditions, power used for contacts, etc.

5. The R.S.G.B. will present a suitable Trophy to the winner, whilst certificates of merit will be awarded to the leading station or stations in each country.

6. No entrant may employ Interrupted Continuous Waves, Modulated Continuous Waves, Telephony, or any other form of modulated carrier, for contacts claimed in this Contest.

7. At the time of the contact both stations must be operating on 56 Mc. from their fixed station addresses.

8. Only one contact with a specific station may count for points in any 7 Day period.

9. Entrants must adhere to the terms of their licence.

10. Final entries must be received by R.S.G.B., 53 Victoria Street, S.W. 1, not later than February 28, 1939. (W and VE entrants may send their entries via A.R.R.L.)

11. The decision of the Council of the R.S.G.B. shall be final in all matters relating to the Contest.

Attention is called to the cup award being offered by the Milwaukee Radio Amateurs' Club to the first licensed United States amateur to work 56-Mc. two-way between continents, properly certified by documentary evidence. Complete details of this offer appeared on page 35, July 1937 *QST*.

The Wireless Institute of Australia reports that 56-Mc. transmissions are conducted by VK4's each Sunday at 0900 G.T. and at 0000 G.T. on the last Sunday of each month.

56-Mc. Reception Contest

In conjunction with the International 56-Mc. Transmitting Contest, and in order to encourage non-transmitting amateurs to collect and tabulate phenomena relative to the 56-Mc. amateur band, the R.S.G.B. has decided, provided sufficient entries are received, to offer a suitable trophy to the non-transmitter whose log covering the period January 1 to December 31, 1938, is considered by the Council of

BRASS POUNDERS' LEAGUE

(September 16th–October 15th)

Call	Orig.	Del.	Rel.	Extra Del. Credit	Total
W6ITH*	97	312	281	296	986
W4PL	12	29	874	9	924
W6JTV	112	267	219	204	802
W8MOT	365	15	314	12	706
W6IOX	17	59	614	14	704
W8HCS	37	180	362	102	681
W4IR	40	97	434	73	644
W9ESA	58	95	414	73	640
W1AKS	120	127	330	—	577
W6LLW	15	31	496	4	546
W8OFO	33	16	472	24	545
W2BCX	15	12	512	—	539
W3SN	104	157	271	—	532

MORE-THAN-ONE-OPERATOR STATIONS

Call	Orig.	Del.	Rel.	Extra Del. Credit	Total
K6OGD	244	226	1464	125	2059
W5OW	164	371	676	129	1340
W9BNT	153	255	564	—	972

These stations "make" the B.P.L. with *total* of 500 or over. One hundred deliveries + Ex. Del. Credits also rate B.P.L. standing. The following one-operator stations make the B.P.L. on deliveries. Deliveries count!

W6BQO, 264 W6IMI, 177 W6LBB, 117
W3CIZ, 216 W3QP, 166 W9VDQ, 110
W5FSK, 204 W2JWT, 148 W1JMY, 103
W9LEZ, 132

A.A.R.S.

Call	Orig.	Del.	Rel.	Extra Del. Credit	Total
WLMI (W6GXM)	67	141	434	—	642
WLMA (W8YA)	26	6	550	2	584
WLNF (W2BCX)	2	12	498	—	512

WLTK (W9KJY) and WLNB (W2DBQ) made the B.P.L. *on 200 and 113 message deliveries* respectively.

MORE-THAN-ONE-OPERATOR STATIONS

Call	Orig.	Del.	Rel.	Extra Del. Credit	Total
WLM (W3CXL)	209	169	1344	—	1722

A total of 500 or more, or 100 *deliveries* Ex. D. Cr. will put *you* in line for a place in the B.P.L.

* All traffic handled by two-way radiotelephone.

that body to contain the most valuable information. Certificates of merit will be awarded to those submitting the most valuable information at the conclusion of the Contest, irrespective of the number of entries received. Logs must be received by R.S.G.B. not later than February 28, 1939. For the purpose of this Contest a non-transmitter shall be regarded as a person who did not hold a radiating permit on January 1, 1938.

DX Century Club

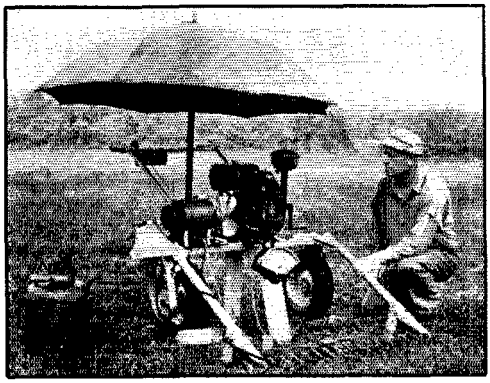
TWO more operators have attained membership in the DX Century Club since the November listing—G2ZQ and W1SZ. The total membership is only seven at this writing. Several operators have increased their standing, and we find some new faces in the 75-or-over ranks. That these listings represent real accomplishment is proven by the fact that so few amateurs seem able to qualify. What of those fellows who have been claiming such stupendous DX records through the years? Have they nothing with which to back up their claims? Amateurs the world over are invited to submit confirmations of contacts with 75-or-more different countries for *QST* listing, or 100-or-more for Century Club membership. See pages 59 and 60, September *QST*, and page 51, November *QST* for the rules and complete details.

MEMBERS, DX CENTURY CLUB

	Different Countries
H. A. Maxwell Whyte, G6WY	114
Frank Lucas, W8CRA	112
John Hunter, G2ZQ	106
Jefferson Borden IV, W1TW/W1CMX	105
Douglas H. Borden, W1BUX	104
Henry Y. Sasaki, W6CXW	101
Clark C. Rodimon, W1SZ	101

The following have submitted proof of contacts with 75-or-more Different Countries:

W1TS	94	W1DUK	80
W2GTZ	88	G2DZ	79
W2GW	88	W8KKG	78
W8OSL	88	G2DZ	78
W6GAL	86	VE2EE	78
W9KA	86	W3BES	77
W1ZI	83	W9ADN	76
W1DF	81	W2GVZ	76



THE "ULTRA ULTRA" IN PORTABLE POWER SUPPLIES!

Benton White, W4PL, inspects the outfit that supplied power for W4CDC-4, Chattanooga Amateur Radio Club, in the June Field Day. The generator is mounted on a power lawn mower, direct-connected to a 1 h.p. gas engine. This "animal" pulls itself to the field, cuts the grass around the tent, and then contentedly furnishes juice as long as desired!

1.75-Mc. Code Practice Stations

Code practice transmissions for the benefit of beginning amateurs have been announced by the following stations: W1ASD, Hartford, Conn., 1882.5 kc., Tues., Wed., Fri., 7:30 P.M. EST. . . . W1ASZ, Pawtucket, R. I., 1925 kc., intermittent days, 6:30–7:00 P.M. EST. . . . W1GIX, East Windsor, Conn., 1823 kc., Mondays, 7:30–8:30 P.M., Thursdays, 9:00–10:00 P.M. EST. . . . W2DSH, Arlington, S. I., N. Y., 1833 kc., Thursdays (exc. holidays), 7:00–8:00 P.M. EST. . . . W2FYW, New York City, 1950 kc., Mondays, 7:00–7:45 A.M. EST, Fridays, 5:00–5:45 P.M. EST. . . . W2HRZ, Nutley, N. J., 1876 kc., Mon., Thurs., Sat., 8:30–10:00 P.M. EST. . . . W3GYR, Philadelphia, Pa., 1960 kc., Fridays, 6:00 P.M. EST. . . . W5CFQ, Paris, Ark., 1840 kc., Mon., Wed., Fri. . . . W5GAS, Fort Smith, Ark., 1910 kc. Tues., Thurs. . . . W7DVY, Seattle, Wash., 1965 kc., Fridays, 10:30–11:00 P.M. PST. . . . W8IFL, Plymouth, Mich., 1985 kc., Wed., Fri., 7:30–8:30 A.M. EST. . . . W8JYO, Cridersville, Ohio, 1874 kc., Tues., Fri., 6:30–7:30 P.M. EST. . . . W8PBP, Pontiac, Mich., 1763.5 kc., Tues., Thurs., 7:00–7:45 P.M. EST. . . . W8PBX, Cincinnati, Ohio, 1865 kc., Mon., Thurs., 6:45–7:15 P.M. EST. . . . W9BSP/W9UA, Olathe, Kansas, 1903 kc., Daily, 7:30–8:30 P.M. CST. . . . W9OPG, Cedar Rapids, Iowa, daily exc. Sun., 9:00–10:00 P.M. CST. . . . On the 56-Mc. band, W1HXE, Lawrence, Mass., sends code practice on 56.2 Mc. daily from 7:00 to 7:30 P.M. EST. . . . Station W8XH, Buffalo, N. Y., conducts a code class on 7.3 meters. . . . The W9BSP/W9UA schedule starts Dec. 15th, ends Feb. 1st.

More 1.75-Mc. amateur stations are needed to assist in the A.R.R.L. code practice program. Drop a line to A.R.R.L. Communications Dept., West Hartford, Conn., and we will send you some hints on how to conduct code lessons by radio.

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O.B.S.

The following is a supplement to the list of A.R.R.L. Official Broadcasting Stations in October *QST* (page 50): W1ASI, W3CDQ, W4ASR, W4CXY, W6LFZ, W7FPN, W9DDF, W9ECY, W9VTG, VE3PL, VE4LQ.

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Briefs

W2KJY inquires, "Did you hear about the fellow who worked for a condenser company and got discharged?"

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W1AJ calls attention to his schedule with NY1AA, Balboa, Canal Zone. This schedule is on Monday and Thursday each week and has been in effect since early 1936. W1AJ solicits C.Z. traffic, which may be routed direct to him (7224-kc.) or via W1IOR through O.R.S. channels.

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Field Day Reports

A report on participation of the Elmira Radio Amateur Assn. in the June Field Day was received too late for the report in November *QST*. W8CJJ-8 was the call used with W8CJJ, W8CHU, W8AYD, W8DZC and Lew Roy as operators. Score was 582. . . . 69 QSO's. . . . The score of W9KXJ-9 was erroneously listed in November *QST*. The correct score is 711. . . . The score of 333 credited to W2IXJ-8 should have been credited to W2IZJ-8 with W2HLI, W2ECL and W2IZJ as operators.

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W7GEQ, who started in radio in 1907, suggests that we end our sign-offs with the year we started hamming, viz., '07, '12, '24, etc. This might prove interesting, especially in the case of 20-Year Club members.

How's DX?

THE 28-Mc. band is again in full swing at the time of this writing. If you want to add to your list of countries worked on 28 Mc., now is the time to do it. You'll stand a good chance of working some new ones too.

W8MAH, Williamsport, Penna., sends in some very interesting general information on conditions on 28 Mc.:

"There are a few generalities which can be mentioned at this time about 28 Mc. that may be helpful to many of the gang. These are based upon general normal conditions.

"European stations come through in the mornings and stay in, with a weak period around noon (E.S.T.), until 3 P.M. The South African stations come through rather poorly from 10 A.M. until noon, when they start to become very much stronger, reaching a peak between 1 and 3 P.M. with fade-out shortly thereafter. South Americans seem to be best from noon until 8 P.M., with their best signals from 5 to 8 P.M. Australia comes through as early as 3 P.M. and stays until an average of 8 P.M. This is also true of ZL's and K6's. The signals from Japan, based mostly upon JNJ's harmonic, start coming in around 4 P.M. and build up for a short while, but have a very weak to fade-out spell between 5:30 and 6:00 P.M., after which they are much stronger, but gradually fade out to stay about 7:30 or 8:00 P.M. Signals from India and thereabouts seem to be best between 10 and 11 A.M.

"The following frequency list was carefully made: ZS1AH 28050 28092, ZT6J 28330 28550, ZT6Y 28100 28330, ZT6AU 28180, ZT2Q 28070, ZT6AK 28100, ZU6P 28325, ZS1AJ 28085 28200, ZS6T 28120, ZE1JJ 28230, ZE1JR, 28170, LU3DH 28180, LU7AZ 28200, LU5AN 28180 28030, LU6AX 28180, OA4J 28300, PY1BR 28320, PY3BY 28290, K5AY 28050, K5AG 28170, TI2RC 28115, HR4AF 28350, CN8AV 28530, FQ8A 28060, I1KN 28260, CT1KH 28210, YL2CD 28170, OH2NM 28300, OH2NB 28075, LA4P 28240, YR5CF 28000, YM4AA 28000, D3BMP 28000, D4FND 28075, OK2MV 28125, OK3VA 28135, OK1FF 28040, F8RR 28200, F8BS 28130, F8GQ 28075, F8WK 28135, GM5KF 28200, F8HS 28470, K6NYH 28280, ZL4DQ 28200, ZL1MR 28100, ZL1DV 28125, VK5KO 28000, J3FJ 28170, VU2CQ 28320."

W3EXB worked ZB1C 28600 which, he believes, is the first ZB-W contact on 28 Mc. He also reports TF5C 28480. W2GW worked VS1AA 28325 for an hour recently around 10 A.M. E.S.T. W1EWD reports U9ML 28150, and SV1RX 28175 and others. VU2AU is coming through quite regularly on the East Coast at 7:30 to 8:30 A.M. on about 28100. He has moved recently and is now located at Quetta, Baluchistan. Europeans come through as early as 7 A.M.

W8MAH QSP's the information that VKSKO needs only Vt., R. I. and Md. for 28-Mc. WAS. He is on daily from 2030 to 0100 G.T.

On 14 Mc. W2GTZ reports recent QSO's as follows: PK1BO 14160, PK1RI 14300, PK1MF 14310, PK1VX 14340, XU8RL 14300, KA1AN 14398, VU2FV 14070, VU2FH 14170, FQ8AB 14260, FP8PX 14350, K7GIE 14014, K7DAM 14010. He has also heard ZA4X 14420, U8ID 14430, XZ1S 14260, XU8HM 14015, J2OY 14140, VQ8AS 14130 and FI8AC 14240. His claimed countries now totals 104.

W9AXX works them with an 807 final. Some of his more recent contacts are: MX2B, PK3LC, VS7MB, VS1AI, SM7QD, J9CA and XU8ZT. RXJB, who gives his QTH as Gold Coast, Africa, was worked recently by W2CYS. His frequency is 14370. Whether ship or shore station we do not know. W2CYS, by the way, does some nice work with an attic antenna. Look them over—PK1MF 14280, KA1AN 14405, XU8RL 14280, K6OJG (Guam) 14270, FR8VK 14440, VU7FY 14386, OX2QY 14386, VS7MB 14275 (5 P.M. E.S.T.), VR4CD 14300, VS1AF 14040 and VS4CS 14290.

W9ALV reports VS6AO, VQ8AS, YV5AP, FI8AC, VU2FH, VU2FD, VU2FS, VU2FX, UK8IA, U8ID, YU7XX, CN8AV and KA1QL. CM2AO has worked VR4AD on 14085. UPOL is still active according to W8PMB who worked him at 11 P.M. E.S.T. His frequency is 13995. W3EXB reports a new one, AA5CN 14450, who gives his QTH as Tangier Zone, North Africa. VO3P worked AC4AA for his first Asian. Anyone know anything about him? W9ALV and W7DXZ have worked FI8AC 14260. This makes 79 countries for W7DXZ.

For the past several weeks, conditions on the East Coast have been very good for Asia, chiefly between 6:30 and 9 A.M. In addition to many of those mentioned elsewhere, we have heard or worked VS7RP 14255, VS7JW 14350, VU2DR 14150, J2DI 14225, J6DN 14075. If any of you DX men in the East happen to be prowling around at 3 to 4 A.M., it might pay to take a listen over the 14-Mc. band. Occasionally the J's come through at this time with stronger signals than at any other time. They may also be heard between midnight and 1 A.M. and from 4 to 6 P.M. as well as the usual 8 to 9 A.M. period. The competition is not so tough in the early hours and they may be raised more easily. Other Asians come through frequently in the early evening.

A new U9 is U9AX 14380 located in Novosibirsk. He worked W1 for his first QSO on the air. U6AN and U6ST are among the newer stations heard from the trans-Caucasus region.

The atmosphere of suspicion surrounding XZ1S has been cleared up by W8CRA, who received a handmade QSL. XZ1S is in the Asiatic fleet operating under cover. He made most of his contacts from Singtao, China.

Checking cards for the DX Century Club has revealed the disappointing fact that none of the FF cards submitted thus far confirms a contact with French West Africa. Checking the locations given on the cards with the map shows that all of them are well within the boundaries of Algeria. Why they use the FF prefix, we do not understand. As far as we know there is no ham activity actually in French West Africa.

ZA7A worked recently is apparently a foney. G6WY says ZA3X is also reported, but as far as the RSGB Headquarters is aware there is no activity in Albania, legitimate or otherwise.

VK5RX furnishes the QTH of FN1C. He is D. W. Patterson, Gondalapara, Chandernagore, Bengal, French India. VS4JS is in Jesselton, North Borneo. W2GFF says that VQ8AS (Chagos Is. in case you haven't heard) uses 10 watts input. VO3X is doing some nice DX work with his 807 final. He needs Mont., Wyo., Ida., Ariz., Nev., Miss. and La. for WAS. We don't doubt that there are several fellows in each of these states who would be glad of a VO contact.

Those of us who did not work K6LHA or K6TE while they were at Wake Is. will have to wait awhile. Both are now back in the States.

Rumors are circulating about in DX circles that YI2BA sent a batch of QSL's which were returned by A.R.R.L. Headquarters office because of insufficient postage. This rumor is entirely untrue. If the cards were actually sent and were returned, they must have been stopped before they arrived at the West Hartford post office. To date, we have heard from no one who has received a card from YI2BA.

The Postmaster-General's office for Kenya, Uganda and Tanganyika advises us that the call of VQ3MSN is being bootlegged. He is receiving several cards from W stations although VQ3MSN has been out of operation for a considerable time.

When it comes to fone DX, it takes an SWL to haul them in. We are much indebted to W. Mayes of Maywood, Ill., for the following list of 14-Mc. fone frequencies: VS2AO 14260, VS2AK 14260, VS1AI 14040, VS1AB 14250, J2MI 14100, KA1ME 14150, KA1MM 14090, PK3WI 14030, PK1MX 14320, PK1GL 14260, PK3GD 14020, PK4VR 14375, PK3ST 14310, PK1RI 14375, PK6CI 14080, VK6WS 14145, VK6MU 14140, SU8MA 14090, Su1SG 14375, TG1AX 14105, LA1G 14130, CN8AM 14100, CN8AJ 14090.

W1HKK reports the following 14-Mc. fones: FA3HC

14300, ZU6P 14120, EA9AH 14000, EA8AE 14010, HA4A 14140, HA8N 14120, PAØMQ 14100.

W6ITH says to listen for South African and Asian fones around 8 A.M. P.S.T. and Europe around 11 P.M. He has recently worked ZS1AV 14272, VS2AK 14256, G2PU 14120, G6LK 14100, F3OO 14140, ZS5M 14314 and ON4VK 14050 Reg now has 58 countries on fone. He furnishes the QTH for FI8AC whom he has worked on fone as R. R. Lebon, P.O. Box 13, Hanoi, French Indo-China.

W6AM made WAC on fone in one day, an unusual accomplishment for W6.

A high power fone in Austria will be on the air soon. The call is OE1RV. The transmitter will run an input of 600 watts compared to the average input of 50 watts used by other OE stations.

The ZL's are now permitted to operate fone on the frequencies of 14150 to 14250 kc. between the hours of midnight and 7 A.M. local time.

From W6TT we learn that on one occasion over fifty women crowded into KA1ME's shack to talk to their husbands in Shanghai via XU8MC.

VP9G in Bermuda is now on fone on 14280 doubling the former VP9 fone forces. A new one to look for in British Guiana is VP3PH 14050.

We hear XZ2DY about 14375 frequently around 7:30 A.M. E.S.T. He uses fone mostly, but occasionally gives the c.w. boys a break.

W1JPE is travelling through the western section of the country this month. He should be able to give some interesting slants on DX from the West Coast next month.

73 *W1TS*

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Briefs

W8FU lists the following hams all of whom are employed in the radio transmitter building at the General Electric works, Schenectady, N. Y.: WICPN W2DC BXC CNF DFX EHF CBO CSN KFN KLM EBG HTR CJP JKF DSH CEM JQP IKA CVV FRY JHD W4FM TR W6ASQ W7GHN W8PI JHW FU EBR W9AHH BZD TYO FPX ex-K6MEG W2CCG W3FRR W9EE. These fellows work on the transmitters made for the Army, Navy, Coast Guard, Fireboats, Police and many other services.

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The ham program from WILL, University of Illinois, has changed time to 1:30 P.M., Saturdays. This program is heard in all neighboring states and news is solicited. Address and reports and comments to Bill Livesay, W9MLH, care of the U. of Ill., Champaign.

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A snow trip to the Feather River Canyon is being planned by the Oakland Radio Club. A special train will leave Oakland on a Saturday night and return Sunday night, spending six or seven hours in the snow. Refreshments will be served in the special car attached to the train for that purpose. A baggage car will also be in the train for the purpose of setting up transmitters (56-Mc. rigs to be used mobile and other rigs to be used at the destination). The exact date and price of the trip has not yet been decided. Anyone interested may write Oakland Radio Club, Inc., 1018 Oak Street, Oakland, Calif., for further information.

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During October W8DMF took his portable rig with him on a hunting trip into the mountains of Clay County, W. Va. By evening he found the rivers had covered the highways and isolated him. Amateur radio to the rescue, he fired up the portable outfit and via the W. Va. Net had W8LII phone his family that he was OK!

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W4AXP suggests that when our brother hams are ill, at home or in the hospital, we pass the word around among the gang with the request that everyone write a line of cheer to the fellow who is laid up. AXP says, "One rose by the sick bed is worth ten wreaths on the casket." During a recent spell in the hospital he found much pleasure in the letters and cards received from brother hams.

From W2BYX via W2GMN: The National Broadcasting Company operates two ultra-high-frequency transmitters daily from 8:00 A.M. to 11:00 P.M. W2XDG operates on 38.65 Mc., transmitting the programs of the Red Network; W2XHG on 41 Mc. carries the Blue Network programs. Each station is of 100-watt carrier power. The N.B.C. is glad to have reports of reception.

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U. S. S. *Chicago* Works Amateurs

An exercise between N.C.R. members in the 12th Naval District and the U.S.S. *Chicago* was part of the radio program for Navy Day, October 27, 1937. The *Chicago*, NAGM, used 3475 kc. and listened for N.C.R. members between 3500 and 3900 kcs. Two receivers were used on the cruiser to facilitate finding the N.C.R. stations. All transmissions were in proper Naval procedure and the messages consisted either of greetings to the Navy generally, or to some individual with whom the N.C.R. member was acquainted. A QSL card was sent to every station worked. During the NPG Navy Day broadcast the *Chicago* circuit was secured so that all hands could copy the message from the Secretary of the Navy; 105 stations were worked by NAGM during the period 4:00 to 10:00 P.M. This was the third annual contact between the N.C.R. and a Naval vessel anchored in San Francisco Bay. In 1935 there were 77 contacts; in 1936, 92 contacts. The drill was under the supervision of Lt. Sydney J. Fass, U.S.N.R., W6NZ, who was the Navy Day Chairman for Radio in the 12th Naval District. The ship's radio room was literally turned over to the N.C.R. and its equipment was operated by N.C.R. men.

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The Oakland Radio Club is holding its annual 56-Mc. contest, starting the first Friday in December. The rules are practically the same as last year. Two loving cups are offered, one for the highest scoring mobile transmitter, one for the leading fixed station. Points will be awarded on mileage. For further information contact W6NOE, the 56-Mc. chairman, or W6ZM, secretary of the Oakland Radio Club.

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The following is quoted from the U. S. Coast Guard Communication Bulletin, October, 1937: "On 14 August, 1937, the *Spencer's* Plane V-144 was dispatched on an assistance case which involved the transporting of an injured man from Port Hobron, Kodiak Island, Alaska, to Seward, Alaska, for hospitalization. Through the coöperation of the Army Signal Corps Station (WXE) at Anchorage, Alaska, the *Spencer* contacted amateur station K7BVA at Port Hobron, the destination of the flight. Direct contact was established with K7BVA, the *Spencer* using 4050 kc. and K7BVA using 7200 kc. Through this contact, progress of the flight and developments at the scene of the accident were rapidly dispatched between the *Spencer*, the plane and Port Hobron. K7BVA maintained a continuous watch from 2000, 14 August, to 0800, 15 August. The operator at K7BVA, Mr. H. L. Riebe, performed commendable service.

20-Year Club

NEW 20-Year Club members: W1DMP W2BYW W2DI W2DYT W2GVU W2HCO W2IW W3ACX W3GJ W5NT W6AM W6KTQ W6MSN W6NPD W8APD W8CNX W8ND W8ZY W9AA W9CSZ W9CX. Membership in this group of old timers is open to any amateur who held a license (amateur operator or station) 20-or-more years ago and holds a ham call to-day.

Merritt E. Gregory, W8JL: "1910 used call MG—Ford spark coil somewhere between 400 and 1500 meters. Crystal detector-receiver coil somewhere's around 14 inches long. Later a ¼-kw. Acme with Murdock rotary gap. Closed down during World War. After war licensed as 3JL and came on with a 1-kw. Thor. and rotary gap. Used Audiotrons for receiving with honeycomb coils on 200 meters, finally changing to two 5 watt tubes self-rectified. Hold

oldest ticket in Morris County and the 2nd one issued. Been off the air less than a month during said period. Using the call MG, or as I used to make it . . . (9)—Boy, those were the days!" *Arthur C. Jacoby, W3DRO:* "After learning the code in 1914, I started out with a one-inch spark coil home made glass condensers, and tuning inductance as the transmitter. For receiving I made use of a Clapp-Eastman tuner and variable condenser, crystal detectors, such as silicon and galena, and a pair of Brandes 'phones. My first operator's license issued to me was an Amateur, Second Class, received through the mail. At the same time I was issued the call letters 30V. The following year, 1915, I took a personal examination at the Navy Yard, Philadelphia, Pa., and received an Amateur First Class Operators License. The same year I also constructed a ½-kw. spark transmitter, with a non-synchronous rotary spark gap. This equipment was used with moderate success until this country entered the World War when I was notified to dismantle the station. In June 1916, I entered the employment of the Marconi Wireless Telegraph Co. of America and subsequently the R.C.A. I remained with them for a period of four and one-half years, and then obtained a local position. All amateur activities were dispensed with until I was induced to sign up with the Naval Communication Reserve in 1932. In May 1933 I again took the Amateur examination and, having passed the same, was issued my present call letters W3DRO." *G. S. Corpe, W6LM:* "Had my first station in Santa Barbara, Calif., in 1909; call letters 'XRK.' (All hams in Santa Barbara belonged to a club which we called by the slightly ambitious title 'Southern California Wireless Association,' and all calls ended in 'RK,' the only differences being in the first letter.) The heap was a 1" spark coil; helix, and huge 6-wire antenna. Receiver loose-coupler and 4 or 5 crystal detectors, Brandes Navy Type Phones. After two years of hamming I went to San Francisco and went to sea for the old United Wireless Co. Took the examination at Mare Island Navy Yard and secured my first license—'Certificate of Skill in Radio Communication' and still have it—hi. I should tell you about that examination at Mare Island. It consisted of four questions and a code test, given over the air from NPH—the Examiner would 'phone the station and have them transmit for the tests! Come here to El Monte and with my brother bought the local Ford Agency in 1914. Had a ham set, of course; call letters 6GE—by that time the Radio Act of 1912 was passed and hams had to be licensed. When the War started, enlisted in the Signal Corps. Was discharged early in 1919 and got back to the Ford business. Did a little plain and fancy bootlegging with a receiver before they lifted the ban; then secured license 6LM and still have it. When broadcasting started, owned and operated KUY for a couple years, also having experimental license 6XAX. Sold KUY to the first KNX in Los Angeles—KNX has grown from that first 100 watter to a 50,000 watter—hi. Joined the A.R.R.L. in early 1916 and been with it ever since. Wish all 'later model' hams could realize as I do the debt we owe A.R.R.L. I am absolutely sure there wouldn't be any ham radio except for our A.R.R.L. Have a complete file of *QST* magazines—from the first right on. My principal hobby for 25 years has been collecting old radio items; have about everything in the collection you can mention, now. The prize item is a 'DeForest Wireless Responder' of 1904 vintage—electrolytic detector 'nevery-thing." *Joseph Fairhall, Jr., W9VV:* "The first real notice that I took of wireless was at the time of the great Titanic disaster. My early connection with radio was using a small crystal detector and an old slide Navy type tuning coil. By very careful tuning of the coil and with the aid of the crystal detector we were able to tune in the time signals of NAA at 11 A.M. C.S.T. During 1917 I applied for my license and was given the two-letter call 9VV. Have held it ever since. At last a detector tube came out for the amateur; cost $4.50. A long slim tube with three wires on one end and two on the other and we had to make our own base. When one side of the filament burned out we simply hooked onto the other wire and went ahead until it burned out. My first transmitter was a small Ford coil. Later on ¼-inch kw., then ½-kw., and finally what we called in those days a rock crusher which was full one kw. using a special Westinghouse Synchronous Motor, 9-tooth spark gap, with points 1¼ inches wide, inductance made of copper ribbon 3 inches wide, and full 1-mfd. condenser 3 ft. long, 1 ft. wide, 1 ft. square, using plate glass plates with sheet copper between the whole thing submerged in transformer oil. The coil was an immense affair generating a terrific voltage which would easily jump a seven inch gap. In those days we used to have a lot of fun pounding out on 200 meters, more or less. One hundred miles was wonderful DX. I had a lot of fun broadcasting music with a little transmitter made up of four 201A Tubes and using for plate voltage the juice from Trolley wire. I have had a lot of fun following the wireless game all the way through. I believe the real kick was back in the old spark. I have saved nearly all of my early apparatus, and some day am going to make a display of it for our amateur club to look over." *Edward Lipson, W5ERJ:* "Became interested in Radio in 1908 using the usual coherers and spark coils of that date. Call letters were 'ELM,' my initials and 'M' for Mass. In looking over some old call books recently, I noticed one called the 'Second Annual Official Wireless Blue Book of the Wireless Association of America' to June 1, 1910, with my call 'ELM' listed with a 4-inch Jump spark coil as a transmitter. Another call book called the 'Amateur Wireless Stations' within 20 miles of Boston compiled by the Harvard Wireless Club to March 11, 1912, with my call ELM listed using a ½-kw. transmitter. When the Radio Law came into effect I received a 1st Grade Commercial Operators License and held it to 1921. My call received then was 1SC. The station was closed down during the War. Served in the Signal Corps from 1917 to 1919 during the War as Chief Assistant Instructor in Radio Telegraphy and Telephony, Land and Air Forces, Army Signal Schools, Langres France A.E.C. In 1934 went back to the amateur field with call W1HWL. Moved to Texas and received call W5ERJ which I am now holding." *Stewart S. Perry, W1BB:* "Interested in tuning coils, detectors, Tesla coils and general electrical experimenting 1914–1917. April 7, 1917, received amateur first-grade license. Had Ford spark coil rig all ready for use but same day, as operator's license was issued, orders came from Washington to close all amateur stations on account of the War. Therefore, no station license was issued. Continued electrical and chemical laboratory work during the War. Was 28th in line at Boston Customs House the morning after the ban was lifted and received call 1BB October 2, 1918. This has been held without interruption to date."

ELECTION NOTICES

To all A.R.R.L. Members residing in the Sections listed below:

(The list gives the Sections, closing date for receipt of nominating petitions for Section Manager, the name of the present incumbent and the date of expiration of his term of office.) This notice supersedes previous notices.

In cases where no valid nominating petitions have been received from A.R.R.L. members residing in the different Sections in response to our previous notices, the closing dates for receipt of nominating petitions are set ahead to the dates given herewith. In the absence of nominating petitions from Members of a Section, the incumbent continues to hold his official position and carry on the work of the Section subject, of course, to the filing of proper nominating petitions and the holding of an election by ballot or as may be necessary. Petitions must be in West Hartford on or before noon of the dates specified.

Section	*Closing Date*	*Present SCM*	*Present Term of Office Ends*
San Diego	Dec. 1, 1937	Harry Ambler	Dec. 16, 1937
Maritime*	Dec. 15, 1937	Arthur M. Crowell	June 14, 1937
Nevada	Dec. 15, 1937	Edward W. Heim	June 14, 1937
Ga.-Cuba-I. of P.-P. R.-V. I.	Dec. 15, 1937	Bannie L. Stewart	Dec. 14, 1936
Virginia	Jan. 3, 1938	Charles M. Waff, Jr.	Jan. 17, 1938
Alabama	Jan. 3, 1938	James F. Thompson	Jan. 17, 1938
Alberta	Feb. 1, 1938	Alfred D. Ketten-bach	Feb. 18, 1938
Washington	Feb. 1, 1938	Robert H. Votaw	Feb. 17, 1938
Montana	Mar. 1, 1938	Russell U. Rich-mond	Mar. 13, 1938

* In Canadian Sections nominating petitions for Section Managers must be addressed to Canadian General Manager, Alex Reid, 169 Logan Ave., St. Lambert, Quebec. To be valid such petitions must be filed with him on or before the closing dates named.

1. You are hereby notified that an election for an A.R.R.L. Section Communications Manager for the next two year term of office is about to be held in each of these Sections in accordance with the provisions of the By-Laws.

2. The elections will take place in the different Sections immediately after the closing date for receipt of nominating petitions as given opposite the different Sections. The Ballots mailed

from Headquarters will list in alphabetical sequence the names of all eligible candidates nominated for the position by A.R.R.L. members residing in the Sections concerned. Ballots will be mailed to members as of the closing dates specified above, for receipt of nominating petitions.

3. Nominating petitions from the Sections named are hereby solicited. Five or more A.R.R.L. members residing in any Section have the privilege of nominating any member of the League as candidate for Section Manager. The following form for nomination is suggested:

(Place and date)

Communications Manager, A.R.R.L.
38 La Salle Road, West Hartford, Conn.

We, the undersigned members of the A.R.R.L. residing in the.....Section of the.....Division hereby nominate.....as candidate for Section Communications Manager for this Section for the next two-year term of office.

(Five or more signatures of A.R.R.L. members are required.)

The candidates and five or more signers *must* be League members in good standing or the petition will be thrown out as invalid. *Each candidate must have been a licensed amateur operator for at least two years, and similarly, a member of the League for at least one continuous year, immediately prior to his nomination or the petition will likewise be invalidated.* The complete name, address, and station call of the candidate should be included. All such petitions must be filed at the headquarters office of the League in West Hartford, Conn., by noon of the closing date given for receipt of nominating petitions. There is no limit to the number of petitions that may be filed, but no members shall sign more than one.

4. Members are urged to take initiative immediately, filing petitions for the officials for each Section listed above. This is your opportunity to put the man of your choice in office to carry on the work of the organization in your Section.

—*F. E. Handy, Communications Manager*

ELECTION RESULTS

Valid petitions nominating a single candidate as Section Manager were filed in a number of Sections, as provided in our Constitution and By-Laws, electing the following officials, the term of office starting on the date given.

Eastern Florida L. A. Connolly, W4DVO Oct. 15, 1937

In the Missouri Section of the Midwest Division Miss Letha Allendorf, W9OUD, Mr. Henry J. Eschrich, W9KEF and Mr. Fred M. Kamp, W9KEI, were nominated. Miss Allendorf received 57 votes, Mr. Eschrich received 56 votes and Mr. Kamp received 23 votes. Miss Allendorf's term of office began October 19, 1937.

Station Activities

CANADA

MARITIME DIVISION

MARITIME—SCM, A. M. Crowell, VE1DQ—FQ has been appointed P.A.M. and is lining up a 'phone net. JA and GR, together with W1IIM, handled a death message to resident of Glace Bay visiting the States. Thanks also to W1AUJ, W1FBJ and W1AXE who aided in QSP. GK has an ACR-136. JZ has finished his nine-tube super. At a recent meeting of the H.A.R.C. the following officers were elected: pres., AW; vice-pres., EK; secy.-treas., FB; asst. secy.-treas., FO. BV snagged his first VK 'phone—using only about 15 watts and an indoor ant. too!! EA has a new RME 69. Moncton notes via EV: LP's new rig will use 58, '45, pair '45's. CX has new exciter completed—89 and RK25. IL has annexed a new Sky-Buddy. IJ is rebuilding to 59, 59, pair '46's. DC has new band-switching rig nearly completed. EV changed QTH to help out B.C.L. QRM. New officers for the M.A.R.C.: IJ, pres.; CX, vice-pres.; EV, secy.-treas. St. John news via EE/KZ, press rep. for L.C.A.R.C.: At the opening meeting of the season the L.C.A.R.C. members fully discussed the B.C.L. interference problem and the various steps which may be taken to eliminate this trouble. GP has moved in from his summer home after a successful summer on 14 Mc. IF operates on 28 and 3.9-Mc. 'phone. FL gets FB quality reports from everywhere. FC is on again. GQ sounds nice. EI is on 14-Mc. 'phone. JN has a new super-het. KZ is heard occasionally. EE put up his doublet again. BF is making a small stand-by transmitter. KQ is back on 7 and 3.5 Mc., '46 and T20. JP is rebuilding with P.P. T20's. VO4A schedules CN and AB on 7086 kc. Active VO boys are II, 6JQ, 6L, 3Z and 2Z. Many of the VE1 gang were glad the OIC (Dick) of VE5TV arrived back safely in the old home town.

ONTARIO DIVISION

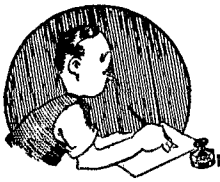
ONTARIO—SCM, Fred H. B. Saxon, VE3SG—R.M.'s: 3ABW, 3DU, 3GT, 3MB, 3QK, 3TM, 3WK. DH has a new second op; congrats, Jack. QB has at last got hydro power and is using 41 crystal osc., 6L6 amplifier with 40 watts input. PL is now in Toronto and is on the U. of T. staff. MB had visits from GA, YC, ACF, AIK and UO. QK joined the Michigan Net on November 1st. NC has had a flock of visitors this fall. ABW has new antenna up. VC sold his FB-7 and now has a t.r.f. SG is lone VE in traffic net with six W's; each op is O.R.S., R.M. or S.C.M. ABC, up beyond Kenora, has a 2A5 crystal osc. and 6L6 doing nicely. ZE has his rig working nicely on 3.5 Mc. VA has taken over T.L. "I" in Ontario. WK is picking up his old schedules. Watch next month's report for the announcement of a SECTION QSO PARTY. The North Toronto Club had a splendid meeting at the home of EO. LG is new in Windsor. CP is working 3.5, 7 and 14 Mcs. AU worked 8 hours in the VK-ZL contest, scoring 3530. The Ottawa Club is away to a good start for the season. RK, SR, XL, and PD, all from Ottawa, are at Queens this year. SS is studying for 2nd Class Commercial ticket. HY is contemplating a swing to 'phone. HV has a new Collins 45A. ADZ is on with an '03A. OI needs Nevada for W.A.S. DH is keeping traffic schedules with temporary rig while rebuilding. AND has new antenna. RR is back with an FB 'phone. After a season of hard work DW and the YF are getting back to their old haunts—the shack. BY has 6L6, RK23 and T55 with 125 watts and is contemplating O.R.S. ZQ, late of Ottawa, asks me to let the gang know that he is now on the Radio Beacon Station at Regina, Sask., and will be glad to hear from the eastern fellows. Let's have more news next month, gang. 73.

Traffic: **VE3**QK 144 SG 72 AU 65 GT 41 DH 32 AJB 31 VA 29 NM 23 PE 12 OI-QB 10 MB 9 SS 8 AA 7 ABC 5 AND 4 WK 3 ZE 2 VE9AL 16. (August–September: VE3AID 6 QB 2 MB 1 VE9AL 12.)

QUEBEC DIVISION

QUEBEC—SCM, Stan Comach, VE2EE—Thanks to those who so kindly wrote the S.C.M. FK deserves credit for being the highest Canadian 'phone scorer in the recent DX tests. FT is rebuilding. KN has a schedule with Ottawa three nights a week. We regret to hear that HH has been confined to bed for some time. We hope for an early recovery, John. NX would like it mentioned that she is a YL; Miss Varey operates on 7170 kc. DP is planning a new transmitter with a pair of T-20's in final. HG has received his W.A.C. 'phone certificate; the Prof. handled a message from VP3BG for Lachine and had a reply back to BG in 20 minutes. JK is now located at Northwest River, Labrador, and is using the call VO6L. JJ is the new treasurer of the M.A.R.C. W2KKT was a visitor at DR. LJ and LU, along with some of the gang, took part in the Army maneuvers. BU is back on the air keeping his old schedules, Hartford and Toronto, daily. KM has half of his new rig perking. FF is an old sea-going op and met your S.C.M. when he was on the S.S. *Canadian Volunteer*, running to the West Indies. AB, LQ, AP and KO were on a fishing and hunting trip end of Sept. and were the guests of NI and his YF. EM paid a short visit to AB in Quebec. Your S.C.M. had the pleasure of a month's stay in Quebec, meeting the gang; a special debt of gratitude is owed to FA, DL, AB, EY and HL for their many kindnesses. HD is operating on 56 Mc. with EY. NI, HL and CH have been handling traffic from the Expedition Schooner *Marie Therese*, whose operator was KI. EK is now Chief Engineer at CHLN, Three Rivers. DU, II, IO, HP and HL traveled down to join the boys at the Bridgeport Convention, and all won prizes; the same gang won first prize in the musical amateur show. HY was down at Three Rivers for the opening of CHLN. DF has erected a Diamond antenna and is getting plenty of DX. EU and AG are active on 3.9-Mc. 'phone. IN is back in town and has resumed studies at McGill. EW sold his old transmitter to a prospective ham. AY spent three months up in the Ontario mining district. LQ visited the big city recently. CR has moved to Patricia Ave., N.D.G. BG has been having quite a few contacts with YI2BA. Elections at the Club "Les Amateurs Canadiens-Francaise de la T.S.F."

(*Continued on page 106*)



CORRESPONDENCE

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

The Facts on RST

Box 626, Riverhead, L. I., N. Y.

Editor, *QST:*

In reference to the editorial in the October, 1937, issue of *QST*, dealing with signal strength reporting, I should like to explain a few points which may not be familiar to some of us. Considerable time has elapsed since the original article on RST appeared (October, 1934, *QST*), and some may have forgotten the underlying reasons for advancing a new system. I should like particularly to bring out certain phases of RST which have not been stressed before.

The new system was devised with the idea of correcting certain evils which had grown upon amateur reporting practice. In the first place, I felt that our reporting procedure should be systematized. Where previously there had been no system whatever, just the indiscriminate use of the three separate scales, I attempted to substitute an orderly system which would both standardize and facilitate the exchanging of reports. In the second place, I wanted to rationalize the scales themselves. The existing codes of so-called "readability," audibility, and tone, which were contradictory and inconsistent among themselves, were replaced by three scales, (R)eadability, signal (S)trength, and (T)one, which could be used singly or together without any conflict or change in meanings.

Referring now to the signal strength scale, it embraces a certain range of strength. This range is the same whether we divide it up into 5, 9, or any number of gradations. Since the new signal strength (S) scale and the old audibility (R) scale each have nine steps, if we should strip them of their definitions, they should be identical, theoretically. In each scale, any given step should be in the same ratio to the corresponding adjacent step. That is to say, if S7 is twice as strong as S6 (assuming received signal intensities to be measured in voltage), then R7 should be twice as strong as R6. Practically, however, this is not true, because, unfortunately, this simplicity in the audibility (R) scale was destroyed by an unwise choice of definitions. Take a look at the old R scale. Besides an illogical arrangement of the wording describing successive steps, such as going from "moderately strong" to "good," and then to "good strong," irrelevant terms on *readability*, *interference*, and *audio strength* were injected into them. It was a case of trying to make one code cover too many things, and not doing a good job on any one of them. The same thing also happened in the old tone code. It was *these qualifying terms* that ruined the chances of the R code ever being used to correctly rate signal strengths. It is human nature to follow the definitions, and if a signal is not capable of overriding bad QRM it is pretty hard for the conscientious operator to call it R7, even though its actual strength in the absence of the QRM would make it so. This is true also for the other gradations containing readability or audio-strength terms. The practical result is that a given step does not always describe a signal a given strength above the preceding step. From the foregoing it is evident that in the interest of accuracy the old audibility code should be forgotten as soon as possible, both in 'phone and c.w. work.

It was with the view of correcting these difficulties that the S scale was devised. It was desired that this scale should describe signal strength, and signal strength only. In it will be found no definitions whose meanings can be influenced by extraneous factors, such as readability, interference, etc. S7 should refer to a signal a definite amount stronger than S6 under any possible condition. Actually, of course, the wordings of the definitions have no quantitative meaning, and it is this very quality which gives the scale its great advantage. It should be remembered that in the strength scale *the numbers are the steps;* the definitions are given merely as an aid in distinguishing between steps. It will be noted that a logical progression in definitions was adhered to; for instance, a "fairly good" signal is lower than a "good" signal, but higher than a "fair" one. Similarly, "moderately strong" comes below, but next to, "strong." This should explain any discrepancies between the S and old R scales.

Examination will reveal that the same plan of assigning definitions was followed in the readability and tone scales, always as smooth as possible a progression of increasing values. In the case of the tone scale this was naturally not quite so simple, but, as pointed out in the editorial, the limits were fixed, and all types of notes had to come between them. So we have in the middle the musically modulated note, which is the point where a.c. and d.c. meet. Toward either end of the scale the a.c. or d.c. component becomes increasingly predominant. It will be remembered

that the "x" or stability term was carefully kept separate from the tone characteristics.

If, as was stated in the editorial, amateurs in making reports are influenced by such factors as conditions, noise, distance, etc., it is indeed unfortunate. It was hoped that the new system would tend to correct such practice. An S6 report to England should be exactly the same as the S6 report to a "W" or a "J," under any conditions. Otherwise, signal rating becomes meaningless. I always try to rate a DX signal strictly on its merits, with no "weighting." I should like to feel confident that the fellow at the other end is doing likewise. I believe we should all earnestly endeavor to be more conscientious in this respect.

The signal strength scale as we know it embraces a certain range of signal intensities. This does *not* mean that S1 is the weakest signal we can perceive on a two-tube set with 'phones and S9 is the loudest signal we can stand out of a loudspeaker system. The original scales were devised when receivers consisted of a detector and one or two stages of audio, plus headphones. *Estimates of signal intensities to be done with any degree of accuracy by ear should be made only at headphone levels.* The loudspeaker is "out," because above headphone levels the ear is no longer accurate as a measuring device.

It has been found, through the researches of various investigators, that the average difference in signal intensity between successive steps is roughly in the order of 6 db. This corresponds to a change in strength of two to one (four to one in power), and this is about the minimum difference in level that can be distinguished over a radio circuit. It is true that for a perfectly steady, pure tone an instantaneous change of as little as 1 db can be detected. However, in a space circuit, where fading ratios are important (and it is surprising how much a seemingly steady signal actually fluctuates in strength), this is not possible. The situation is further complicated in the case of a keyed or modulated signal.

Since each step represents an increase of about 6 db, the total range of signal intensities from 1 to 9 is seen to embrace approximately 48 db. It is rather fortunate that this is true, since 6-db steps are very convenient to use in making calibrations. In the future, time permitting, I hope to be able to prepare a short article dealing with the measurements on which these conclusions are based. In the meantime it is hoped that this discussion may serve to satisfactorily clear up any misunderstandings which some may have concerning the aims and purposes of RST.

—Arthur M. Braaten, W2BSR

More on Planned Use

612 Atlantic Ave., Morris, Minn.

Editor, *QST:*

I have been planning on writing the League for some time. The new "Sub-division Plan" by D. A. Griffin in October *QST* is the spark that has set me off.

. . . I have yet to see our radio misanthropes offer any plan which promises to do anything really constructive. It is this which I am venturing to undertake.

I have an ACR 175, and when I tune over the broadcast band I marvel at the sharp tuning and lack of interference. The reason for this is that "it was planned that way." All stations on the b.c. band *must* use a frequency which is a multiple of 10 kc. This is because a receiver when heterodyning stations 10 kc. apart makes only one audible, since 10 kc. is too high a frequency to hear. Thus the b.c. band is free from whistles and cat-calls other than those due to the radiation of the harmonics in the beat oscillators of other receivers.

. . . There are four types of [broadcast] licenses: local, regional, high-power regional, and clear channel. In amateur radio this classification would not be practical; we would all be together. In amateur radio if a kilowatt 'phone comes on he blots out the lesser ones anyway, but if you were 10 kc. away you would not be blotted out by superior power, at least not on a good receiver.

. . . Now if two 'phones are 15 kc. or so apart and another station attempts to come in between, all three are blotted out, yet there is 5 kc. going to waste.

Suppose we put it this way. If the only frequencies to be allowed were ones such as 1800 kc., 1810 kc., 1820 kc., 1830 kc., etc. (plus or minus 500 or so cycles per sec.), then it would be possible to hear without interference or whistle 20 'phone stations at one time, believe it or not. Now since the c.w. men do not use the 160-meter c.w. band, why not give that back to the 'phones, making a possibility of 29 perfect 'phone signals on the entire new 160-meter 'phone band. In contrast, what does one usually hear? One night recently I heard a station in Bensonville, Ill., say that though he had a receiver that cost over $100.00, he could make out only two stations in the entire 'phone band, which was no worse than I could do. Many nights I can't make out more than four, and seldom more than eight. However, the band is swamped with whistles and gibberish, which shows that there are plenty of those who would like to use the band if it could be made usable.

There is another advantage, too. Since amateurs generally answer those on or near their frequency, there would be many times when QSO's would take place on one channel, instead of occupying two, as is usual. This would be more and more the case as time wore on, and amateurs acquired more than one crystal.

Now about the interference caused to the tune of 67 per cent. by 160-meter 'phone. C.w. causes a more annoying interference than 'phone in the estimation of everyone I have talked to.

Moreover, there is a way of reducing b.c.l. interference and harmonics as well. As the electric field is shielded in coaxial cable, radiation from the feeders is greatly reduced or practically eliminated. I know such cable is quite expensive. But W9JDO reports that b.c.l. QRM was greatly reduced, presumably for the same reason, i.e. feeder radiation is greatly reduced, by the installation of EO-1 cable. He also reports that harmonic trouble with Grand Island was also eliminated.

It seems more practical to require coaxial feeders by law, for 160, rather than give up the 160-meter band entirely. The amateur would find his sock improved in value by more than the cost of the coaxial cable. . . .

—Dwight Stebbins, W9WLK

EDITOR'S NOTE.—Some dozens of comments on W2AOE's sub-division plan published in October *QST* have been received, some *pro*, mostly *con*. No attempt is being made to publish these letters because for the most part they are merely comment, offering opinions but no new thoughts. They are being held for the attention of the League's planning committee, in whose behalf these current discussions on planned use (the French I.A.R.U. proposal, the Griffin plan, etc.) are being stimulated. In this connection we solicit further new ideas from other correspondents.

Meanwhile, we present above still another slant on the problem. Obviously, there will be no widespread immediate agreement to this—or probably any other—plan. Yet from the whole discussion some useful thoughts are bound to arise, which can then be made the subject of thoughtful consideration by our planning committee.

Equalizing Voting Power

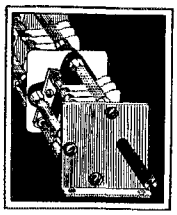
713 St. Louis Ave., East St. Louis, Ill.

Editor, *QST:*

The A.R.R.L. was primarily intended to be a democratic organization, controlled by its members through a Board of Directors elected by the membership. In theory this is a good set-up for placing control of the League in the hands of the members. But in theory only, in fact the members have very little to do with controlling and deciding the policies of the League.

The unreasonable part of the present arrangement in this apparently democratic organization is the unequal distribution of voting power among the directors. To make this statement clear I point out to you, for example, the director of the Central Division who represents over 4000 members

(*Continued on page 62*)



ONCE every few years we make a futile attempt to use the broadcast receiver type of construction somewhere in a National Receiver. We should have learned our lesson by now, but broadcast receiver parts cost so much less than ours that we have to reassure ourselves, now and then, that we really are on the right track. For example, a "good" broadcast tuning condenser sells for about a third as much as the labor and materials alone in a PW condenser.

In the NC-80X and 81X we have tried to give as much performance per dollar as possible, and it struck us that the economy would be well worth while if we could use a commercial tuning condenser. We shopped around. One of the best manufacturers in the field agreed to build us a special job with low-loss insulation and other refinements, and we purchased a number of units.

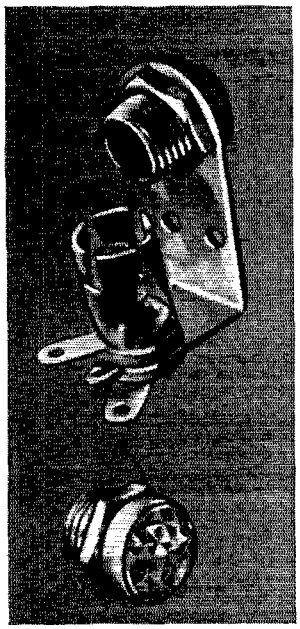
But when the production sets came through it became apparent that these condensers would not do. The ganging was not good enough and backlash was perceptible when using the high selectivity of the crystal on the bandspread amateur bands. We found that by careful refitting these were satisfactory for the NC-80X (which has general coverage ranges) but not for the NC-81X (which has extreme bandspread on the amateur bands.) But this refitting brought the cost up as high as a PW, so what the heck.

This unfortunate discovery was made in October, just when we were starting deliveries. This is why these receivers are so late. NC-81X Receivers (with PW condensers) will be delivered about the time this page is published. In the meantime, we are filling orders for the 80X by using the refitted condensers described above. Later production will employ PW units exclusively. Of course, substituting the more expensive condenser means that the NC-81 is no longer an $88.00 receiver. However, we have never built a poor receiver and we would rather take a licking than do so. So for the present there will be no price increase.

This account of our troubles is by way of explaining why the deliveries are late. It is not a criticism of the broadcast parts manufacturers, who know exactly what they are doing. The condensers are fine for a set with a maximum selectivity of about 5 KC, but a communication receiver with a maximum selectivity of 320 cycles is something else again, to name just one of the more obvious differences.

It is too bad, though, that broadcast methods will not do. One very clever economy is the way they adjust coils. The coils are wound oversize, and while the impregnating wax is hot, are squeezed with special pliers until the inductance is exactly right. When the wax sets, the inductance remains fixed, — for a while. If you have ever operated a pseudo-communications receiver over a period of months you have probably noticed the steady sliding out of alignment and calibration as the cold flow of the wax allowed the coils to regain their normal shape. It works out very well in broadcast receivers, however, and we only wish it would in ours. It is such a lot cheaper than the exceedingly laborious method that we use, which is to adjust the number of turns with no internal stresses. It is too bad that broadcast methods will not do.

JAMES MILLEN



Correspondence Dept.

(*Continued from page 60*)

of the A.R.R.L. and has one vote at the board meetings. The director of the Delta Division represents about 400 members of the League and also has one vote.

Here is a case where 400 men have the same voice in governing the League as 4000. Nothing much democratic about that. I believe a great majority of League members would like to see this condition changed and have a more equal voting power created by either redistricting the present divisions of the League or giving each director one vote for each hundred members he represents.

This change can be brought about in one way only and that is through the directors themselves. It will accomplish nothing bombarding Warner with letters blaming him and all Headquarters for the present set-up. The proper man to spill your ideas on the subject to, is your director. If a majority of the members in your division wish this change made and your director votes contrary to your wishes there is then only one thing to do. Kick that director out by electing a man who will vote the way a majority of the members in your division wish him to.

You League members who would like to see the A.R.R.L. really controlled by the men who pay in the dues and make the organization possible get busy and write your director demanding him to vote for this long overdue and much needed change in the League's Constitution.

—*Earl R. Linder, W9DZG*

EDITOR'S NOTE.—File No. 129 in the Secretary's File at the Headquarters office is an inch-thick collection of data on the subject of "Reapportionment of A.R.R.L. Divisions." The question is one that has received much attention in the past. The last official actions occurred in 1931 and 1932. The A.R.R.L. Board, at its 1931 meeting, acting upon the suggestion of the Executive Committee, instructed the Committee to draw up a detailed plan for such reapportionment. This was done in the following year and the plan submitted to the Board at its 1932 meeting. At that time it was voted to lay the question on the table, and there it has remained.

Ham Helpfulness

Koch Hospital, Koch, Missouri

Editor, *QST:*

About a year and a half ago I wrote you a letter asking you if you could help me get some kind of a job that I could do in the hospital in order to get enough money to get together a transmitting outfit. You did not help me get the job but you did see to it that I got on the air. You referred the letter to as fine a bunch of fellows as can be found anywhere—the Order of Brasspounders, Chapter No. 1, St. Louis, Missouri. They supplied me with an SW-3 receiver, 'phones, code practice oscillator and helped me get my ticket. After I got my ticket they supplied me with the transmitter and a converter to supply a.c. for the plates and filaments. They also gave me 135 volts of "B" batteries when power lines here were too noisy for reception last summer. They have given me many other things too numerous to mention by name. Now I find that they have made me a present of one year's subscription to *QST*. Truly my cup runneth over. . . .

—*Waldo E. Good, W9ZND*

More Ham Helpfulness

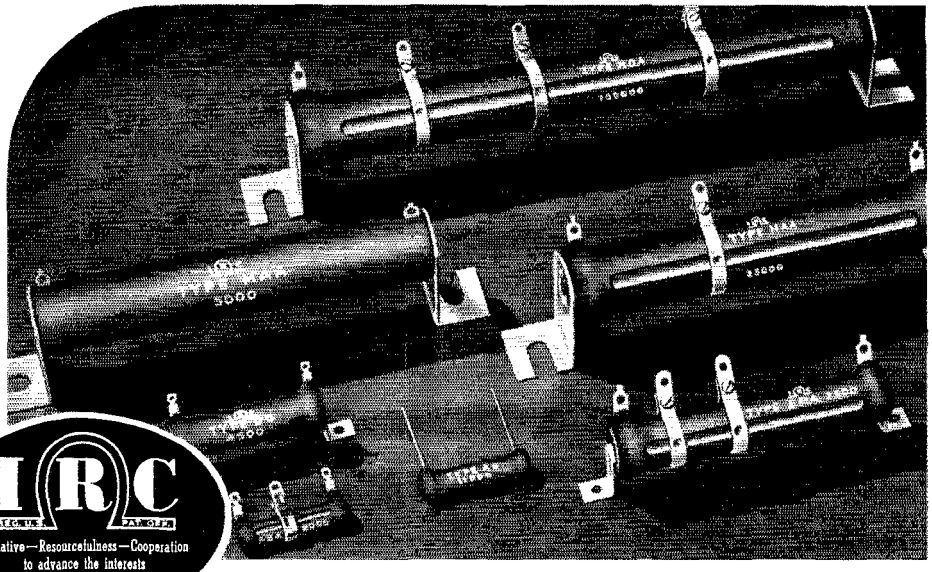
2304 Chamberlain Ave., Chattanooga, Tenn.

Editor, *QST:*

Through good fortune and a little forethought, my vacation this year included the VE1 Hamfest at Halifax, Nova Scotia. I took my father, now 82 years old, to see the two remaining members of his generation, my mother's sister in

AS GOOD LOOKING AS A BULL DOG...

....and TOUGHER



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Initiative—Resourcefulness—Cooperation to advance the interests of the industry

Cement Coated TRANSMITTING POWER WIRE WOUND RESISTORS

NO SIR! IRC Cement Coated Wire Wound Transmitting resistors were never designed for beauty. Yet, there is a certain "something" about them — the same beauty you'll find in a prize bull dog. No more. No less! It is the beauty of intense ruggedness — toughness — loyalty — dependability through thick and thin.

In short, IRC Cement Coated Power Resistors are built to do a job. They are built to do it better and longer than any other type of resistor you've ever used before. They stand the overloads. Heat does not crack or deteriorate their tough cement coating. Actual tests show their amazing superiority under moist or salt air conditions. *They will not let you down!*

Made in a complete line of fixed and adjustable types from 100 watts to 200 watts.

INTERNATIONAL RESISTANCE COMPANY
401 NORTH BROAD STREET, PHILADELPHIA, PA.
Factories or Licensees in Canada, England, France, Germany, Italy, Denmark and Australia
MAKERS OF RESISTANCE UNITS OF MORE TYPES, IN MORE SHAPES, FOR MORE APPLICATIONS THAN ANY OTHER MANUFACTURER IN THE WORLD

Halifax and her brother in Ship Harbor. We had not seen either of them in 45 years.

On the train, we met up with some of the hams en route to the meet, and were welcomed by them enthusiastically. Several cars met the train at Halifax and, with characteristic ham spirit, one car was assigned to seeing that we reached our hotel. Owing to other conventions in progress, that hotel was unable to take us in, so the boys carried us around until we were accommodated. Only someone who has been in such circumstances can understand how much this courtesy was appreciated.

I went to the Nova Scotian Hotel to register on Saturday and, by some chance, happened to be there just as it started with the result that I was the first one on the list. This soon brought many of the hams to look me over, some because of previous knowledge that I was expecting to be there, others to ask of friends in Chattanooga whom they had worked. Foremost among these were VE1DZ and VE1DQ. The latter carried me to be presented to Mr. Alex Reid, Canadian General Manager, who put himself to the trouble of hunting me up several times during the three days to see if I were enjoying myself. They all outdid themselves in courtesies, seating me at the speaker's table at the banquet, with someone always at my elbow to see that I was introduced to others, assigning me to one of the cars in the hidden transmitter hunt, and other expressions of care and thoughtfulness too numerous to mention. I shall always remember that Hamfest as one of the bright spots in my life. Had I been a prominent ham, I could not have been treated with greater consideration.

Of course, all this went to my head, naturally, and I made bold to criticize Mr. Reid's use of the name "American" to distinguish hams of this country from those of Canada. First explaining that my father was a native of Massachusetts, my mother born in Nova Scotia, and being born myself on the Bay of Fundy, I considered that I had a claim to being native to both, I told him that I objected to the use of "American" to only one of the countries. I thought that the Canadians had just as much right to that name as the citizens of the United States. Being the gentleman that he is, as well as the perfect amateur, he took it in the spirit intended and, for the balance of the hamfest at least, he called them "United States and Canadian" hams. Not many men in his position would have accepted such a criticism, let alone be governed by it, from one who was not even a ham himself.

At the meeting of the Chattanooga Amateur Radio Club last night, I was informed by several that they had been told by VE1 hams that I had been to their Hamfest, and they sent best wishes to me in that way—just one more way of being courteous to the stranger within their gates. I would like to tell the world just what the ham spirit is like, and to tell them that anyone with a VE call can consider himself or herself my friend for life.

—*W. H. Lord*

SWL QSL Bureau

615 Church St., Wisconsin Dells, Wis.

Editor, *QST:*

. . . With the recent refusal of QSL bureaus to accept listeners cards the SWL QSL problem is becoming worse. Here is the solution I have worked out.

I am setting up a place in Wisconsin Dells known as the "SWL Bureau." All U. S. and foreign amateurs may send their SWL reply cards to the bureau and they will be forwarded by means of self-addressed stamped envelopes, the same as the A.R.R.L. bureau for hams.

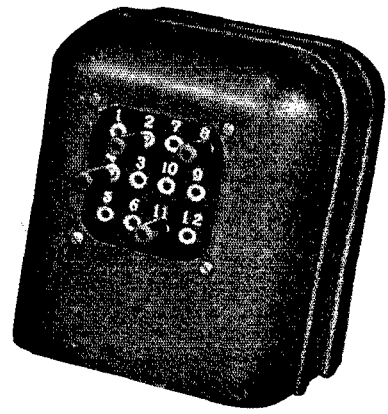
This service will be supported by a yearly membership fee of 25¢ from each short-wave listener and will be absolutely free to all amateurs. I have tried to make this fee low enough so it will not look like a money-making scheme and still high enough to offset the expenses of the service. . . .

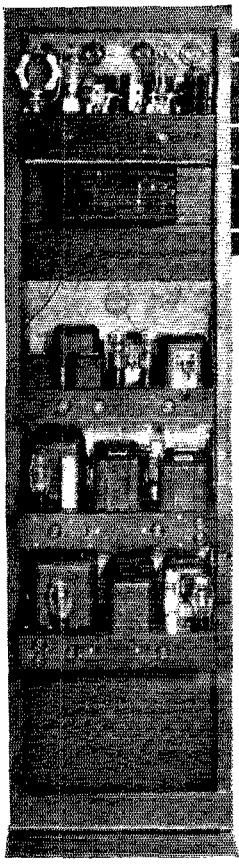
The number of cards received by the SWL's would certainly increase greatly due to the decreased expense and bother—especially by our foreign ham friends.

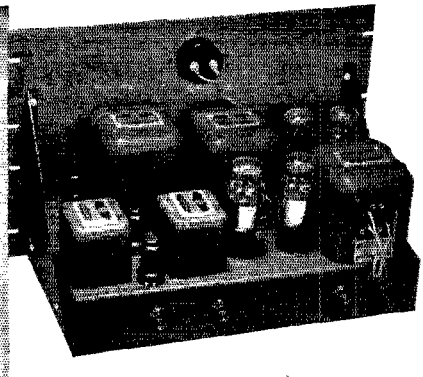
It will also be a big financial help to the listener as reply coupons are expensive and few send them anyway. It is not intended to forward QSL's to foreign listeners from W stations at first. If it can be worked out—OK! . . .

—*Ross Hansch, W9RBI*

ONLY WITH C.H.T. TRANSFORMERS WILL YOUR "RIG" LOOK LIKE THIS







- Streamline case
- Uniform appearance
- Flexible design

A NEAT RIG, O. M.

Only with C.H.T. transformers can you get this uniform "factory built" appearance. Each, from smallest audio to largest plate transformer, follows the same basic design. C.H.T. transformers are built to the highest standards of quality performance.

See your parts distributor today for particulars and prices or write factory for FREE Catalog No. 400-A.

THORDARSON ELECTRIC MFG. CO.
500 W. HURON ST., CHICAGO, ILL.
Demand "Power by Thordarson"

Radio Amateurs in the Television Picture

(Continued from page 10)

the circuit adjustment, not in the assembling and wiring.

How much will the parts for the vision receiver cost? In the neighborhood of one hundred dollars, everything included. If parts already on hand are worked in, or if an alternative input tuning system is used, the cost may be lower. Then again, if a larger-type tube than a 5-inch or 7-inch size is demanded by the more ambitious, it may cost more. In other words, the price will be on the order of what many amateurs pay for their communication-type receivers.

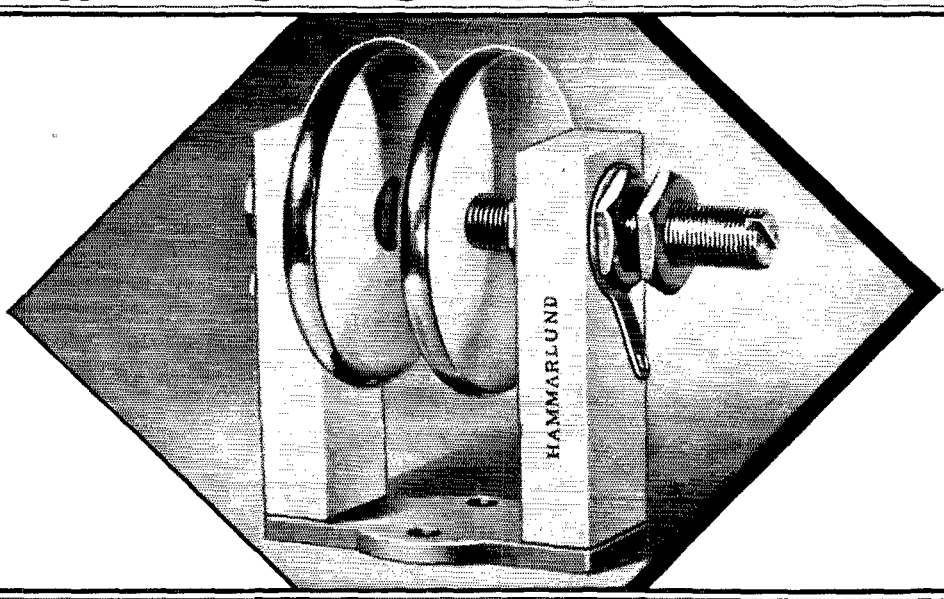
Who will be able to make first practical use of the receiver design, construction and adjustment information? The answer to that is, of course, those within range of a television transmitter. In the beginning, this will mean, generally, amateurs in the metropolitan areas of cities that have experimental television transmitters in operation at the time the receiver articles are completed, which will be late this winter. (A list of cities which now have experimental transmitters and in which transmitters are contemplated for the early future is given in W2KJL's article elsewhere in this issue.) As it happens, the regions in which television signals will be first available are practically the same as those where ultra-high frequency amateur activity has been, and is, greatest. The u.h.f. gang is in a good position to take advantage of that logical coincidence.

How will all amateurs benefit? From the articles themselves, every amateur who is sincerely interested in developing his technical knowledge will profit by reading them and learning thoroughly the lessons they teach. Even though the individual may not be in position to build and make immediate use of a receiver, it will serve him well to make himself as familiar as possible with the practical technique of television. Commercial television executives have stated to us that commercial television broadcasting will demand hundreds of engineers and thousands of servicemen who are familiar with television technique, and that in television, as in broadcasting, amateur radio must be the reservoir of technical personnel.

How can amateur radio contribute to the technical progress of television? Those within range of the experimental transmitting stations will make valuable contributions to the development of television by reporting on the transmissions received, particularly with regard to the signal strength, synchronization under different transmitting conditions, variations in signal-noise ratio. A large number of receivers distributed over a wide area promises to answer one of the most perplexing problems worrying the television people to-day; namely, what is the effective range? They are looking to us to give an answer. We are confident that we can do it.

By such coöperation, we shall continue the traditional proving-ground service to radio development which has played its part in earning

NEW "N-10" FOR NEUTRALIZING



... by HAMMARLUND

HAMMARLUND now introduces another exclusive transmitting condenser development — the "N-10" neutralizing condenser! This new condenser, designed for horizontal adjustment, affords easier and safer operation. Thick aluminum plates with round edges are polished over all surfaces. For smooth micrometer control the "N-10" features an oversized fine thread screw with lock nut. A stop is provided to prevent any possibility of shorting. Insulation is B-100 Isolantite. Capacity range is from 2 to 10 mmf., with air gap range from 1/16" to 5/8". Two-hole base mounting.

Illustrated below are other recent Hammarlund transmitting condenser developments that have rapidly gained the favor of amateurs the world over. For quality transmission, install the new "N-10" along with other precision transmitting condensers by Hammarlund!

Mail coupon for new "38" catalog — just off the press — with details on the "N-10" and other Hammarlund transmitting products!

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424-438 W. 33d St., N. Y. City.

☐ Please send me new "38" catalog.

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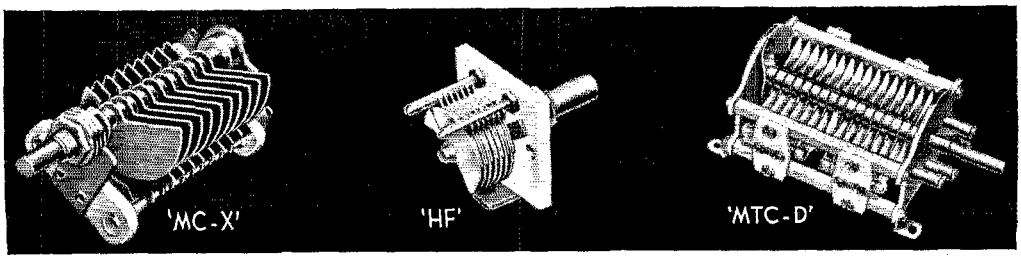


for amateur radio the position it holds to-day. Our coöperation will not revolutionize the advancement of television, of course, any more than our participation in television development will revolutionize amateur radio. But by our constructive coöperation we shall contribute to its progress—while continuing our other activities in full stride.

Introduction to Modern Television

(Continued from page 15)

2. Channel width, 6 megacycles.

3. Spacing between television and sound carriers, approximately 3.25 megacycles.

4. Television carrier higher in frequency than sound carrier.

5. Polarity of modulation, negative or positive.

6. Number of lines per picture, 441 (interlaced).

7. Picture or frame frequency, 30 per second; half-frame or field frequency, 60 per second.

8. Aspect ratio (width to height of picture), 4-to-3.

9. Percentage of television signal amplitude devoted to synchronizing signal, not less than 20%.

10. Duration of horizontal impulse, approximately $\frac{1}{10}$ of the time to scan one line; duration of blanking impulse, $\frac{1}{10}$ of the time to scan one half-frame; position of synchronizing impulse, approximately at leading edge of blanking signal impulse. (Average brightness of the picture transmitted by either varying the pedestal height or by d.c. modulation of the output of the transmitter.)

A simple formula gives the minimum bandwidth necessary in the receiver to obtain satisfactory pictures. This formula is

$$F = 0.64 \frac{A \times N \times n^2}{2}$$

where F = the maximum modulation frequency transmitted, A = the aspect ratio, N = the number of complete pictures scanned per second, n = the number of lines, and 0.64 is a correcting factor to give equal vertical and horizontal detail.[4]

It will be seen from this formula that it is necessary to transmit a sideband approximately 2½ megacycles wide. This means that intermediate frequency stages must pass at least 2½ megacycles with the signal tuned in so that single-sideband reception is approached.

UNITS OF THE TELEVISION RECEIVER

In the block diagram Fig. 7 are outlined the components of a modern television receiver. It consists of four different units. The first contains two power supplies, one for the tuners and sweep circuits, the other to generate high-voltage d.c. to accelerate and focus the cathode-ray beam. The second unit contains a sound receiver which may be a simple ultra-high frequency type. The third unit is the vision receiver, which may be either a tuned r.f. job, if one is comparatively near a transmitter, or a superheterodyne for more effec-

[4] Kell, Bedford and Trainor. *Television* (RCA Technical Press.)

CENTRALAB ····· WILL STAY QUIET

U. Elgin Chandler
Radio Sales and Service
Louisville, Ky.

U. ELGIN CHANDLER
Radio Sales and Service
1382-84 Bardstown Road
LOUISVILLE KY

June 9th, 1937

CENTRALAB,
Milwaukee, Wis.

Gentlemen:

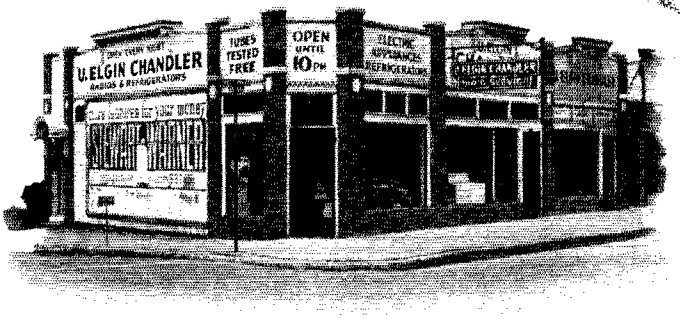
The writer first became acquainted with your Volume Controls in 1925, and since that time has used them almost exclusively.

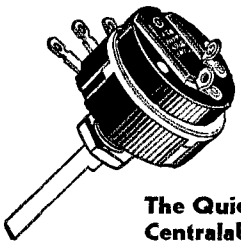
Each time, I have gone back to Centralab, because it is the only control that I have ever found that will stay quiet.

Here in our shop we make every effort to avoid "call backs", and we have found that the use of your volume controls means one hundred percent satisfaction.

Both yourselves and the local service men are fortunate in having a distributor who promotes your merchandise as does P. I. Burks & Co., of Louisville.

U. Elgin Chandler





The Quiet Centralab Control

offers maximum resistor length for case diameter . . . close uniformity between resistors . . . accurate tapers . . . uniform current distribution . . . better power dissipation and longer life

Fine phrases seldom fool a radio man. Graphs, curves and self-praise may read well . . . but customer complaints put a "negative-bias" on such bouquets.

So, when an "old timer" like Mr. Chandler writes . . . "Since 1925 I've used your controls almost exclusively, in fact each time I have gone back to Centralab, because it is the only control that I have ever found that will stay quiet." . . . we say

"Here's proof for manufacturer . . . for experimenter and for the servicemen." Specify Centralab.

• Centralab

DIVISION OF GLOBE UNION, INC.
MILWAUKEE, WISCONSIN

BRITISH CENTRALAB, LTD.
Canterbury Rd., Kilburn
London, N.W. 6, England

FRENCH CENTRALAB CO.
118 Avenue Ledru-Rollin
Paris XI, France

tive selectivity, flexibility and sensitivity. The fourth unit contains the sweep circuit, the synchronizing signal amplifiers, and the synchronizing signal separating circuit.

The operation of the receiver requires that there be provision for control of the frequency of the line-sweep generator and of the frame-sweep generator, and there must be control of the width of the picture and the height. There also should be controls for determining the picture brightness and contrast, in addition to the sensitivity controls for the sound and the vision receivers. Most of these controls, however, can be set by a screwdriver adjustment and left without attention for long periods.

The tubes, including the cathode-ray tube, in even a simple vision receiver must be designed for the purpose. Few standard receiving tubes are suitable as video-frequency amplifiers because high transconductance and low input and output capacity are required. At present the National Union Radio Corporation is developing such tubes especially designed for the purpose.

It should be pointed out that at this time television signals are being transmitted only on an experimental basis in the metropolitan areas of New York, Philadelphia and Los Angeles; in New York jointly by RCA and the National Broadcasting Company, in the Philadelphia area by RCA, Philco and Farnsworth, and in Los Angeles by the Don Lee Broadcasting System. These transmissions are not at present on consistent schedule; but, before this series of articles is completed, it is expected that transmissions will be more regular. The Columbia Broadcasting System is making an installation on the Chrysler Building in New York, and it should not be long before this transmitter also will be in operation.

Reliable information indicates that experimental television transmitters are also in prospect for Boston, Mass., Albany, N. Y., Bridgeport, Conn., and Kansas City, Mo., with others likely in the near future. Accordingly, no small number of amateurs throughout the country will be in a position to make early practical use of the information contained in this article and in those to follow.

The second article of this series, treating the functional operation of television receiver circuits, will appear in an early issue.—EDITOR.

Strays

W2KR tells how he fearfully looked for a belless apartment house when moving into New York City from the country. Finding a good location on Riverside Drive, he nervously asked the manager of the house if it would be all right to have a radio station there. Whereupon the manager said, "Are you a ham? I'm ex-W2AWZ" —and the roof was promptly signed over to 2KR!

—···—

VE2DR thinks the ham station pictured in an ad in the latest call book deserves credit for some startling work. The shack wall shows confirmed contacts with VE7, CM3, XE6, and SM8!

THE SUPER SKYRIDER
THE SKY CHIEF
THE SKY CHALLENGER

THE ULTRA SKYRIDER
THE SKY BUDDY
THE SKYRIDER COMMERCIAL

COMPARE! ITS PERFORMANCE!

THE NEW 1938 SUPER SKYRIDER

You really have to sit down and spin the dials of the NEW 1938 SUPER SKYRIDER — *actually operate it* — before you can fully appreciate how advanced a receiver it is! That's why we want you to hear it in your own shack — and we're willing to bring a New Super Skyrider out for demonstration anywhere within a hundred miles of Chicago, so that you can judge its performance under the actual conditions under which it will operate. Get acquainted with "E and R" service. We check every receiver we sell to assure perfect satisfaction for our customers. Write or phone today for complete information.

★ $99.00

Less Speaker
Less Crystal

$111.00 with Crystal

Matched Speaker P. M. Dynamic $12.00

CHECK THESE FEATURES:

- Over 1000° Band Spread
- 5 to 550 Meters Coverage
- 11 Tubes
- Wide Range Variable Selectivity
- 5 Meter and Broadcast Band
- Better than 1 Microvolt average sensitivity

ALL HALLICRAFTERS RECEIVERS AVAILABLE ON LIBERAL TERMS

ELECTRIC and RADIO SUPPLY CO. ★

25 NO. FRANKLIN STREET CHICAGO, ILLINOIS

the hallicrafters inc.

An Improved Dual-Diversity Receiver for High-Quality 'Phone Reception

(Continued from page 21)

Attached to the shaft of the tuning knob is a heavy four-inch cast-iron fly wheel, the purpose of which is to allow the dials to be spun by a quick twist of the knob, thereby avoiding the tedious business of having to turn the tuning knob 35 times to go from one end of the main dial to the other. With this arrangement two or three quick flips on the knob will spin the tuning dials rapidly over that complete range.

PANEL ARRANGEMENT

The meter on the left-hand side of the receiver is a zero-center type reading 50 ma. either side. Its purpose is to check the operations (particularly to equalize the gain) of the two receiver circuits. It is connected in a balanced bridge circuit in such a manner that when the gain of one receiver practically equals that of the other, the meter will read zero. Below the meter are three knobs. The center knob is the master r.f. gain control. The knobs to its right and left are the gain controls for the i.f. amplifiers of circuit "A" and "B," respectively. With the key switch to the left of the meter in its center position, both receivers work in diversity; and when thrown up or down it switches either receiver to work independently. Of the controls near the bottom of this same panel, that at the right is the variable infinite-rejection control for circuit "A." Next to it is the power factor corrector resistor for this circuit. Alongside this is the 'phone jack, which is connected across the output of a 500-ohm line transformer. Approximately 300 milliwatts is the maximum output available from the first audio stage. On the extreme right hand panel is located the signal intensity meter which will read either the signal intensity of receiver "A" or "B" separately, or the signal level for the combination in diversity. This meter is in the circuit of the d.c. vacuum-tube voltmeter connected across the combined diode load. The two key switches are for c.w.-'phone operation and stand-by (send-receive) switch. The standby switch has a locking and non-locking position. Below the meter is the master audio gain control. The other knobs are for audio tone control and c.w. pitch control. Below these controls are the infinite rejector controls for circuit "B." Alongside of these controls is the a.c. switch for turning on and off the receiver, operating on the power supplies of the two separate units.

PRACTICAL RESULTS

The small unit with two meters, shown on top of the receiver, is the diversity meter box. With the set operating as a diversity receiver, these meters show at a glance the fading effects in the two separate circuits. Under normal conditions in long-distance high-frequency reception they will vary up and down, from zero to plus 9, very rapidly. The interesting point is that very

EIMAC HAS MADE THE INDUSTRY VACUUM CONSCIOUS

Your tube is no better than its VACUUM!

Long filament life . . . uniformity of characteristics . . . outstanding performance and *Complete Freedom from Failure Caused by Gas* depend entirely upon one important factor . . . *Vacuum.*

Obviously the material of which the elements are fabricated has a direct bearing on vacuum. Eimac uses Tantalum because this material has a very low initial gas content, and when properly handled can be completely degassed. Gas content of Tantalum is but 1/10 that of molybdenum and only 1/1000 that of conventional carbon anode. While Tantalum has many advantages, its use alone does not necessarily produce a better tube. This material requires expert handling to get full advantage from its peculiar properties. Eimac engineers developed an exclusive process (patent pending) for the fabrication and exhaust of their tubes. That's why Eimac tubes are guaranteed never to fail because of gas released internally.

Eimac disproves the popular fallacy that anode temperature affects emission. In conventional tubes, high anode temperature releases gas that should have been removed in the original exhaust. This gas is what affects . . . or poisons . . . filament emission. The temperature of the anode in an Eimac tube will never affect filament emission because the gas has been properly removed. Eimac tubes are conservatively rated as to plate dissipation. Momentary overloads of 400% to 600% which is sufficient to cause the anode to become incandescent will positively not release gas.

Ceramics as used for vacuum tube insulators are incapable of complete evacuation and therefore are a potential source of gas. Since Eimac tubes have no internal insulators this source of gas is entirely eliminated. The proper use of Tantalum . . . the elimination of all internal insulators . . . plus a severe exhaust on high speed diffusion and oil pumps, produces a better and more dependable vacuum than can possibly be obtained by the use of a chemical agent or "getter." Eimac uses no "getter."

Try Eimac Tubes in your transmitter and you'll agree that the use of the more expensive materials, the long severe exhaust and the unique construction produce outstanding results.

Eimac TUBES

EITEL & McCULLOUGH, INC. • San Bruno, California

seldom will they both vary either upward or downward together. In fact, they give the illusion of being oppositely geared together, for when one pointer goes up, the other will almost invariably drop down, or *vice versa*.

The signal meter on the main panel of the set, at the right, indicates the average combined signal level. The three meters together give a pretty conclusive visual indication of the diversified fading that goes on in the field of two antennas separated but a relatively short distance apart. The diversity meters indicate what each receiver is doing at each instant and the third (combined) meter indicates the resultant output of the two receivers, thus graphically showing the improvement accomplished by diversity reception; for invariably, when the diversity meters are swinging up and down with great rapidity, the combined meter will vary but a slight percentage of the variation afflicting either of the other two.

An interesting check on the benefits of diversity reception in improving signal-to-noise ratio, as well as in the reduction of fading, is to tune in a long-distance high-frequency-broadcasting signal at a time it is subject to deep fades and, after listening for a while with diversity, switch one receiver off and notice the aural as well as the visual difference on the third signal-intensity meter. Such a test shows pretty conclusively that the amateur, with antennas not any more complicated than he is now using and strung up but a wavelength or so, can derive worth-while benefits from this interesting and improved method of reception.

Where possible, it is recommended that the two antennas be put up a hundred feet or more apart with balanced transmission lines feeding the two receivers. We have observed considerable improvement in reception, with striking visual proof of diversity action on the diversity meters, even when two antennas running parallel one above the other and separated only ten feet were used. However, where two antennas have to be placed very close together it is recommended that they be placed at right angles to each other or in different planes to each other, one horizontal and the other vertical.

In addition to reducing fading effects, diversity reception also reduces heterodyne interference in the reception of amplitude-modulated ('phone) signals.[4] This may be considered as a species of phase selectivity peculiar to the diversity system, irrespective of its frequency selectivity characteristic. When the audio frequency outputs representing the envelopes of two modulated signals are combined in the audio load circuit, they will add arithmetically. However, beat-frequency heterodyne products from an interfering carrier will add up vectorally. Hence, with the dual-diversity system the interference-to-signal ratio will, at worst, be the same as with a single receiver when the heterodyne outputs of the two detectors are in-phase aiding and of equal amplitudes. Under all other conditions, the beat-note

[4] J. J. Lamb, "Interference and Noise Reduction in Communication-Type Receivers," *Proc. Radio Club of America*, Nov., 1936.

products will cancel each other more or less. The combined beat-note output may be reduced to zero when the separate beat-note products are of equal amplitude and opposite phase. Since the relative phase of the interfering heterodyne outputs of the two detectors depends on the radio-frequency phase relationship at the inputs to the receiver, and since this relationship is likely to shift continually, the average heterodyne interference is considerably reduced. This accounts for reports from Dr. Hard that heterodyne interference is largely alleviated with his diversity receiver.

An incidental use of dual-diversity reception, pertinent to amateur experiments, is in showing up instantaneously the efficiency and directional properties of two different types of antennas over a range of frequency bands. It is often observed that on some signals one antenna "does all the work," while on other signals the other has the higher signal level. This application is of value in comparing antennas for different directions and frequency bands.

In conclusion, it can be stated that the single-control dual-diversity receiving system does four important things. First, it eliminates or reduces to a marked extent bad fading in long-distance high-frequency reception. Second, it gives an average increase in signal strength beyond that obtainable with any single receiver. Third, the signal-to-noise ratio of the two receivers in combination is better than with one receiver alone. And fourth, it reduces heterodyne beat note interference to a noticeable degree.

Description of a modulation system for diversity c.w. telegraph reception has not been included in this article. As was explained in the previous article on this type of receiver, it is impossible to use a beating oscillator, as is common practice in single-receiver circuits, because of the heterodyne cancellation which would take place at the output. We have been working on several methods, including modulating the h.f. oscillator with an audio tone, which show promise of getting around this difficulty. But, as frequently occurs in the early development stage, unfortunately there are bugs. We'll give you the story when it is perking properly.

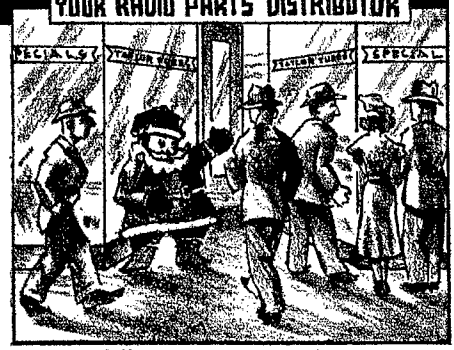
Low-Power Contest Results

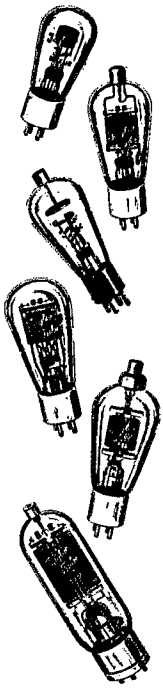
(Continued from page 81)

from 96 QSO's. This is the highest score in the "home station" group and was made by two operators, VE3GT and VE3BC. Operation was on 3.5, 7 and 14 Mc. Transmitter power came from the a.c. mains, receivers were run from d.c. In fifth place is a single-operator home station, W6NLZ. . . . 90 QSO's, 150 points. He also chose to use a.c. power sources for the transmitter, self-power for the receiver. A separate rig was used on each band—3.5, 7 and 14 Mc.

The various stories told by those taking part closely parallel the June Field Day experiences, which were quite fully given in November *QST*,

YES THERE IS A Santa Claus





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so we will not go into great detail again here. However, a few notes taken from the various reports may prove of interest: "Sure surprised at the good signals most of the low power rigs had. Compared very favorably with 100 and 300 watt rigs."—W5DYH. . . . W6JWY used 1.75-Mc. 'phone entirely, working 48 stations. . . . "Called 34 stations and worked 25—not bad for 16 watts."—W8LDA. . . . W9TDR used but 2.28 watts, apparently the lowest powered station in the contest. . . . Conditions (both radio and weather) were reported bad in many quarters. . . . All but one of W9FUH's 74 QSO's were on 14-Mc. 'phone. . . . There is no rest for a ham—W3DOD and W3GXA were aroused from their sleep in the early morning hours to re-erect the mast which came thundering earthward at W4BRB-4. . . . About 50% of the operation at W6KBB-6 was on 56 Mc. 'phone. . . . A near emergency existed for some of the boys out in the open when the rain started to come down by the buckets-full—it seemed that they would have to make real emergency use of their sets. . . . Input at W8JA-3 varied between 3.5 and 4.8 watts. . . . Only 3 watts input at W8KO-8. . . . 19 contacts were made on 14-Mc. 'phone at W2KR-2. . . . W6NRE's work was all on 1.75-Mc. 'phone. . . . 4 watts input at W1JAH. . . .

Like the Field Day in June, the August Low Power Contest provided another test for emergency/portable apparatus. We are now coming into the season when many of us may be called upon to use our auxiliary gear in actual emergencies. Are you ready? Participation in the F.D. and L.P. contests help prepare us for these emergencies. Plan now to get into all such activities in the future. You'll have a lot of fun at the same time you do something worth while!

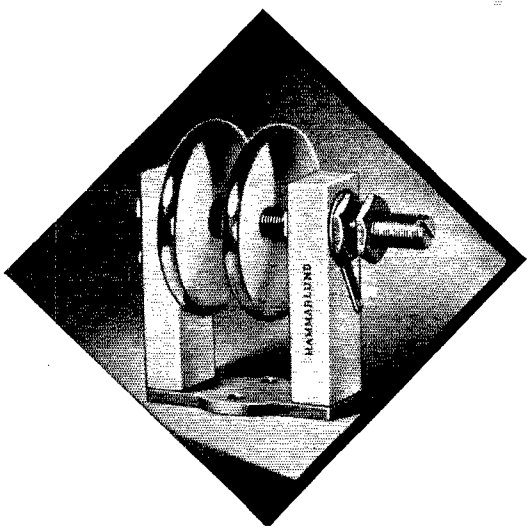
—*E. L. B.*

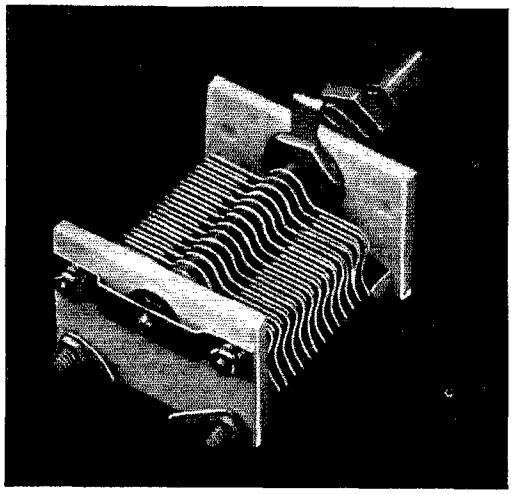
LOW POWER CONTEST SCORES

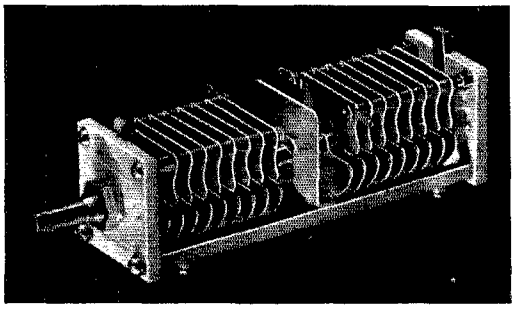
HOME STATIONS

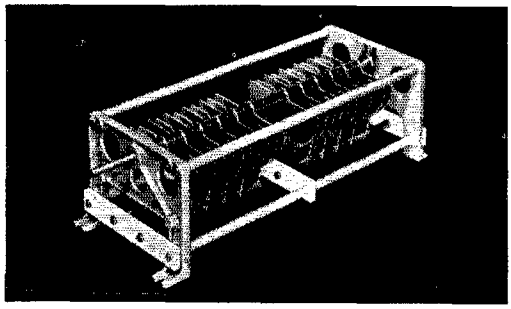
Station	*Operators*	*QSO's*	*Score**
VE3GT	VE3BC-VE3GT	96	159 R
W6NLZ	W6NLZ	90	150 R
W9TOP	W9TOP	53	126 RT
W9RQM	W9RQM-W9SJF-W9RLB	73	124.5 R
W6OFQ	W6OFQ	50	100 RT
W5DBR	W5DBR	49	98 RT
W5FH	W5FH-exW5BRY (log keeper)	50	97.5rT
W1BFT	W1BFT	30	80 RT
W9AHA	W9AHA-W9CMB	41	76.5 R
W8LCN	W8LCN	41	76.5 T
W5FZG	W5FZG-W5EKK	40	75 R
W1AUN	W1AUN-W1KIK	37	70.5 T
W1JAH	W1JAH	21	62 RT
W5DYH	W5DYH	48	58
W5ABN	W5ABN	44	54
W2EIL	W2EIL	33	50.5Rt
W1ABG	W1ABG	15	50 RT
W6JWY	W6JWY	48	48
W3GHM	W3GHM	38	48
W4COV	W4COV	38	48
W5EGP	W5EGP	48	48
VE3WD	VE3WD-VE3RO	23	46 RT
W1JYW	W1JYW	30	40
W8QHX	W8QHX	33	33
W8OYY	W8OYY	11	31.5 R
W6NRE	W6NRE	21	31
W8PSR	W8PSR	30	30
VE5UK	VE5UK	10	30 R
W3FPQ	W3FPQ	15	25
W4EPT	W4EPT	15	25

LEADING MANUFACTURERS SPECIFY ISOLANTITE









Photos courtesy of Allen D. Cardwell Manufacturing Corporation, Hammarlund Manufacturing Company, Inc., and National Company, Inc.

Leading manufacturers of variable condensers select Isolantite* for end support and base insulation—because Isolantite has been shown, by laboratory test and practical performance, to possess *all* the desirable characteristics of a high quality ceramic insulation. Typical of the condenser applications in which Isolantite is liberally used are Cardwell's Single Trim-Air Type ZU-140-AS and Dual Trim-Air Type ET-30-AD; National's heavy duty transmitting condenser Type TMA, and Hammarlund's new Type N-10 neutralizing condenser, just placed on the market.

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W8LDA	W8LDA	25	25
W2GVZ	W2GVZ	6	24 T
W9VOD	W9VOD	24	24
W1JTD	W1JTD	12	22
W6AAI	W6AAI	20	20
VE3ACB	VE3ACB	20	20
W4APU	W4APU	19	19
W9FWG	W9FWG	7	17
W8CZ	W8CZ	13	13
W9TDR	W9TDR	8	16 RT
W3FSP	W3FSP	12	12
W8KZL	W8KZL	8	12 R
VE3LI	VE3LI	11	11
VE4VJ	VE4VJ	9	9
VE2GZ	VE2GZ	8	8
W1JLG	W1JLG	6	6

FIELD STATIONS

W2DKJ-2	W2DKJ-W2JHV-W2IGK	107	234 RT
W9PWU-9	Central Colorado Radio Association [1]	76	172 RT
W8IFD-8	W8OBP-W8QQE-W8IFD	70	160 RT
W4CDC-4	Chattanooga Amateur Radio Club [2]	62	144 RT
W9FUH-9	W9FUH	74	131 rt
W6KSX-6	W6NSC-W6OKL-W6KSX-Ralph Dow (cook)	53	126 RT
W2KR-2	Northern Nassau Wireless Association [3]	58	116 RT
W4BRB-3	W3DOD-W3GVO-W3GXA-W4BRB.	38	96 RT
W8CFR-8	Amateur Transmitter's Assn. of W. Pa. [4]	36	92 RT
W6KBB-6	W6KBB-W6JRZ	45	90 RT
VE3KM	Hamilton Amateur Radio Club [5]	58	87 R
W9SFZ-9	W9SFZ-W9KXJ-W9FND	43	86 RT
W3BKQ-3	Chester Radio Club [6]	38	76 RT
W8KO-8	W8KO	26	72 RT
W3BGD-3	Beacon Radio Amateurs' Club [7]	33	66 RT
W8JA-3	W8JA	15	50 RT
VE3SY	VE3SY	25	50 RT
W2AHC-8	W2AHC	14	48 RT
W9HHT-9	W9YNR-W9OMG-W9HHT	24	48 RT
VE3BY	VE3AJB-VE3BY	14	48 RT
W7GDB-7	Butte Amateur Radio Club [8]	31	41
W5ABQ-5	W5ABQ	14	28 RT
W9NGG-9	Starved Rock Radio Club [9]	16	27 Rt
W9RSL-9	High Frequency Communications Assn. [10]	11	22 RT
VE4ABM	VE4ABM-VE4AF	10	20 RT
W2HLB-2	W2HLB-W2HYQ	19	19

* An R after the score indicates that receiver was self-powered; T indicates that transmitter was self-powered. No indication means that power was secured from the public mains. Where self-power was used part of the time, this is indicated by an r or t.

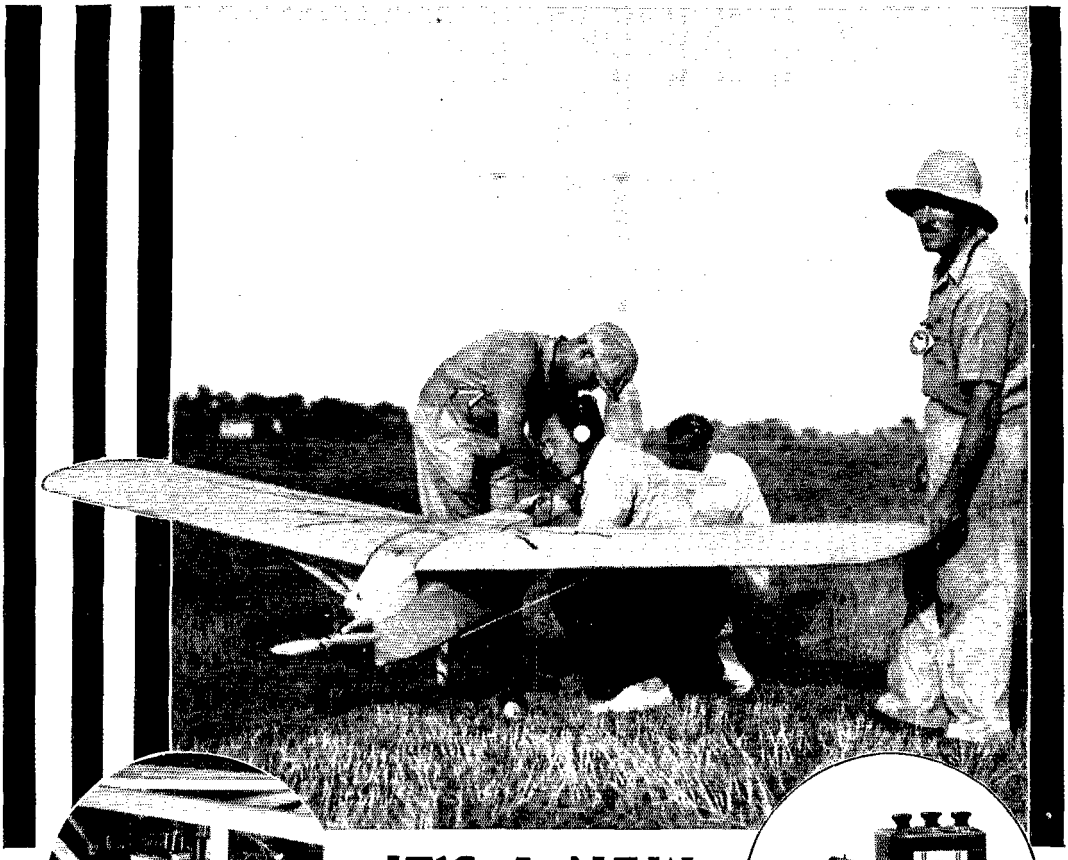
Club operators: [1] W9OKH, W9PWL, W9PWU, L. R. Ware (log keeper), Mrs. W9OKH (cook). [2] W4CDC, W4DUS, W4EXK, W4PL. [3] W2AOL, W2AYJ, W2AZS, W2DDU, W2DUA, W2DXO, W2FMC, W2GZS, W2HQJ, W2KR. [4] W8BSO, W8CUG, W8NXD, W8AVY, W8CFR. [5] VE3PO, VE3VZ, VE3GZ, VE3KM, VE3AFA, VE31A. [6] W3DGM, W3ATK, W3CWQ. [7] W3ATR, W3BZC, W3CMW, W3CNP, W3DYL, W3ETA, W3FLY, W3BGD. [8] W7GDB, W7FRS, W7FHF, W7FXF, W7GJC. [9] Operators not listed. [10] W9RSL, W9UXD, W9SRT, W9SNU, W9PZM.

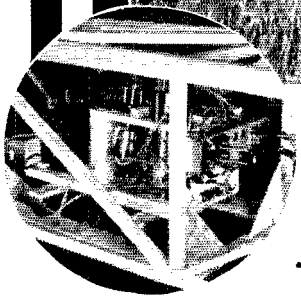
Inverse Feedback to S. A.

(Continued from page 84)

will result in oscillation, so that it is not difficult to get the polarity right.

A new frequency run on the amplifier showed that the response now was within 1 db from about 200 cycles on up to 15,000, using 400 cycles as a reference. At the low end, however, the output showed a rise instead of the previous drop, being up about 5 db at 100 cycles. Check on the oscilloscope showed, as expected, a phase shift at the low end which indicated reduction of feedback or possibly regeneration. The former seems more probable, since there was no tendency toward oscillation, nor did the output rise above the nor-





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mal value without inverse feedback. In either case the cure would be to load one of the interstage transformers with resistance. The loading resistor is R_{13}, whose value was determined experimentally to make the response at 100 cycles the same as at 400. If a rising characteristic is wanted at the low end, the resistor may be omitted.

When R_{13} was added, the frequency characteristic of the complete amplifier was as shown in Fig 2. From 70 to 15,000 cycles, the output is within ½ db of the 400-cycle reference value; for comparison, the original characteristic without feedback is plotted in dotted lines. The slight dip at about 10,000 cycles is probably a result of phase shift in the transformers in that region; it is accompanied by slight distortion of the waveform which, however, is quite unapparent to the ear because the frequency is so high.

So far as practical operation is concerned, the most marked difference is in improved low-frequency response. Better high-frequency response aids considerably in improving the naturalness of speech, but the benefits are largely lost because receiver selectivity cuts off most of the highs even though they may be present in the transmitted signal. On music, of course, the difference between the two characteristics is a great deal more noticeable, so that the solid characteristic is unquestionably to be preferred. The difference is plain, for instance, when the amplifier is used for phonograph record reproduction.

The penalty for improved frequency response with inverse feedback is reduction in gain. This means that more input voltage must be applied to the 6J7 grid for the same power output from the 2A3's. No accurate figure is available on the gain reduction under the amplifier conditions originally existing, because on completion of the work of installing negative feedback the 2A3's were shifted from self-bias to fixed-bias to increase the power output. With this change, the amplifier gain is down about 8 db at the 10-watt output figure. For 15 watts output (obtainable without distortion with fixed bias) the input voltage required is about three times that originally needed for 10 watts with self-bias. There is still more than enough gain for a crystal microphone, since the original sensitivity was considerably in excess of normal requirements.

GETTING MORE POWER OUTPUT

Although 10 watts from the driver is sufficient to excite a great many Class-B combinations, the additional 5 watts which self-bias operation will give is often desirable, especially when the Class-B tubes' grid requirements are near the 10-watt figure. Excess driver power is helpful in improving grid regulation and thus reducing distortion. In this case a slight rearrangement of the power supply and the addition of an inexpensive rectifier-filter bias-supply system were all that was necessary. The power transformer specified originally is provided with a secondary tap for bias purposes so that no special transformer or circuit is necessary. The revised power-supply diagram is given in Fig. 3. The bias-supply circuit consists of the 1-V rectifier, filter L_2C_2, and volt-

age-divider R_6. To reduce the plate voltage to the rated figure for the 2A3's (in the self-bias arrangement there was a drop of about 60 volts in the cathode resistor) the plate supply filter is changed from condenser- to choke-input and the transformer secondary taps changed from 360 to 425 volts. Under load conditions, the supply voltage to the 2A3's is 320 volts, allowing for a slight drop in the output transformer windings.

R_6 is a slider-type resistor, the slider being set to give the proper operating grid bias. This may be done with the aid of a high-resistance voltmeter or—and this probably is the preferable method—by adjusting the slider so that the plate current to the 2A3's is 80 milliamperes under no-signal conditions. The positive lead can be temporarily disconnected from the output-transformer primary center-tap and the meter inserted to get the reading.

In connecting the bias-supply filter condenser, make sure that the positive terminals are grounded and the negatives connected to the choke. This is the reverse of the normal procedure, and it may be necessary to make a conscious effort to overcome habit!

The extra bias lead requires the use of an 8-wire cable instead of the original seven, so that it becomes necessary to substitute 8-prong sockets and plugs in place of those originally specified for the supply connections between the two units.

The lower plate voltage under the revised circuit conditions reduces the voltage available to the low-level tubes through the voltage regulator. As indicated on the diagrams, the regulated voltage is approximately 200 volts. This is adequate for all stages, including the push-pull stage driving the 2A3's. The rated 15 watts output can be developed without perceptible waveform distortion.

There is plenty of room in the power-supply chassis for mounting the extra parts. The most convenient arrangement is to mount the 1-V socket on the chassis in the position formerly occupied by the voltage control, R_3, moving the latter to the edge of the chassis where it can be reached without removing the cover. The choke and condenser for the bias-supply filter can be mounted on a convenient inside edge.

Although the conditions existing in the amplifier with feedback do not approach the ideal—for example, with resistance coupling throughout the phase shift could probably be eliminated within the useful audio range—it does seem to us that the improvements resulting from the changes described above indicate that equal benefits could be secured in other types of speech equipment through a few simple modifications. Provided the amplifier reserve gain in the first place is high enough to take care of the reduction brought about by the use of inverse feedback, it should always be possible to improve the frequency characteristic and to reduce distortion. Most of us find such possibilities interesting, and certainly worth a trial when little besides time needs be expended.

A Rotary Spider-Web Loop Antenna with Reflector

(Continued from page 26)

sembled. All the poles are laid out on the ground as shown in Fig. 1 so that their included angles are 45 degrees and lengths O-B, O-C, and O-D are made 6 feet. Then lengths O-B′, O-C′, and O-D′ are trimmed to 12 feet (at the small ends of the poles, since these portions are rather weak). They are then lashed together at point "O" with the large ends of the poles at points A, B, C, D and A′.

Ordinary antenna insulators are used at "X" and "Y." Two insulators at point "Y" can be used to better advantage than a single insulator since this will provide a means for drawing up the radiator to make it taut after it is of the correct electrical length. At all points other than "X" and "Y" (a total of eleven) where either the radiator or reflector is secured to a point on any bamboo pole, the above-mentioned porcelain cleats or other insulators are used.

The distance from insulator "X" to point "G," at the center of reflector, is approximately one-quarter wave. The reflector is cut long and pruned for greatest current in the reflector at point "G" with the radiator excited. A small incandescent bulb (Xmas tree type) shunted across a few inches of the reflector at point "G" is a simple means for indication of maximum current at this point. Should you have a radio-frequency meter around the shack with appropriate scale, it can be used to advantage. The reflector length was found to be quite critical.

The spacing of the reflector and radiator should be set with a signal-strength meter if possible. Testing with a distant station is also all right, provided the receiving station has a meter of some kind for indication of signal input and the band is in a steady condition at the time of the tests. This latter, however, is practically impossible to attain. In tuning up be careful to make sure that the antenna is always at the same height because the effective height above the ground influences radiator and reflector lengths. In one instance here we found that the radiator had to be lengthened 7 inches when 4 feet off the ground whereas at 24-foot height it had to be this amount shorter. Remember that care in pruning is the difference between an antenna that goes places and one that is just another antenna.

As mentioned previously, the array can be suspended between two masts or poles by making a simple bridle of rope (similar to a kite bridle) attached to points 1, 2, 3, 4, 5, 6, 7, 8, and 0. We tried attaching the bridle to points 1, 2, 3, 4 and 0, but prefer the former because it prevents sag. Shortening up on the forward ropes permits adjustment of the tilt angle. A separate rope could be run to the operating room to adjust the tilt angle if preferred. This could be accomplished by running a rope through a small pulley which is secured to a stick driven in the ground directly beneath the antenna pole intersection. We have

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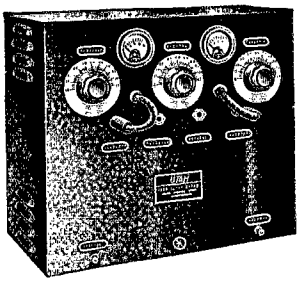
CORRECTION!

An error was made in the Listing of the Prices on the Utah Amateur Transmitter Kits ON PAGE 37 OF THE NEW NEWARK HAM CATALOG. The correct prices of the Kits are given below. Please change the prices in your catalog accordingly.



UTAH JR. $15.95
UTAH KIT NO. 1 $49.75
UTAH KIT NO. 2 $44.50
UTAH KIT NO. 3 $13.95
UTAH KIT NO. 4 $49.75
UTAH KIT NO. 5 $49.75

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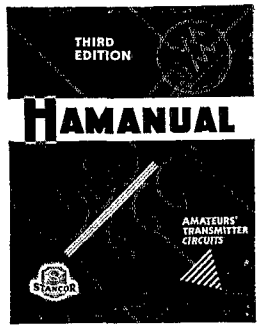

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not attempted this, but believe it could be made to work.

A word about the tilt angle. A fixed tilt angle of 15 to 20 degrees, determined experimentally here at this location, seems to be about right. On tests with stations in this country we found that a tilt angle of approximately 20 degrees increased the signal strength nearly 33 percent as compared to either a tilt angle of 0 degrees or 45 degrees. As the tilt angle approached 45 degrees the gain equaled that which was obtained in the horizontal position. The radiation to the rear decreased at a 20-degree tilt angle and increased to half the forward radiation at both 0 and 45 degrees. This made for a front-to-back gain in the array of approximately 8 db at the distant receiving station.

In Fig. 2 a field-strength diagram is given for the array. This was taken by setting up a field strength meter 300 feet distant from the antenna and then rotating the array. The curve is plotted for db values above the minimum observed. The pattern is unbelievably sharp for such a simple array. Often, after hearing some station, we rotate the beam until we get maximum signal

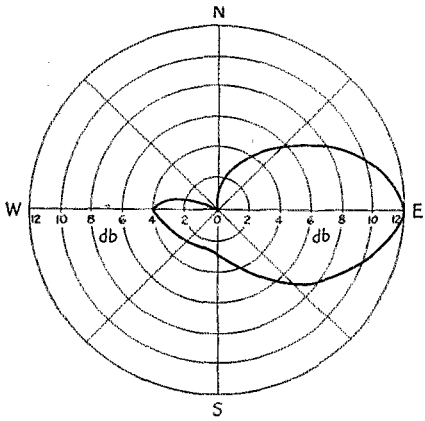

FIG. 2—RADIATION PATTERN PLOTTED IN DB ABOVE MINIMUM FIELD STRENGTH IN N.W. DIRECTION

The measurements were made with the web 24 feet above ground and tilted 20 degrees above horizontal in the forward direction.

strength on the receiver. You really get a kick hearing a weak DX signal build up until it is above the noise. Also, it is amusing how it discriminates against signals that would otherwise make a QSO impossible.

In addition to having a lobe right off the front there are also lobes off the top and bottom. Working at a height of one-half wavelength above ground seems to assist in cancelling these two lobes. However, they are not entirely lost and they undoubtedly help from a high-angle radiation standpoint. It seems to work out in practice that during the daylight hours when skip is comparatively close in, possibly only 1 to 2 S-points difference in signal strength may be noted with rotation of the array. However, at other times, when the skip distance is much greater, a differ-

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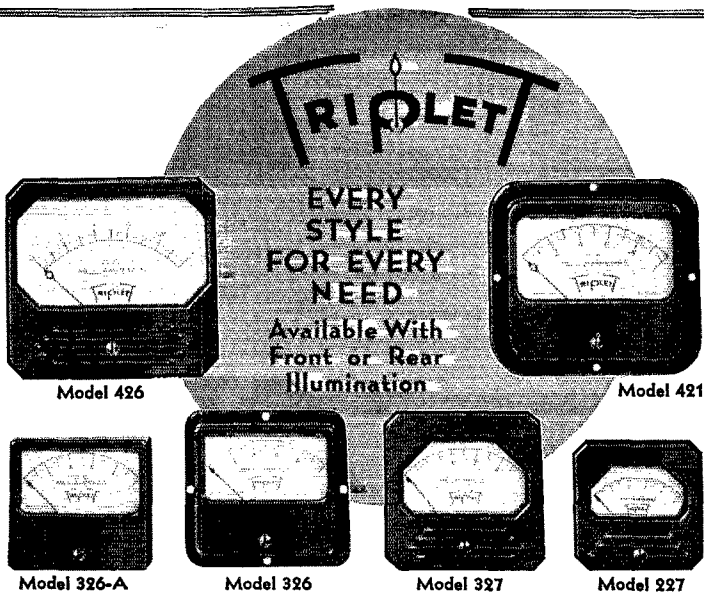

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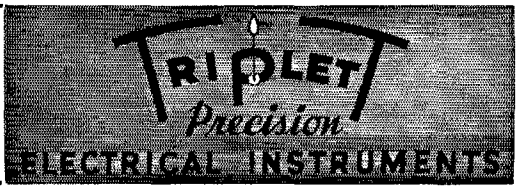

ence of as high as 6 S-points have been noted after rotating the array.

W8MJM has had one up for approximately five months and claims much for it, especially from the receiving angle. W9CIH, Bob Palmer at Ashland, Wis., has also had one up for quite some time. He has been reported "S9 plus" in Manila, P. I., at noon, C.S.T., and says that to date he never has had less than S7 from VK's. The snapshot of W8MJM's installation shows it to be more of the conventional type of rotary set up. Bob has his on top of the house.

In conclusion, we can state that the rotary web array has far surpassed the general run of fixed type antennas used at this location. It has been in operation since March 20, 1937, and has given excellent service since its installation. QRM is decreased to a remarkable extent when using the array for a receiving antenna; and the system also has been a revelation in hearing and working DX.

. . . 78° North, 72° West

(Continued from page 31)

signals have been heard on the 3.5- or 8-Mc. bands. On 28 Mc., during the first part of October, I did hear a few weak signals. However, not much time was spent there; merely listening just to see what conditions were like. I hope we shall be able to contact all of you boys who want to get another country or zone that lies up here for you. Your messages, relays and contacts are all greatly appreciated by Captain C. J. MacGregor, by the crew and me. We will be frozen in here at Reindeer Point, near Etah, Greenland at least until the middle of next July—then we leave as soon as the ice breaks up and we can get out.

The MacGregor Expedition Transmitter

THE r.f. line-up consists of an RK-25 crystal oscillator capacity coupled to an RK-39 buffer-doubler. This stage is link-coupled to a pair of RK-20's which furnish ample power to drive the final, consisting of two HK-354's running at 2000 volts with an input of 500 watts. When this layout was decided upon it was borne in mind that it would be possible to use the RK-20's as the final should reduced-power operation become desirable.

To guard against burning out irreplaceable parts, an underload and an overload relay were incorporated in the power supply of the final.

The audio-frequency end of the transmitter was built to operate from a crystal microphone. The speech equipment is divided into two sections, a pre-amplifier and main amplifier, so designed that the frequency response characteristic and hum level are satisfactory for re-broadcast use. The pre-amplifier is resistance coupled up to the output, and is very compact. Two gain controls are provided to take care of the different levels of the microphones used. The volume con-

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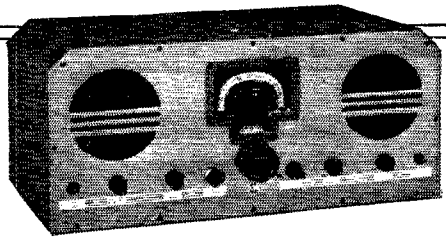

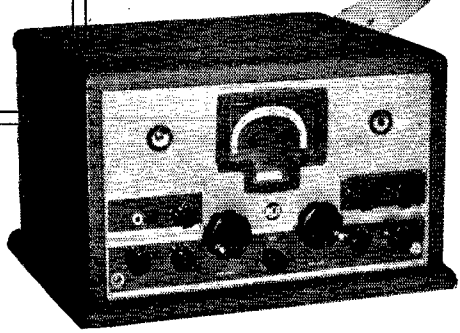

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trol in the grid of the last pre-amplifier stage is always kept at the lowest setting possible without making it necessary to overload the first two stages. This, together with the fact that the low-level stages are run at greatly reduced plate voltages, makes it possible to have a large amount of gain in reserve without the attendant microphonic and noise problems. In order further to reduce microphonics the chassis is mounted on four conical springs which absorb and deaden shocks. The pre-amplifier sits on the operating table beside the microphone, convenient for gain adjustments and well separated from its power supply, which is in the rack. The output is coupled to the main amplifier from the 500-ohm output through a shielded cable.

In the construction of the entire transmitter "trick" circuits were avoided; only the tried and proven ones were used. This was not necessarily dictated by a conservative nature but by time. The ship was due to sail within such a short time after all the parts were at hand that the bugs to be ironed out had to be practically non-existent. Two racks full of parts had to go together and work right, the first time. They did. In fact there was enough time left over to get a few hours' sleep before loading the transmitter on ship board.

Following this conservative design the driver for the modulator consists of push-pull 6C5G's transformer coupled to push-pull 2A3's self-biased. The 2A3's drive a pair of United Electronics 905's operating at zero bias and 1250 volts plate. The 2A3's provide ample driving power with good regulation so 250 or more watts of audio are available. The 905's are capable of delivering 300 watts under the operating conditions, so no more than the usual trouble of adding a stabilizing resistor or condenser in the various grid circuits was anticipated. Upon final test, however, it was evident that the full power output with beautiful quality was being obtained. No further adjustment was needed.

The power supplies are designed to operate well within the maximum tube ratings in order to obtain trouble-free operation. Time-delay relays protect all mercury-vapor rectifiers from the application of plate voltage before the filaments are up to temperature, and more than adequate wiring insulation throughout insures against breakdowns.

To keep hum level down sufficiently to be acceptable for rebroadcast purposes, ample filtering is used on all power supplies. Careful checks at the time of construction indicated a hum level 55 db below maximum signal.

For several reasons it seemed best to construct the rack assembly so that all the input and output connections on each chassis would be readily accessible from the rear. In the first place, the racks had to be completely taken down to get them in or out of the cabin of the ship. Secondly, it would be easier to locate and isolate any fault. Following this plan each chassis was provided with screw terminals for its a.c., d.c., audio or r.f. inputs or r.f. inputs and outputs, stand-off insulators being used when necessary. The final

cabling and installation of protective relays and switches was done on board ship. A type of varnished-cambric covered wire which will stand a test of 12,000 volts was used for all high-voltage leads.

A message dated October 28th to A.R.R.L. Hq. was received by W1DF saying that the following stations had been worked by OX2QY-W10XAB-WAWG up to date of Oct. 28th:

W1ADM W1AQF W1AQT W1BLO W1CC W1CRW W1DF W1EH W1IAS W1IED W1JND W1JNH/2 W1JZA W1KCK W1LZ W1SZ W1ZB W2AN W2AZ W2BYP W2CIF W2CQL W2CYS W2EEN W2FZY W2GTZ W2GUM W2IJG W2IXY W2JT W2PP W2QL W2WC W3ANH W3BEM W3BSY W3CIM W3CZS W3DHM W3DPU W3EMA W3EMM W3ETV W3EXB W3FQP W3GIH W3QP W4AHH W4BAZ W4BYY W4CYU W4DCR W4DSY W4EQM W4ERT W4MS W4QI W4TO W5ACF W5ASG W5COU W5CYC W5ECT W5EGQ W5FHJ W5FIY W6EW W6EXQ W7ALZ W7AMX W8AON W8AYN W8BTI W8CJG W8CJJ W8CRA W8DFH W8DHM W8FJN W8GYB W8HXO W8HZU W8ISK W8ITK W8KML W8LJ W8LPI W8LRJ W8LTR W8LYQ W8MAH W8MPX W8NHP W8NJP W8NWV W8NXQ W8NYD W8ORQ W8POQ W8PTD W8QDU W8QFI W8QGU W8QXT W8RL W8WI W8ZY W9ADN W9AFB W9AKI W9BBU W9BCV W9BEZ W9CJJ/9 W9DGL W9EBQ W9EME W9FJK W9FKA W9FOV W9FS W9HER W9HVT W9IAC W9IVG W9JIE W9MDF W9NER W9QI W9SDQ W9UAZ W9VDY W9VXZ W9WZW W9YOL W9ZDO W9ZTO CO2EG CO7CX HI7G LU9BZ VE2GA VE3QL VE3RN VE4BB VE4RO VO6JQ.

Army-Amateur System Activities

(Continued from page 32)

The Ninth Corps Area won first place, the Third Corps Area second, with the Seventh Corps Area third.

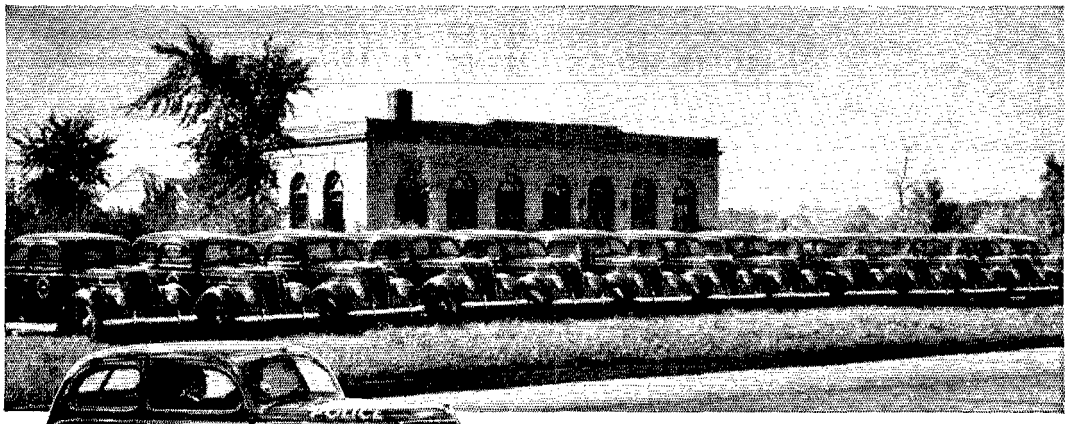
W8GMZ, Third C.A., had the highest individual score of 75 points. W6CVL, Ninth C.A., was second with 56 points, and W9BNT of the Seventh C.A. and W6KFC of the Eighth C.A. tied for third place with 53 points each.

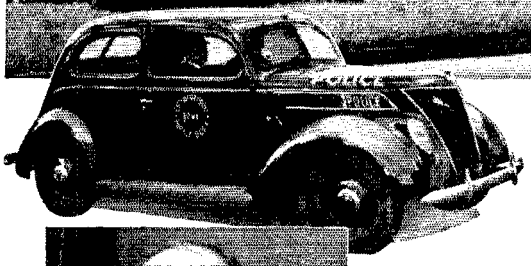
Designing the Speech Amplifier

(Continued from page 34)

is needed. The gain of the input amplifier described in this article is about 21 db. The 6J7-6J5 combination is an ideal one to drive a pair of 2A3 tubes in Class-AB. The gain is adequate for use with microphones of — 60 db or higher output level.

These design considerations have worked out very well in practice. In the photograph is an amplifier which was built by the author for the Bowdoin Expedition station, VE1IN. This was originally designed with a triode instead of a pentode in the input stage. When an attempt was made to transmit bird calls to a receiver and sound truck for scientific recording purposes, we had





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great difficulty with r.f. pickup coming in from a 1400-foot unshielded cable connecting a field amplifier of — 25 db output to the speech amplifier illustrated. We had expected, too, that this pickup could be eliminated by choice of band-stop or low pass filters inserted in the 500-ohm line. However, even such drastic methods would not stop the r.f. interference. Then the 6J7 pentode was installed in the amplifier and the trouble was cured completely. Furthermore, this almost phenomenal success has been duplicated by us with entirely different setups.

Cathode Coupled Driver for Class-B Modulators

(Continued from page 55)

preamplifier, employing, for instance, push-pull 6C5's, 56's, 76's, or their equivalent, as the final stage.

It is well to admit here and now that the drive delivered by the 6L6 to the 805's in this circuit possesses some harmonic content at high power levels, but this is so small that on voice amplification it is not noticeable to the ear, and shows up but slightly on a 'scope. This should not be misconstrued as a reflection on this economical drive system; many of the conventional plate-coupled drivers produce much more distortion.

The modulator, shown in Fig. 1, is so designed that it will work from any line having a level of + 14 to + 20 db, although it could be coupled directly to a low-level stage by use of an inter-stage transformer with a 3:1 step-up ratio. As previously mentioned, this type of driver is degenerative, and thus more voltage must appear from the grid of the 6L6 to ground than across the primary of the driver transformer T_2. This means that more voltage is usually needed at the grid of the 6L6 than could be obtained from a low-level stage. The 6L6 is operated with 400 volts on the plate and 300 volts on the screen.

A variable resistor is used in the cathode of the 6L6 tube. This is for adjusting the bias on the 6L6 (— 20 to — 22 volts). A jack for reading the plate current of the 6L6 (50 to 55 ma.) is also included so that the tube may be adjusted for maximum swing without overloading. This condition would be indicated by a shift in the plate current of the 6L6. Furthermore, the driver transformer used is of the variable-ratio type, which allows adjustment for best results and covers a wide range of ratios. Thus the constants of the circuit in which the 6L6 operates may be varied for optimum performance.

The best ratio, as found by the author, was a step-down ratio, primary to ½ secondary, of 1.30 to 1.0; that is, a step-up ratio, primary to total secondary, of 1:1.54—so that an r.m.s. grid voltage of 150 volts grid-to-grid at the 805's necessitates approximately 100 volts on the primary of the driver transformer, and approximately 120 volts to the grid of the 6L6—which boils down to approximately the original + 14 db level input, when transformed from the 500-ohm line.

A Complete Oscilloscope

(Continued from page 37)

are shown. These have proven entirely satisfactory, although the holes in the bottom and back are still necessary because without them there is practically no ventilation and even the tubes radiate a respectable amount of heat. The cabinet should be mounted on rubber feet to permit the air to enter the cabinet through the bottom.

The frequency response range of the amplifiers should be very great, extending from the very lowest audio frequencies to the lower r.f. frequencies. No facilities have been available for check-

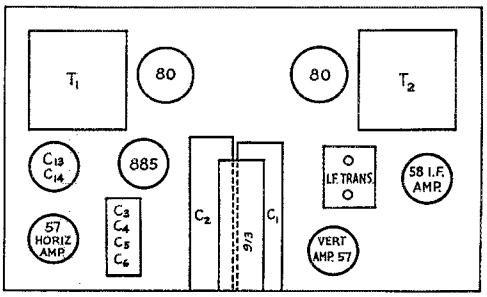

FIG. 2—PLACEMENT OF THE PRINCIPAL COMPONENTS IS INDICATED BY THIS SKETCH

ing this response but it has been found adequate in service. The gain controls are connected as variable resistors in series with the plates so that as the value of resistance is reduced the gain in the stage drops but the high frequency cut-off frequency increases. The disadvantage of this method of controlling the gain is that the voltage applied to the grid of either amplifier must not exceed the bias voltage or serious distortion will result. If the voltage to be observed exceeds this value but still is not sufficient for adequate deflection without an amplifier, an external voltage divider must be used. For this reason, and because the response of the amplifier should be adequate for all audio frequencies with the maximum resistance in the plate circuits, it probably would be better to replace the 75,000-ohm variable plate resistors with fixed resistors of that value and put the gain controls in the grid circuits. If this is desired, the 2-megohm grid resistors may be replaced with 1-megohm potentiometers, connecting the grid to the moving contact and the outer ends to input and ground. This does not refer to the i.f. amplifier, the gain control for which should be in the cathode as shown.

The frequency of the i.f. transformer should be, of course, the same as that of the i.f. amplifier of the receiver. In most cases it will be approximately 460 kc. Little or no selectivity is desired in this stage but maximum gain is necessary; so the i.f. transformer should be removed from its shield and the coils pushed closer together. This may usually be accomplished by heating the wax with a soldering iron. About a half or a third of the original spacing will be satisfactory. The

transformer may then be reassembled in its shield and installed.

If proper components are used and no mistakes have been made in the wiring, the oscilloscope will go right to work without any adjustments except rotation of the tube so that the horizontal deflection will be horizontal and the vertical deflection vertical, and trimming of the i.f. transformer to the proper frequency.

When wiring the 913 socket the leads should be left long enough to permit 90-degree rotation of the tube. The i.f. transformer may be tuned to resonance at the i.f. frequency by coupling the grid of the 58 to the grid of the last i.f. stage in the receiver with a small mica condenser. The chassis of the scope should be connected to the receiver chassis. Then with a strong signal tuned in, the i.f. transformer in the scope should be adjusted for maximum vertical deflection. The linear sweep circuit should be used for horizontal deflection. Because the input capacity of the 58 plus the lead to the scope will detune the receiver i.f., it will be necessary to retrim the receiver i.f. for maximum sensitivity and selectivity.

Control R_5 is useful to permit some of the observed voltage to be coupled to the linear sweep to keep the pattern from moving on the screen. Resistor R_4 is the vernier sweep-frequency adjustment and SW_1 is the coarse sweep frequency control. Resistor R_{11} controls the horizontal amplifier gain and R_{16} the vertical low-frequency amplifier gain, while R_{12} controls the i.f. amplifier gain. R_{20} controls the brilliancy of the picture and R_{19} controls the focus, although these controls are interlocking to some extent and proper focus involves proper adjustment of both. The use of the other controls should be evident from the diagram and panel view.

The satisfaction derived from the use of the instrument will more than justify its cost; and not a little of the satisfaction will come from knowing that the inclusion of the i.f. amplifier makes it more complete for amateur use than most of the expensive commercial oscilloscopes.

Silent Keys

It is with deep regret that we record the passing of these amateurs:

Harry B. Boyer, W8FRL, Youngstown, Ohio
Wm. L. Coogan, W1HZH, Winthrop, Mass.
Harry G. Cotter, W8AXF, Toledo, Ohio
Robert E. Dennis, W3DJE, Washington, D. C.
Samuel Frankel, W8BYI, Wilkes-Barre, Pa.
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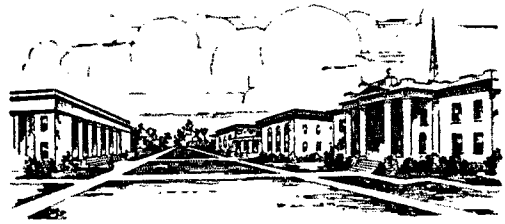

Practical Experience
Studio— Transmitter— Announcing

PORT ARTHUR COLLEGE has been teaching Radio for twenty-eight years, and during this time it has never been our policy to guarantee positions to prospective students, directly or indirectly. We believe it wisdom at this time, however, to go on record in our *QST* advertising to say that it is impossible for us to even come near to supplying the demand for Radio Operators received by our Employment Department. We do not mean by this that all students who enroll will automatically secure positions. The demand is for graduates — good men who deserve and are qualified to hold positions. The graduates of our Radio School, so far as we know or can learn, are employed 100%.

It is possible for every student who enters the P. A. C. Radio School and completes the course in keeping with our standards to receive employment as a Radio Operator for our station K P A C at the transmitter, in the control room, as trans-radio press operator, or announcer, and not only earn more money than he pays for the training but to also continue his training as a post-graduate student in advanced work and prepare himself to secure and hold operating positions in the upper bracket of broadcasting, marine work, announcing, or airways.

Port Arthur College advertises primarily to Radio Amateurs, and the training is too technical for the average student who has not selected Radio as his life's work. We know the opportunities for positions and advancement are unlimited for men who are interested in Radio and who plan to make this their career and are willing to make the sacrifice and effort necessary to master our training. P. A. C. maintains strict collegiate rank — only high school or college graduates are eligible for enrollment.

If interested in details about Radio Course, write for bulletin R

PORT ARTHUR COLLEGE ▪ **PORT ARTHUR** *(World-known port)* **TEXAS**

(*Continued from page 58*)

resulted in the following changes: pres., FS. and treas. HG. EU is still sec'y. Flash. . . . Congrats are in order for IE, a new YL operator has arrived. Will the following please drop me a line to the S.C.M. before the 16th December: AK, BQ, CY, DA, EG, FR, GD, HR, IF, JH, KP, LB?

Traffic: **VE2**LU 8 KF 11 EC 32 AB 7 DR 14 EE 10 KN 12 HL 6 LC 26 BE 5.

VANALTA DIVISION

ALBERTA—SCM, Alfred D. Kettenbach, VE4LX—Due to the illness of his son, LX will be absent from Alberta until March 1st. During his absence GD, of 611 First Ave., N.W., Calgary, will act as S.C.M. Please send Jim your monthly reports and notes on Ham doings. FR bought an R.C.A. 14-Mc. crystal. AAB using the Varsith Ham Club rig. AH has receiver finished. BV's junior ops went "on the air" one night when the OM and XYL were away; consequences are BV has to rebuild. LQ is the first and only ham in Edmonton to work five bands on one rig. LQ is now Official Broadcasting Station for Northern Alberta. AEA gets good results on 56 Mc. VJ and ABH are also on 56 Mc. VJ is using pair of tens in final with 85 watts input; he is the Northern Alberta representative of T9X. AGZ's new antenna works FB. HM returned from his trip down East and reports a very fine time all around; he brought back a tape recorder, so watch those fists, gang, or Chas. will put the "bee" on you. XE put in new crystal. AHY is blossoming out with a pair of '45's TNT. HJ is going to try P.P. e.c. rig. BW made trip North to install commercial rig. ABH's second op is taking over, as the OM is QRL in B. C. EA is to be congratulated upon obtaining his W.A.C. certificate. YD, new O.R.S. and on Alberta Net, will put Peace River on the map. UY makes QTH at Grande Prairie now. AAS will be on with VE5 call soon. ADD will try 28-Mc. 'phone. AEV is heard on 3.5-Mc. 'phone. IN is on again. HF and his two or three watts are sure going places. XX is series modulating on 3.5-Mc. 'phone. N.A.R.C. met Oct. 9th with good attendance; monthly raffles stimulate interest in the meetings. KI is after 14-Mc. DX. AFT still leads the traffic hounds. AJQ is new ham at Three Hills, active on 7 Mc.

Traffic: **VE4**AFT 38 GE 27 LQ 12 YD 8 WX 7 KI 6 QK-SW 5.

PRAIRIE DIVISION

MANITOBA—SCM, A. J. R. Simpson, VE4BG—Once again we find full operation on the Trunk Line with AAW ably holding down the job as key station for Winnipeg. GC is kept too busy at the job to put in time operating, but is there if AAW should need relief with T.L. schedules. IP completed rebuilding. Probably the most consistent 14-Mc. 'phone in Winnipeg is NI. With the arrival of a Collins 45A rig at ZK we now have ZK and KX with companion transmitters. EK and TJ have installed signal squirters. EJ is installing a new 28-Mc. antenna. JI is the Winnipeg Radio Club station. GL is installing a 35T to replace the '10's in a buffer stage. AEC has replaced his RK20 with a T35. OK is heard on 14-Mc. 'phone. QF will shortly be leaving for Kansas City to spend the winter months taking a course in aviation radio. AEO up at the Flin Flon sends in news on the boys there. WR is now located in New Westminster, B. C. IA has moved to the Flin Flon and, when not pounding brass, is busy pounding the rock roads in a gold mine company truck; he is looking for a 110-volt a.c. generator, 200 watts. Anyone knowing of such a generator should write to IA at the Flin Flon. OB is another Winnipeg ham moved to the Flin Flon. AEQ is back from his vacation with a 600-volt power supply. AEO has antenna up at the new location. AEB, whose rig at Reedy Creek came in very helpful during several emergencies, is now located in Winnipeg. CQ of Waldron, Sask., was a visitor to Winnipeg. W3IPP also visited in Winnipeg. AJC joined the Rag Chewers Club. MY has completed a new super receiver. RO works all the DX to be heard. SR has his grid-bias 'phone working nicely on 28 Mc. AFK is putting out a nice signal on 14 Mc. with a 6L6 final. AG finds 3.9-Mc. 'phone much more comfortable than 14 Mc. Reports and comments from the rural and outlying points in Manitoba would be appreciated by your S.C.M.

Traffic: **VE4**AAW 39 AJC 5.

SASKATCHEWAN—SCM, Wilfred Skaife, VE4EL—EL, our S.C.M., is in hospital recuperating from an operation. The gang wish him a speedy recovery. Regina hams started off season with a banquet and election of officers: Howie Furnell, pres.; Alex Schultz, secy. XM is experimenting with aerials. A little Loud Speaker has arrived at FY's. KM is building a new superhet. SY is going to try a T55. OM is now using an HF100. AJA is a new Moose Jaw ham; welcome, OM. OP has his stick up at new QTH. MI, formerly PG, is back again working at Govt. Elevators. JV is chasing the elusive DX on 28 Mc. ZC snared an OX. RH, XY and SQ are new comers to Saskatoon. SQ is heard on 3.9-Mc. 'phone. JB is now at Yorkton. VK is on 28-Mc. 'phone with 20 watts input. OZ is busy handling traffic and studying for 2nd class ticket. ACC rebuilt transmitter to a 6L6 tritet. VZ is proud possessor of an ACR-136. ABF is pleased with his vibrator power supply. PV is using 500 volts from wet batteries. MX is ready again on 3.5 Mc.

ATLANTIC DIVISION

EASTERN PENNSYLVANIA—SCM, John Buck Morgan, W3QP—RM's 3AKB, 3AQN, 3EOP, 8ASW. P.A.M.: 3EOZ. 3BGS hooked three new countries. 3DGC is sporting new Harvey 60X. 3GMK is going strong on 1.75 Mc. 8ASW had the shack done over and is all set for big business. 8DHT is all set for net schedules. 8AXH has 6L6-560 working in great shape. 8HKS wants in on traffic net. 3CXE reports 3GFK either struck oil or is putting up a signal squirter. 3GXK is on 28 Mc. 3GJA about finished rebuilding. 3GJA is on 14 Mc. 3GUM is on 7 Mc. 3CZS worked OX2QY. 3EOZ, P.A.M., has new 14-Mc. beam. 3GNF, second opr for long time at 3IU, is working 1.75-Mc. 'phone. 3EML schedules K5AA while QP is away. 8CDT is helping 8RFN get on. 8BQ is experimenting with new e.c.o. CUD's daughter married AZG. Congratulations! 3ADE and 3AGK are all shined up for big season. 3AQN and 3EHZ are keeping schedules. 3FVQ attended Hudson Div. Conv. 8EU reports 8BYI "Silent Key." Your S.C.M. made B.P.L. this month on deliveries. Last but not least, we have on for "Ripley." Your SCM has taken unto himself a wife, and at this writing is on a honeymoon to parts unknown. The gang joins the stooge writing this report in saying "Congratulations, Jack and much happiness."

Traffic: **W3**ADE 9 3AGK 4 3AKB 87 3AQN 75 3BGD 4 3DGC 22 3EHZ 8 3ETM 6 3EWJ 85 3GDI 35 3GMK 6 3QP 216 8ASW 56 8AXH 3 8DHT 101 8EU 7 8HKS 14 3EOP 2 3IU 4 3EML 17 8CDT 3.

MD., DEL., D. C. SCM—E. L. Hudson, W3BAK—3CQS, 3CXL, R.M.'s. 3BWT, Chief R.M. BWT relayed to Wake Forest College in N. C. via 4DW the complete description of the G. Washington vs. Wake. Forest football game played in Washn., for publication in Wake College weekly paper. GKN has installed new concentric cable. JA/3 is running 5 to 6 watts input. GXO is O.P.S. in Baltimore. BAK is rebuilding. EHW plans to move to Baltimore. HBQ is new Westminster ham. GRX is in hospital with asthma. FN is building 14-Mc. rotatable beam. Following notes from EZN of Washington Radio Club: Er returned from a cross-country trip with President Roosevelt. CDQ returned from a summer's vacation abroad; she visited many interesting DX stations GUW has been confined to hospital. BKZ lost his appendix Aug. 23.

Traffic: **W3**CXL 177 (WLM 1722) SN 532 CIZ 422. BWT 302 GKN 87 EIV 116 FSP 63 FPQ 19 GKZ 11 JA/3 10 CDG 5 GXO-BAK 5 CYV 3.

SOUTHERN NEW JERSEY—SCM, W. Walter Filson, W3BEI—The So. Jersey 3700-Kc. Net is again holding its regular sessions. EFM has taken over the Eastern terminus on Trunk Line "B." FCQ is operating on 14, 7 and 3.5 Mc. FPA, a new addition to the Section, helps fill in for Atlantic City. DNU reports the following officers for Atlantic Radio Club: Pres., PC; Sec., FML; Treas., UT. The Greater Camden Club sent a delegation to the Hudson Div. at Asbury Park comprised of BYK, CZN, DBF and DJR. CES took a month's vacation in Florida. BYR is acting as alternate station in Trunk Line "B." BO is going 3.9-Mc. 'phone in spare time. ZX has completed his schedules with Russia. BEI still schedules K4ENY.

Traffic: **W3**BYR 92 EFM 49 (WLNJ 61) BEI 26 FPA 10 FCQ 9 AEJ 8 DNU 7 FBM 4 ZX 4 ZI 119.

WESTERN NEW YORK—SCM, Charles Smith, W8DSS—R.M.'s: 8BJO, 8CSE, 8AQE, 8JTT. P.A.M.,

8CGU. FCG and GWY have done good work by filling in as temporary N.C.S. in W.N.Y. 1 Traffic Net. PLA leads the traffic gang. CSE is one of the busiest hams in the Section. Our new O.R.S., QMR, has a real total with his first report. AQE, DHU, MQX, KXA and GWT expect to line up some real active schedules. PCW is conducting code classes at U. of Cincinnati and operating 8YX in spare time. QIL wants to join O.R.S. and A.A.R.S. LGH and PWU send fine examinations on O.R.S. Test. KXA says EBO has new receiver and NFT is operating portable 3.9-Mc. 'phone in Canandaigua. CGU has a new beam antenna and is doing wonderful DX work on 14-Mc. 'phone; he has a regular schedule with Australia. QOP and ABN are progressing nicely with their O.R.S. work. The Schenectady Hamfest was well attended by Western New York hams including, among others, LUQ, CGU, DT, GWY, LN, CPC, DSS and FPG.

Traffic: **W8**PLA 271 CSE 156 (WLNM 50) QMR 53 FCG 47 DSS 24 DHU 8 CGU-QDP 6 AQE 3.

WESTERN PENNSYLVANIA—SCM, Kendall Speer, Jr., W8OFO—R.M.'s: 8KUN, 8KWA, 8MOT. New R.M.: 8GBC. P.A.M.: 8QNQ. A.A.R.S. Liaison R.M.: 8UK. N.C.R. Liaison R.M.: 8KOB. New O.R.S.: 9YXD/8. Prospective O.R.S.: HBG; O.P.S.: GQE. The traffic season is in full swing with the two O.R.S. nets doing a bang-up job. The O.P.S. 1.75-Mc. Net is beginning to take shape. C.W. and 'phone men interested in traffic work are requested to write the S.C.M. for application blanks for membership in either net. Only requirements: You must become an O.R.S. or O.P.S. and be active on net schedules. Crystals are furnished gratis. Western Penna. is represented in the National Trunk Line Net by KWA and OFO. KWA, MOT and OFO also operate on the regular trunk lines: "A," "L" and "M" respectively. For speedy delivery, route your traffic through Western Penna. O.R.S. and Trunk Line stations. Two O.R.S. made the B.P.L. this month: MOT and OFO. WLMA/8YA made the B.P.L. in the A.A.R.S. UK lacks seven for B.P.L. on deliveries. MOT says JIC has moved from W.N.Y. to this Section. JMP's DX is now one hundred countries. KBJ is working 14 and 28-Mc. 'phone. UK is building new rack-and-panel rig. YA has been handling quite a bit of China refugee traffic. INE is back on. NDE says the Humdinger Net has swung into action again. DDC will alternate for OFO on T.L. "M." GBC is alternating on T.L. "L" for MOT. IOH says REE makes the fourteenth amateur in St. Marys. CMP is grandfather on three counts now, but only one a possible op. PFW worked on W6 on 3.5. Mc. with S8 report. DGL says 6KKO has moved to Monessen. QCR has joined C.C.C. GUB is attending Dodge Institute in Ind. NCJ is working hard for W.A.C.; he worked all continents except Asia in two hours and fifty minutes. NCJ's XYL is taking code at better than 15 w.p.m. and will go up for exam soon. RBN increased power and installed new mike. QNW increased power to 600 watts. GQE completed rebuilding and has 350 watts. EUM's rig is now 750 watts, Class B modulated. OLU has married. Stations rebuilding are BID, MWY, QVQ, QNQ and QCI. LRL is working DX on 1.75-Mc. 'phone. LBB has a new 14-Mc. 'phone. OVQ is on 14-Mc. 'phone. MGZ is on 3.9-Mc. 'phone.

Traffic: **W8**MOT 706 OFO 545 KUN 287 KWA 276 GBC 247 UK 194 YA 106 (WLMA 584) NDE 91 DDC-QAN 86 KOB 83 IOH 71 CMP 67 FUW 36 AXD 33 MJK 32 PFW 21 HBG 10 MIW 5.

NEW ENGLAND DIVISION

CONNECTICUT—SCM, Frederick Ells, Jr., W1CTI—JMY is having a grand time in Nutmeg and A.A.R.S. nets with his new NC10IX. JBJ has a new NC10IX also. JXP finds traffic good in both Nutmeg and Humdinger nets. JBJ joined A.A.R.S. ITI tried 28 Mc. AFB is active on Trunk "C". HXZ made R.C.C. HYF won the main prize at Bridgeport State Convention, a National 10IX. College is just one big hamfest at Trinity (W1JUD); licensed hams attending are IRW, GWH, BNP, ILA, JDH, ILI and GKM. BFS is having plenty of trouble getting on the air what with Farming and night school, receiver out of order and transmitter partly rebuilt. TD will be on soon with buffer stage of new rig. A 9 lb., 5 oz. YL arrived at JLG Oct. 11th. Congrats, OM. CTI is anxious to appoint Emergency Coördinators in all cities of over 25,000 population or that have over 20 active amateurs. The Emergency Coördinator will be the S.C.M.'s chief assistant wholly responsible to the S.M.C. for the specific and important subject of amateur emergency organization progress in Connecticut. Note to clubs: Please refer to your September Club Bulletin and send in recommendations for the E.C. appointments.

Traffic: **W1**JMY 307 JXP 223 KV 174 (WLGI 26) AJB 149 (WLGG 69) DMP 146 UE 139 ITI 99 AFB 73 JYJ 59 KFN 49 ES 47 BDI 41 IYB 35 AMQ-BEO 18 HXZ 17 CTI 11 KQY-GKM 10 APW 8 AW-BNB 5 HYF-HTS-DWP 2 JUD 1.

MAINE—SCM, Winfield A. Ramsdell, W1FBJ—GOJ leads the list in traffic with very fine total. AQL is rebuilding. PQ has an outfit on 3.9-Mc. 'phone located at WABI. AKR and DUZ also operate this rig. JZM is designing and installing a 600-watt 'phone transmitter at Bowdoin College to operate on 3.9 Mc. under the old call OR. The Portland Amateur Wireless Ass'n has new call KVI and will operate on 3.5 and 56 Mc. from the clubhouse. SM5SX, Olof Rydbeck of the Royal Technical University, Stockholm, Sweden, was a recent visitor in Portland en route to Harvard, where he is spending a year. SM5SX plans to visit some of the hams whom he has worked many times on 14-Mc. 'phone. VV has purchased 1938 Skyrider and is building complete new outfit. PD is now living in Bedford, N. H. DOZ is new O.P.S. Plans are under way for a Maine Section QSO party to be held sometime in January. Details and date will be announced in next report. DHH had the misfortune to lose his 860, but has '52 in the final now running 200 watts. DRZ will be on 28 Mc. soon with 20 watt 'phone. JRS is using 6L6 osc. on 3.5. Mc. GXY attends the meetings of the P.A.W.A. frequently and would like to make contact with some of the Portland gang on 56 Mc. FAP is member of the Maine A.A.R.S. net. GVS has a 56 Mc. rig in his car which works FB. FIV is operating 3.9- and 14-Mc. 'phone. KUS has moved to Portland. This Section is far behind the leaders in the number of stations reporting traffic and the number of O.R.S. and O.P.S. stations. Let's all pull together and get up there at the top of the Division.

Traffic: **W1**GOJ 248 IST 111 INW 102 CFO 94 FAP 45 IVV-FBJ 21 HSD 17 HSE 14 DHH 2.

EASTERN MASSACHUSETTS—SCM, Sam Gross, W1IWC—IHI is proud papa of YL and is doing FB job as R.M. JCK is new member of E.M.N. INA finds time to play around on 14 Mc. between schedules. EMG almost made B.P.L. on deliveries. IWC has single control tuning for 89-807 exciter. JTM is trying 7 Mc. QA is back in traffic game. JJY is new net member in New Bedford. Well, gang, you certainly made your new S.C.M. feel good this month. Not satisfied with increasing last October's traffic total you topped it by nearly 45%! Thanks and congratulations. We still need more stations on the Section Net. Anyone interested in traffic work is invited to join us. Drop the S.C.M. a line for full dope. ALP is looking for new members for the South Shore Amateur Radio Club. ALB sends reports of the Hi-Q Club members. Thanks, Ray (other clubs please copy). ABG is active in N.C.R. JMS won T-125 at Boston Hamfest. FI (DA1C) starts N.C.R. Class C drills from Unit 1 Headquarters at Squantum. PI returned to "hamming" after many years as Radio Aide to 1st Corps Area, A.A.R.S. ALB, HA, INO, IQO, JIX and JQZ are having FB time with 28-Mc. 'phone. ALG is back on 7 Mc. ERH is playing with 3.9-Mc. 'phone with dummy ant. GXI has new Jr. Op. Congrats, OM. IPS is working plenty of DX on 14 Mc. JYB gets out FB with low power on 7 Mc. The Hi-Q Radio Club paid transportation expenses of its members to the Boston Hamfest. BAQ needs Ariz., N. Mex., Utah, and Nev. for W.A.S. KKO (16 yrs. old) asks if he is youngest ham in E. Mass. KMS worked 2KMS. WV is still at it—latest count, 800 G QSO's. The Cape Cod Radio Club held its annual hamfest at Orleans on Columbus Day.

Traffic: **W1**AKS 577 (WLGO 102) IHI 412 JCK 350 INA 277 EMG 246 JNF 184 (WLGY 52) HWE 121 IWC 89 DMF 72 KCT 69 JTM 52 AGX 47 HFJ 43 QA 38 IUQ 29 BEF 21 JJY 9 ASI-GLE 7 BMW 4 QW 1. (August-September: **W1**IHI 215 JMS 29.)

(*Continued on page 110*)

Standard Frequency Transmissions

Date	Schedule	Station	Date	Schedule	Station
Dec. 3	A	W6XK	Jan. 7	A	W9XAN
Dec. 10	A	W9XAN		B	W6XK
	B	W6XK	Jan. 14	A	W9XAN
Dec. 17	A	W9XAN		A	W6XK
	A	W6XK	Jan. 21	BB	W6XK
Dec. 24	BB	W6XK		A	W9XAN
	A	W9XAN	Jan. 22	BX	W6XK
Dec. 26	C	W6XK	Jan. 23	C	W6XK
Dec. 31	A	W6XK			

STANDARD FREQUENCY SCHEDULES

Time (p.m.)	Sched. and Freq. (kc.) A	B	Time (p.m.)	Sched. and Freq. (kc.) BB	C
8:00	3500	7000	4:00	7000	14,000
8:08	3600	7100	4:08	7100	14,100
8:16	3700	7200	4:16	7200	14,200
8:24	3800	7300	4:24	7300	14,300
8:32	3900		4:32		14,400
8:40	4000				

Time (a.m.)	Sched. and Freq. (kc.) BX
6:00	7000
6:08	7100
6:16	7200
6:24	7300

The time specified in the schedules is *local standard time at the transmitting station.* W9XAN uses Central Standard Time, and W6XK, Pacific Standard Time.

TRANSMITTING PROCEDURE

The time allotted to each transmission is 8 minutes divided as follows:

2 minutes—QST QST QST de (station call letters).

3 minutes—Characteristic letter of station followed by call letters and statement of frequency. The characteristic letter of W9XAN is "O"; and that of W6XK is "M."

1 minute—Statement of frequency in kilocycles and announcement of next frequency.

2 minutes—Time allowed to change to next frequency.

W9XAN: Elgin Observatory, Elgin National Watch Company, Elgin, Ill., Frank D. Urie in charge.

W6XK: Don Lee Broadcasting System, Los Angeles, Calif., Frank M. Kennedy in charge.

WWV Schedules

EACH Tuesday, Wednesday and Friday (except legal holidays), the National Bureau of Standards station, WWV, transmits with a power of 20 kw. on three carrier frequencies as follows: 10:00 to 11:30 A.M., E.S.T., on 5000 kc.; noon to 1:30 P.M., E.S.T., on 10,000 kc.; 2:00 to 3:30 P.M., E.S.T., on 20,000 kc. The Tuesday and Friday transmissions are unmodulated c.w. except for 1-second standard-time intervals consisting of short pulses with 1000-cycle modulation. On the Wednesday transmissions, the carrier is modulated 30% with a standard audio frequency of 1000 c.p.s. The standard musical pitch A = 440 c.p.s. is also transmitted from 4:00 P.M. to 2:00 A.M., E.S.T., daily except Saturdays and Sundays, on a carrier frequency of 5000 kc., power 1 kw., 100% modulation. The accuracy of the frequencies of the WWV transmissions is better than 1 part in 5,000,000.

Strays

And according to an AP dispatch, outdoor television pickups are being relayed to the studio by means of an ultra-violet wave transmitter!

(*Continued from page 107*)

WESTERN MASSACHUSETTS—SCM, William J. Barrett, W1JAH—IOT is trying low power DX on 14 Mc. IOR snags plenty of traffic with the new rig. BVR has been appointed Radio Aide for First Corps Area A.A.R.S.; Perce handled some Shanghai refugee traffic. ZW reports results of Worcester Radio Ass'n election: IOR, pres.; JNZ, vice-pres.; IZW, sec.-treas. How about some news from the other clubs? Ex-W3FXZ is now 1KUQ. ZB raised country total to 111. BKG is still working on the Super. HNE and AZW are lining up schedules for winter. KJK is new O.R.S. in Springfield. EOB is about ready to christen new rig with '04A in final. HJR finished second suitcase portable station. BNL is back on 3.5 Mc. and looking for schedules. AVK is Emergency Coordinator for Springfield.

Traffic: **W1**IOT 424 (WLGN 64) IOR 324 BVR 109 (WLG 192) IZW 66 KUQ 55 AJ 54 ZB-BKG 50 HNE 30 AZW 28 KJK-JAH 10 ISN 5 AJD 2.

NEW HAMPSHIRE—SCM, Carl B. Evans, W1BFT—The N. H. State Traffic Net is functioning smoothly every night except Sunday from 6:30 to 7:00 P.M. on 3840 kc. as a spot frequency net. QRZ's are called by control station and territory from 3750 to 3900 kc. are covered for anyone wanting to break in on the net. Sunday emergency net drills have been discontinued for the time being due to poor conditions. Any and all stations are welcome to break in on the State Net. The net still needs coverage in the northern part of the state: Hanover, Lancaster, Berlin, Plymouth and Laconia are needed to round things out. Stations in the above localities interested in the net, please get in touch with the S.C.M. right away. It is not necessary to be on every night; two or three nights a week will be sufficient. HOV joined the ranks of the Benedicts on Oct. 23rd. Congrats, best wishes, and lots of happiness from the whole section, Eddie. The M.V. A.R.A. sponsored a "send-off" party for HOV at BFT's shack in Riverhill. A beautiful gift was presented and a good time was had by all; 24 hams and friends attended. EAK is on 3.5 Mc. with a T-55 final. JSL has moved to new location which should be FB for 56 Mc. FCI has a new Harvey 700-R and should go places. IP is in the Nat'l Trunk Net. IVU put in a pair of RK37's. GKE put up a new 60 foot pole for DXing this winter.

Traffic: **W1**GMM 216 BFT 208 FFL 197 (WLGB 32) IDY 96 KIN 84 IP 78 TA 68 GHT 62 AXL 51 HTO 48 ANS 45 GDE 32 CEA 36 EAL 21 FCI 19 ITF 12 JDP 10 IJB 9 HGV 6 JGI 4.

RHODE ISLAND—SCM, Clayton C. Gordon, W1HRC—BVI is on 1.75 Mc. HJ is getting transferred to Norfolk, Va. HPE is building a shack to house the rig and entertain the gang. JFF has moved to new QTH with BVI and JNO helping the moving. JNO joined Supporting Division of A.R.R.L. Emergency Corp., put T-20's in final in place of '10's, and is active on 28 and 14 Mc. HRC took second trip up Mt. Washington and found ENU cooking for construction gang up there—held midget hamfest. ARK is back from the South, where he helped Dr. Andrews set up some "brain-wave" apparatus. CAB gave a talk on antennas at P.R.A. ETD and the Ex-YL took trip south to Washington, D. C.

Traffic: **W1**GTN 110 HRC 34.

VERMONT—SCM, Alvin H. Battison, W1GNF—C.R.M.: 1FSV. R.M.: 1EZ. P.A.M.: 1AVP, 1DPO. ERJ moved to Cornish, N. H., but plans to keep his station in Windsor. KUV in Johnson is using a '47-'46-'45's transmitter on 3647 kc. FSV makes a plea for more traffic activities from the gang. Traffic handling is the best operating practice in the world. Whether you are an experimenter, "DX'er" or "rag-chewer" you should, in order to gain the most from your hobby, handle some traffic each month. Be as proud of your "fist" as you would your manner of speech. It is as much a part of you—in radio operating. Traffic handling will do it. AAJ, BNS, FSV, GAN and YF and GAE attended the Schenectady, N. Y., Hamfest. FSV won a National 81X receiver. GAE won an 807 in the code speed contest. GAN won a pair of '66A's. GAN is building a new transmitter for BNS. CBW got married. KJG is running his A.E.C. transmitter on regular schedules. FPS has a new radio room and antennae. KOO completed the construction of a frequency meter-monitor. KVB, a new amateur in St. Albans, is using a c.c. '47-'46 transmitter and Sky Buddy receiver. HLH is rebuilding. ITE visited at KOO. JHE moved to Pennsylvania. JVS is using a c.c. 203B transmitter with 350 watts on 7, 14 and 28 Mc. KTB is the call of Merwin Forbes, Lyndonville. DPO is installing a new microphone. JPZ and ILX visited KJG and JRU. JLF has been running the 1.7-Mc. net in DPO's absence. BD resigned as N.C.S. of the A.A.R.S. His duties have been taken over for the present by GAE. ILX has constructed a rotary beam 28-Mc. antennae. AHN and GNF attended the Boston Hamfest and visited HE. JRU, JPZ, ILX and IDM visited at JLF. IDW has a new NC100 receiver. 8AJS is second operator at IDW while waiting for his new call. BJP visited at HRX, HTJ, BLC and received visits from UE2II, VE2FE, BLC, CUN and TJ. AD is putting a pair of '04A's on 1.7-Mc. 'phone.

Traffic: **W1**FSV 73 GNF 9 KVB 6 AHN 5.

ROANOKE DIVISION

NORTH CAROLINA—SCM, H. S. Carter, W4OG—8KKG, the ex-SCM of W. Va. s attending school at the U. of N. C. The gang extends a cordial invitation to all visitors to the State to attend our Floating Club meetings. DZS is on 14 Mc.; he is a member of "Supporting Division" of A.E.C. BVD has his rig with a pair of 100TH's ready to go. BHR is ready for the winter season with a 50 watt and a 500 watt rig. EG is rebuilding. BRT finds some time to be on. ESO is going to move to 3.5 Mc. for the winter. ESB is on 1.75 Mc. FT and EC erected 28-Mc. beams. EWP is on 28 Mc. BQZ built a couple of intercommunication rigs between the office and his home. EEL moved to new QTH. NY has power into his country home now, and is going strong on 28 Mc. BRK and BJV are hard at work with N.C.R. which is now on the air in the New Post Office building. DVU has a new 'phone on 1.75 Mc. DGV and BYA keep a schedule three times a week on 56 Mc. ABT reports some fine traffic now that the Army Net is on the air again; he is building a kw. rig. DWB is using a pair of '10's with 100 watts to a Zepp antenna. 3GKU was a recent visitor. He is on his way to California to become a W6. We will all miss him. DCQ is rebuilding. CFR is active on 7 Mc. WX of Lexington was a recent visitor to 4NC, also Ed Day of WLM/W3CXL.

Traffic: **W4**ABT 51 DWB 42 DW 33 AGF 10 NC 6 DZS 5 ESB 4 DGV 3.

SOUTH CAROLINA—SCM, Ted Ferguson, W4BQE—DYC reports eight hams at Clemson, also that the call ETP has been issued to the Club. DXJ has his O.R.S. DEF took a Naval Cruise. Amateurs at the U. of S. C.: 4ERF, CKA and 8IP. DNR is working 7 and 3.5 Mc. ECG has new skywire. EDQ likes 14 Mc. DNK is rebuilding. CPX has new rig with a 250T. DQY will soon have his rig on the air. CZA schedules BDT and CYY. EAU has new receiver. CKW is using RK-39 in final and has new Sky Challenger. EQP is active on the c.w. bands. EPJ is increasing power and will work both 'phone and c.w. DFC is now Unit Commander of the Charleston Naval Reserve. EWB is active at C.C.C. Camp near Newberry. BAY is planning a new transmitter. ALT and the boys are doing a fine job in the A.A.R.S. EWI is a new 3.5-Mc. ham at Lockhart. Thanks lots, gang, and let's have reports from more of you next time.

Traffic: **W4**BDT 116 CZA 30 EWB 16 CQU 11 DNR 1.

VIRGINIA—SCM, Charles M. Waff, Jr., W3UVA—P.A.M.: 3AIJ—R.M.'s: 3GPC, 3GJP, 3AKN, 3DQB, 3BJX, 3BYA—Organized fall activity has begun in earnest with the formation of the Virginia Traffic Net. GPC replaces BYA, who resigned, as a member of Trunk Line "C". The V.T.N. centers around the R.M.'s who schedule each other and as many others as possible. All interested in joining the V.T.N. may get full information by writing to the R.M. in your section of the state or to the S.C.M. All O.R.S. *should* belong to the V.T.N. If you do not join, your appointment is liable to cancellation unless proof of other traffic forthcoming. This is not intended to put a burden on anyone; daily schedules are not necessary. Virginia O.R.S.: GTS, BYA, WS, GPC, GJP, FMY, FBL, KU, DQB, BIW, MQ, BRA, BJX, BFW, UVA, GBC. Even if you are not interested in belonging to the V.T.N., it is wise to know how to get traffic into it, for connections are available for rapid relaying to all parts of the U.S.A. and the far East through

the Trunk Lines and reliable trans-Pacific schedules. The Virginia 'Phone Net meets regularly on Sundays at 9:30 A.M. All interested in a round table QSO which has genuine enthusiasm and friendliness should be on 3920 kc. or as near as possible. AIJ is the control station and will welcome to V.P.N. all newcomers. OPS are: BIG, EMX, EZL, CHE, FGJ, FMY, AVR, AIJ. BIW operated portable in Fieldale on 7 Mc. for two weeks. BJX wants some good Virginia schedules. GTS worked some good DX and has a nice traffic total as well. GJP is new Route Manager. FGJ is putting in new modulation transformer. GPC is a new R.M.; "Doc" schedules 3BWT, 3GJP, and 4DW daily. DZW will be on 7 and 14 Mc. FQY is now in Richmond on 14-Mc. 'phone. FMY is using P.P. 808's final modulated by 35 T's. 9RMZ/3 is on 3.9-Mc. 'phone. BFW needs a skywire. HBF is new ham with 6L6 osc., 15 watts. Welcome. MQ expects to be transferred out of state. FJ is back in Richmond. GBC received an NC-101X for a birthday present! GCO gets into V.P.N. BSY is attending the Univ. of Va.

Traffic: **W3**GTS 138 (WLQE 83) (WLMG 115) GPC 72 GJP 32 GBC 26 FJ 18 BJX 14 FMY 5 AIJ 3 BIW 1.

WEST VIRGINIA—SCM, C. S. Hoffman, Jr., W8HD—Preparations are under way for the organization of a strictly O.R.S. Net in the State, to be run at 7 P.M. on 3700 kcs., the two R.M.'s having it in charge. Active amateurs are invited to join. Out of state traffic will be handled over League Trunk Lines. KKG located at Chapel Hill, N. C., EIK at Horton, Va. The Charleston and Wheeling Radio Clubs began lecture courses in radio engineering and mathematics. PHY and REP have a private DX Contest. PQQ is student at YX. QQZ had trip to Cincinnati. BWK, ELO and OLV may be heard on 3700 Kcs. KSJ worked SM5SX, who was in the Atlantic Ocean. LCN, new O.R.S., is doing FB on his K5AG schedule. PTJ built new set. for all bands. BDD is using 3.5- and 14-Mc. 'phone. ZW is constructing mobile transmitters at WWVA. MCL is now Ensign in U.S.N.R. Hams belonging to Bluefield U.S.N.R. Unit: NLE, OHW, OFE, and ex-8BVA. The S.C.M. is QRL Trunk Line schedules.

Traffic: **W8**PTJ 151 MCL 149 HD 63 OLV 60 LCN 52 CZ 17 PSR 4 ELO 2 BWK 2 KSJ 6 MOL 6 PHY 4.

HUDSON DIVISION

EASTERN NEW YORK—SCM Robert E. Haight, W2LU—GZF reports via radio. UL and CL enjoyed FB visit with VE1DC. BLU is new R.M. KFB holds R.C.C. certificate. HCM needs a U9 for W.A.C. and Nevada for W.A.S. IDN reports for first time. JWT wins honors for high man with B.P.L. He is starting QSL net to help 2SN deliver his DX cards; over 30,000 on hand. Listen for QSL Nets Broadcast on 3.5 Mc. from following stations: JWT, SN, JHB, HJT, IXQ, BLS, JGC and KJG. Contact these stations after broadcasts for check for your call in their files. The QSL Net is doing a noteworthy job. All amateurs are urged to coöperate. JQI and HEV are new O.P.S. HNH is kicking out on 14, 7 and 3.5 Mc. with 6L6 e.c. osc. CJS attended S.A.R.A. Hamfest. ISJ reports following N.C.R. members of E.N.Y. section made cruises this summer: aboard U.S.S. *New York* to Halifax, N. S.: VP, LA, CUA, EWR. U.S.S. *Texas* to Halifax: FAR. U.S.S. *Texas* to San Juan, P.R.: ISJ. KRF reports for Mt. Vernon boys. KRF and KSV are new hams. HEC took Class A exam. ITK, new O.R.S. reports HTA has Class A ticket. BDB is W.A.C. KRF is on 1.75-Mc. 'phone and 7-Mc. c.w.; he is 14 years old. A.R.R.L. Emergency Coördinators are to be appointed soon. Your S.C.M. desired the coöperation of active amateurs in all communities with 20 or more active amateurs to help by recommending a prominent amateur for this appointment.

Traffic: **W2**EGF 126 LU 55 GZF 36 (WLNC 10) UL 14 BLU 7 KFB 4 HCM 2 IDN 4 JWT 240 (N.C.R. 63).

NEW YORK CITY AND LONG ISLAND—SCM, Ed. L. Bauanch, W2AZV—BGO and DBQ are Emergency Coördinators for this Section. All those interested in emergency preparedness should get in touch with them. HRB is out for O.P.S. EC, ESO, KCV and KTL are out for O.R.S. PF has been appointed member of the A.A.R.L. committee on engineering study of use of the amateur bands. OQ operates on trunk line "C" at 6:45 P.M. daily. DQW is WLNT on 3497.5 kcs. for the A.A.R.S. IXY works 28 Mc! every Sunday with 90 watts input, also schedules the MacGregor expedition (OX2QY) every Wed. at 9:00 P.M. KMS' call is being bootlegged on 3550 kcs. KMS works only the 56- and 7-Mc. bands. Please look for the bootlegger. AHC reports the Hudson Division meeting will be held at the Army building Dec. 30th. Station JHB is now two years old. EC has been licensed since 1912. HGO contacted EA7PZ Sept. 23rd. IYR is working portable at Syracuse, New York. HMJ's DX totals 73 countries. Due to loss of pole JDF has been confined to 14 and 28 Mcs. JXJ has an all band antenna. JBL has been meeting brother hams at College. IHT's 14-Mc. Q broke down for the third time. CHK is working on his high voltage supplies. JFU's shack is full of prospects for new hams. HAK is in the run again. JJN is going in for traffic on 3.5 Mc. EVA is still working on his rig. AYE is with the N.Y.C. police force. ELK moved his shack from one room to another. EYS operates on 3710 kc. daily. AZV operates on 3570 kc. on Tues. and 3922 kc. Thurs. The Stuyvesant H.S. Radio Club, CLE, has opened session for the fall term with JXJ pres.; KEE, vice-pres.; JXX, sec.-treas. The Radio Club of Brooklyn now has its meetings at the Flatbush Chamber of Commerce, National City Bank Building, Flatbush and Church Aves., Brooklyn, on the second and fourth Fri. of every month. New stations in the Bronx: KST, KSU, KTW. SN has a number of QSL cards for the gang. Please send him a self-addressed stamped envelope. He may have some for you.

Traffic: **W2**DBQ 157 (WLNB 196) OQ 139 PF 121 DQW 72 INF 46 JHB 31 EC 30 KCV 29 BGO 25 HGO 18 IHT 16 AZV 15 JEQ 11 AHC 8 CHK-BYL-HAK 6 JJN-FLD 5 AA-CIT-ADW-VG 4 IXY-ELK-US 2 DOG-JXJ-HYL-HWS 1.

NORTHERN NEW JERSEY—SCM, Fred C. Read, W2GMN—The Intercity Amateur Radio Club has new quarters for its station, GYR at Irvington. CCU plans to be married in Dec. The N.N.J. QSP Club had its first meeting of the season on Oct. 14th at BCX's home in Elizabeth. Men interested in traffic work are urged to attend the club's meetings. Communicate with the Sec'y ELK. HVK is now C.C. on 28 and 56 Mc. HNI is enjoying 14 Mc. IOZ erected "Johnson Q" for 28 Mc. JYK is on 28 Mc. with new transmitter. IZV spends most of his time ragchewing. HZY reports good DX on 3.5 Mc. JCT is installing 35 T final. IQM is also adding 35T. GVZ joined A.A.R.S.; he also specializes in DX, having 94 countries to his credit. ICJ has Class A ticket. HLC has pair of 801's final. HNA has been working 1.7 Mc. The North Newark Amateur Radio Club now has about 20 active members and meets every Wed. evening at the Dutch Reformed Church. JSF is Secy. JOS is prospective O.R.S. The Union County Amateur Radio Association had its annual rally at Elizabeth on Oct. 4th. A good time was enjoyed by members and guests. AU gave an interesting demonstration of a multivibrator unit. IIN also spoke. The club is planning a hamfest for March or April. GNY is Chairman. IY is back on 3.5 Mc. Emergency preparedness is becoming an increasingly important amateur activity. Northern New Jersey has the material for a second-to-none emergency traffic system. Let's see what we can do. If you are interested, get in touch with your Emergency Coördinator or with the S.C.M.

Traffic: **W2**BCX 539 (WLNF 512) CGG 224 GVZ 64 HQL 60 (WLNR 52) HZY 45 HCO 18 CIZ 10 GMN 8 CJX 6 GGW 19 JUC 17.

MICHIGAN—SCM, Harold C. Bird, W8DPE—R.M.'s: 8LSF, 8BMG. P.A.M.: 8CSX. Michigan Eights: LSF has been appointed manager for Trunk Line "A." FX has new rig perking on all bands. FWU is running three nets now. DYH (Ken and Polly) sports a Bliley crystal. QGD is reporting into net now. NDL had to rebuild antenna when neighbors decided they did not want it running across their property. Hope you get on your feet soon, DSQ. PPQ married and is rebuilding rig. CSL is fixing his radio room in new QTH. CCC is changing over his transmitter. DPE is still plugging for the Michigan Net. NXT is now handling morning net at 8 A.M. PBP is playing with 56 Mc. FLASH—Vee Johnson, formerly of 9PCU, Isle Royal, and now located at Lansing, expects to take the fatal leap soon. 9EXT is the lucky man. Our best luck to you both.

A 56-Mc. Portable Mobile

(Continued from page 39)

the speaker, and two red jacks for 'phones for duplex. One side of each of these circuits is grounded so there is no d.c. potential on anything —a great help when in a wet location. This also makes it possible to use a standard telephone handset for duplex operation; the common microphone and phone lead of the hand set is plugged into one of the grounded jacks, the microphone lead into the ungrounded microphone jack, and the 'phone lead into the "hot" 'phone jack. The control to the right of these jacks is the receiver regeneration control.

In the lower right-hand corner is the 5-prong power socket. When working from the 250-volt 50-ma. a.c. power supply, a power plug is inserted which furnishes 6.3 volts a.c. to the filaments and the d.c. potential to the plates. The plug used with the genemotor supply brings in the B-plus and connects the filaments into the battery circuit, as shown by the dotted lines in the circuit diagram. The B-minus is grounded to the case containing the genemotor and filter. No special 5-meter filter is needed with this power supply.

Looking inside the case the modulation choke and 41 modulator tube are mounted next to the transmitter shield, and the first audio tube next to the detector switch. The microphone transformer is mounted under the chassis.

This outfit has a total power consumption of about 50 ma. at 250 volts when working duplex. In spite of the low power, it gets out very well when used with a suitable antenna. The transmitting antenna used on the car is a 37-inch aluminum rod with the bottom end grounded to the center of the rear bumper of a coupe. This rod is fed at the top by an 8-foot wire to one terminal on the transmitter. This makes a ¾-wave antenna with the far end grounded, when the loading at the transmitter end is considered. The length of the vertical rod was adjusted with a field strength meter for best results.

How Would You Do It?

(Continued from page 40)

with plate glass. He obtained a piece from an automobile "graveyard" at a reasonable price. The superior strength of plate glass helps to prevent breakage in drilling and from unexpected strain from the transmission line. The line is, of course, anchored to the outside wall before passing through the glass. W1AUN recommends the method of drilling described in *QST* for October.

One idea of which we have heard several times, although we have never seen it tried, is suggested by George Smith of Chicago. The scheme consists of two sheets of heavy tinfoil or possibly sheet metal, one on each side of the window pane, which form a series condenser with the glass as the dielectric. Pieces six or eight inches square should

provide sufficient capacity to have little effect upon the line. The chief difficulty with tinfoil would seem to be a satisfactory method of making a good electrical and mechanical connection to the tinfoil, while the metal plates present a problem in sticking them to the glass. Ring-shaped plates fastened to the glass by means of rubber suction cups at the center have been suggested. Possibly someone has tried this stunt and can advise us of its practicability.

The old trick of lowering the upper sash or raising the lower sash and inserting a board carrying feed-through insulators was suggested in several forms. The chief objection to this is usually the resulting crack between the window and the board and the gap between the upper and lower sashes. A very satisfactory method of securing a tight joint between the window sash and the lead-in panel, shown in Fig. 1, is described by P. D. Lawrence of Richmond, Va. If the panel is placed under the lower sash, the top edge of the panel is fitted with metal weather stripping. This requires grooving of the lower side of the sash.

Problem No. 12

O. H. has been doing a lot of hot DX work lately and already he has so many cards that the situation is rapidly getting out of hand. Naturally he wants to make a display of them on the walls of the operating room but he hates to start putting them up until he has some scheme that will allow a higher order of neatness and convenience than that seen in most shacks. The walls, as it happens, are plaster and our friend agrees with the O. L. that tacks are out. He wants a scheme that will permit ready replacement of the cards without marring their beauty and one that will present a really orderly appearance. Further, O. H. can't help thinking that there must be some inexpensive way of providing against fly bites and dust—some sort of cheap protective surface covering. What say?

A method which eliminated the necessity for grooving is described by J. M. Overman of Norfolk, Va., and is shown in Fig. 2. A fairly thick lead-in panel is required. The upper and lower edges of the panel are cut out to make overlapping joints with the window sash and frame or sill. He takes care of the gap between the sashes by tacking a piece of rubber inner tube, cut to fit, to the top edge of the lower sash.

The somewhat different arrangement shown in Fig. 3 is suggested by W5GNV. He uses a glass cutter to remove a strip of pane about five inches high. A section of wood or Masonite is substituted for the glass. The edge of the section is stepped to make an overlapping joint with the glass and the joint is plugged with putty. Of course, the transmission line moves up and down with the window unless the section is placed in the stationary sash and the arrangement does not permit complete screening of the window.

W2FFT and W8NXR provide the lower edge

of the lower sash with feed-through contacts. The contacts are closed when the window is down, but jumpers are required if it is desired to use the antenna with the window open. This scheme is less adaptable to tuned lines.

Several of those who submitted papers pointed out that the Underwriters' requirements may be met satisfactorily by mounting the grounding switch inside the house. However, it is usually desirable to be able to open the window for other purposes, especially during warm weather.

We have selected the following prize-winners:

First—John R. Sanders, W5GNV.

Second—J. M. Overman, Norfolk, Va.

Thanks to the following for their efforts on the problem: W1JZU, 2HAP, 5EZA, 5FWA, 8BKE, 8OMM, 9CDU, G2BZK, VE3ACM, D. A. Beuk and F. H. Kistler.

—*D. H. M.*

And again the contest rules:

1. Solutions must be mailed to reach West Hartford before the 20th of the publication month of the issue in which the problem has appeared. (For instance, solutions of problem given in the March issue must arrive at *QST* before March 20th.) They must be addressed to the Problem Contest Editor, *QST*, West Hartford, Conn.

2. Manuscripts must not be longer than 1000 words, written in ink or typewritten, with double spacing, on one side of the sheet. Diagrams and sketches may be in pencil, must be neat.

3. All solutions submitted become the property of *QST*, available for publication in the magazine.

4. The editors of *QST* will serve as judges. Their decision will be final.

Prizes of $5 worth of A.R.R.L. station supplies or publications will be given to the author of the solution considered best each month, $2.50 worth of supplies to the author of the solution adjudged second best. The winners should, of course, state the supplies preferred.

K7EVM, Fort Yukon, Alaska

(*Continued from page 48*)

crete. The engine room is partially heated from the house through vents so that I have to heat the engine oil each time I intend to operate. Consequently in winter I wait until I am sure the band will be alive before I start up—sort of slow business. If the engine gets too hot in winter I open the outer door and let a little 40-below air in.

"Gasoline is rather high-priced here—seventy-five cents a gallon—so I usually run the engine only for 20-meter work, though I have coils for 80, 40 and 20 for each of the transmitters. Usually the 42 is left on 80 and the 46's on 20.

"I have only one transmitting antenna at present, a Zepp-fed 133-foot one running true north and south. This seems to work well for the States, Europe and Australia. Guess I will have to put up another antenna and try to get into Asia a little better. South America, of course, is a hard nut to crack due to the heavy QRM from the W's. I have had only one PY contact but that

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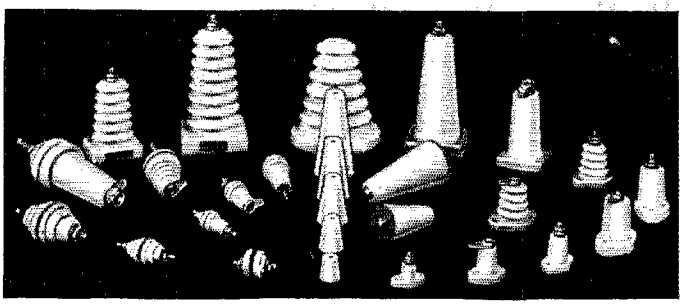

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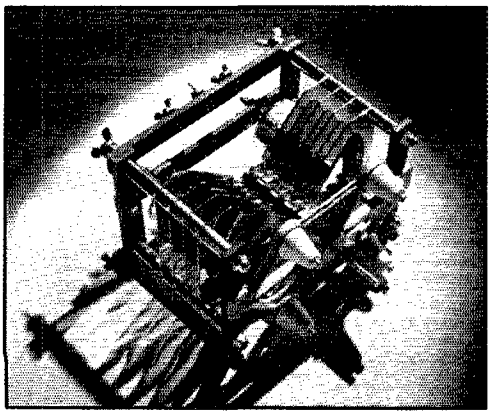

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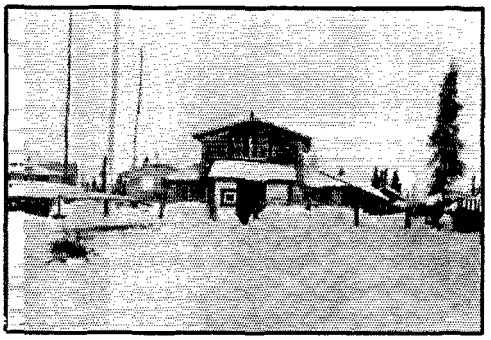
is enough so far as a WAC is concerned. Have had only one African contact so far.

"Fort Yukon is located just over the line inside the Arctic Circle at the junction of the Porcupine and Yukon rivers The name dates back to about 1840 when the Hudson's Bay Company established a trading post here. At that time they thought they were in Canada. Consequently it is the oldest town on the upper Yukon.



"Being inside the Arctic Circle, we can see the sun at midnight for a week or so in June. In December the conditions are reversed with very long nights. The sun is visible by refraction for an hour and a half during the shortest days. The temperature ranges are extreme here; in the summer with continuous daylight it gets to 80 in the shade and the coldest in the four years of my residence here has been 78 below zero.

"I made my start in radio back in 1914 but dropped it until I came up here. I still have the Brandes headphones that I bought then and use them at times. Our mail service is very slow here in winter (dog team) and it took nearly six months to get my license, which was issued in January, 1935. For the first year and a half I used only a battery layout, working on 80 entirely.

"Amateur radio has grown considerably in Alaska since I first got on the air. A considerable network has grown up now and many places that formerly had no communication at all use ham radio with satisfaction. For instance, I maintain a sked with my nearest ham neighbor to the north, VE5QB, which means many hundreds of dollars' worth of business to the local store keepers. We also keep the traders at VE5QB advised as to fur prices, which is worth while to them. Fur is the only product of this region.

"In the spring the rivers break up with a rush, and this year we had an ice-jam which caused the water to overflow in the Yukon and put four feet of water in the house. So I moved the rig upstairs and provided the only communication, as the commercial station was out of commission. Then I had to go down, after the water receded several days later, and put the commercial station back on the air. It is a 'phone station in one of the stores and the operator knows nothing about radio!

"Ham radio is not a toy up here but a real part of our lives and *QST* the bible. More power to you."

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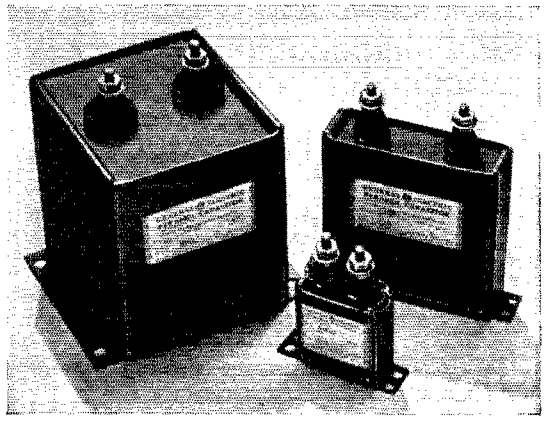

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W3AHR MAIL ORDERS PROMPTLY FILLED W3BMS

CONSOLIDATED RADIO CORP., 612 Arch St., Philadelphia, Pa.

A.R.R.L. QSL Bureau

FOR the convenience of its members, the League maintains a QSL-card forwarding system which operates through volunteer "District QSL Managers" in each of the nine United States and five Canadian districts. In order to secure such foreign cards as may be received for you, send your district manager a standard No. 8 *stamped* 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.*

W1—J. T. Steiger, W1BGY, 35 Call Street, Willimansett, Mass.
W2—H. W. Yahnel, W2SN, Lake Ave., Helmetta, N. J.
W3—R. E. Macomber, W3CZE, 418 10th St., N. W., Washington, D. C.
W4—G. W. Hoke, W4DYB, 328 Mell Ave., N. E., Atlanta, Ga.
W5—E. H. Treadaway, W5DKR, 2749 Myrtle St., New Orleans, La.
W6—D. Cason Mast, W6KHV, 423 East E St., Ontario, Calif.
W7—Frank E. Pratt, W7DXZ, 5023 So. Ferry St., Tacoma, Wash.
W8—F. W. Allen, W8GER, 324 Richmond Ave., Dayton, Ohio.
W9—Roy W. McCarty, W9KA, 11 South Michigan Ave., Villa Park, Ill.
VE1—J. E. Roue, VE1FB, 84 Spring Garden Rd., Halifax, N. S.
VE2—C. W. Skarstedt, VE2DR, 236 Elm Ave., Westmount, P. Q.
VE3—Bert Knowles, VE3QB, Lanark, Ont.
VE4—George Behrends, VE4RO, 186 Oakdean Blvd., St. James, Winnipeg, Manitoba.
VE5—E. H. Cooper, VE5EC, 2024 Carnarvon St., Victoria, B. C.
K4—F. McCown, K4RJ, Family Court 7, Santurce, Puerto Rico.
K5—John J. Carr, K5AV, 78th Pursuit Squadron, Albrook Field, Canal Zone.
K6—James F. Pa, K6LBH, 1416D Lunalilo St., Honolulu, T. H.
K7—Leo E. Osterman, K7ENA, Customhouse, Wrangell, Alaska.
KA—George L. Rickard, KA1GR, P. O. Box 849, Manila, P. I.

Strays

In connection with avoidance of image interference with b.c. receivers (page 12, September *QST*) W9GDB suggests that if the receiver i.f. frequency is unknown, a freqmeter covering the 160-meter band will give a direct reading. Set the b.c. receiver to the desired station and adjust the freqmeter until a beat is heard. The calibration will indicate the operating frequency to be avoided. It may be necessary to use quite close coupling between b.c. receiver and freqmeter to get a good beat.

Where to buy it

A directory of suppliers who carry in stock the products of these dependable manufacturers.

ALBANY, N. Y. Uncle Dave's Radio Shack 356 Broadway

BALTIMORE, MD. 3 North Howard St.
Radio Electric Service Company

BOSTON, MASS. Radio Shack 46 Brattle Street

BOSTON, MASS. 110 Federal Street
Wholesale Radio Service Company, Inc.

BRONX, N. Y. 542 East Fordham Rd.
Wholesale Radio Service Company, Inc.

JAMAICA, L. I. 90-08 166th Street
Wholesale Radio Service Company, Inc.

NEWARK, N. J. 219 Central Ave.
Wholesale Radio Service Co., Inc.

NEW YORK, N. Y. Gross Radio, Inc. 51 Vesey St.

NEW YORK, N. Y. Harrison Radio Co. 12 West Broadway

NEW YORK, N. Y. 100 Sixth Ave.
Wholesale Radio Service Co., Inc.

NEW YORK, N. Y. Terminal Radio Corp. 80 Cortlandt Street

POTTSVILLE, PENN. E. Norwegian & George Sts.
Sylvester Radio & Supply Co., Inc.

READING, PENN. 404 Walnut St.
George D. Barbey Company

READING, PENN. 104 North Ninth Street
Sylvester Radio & Supply Co., Inc.

SPRINGFIELD, MASS. T. F. Cushing 349 Worthington St.

WASHINGTON, D. C. 938 F Street, N. W.
Sun Radio & Service Supply Co.

ALBANY, N. Y. Uncle Dave's Radio Shack 356 Broadway

BALTIMORE, MD. 3 North Howard St.
Radio Electric Service Company

BOSTON, MASS. H. Jappe Company 46 Cornhill

BOSTON, MASS. Radio Shack 46 Brattle Street

BOSTON, MASS. 110 Federal Street
Wholesale Radio Service Company, Inc.

BRONX, N. Y. 542 East Fordham Rd.
Wholesale Radio Service Company, Inc.

BURLINGTON, VERMONT
Vermont Hardware Co., Inc.

JAMAICA, L. I. 90-08 166th Street
Wholesale Radio Service Company, Inc.

MONTREAL, CANADA 285 Craig Street, West
Canadian Electrical Supply Co., Ltd.

NEWARK, N. J. 219 Central Avenue
Wholesale Radio Service Co.

NEW YORK, N. Y. 460 W. 34th St.
Bruno-New York, Inc.

NEW YORK, N. Y. 136 Liberty St.
Sanford Samuel Corp.

NEW YORK, N. Y. 100 Sixth Avenue
Wholesale Radio Service Co.

NEW YORK, N. Y. 12 West Broadway
Harrison Radio Company

NEW YORK, N. Y. 124 E. 44th Street
Grand Central Radio, Inc.

PHILADELPHIA, PENN. 10 S. 10th Street
Eugene G. Wile

PHILADELPHIA, PENN. 117 North 7th St.
Raymond Rosen & Company

PHILADELPHIA, PENN. 512 Market Street
M & H Sporting Goods Company

POTTSVILLE, PENN. E. Norwegian & George Sts.
Sylvester Radio & Supply Co., Inc.

READING, PENN. 8th & Elm Streets
Bright & Company

READING, PENN. 104 North Ninth Street
Sylvester Radio & Supply Co., Inc.

SPRINGFIELD, MASS. T. F. Cushing 349 Worthington Street

 Listings on this page do not necessarily imply endorsement by QST of the dealers or of other equipment sold by them.

Where to buy it

A directory of suppliers who carry in stock the products of these dependable manufacturers.

WASHINGTON, D. C. 938 F Street, N. W.
Sun Radio & Service Supply Co.

RME
RECEIVERS -- PRE SELECTORS
AMATEUR RADIO EQUIPMENT
RADIO MFG. ENGINEERS, Inc.
PEORIA ILLINOIS

ALBANY, NEW YORK 356 Broadway
Uncle Dave's Radio Shack

BINGHAMTON, NEW YORK 25-27 Sturges Street
Radio Testing Station

BUFFALO, NEW YORK 216 E. Genessee Street
Dymac Radio

HARTFORD, CONNECTICUT 210 Chapel Street
Stern Wholesale Parts Company

NEW YORK, N. Y. 12 West Broadway
Harrison Radio Company

NEW YORK, N. Y. Terminal Radio Corp. 80 Cortlandt Street

ROCHESTER, NEW YORK 244 Clinton Ave., N.
Radio Parts & Equipment Co.

RAYTHEON
TRADE MARK
AMATEUR TUBES

ALBANY, NEW YORK 356 Broadway
Uncle Dave's Radio Shack

BOSTON, MASS. The Radio Shack 46 Brattle Street

BOSTON, MASS. Selden Radio Company 28 Brattle Street

BOSTON, MASS. 110 Federal Street
Wholesale Radio Service Company, Inc.

BRONX, N. Y. 542 East Fordham Rd.
Wholesale Radio Service Company, Inc.

BUFFALO, NEW YORK 326 Elm Street
Radio Equipment Corp.

CONCORD, NEW HAMPSHIRE 80 N. State Street
Carl B. Evans

JAMAICA, L. I. 90-08 166th Street
Wholesale Radio Service Company, Inc.

NEWARK, NEW JERSEY 219 Central Avenue
Wholesale Radio Service Co.

NEW YORK, N. Y. 12 West Broadway
Harrison Radio Company

NEW YORK, N. Y. 100 Sixth Avenue
Wholesale Radio Service Co.

WASHINGTON, D. C. 938 F Street, N. W.
Sun Radio & Service Supply Co.

TRIPLETT
INSTRUMENTS

ALBANY, N. Y. 356 Broadway
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I. A. R. U. News

(*Continued from page 50*)

('phone); George W. Perdew, K6CMC ('phone); Charles Boulange, ON4SS ('phone); Leif Salicath, LA1G ('phone); F. A. Robb, GI6TK ('phone); William E. Good, W8IFD; Walter Dewars, W9TQW; Frederick S. Olsen, W2EMI; Gilbert L. Crossley, W8YA; Otis R. Dickinson, W2HTU; E. Sohier Welch, Jr., W1EVE; Clyde R. Brewer, W4RA; John G. Claiborne, W5FDI; Alan T. Margo, W6FZA; John Ginocchio, W2BDZ; Joseph H. Harms, W2JME; Robert H. Webb, W8OWB; A. James Kreider, W3FSD; Howard Gilbert, W8ANN; Leon Frederick Lavoie, K6MAW; Luis Gandia, Jr., K4BU; R. S. Woodford, VE5MZ; W. E. Marsh, SU1WM; John Lay, HB9BG; H. C. Warburton, ZT5P; G. H. Scarfe, ZU5D; M. Lelupe, ON4LU; P. R. Harvey, ZL3HK; T. E. Rowlands, ZL3JX; A. E. Smith, ZL1HH; H. J. Hunt, G5HH; G. Evans, G6YO; Albert Voituriez, F8ZZ; Artur Gersch, D4YWM; Stuart H. Gates, W9CNE; J. A. Twine, ZT6AM; *Dr. J. Lynn Ironmonger, W6MLG ('phone);* Glen Katzenberger, W7DVY; *R. H. Hoffman, W9AGO ('phone); Robert E. Dawson, Jr., W4DSY ('phone); Thaddeus C. Wood, Jr., W4AH ('phone); Donald P. Wilkes, OA4AB ('phone); Petr. Jastrzembskas, LY1J ('phone); Samuel H. Luitwieler, W6GRX ('phone); F. Paul Bour, FB8AB ('phone); Antonio Cruz Uribe, XE1BT ('phone); R. P. Walker-Alexander, VS7RA ('phone); Carl Scheffy, W1ADM ('phone);* Carl Scheffy, W1ADM; *J. M. Moyle, VK2JU ('phone);* A. A. Fietz, VK2QE; A. C. J. Pritchard, VK3CP; R. A. Priddle, VK2RA; H. D. Ackling, VK2PX; R. L. Belstead, VK4EI; E. H. Martin, VK3ZF; Luken Bose, VU2JN; John W. Miles, W6LEA; R. L. Perry, W6MTD; Herb. G. Schmitt, W9VZJ; Espes R. Williams, W6LIF; Charles H. Desellier, W1KID; Robert G. Wilson, Jr., W3GHD; Herbert J. Brough, W3FQG; George H. Nibbe, W9NUF; G. Herbert Smith, VE5KL; Clarence E. Vendley, W6AAE; Oscar W. B. Reed, W3FPQ; Roman Izykowski, SP1LP; John C. O'Connell, W3DAL; Wallace P. Hagestad, W7ENW; Jozef Napurko, SP1HN; A. Jeglinski, SP1CM; James Victor Stout, W3GEB; Art Cook, VE4KZ; Elmer F. Eld, W2AZB; George E. Forrest, W9ISM; E. L. Mazery, VQ8AB; José G. Garza, XE2CG; T. J. Brown, G5TB; Arthur Tibbits, VP2AT; J. MacIntosh VS1AA; C. Valkhof, PAØALO; H. J. Beene, PAØBE; Fernand Munsch, F3AM; Christian Friedmann, D4WCT; Fritz Gorke, D3CDK; Hermann Schäfer, D3CVR; Willi Fock, D4TPJ; H. Herbert Smith, W6AZP; Charles F. Warner, W6MHH.

Strays

A slippery bug cure suggested by W9MRC: Take off the glaze with fine sandpaper, apply some glycerin and then wipe it off with a cloth. The bug will stick to any surface and will not smear or scratch the table.

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 15c 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 7c 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 7c rate. An attempt to deal in apparatus in quantity for profit, even if by an individual, is commercial and takes the 15c rate. Provisions of paragraphs (1), (2), (4) and (5) apply to all advertising in this column regardless of which rate may apply.

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 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.

RADIO engineering, broadcasting, aviation and police radio, servicing, marine and Morse telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, Byrd St., Valparaiso, Ind.

QSL'S, W2SN, Helmetta, N. J.

CALLBOOKS—new DX calls, new prefixes, thousands of new W and VE calls, in the Winter, 1937 Radio Amateur Call Book. Sent postpaid $1.25, or a whole year (four issues) for $4. (In foreign countries $1.35 and $4.35.) Your call and QRA printed in large type $1 per year. Radio Amateur Call Book, 610 S. Dearborn, Chicago.

QSL'S, all colors, cartoons, snappy service. Write for free samples today. W1BEF, 16 Stockbridge Ave., Lowell, Mass.

COMPLETE training for all amateur and professional radio licenses. New York Wireless School, 1123 Broadway, N. Y.

QSL'S—Entirely new printing process makes more beautiful cards at lower cost—Send 10¢ in stamps for elaborate kit with which you can design your own card—Astonishingly inexpensive. QSL Company, Box 481, Hartford, Conn.

USED receivers. Bargains. Price list 3¢. W3DQ, 405 Delaware Ave., Wilmington, Del.

W2CNL selling out.

1000 watt transformers (G.E.) on marble bases 1100–2200–4400 each side center. Hundreds sold hams last eleven years—guaranteed unconditionally. Dawson, 5740 Woodrow, Detroit, Mich.

QSL'S. Better designs; better stock; better workmanship. Free samples to hams only. W2FJE, 101 Hanson Place, Brooklyn, N. Y.

VARIABLE condensers calibrated: ten point calibration against General Radio precision standard. For a limited time, $1.25. W8MYB, Kiamesha, N. Y.

GENERAL Electric dynamotors 24/750 volts 200 mills, $20. On twelve volts deliver 375. Westinghouse 27 1/2/350, $10; 200 Watts 900 cycles, $15; 6–15 volts 500 watts Aircraft, $10. Simon 500 watt 500 cycles with exciters, $8. Slightly used, $6. List. Henry Kienzle, 215 Hart Blvd., Staten Island, N. Y.

QSL'S. Cartoons. Free samples. Theodore Porcher, 7708 Navajo St., Philadelphia, Pa.

QST'S year 1916 wanted. Sell or trade issues 1919–1933. W9EWH.

BUY, sell, trade? Cannady, 38 W. Anderson, Aurora, Mo.

SELL perfect pair RK20's slightly used—$10 each. W1IKE selling out.

TRADE—photos of station or operator or both. W9LM.

RECEIVER—National AGS, crystal, tubes, 110 volts a.c. power supply, bandspread coils: 160, 80, 40, 20. Good condition. For best cash offer. W3FTW, 4505 Ridge st., Chevy Chase, Md.

SURPLUS horseshoe 17% cobalt magnets, 60¢ each, postpaid. Electro-Voice Mfg. Co., S. Bend, Ind.

WANT Rider Manuals. W1DEC.

SWAP: Code machine, ten tapes, for National SW3 and coils. Clarence Williams, W5ADG, Dublin, Texas.

WANTED—FB7 general coverage coils. Carrier 115, Coronado, Calif.

QSL'S, SWL's, 100, 3 color, 75¢. Lapco, 344 W. 39th, Indianapolis, Ind.

QSL cards, neat, attractive, reasonably priced. Samples free. Miller, Printer, Ambler, Penn.

WESTON zero to 3000 volts d.c. voltmeter, $11. Ten other meters. W3CGA.

SELL PR-10 excellent condition, $45. Self-powered preselector, matched cabinet, $15. W2BRE.

FIRST check $9. takes Gardiner-Levering automatic sender. Guaranteed new. Gissler, 3121 Jackson, Chicago.

SELL Esco motor generator, 500 watt, 1000–2000 volts, $75. f.o.b. Carmalt, W8DLG, 1808 Filmore, Box 683, Aliquippa, Penn.

AIRLINE pilot's complete amateur rig. Cost over $1,200. Bargain-of-the-year at $500, or might consider what have you in trade up to $100. Three hundred watts of classiest 10–20 meter push-to-talk phone you'll ever see; also 40-meter c.w. Two-metered modulation monitor alone worth $50. Rig includes RME receiver. Photos only to those genuinely interested. Two rack-panel units, black crackle finished. Will make no deal for several weeks to give distant amateurs chance at it. Wm. Graham, 6915 N. 31st Ave., Omaha, Neb.

SELL: All Star Senior complete, $15. Want FBXA coils. W3FYW.

SELL RCA ACT-20 fone, c.w. transmitter complete to work on 10–20–160 meters, crystals, mike, tubes—nothing else to buy, $130. Also Super Skyrider 1938 model complete with crystal filter, speaker, $89. All equipment same as new. M. Bruno, 900 Columbus Ave., San Francisco, Cal.

CRYSTALS: Zero cut. Guaranteed to compensate at near zero without oven. 80–160 meters, $1.85. Forty meters, $2. postpaid. Holders, 75¢. Fisher Lab., 4522 Norwood St., San Diego, Calif.

600 watt phone transmitter complete with tubes, overload and remote-control relays, remote switch panel, modulation percentage indicator, audio pre-amplifier. RF rack includes 3 power supplies plus 2 bias packs for 47, 46, 801, 203A, pair of HD203A's; coils, crystals for 75 and 20 meter phone; Collins and link antenna matching network. Modulator rack includes 2 power supplies for pp 56 and 2A3 amplifier, and pp 838's QST approved parts all in perfect condition. Price $400 f.o.b. Lancaster, Penn. C. C. Smith, 595 School Lane.

QSL'S. New. Beautiful. Free samples. Maleco, 1512 Eastern Parkway, Brooklyn, N. Y.

METER scales: ask dealer for Ham Crystals Universal Meter Scales for converting one milliampere Westons, Jewells, Tripletts into multimeters.

CRYSTALS: 80M X, $1.50. 160M–80M V, $2.25. Beautiful molded bakelite holders, $1. Catalog. Ham Crystals, 1104 Lincoln Place, Brooklyn, N. Y.

QSL'S. 300 one-color cards $1. Samples. 2143 Indiana Ave., Columbus, Ohio.

TOOL steel punches for round or amphenol sockets at manufacturers prices. Cuts clean hole with hammer blow. Round, $1.; amphenol, $1.50 each postpaid. Gerett Corp., 2947 N. 30th St., Milwaukee.

FREE bulletin describing efficient, stable, and inexpensive long lines 5 meter oscillator. Write Paradio Sales Co., 124 Garrison Ave., Jersey City, N. J.

SELL: National ACR–136. W9SOR, 541 Stilwell Blvd., Port Arthur, Texas.

SELL: Three band rig, Utah design, 2 xtals, neat build, metal rack. W9SMV, 541 Stilwell Blvd., Port Arthur, Texas.

203–A, $5. Air cell battery, $4.50. Both new. W2HNX.

QSL'S. Free samples. Printer, Corwith, Iowa.

CRYSTALS—Unconditionally guaranteed. Supplied within 5 kilocycles of frequency you specify in 160, 80, or 40 meter band. These are X-cut, carefully ground to deliver maximum output and to resist fracture. Exact frequency of crystal written on box. 160 and 80 meter crystals, $1.50; 40 meter crystals, $1.85. For crystals supplied to exact frequency add $1. to above prices. Try these crystals in your transmitter for thirty days. If not fully satisfied you may return them and your purchase price will be immediately and cheerfully refunded. Wright Radio Laboratories, 5859 Glenwood Ave., Chicago, Ill. Telephone—Sunnyside 6168.

WANTED: 1500 new QSL—SWL customers. Samples. Fritz, 455 Mason, Joliet, Ill.

SELL RME69 two months old. Cost, $151.20—Cash, $95. W2AEB.

SELL. Marconi navy receiver $10. FBX with 20, 40, 80 B.S. coils, $30. W4OF, Atlanta, Ga.

EXCELLENT slightly used equipment. 100XS and SW3 National receivers. Transmitters; power supplies; frequency meters; test instruments; complete portable station; many other items. Canadians attention. Special list of equipment located in Canada. Write for complete list—now. Glassford, W2EQK, 1934 University Ave., N. Y.

QSL'S—highest quality—lowest prices. Radio Headquarters, Ft. Wayne, Ind.

FABERADIO, Sandwich, Illinois guarantees crystal satisfaction. Catalog 37 is ready.

QSL'S—2 color—$1. hundred. Samples. (Stamp) W8NOS.

CRYSTALS: Eidson T9 dependable, powerful X cut, 40 and 80 meter bands $1.60, 7301—7500 kilocycle range $2., spot frequencies $2.50, postpaid. Our special grinding process resists fracture, gives greater harmonic output. Compare T9 crystals with any—you be the judge. Fully guaranteed. T9 ceramic holders $1.10 postpaid. C.O.D.'s accepted. T9 crystals for sale by: Pembleton Labs., Ft. Wayne, Ind.; Henry Radio Shop, Butler, Mo.; Southwest Radio Supply, Dallas, Texas. T9 crystals or holders for sale by: Hieronymus Radio, 88-34 209th St., Queens Village, N. Y. or Eidson's, Temple, Texas.

SELL on ten day trial. Send only $5. with order. HROs $129.70, RME-69s $99., NC100Xs $99., NC100s $89., SX16 $89., Breting 14s $79., SX10s $69., ACR-175s $69., SX15 Sky Challengers $59., SX9s $54., PR-10s $39., ACR-136s $39., Sky Buddies $19., FB7s $19., SW3s $12.50, other used sets. List free. Write. Bob Henry, W9ARA, Butler, Mo.

BUY any new receiver, transmitter, or parts on my own 6% plan with less cost. Trade in your equipment. All receivers shipped on ten day trial. It's to your advantage to write me. Bob Henry, W9ARA, Butler, Mo.

CRYSTALS: Unconditionally guaranteed, ± five kilocycles, 7000-7500 kcs. X cut $1.85, low drift $2.20. 3500 or 1750 kcs. X cut $1.65, low drift $2.20 postpaid. A. E. Rydberg, W9AED, Mitchellville, Iowa.

WANTED: Sylvania carbon plate 841. W9AED.

FOR Sale: Pair WE261A's used, good condition, $15. W9MKC.

CRYSTALS: ground to order. 160-80, X cut ± five kilocycles, $1.50. Spot frequency $2.50. Three semi-finished, 80 meter blanks, including carborundum, $1.20. Holders, $1., fit GR jacks. Speedy delivery. William Threm, W8FN, 4021 Davis Ave., Cheviot, Ohio.

TELEPLEXES, instructographs, omnigraphs, vibroplexes bought, sold. Ryan's, Monroe City, Mo.

CRYSTALS: See October Hamads. The Ransom Lab.

USED Comet Pro—crystal filter. W8ANT.

NEW receivers. W8ANT.

USED receivers. W8ANT.

ECONOMICAL oscilloscope kits. W8ANT.

TRANSMITTER kits. W8ANT.

EQUIPMENT built to order. W8ANT.

NEW and used transmitting tubes. W8ANT.

ALL lines of new and used equipment. Parts bought, sold and exchanged. Write to Southern Ohio's only amateur owned amateur business, Jos. N. Davies, W8ANT, 2767 N. Bend Rd., Sta. A., Cincinnati, Ohio.

SELL QST's almost complete 1920 through 1936—all A-1. Tom Chase, 103 Wilson Ave., E. Providence, R. I.

TWO months old and going strong. That new R9 crystal and holder $1.25 in the 80 or 160 band. R9 Crystals, Arnold, Pa.

SELL: complete 160 fone station 150 watts SW3 receiver. All $90. W9KQC, Anoka, Neb.

SELL five tube SW receiver, aluminum chassis, tubes speaker complete as described League Handbook $18. W8ARP.

SHORT wave listener's, amateur's attractive sensational designed QSL's. Samples (stamps). W8ESN, 1827 Cone, Toledo, Ohio.

ALUMINUM call letter plates, ¼" x 2" x 6½". One $1., two $1.50. W8ESN.

TRANSMITTER for sale. Bargain—$195. (CW-fone) Inquire W8DED.

CALLBOOKS (December) $1.25 from W8DED.

CRYSTALS? Bliley (special offer) Write W8DED.

QSL'S. W8DED QSL's. Unbeatable. Samples? (stamp) W8DED, Holland, Mich.

Announcing the JUNIOR MODEL MAC KEY $4.95

I can't take all the space necessary to describe this excellent little speed key. Neither myself nor our mutual friends the distributors who'll handle it, make enough profit on it to spend money advertising its merits. I've got to content myself with this initial announcement and hope that the thousands of operators who're my good friends will pass the word around.

For the newcomers, especially youngsters, who're tempted by wretchedly designed misfits that won't work, offered as leaders at ridiculous prices, this new JUNIOR MAC KEY will be a life-saver.

Go to your nearest jobber to see it! Or write me for the dope.

73s, MAC.

T. R. McElroy 175 Congress Street Boston, Mass.

Your Nearest Dealer Is Your Best Friend

Your nearest dealer is entitled to your patronage. You can trust him. He is equipped with a knowledge and understanding of amateur radio. He is your logical and safe source of advice and counsel on what equipment you should buy. His stock is complete. He can supply your needs without delay. His prices are fair and consistent with the high quality of the goods he carries. He is responsible to you and interested in you.

Patronize the dealer nearest you—You can have confidence in him

ATLANTA, GEORGIA
Wholesale Radio Service Company, Inc.
430 West Peachtree Street, N. W.
"The World's Largest Radio Supply House"

BALTIMORE, MARYLAND
Radio Electric Service Co.
3 N. Howard St.
Everything for the amateur

BOSTON, MASS.
Wholesale Radio Service Company, Inc.
110 Federal Street
"The World's Largest Radio Supply House"

BRONX, NEW YORK
Wholesale Radio Service Company, Inc.
542 East Fordham Road
"The World's Largest Radio Supply House"

BUFFALO, NEW YORK
Radio Equipment Corp.
326 Elm Street
W8OBK — Ham, service and sound equipment — W8OLB

BUFFALO, NEW YORK
Dymac Radio
216 E. Genesee Street
Complete Line Ham and BCL Equipment Cl. 2080

JAMAICA, L. I.
Wholesale Radio Service Company, Inc.
90-08 166th Street (Merrick Road)
"The World's Largest Radio Supply House"

MONTREAL, CANADA
Canadian Elec. Supply Co., Ltd.
285 Craig St., W.
Quality parts and equipment for discriminating buyers

NEWARK, N. J.
Wholesale Radio Service Company, Inc.
219 Central Avenue
"The World's Largest Radio Supply House"

NEW YORK, N. Y.
Gross Radio, Inc.
51 Vesey Street
Fair dealings plus fair prices. Anything in radio

NEW YORK, N. Y.
Wholesale Radio Service Company, Inc.
100 Sixth Avenue
"The World's Largest Radio Supply House"

NEW YORK, N. Y.
Harrison Radio Company
12 West Broadway
"The Friendly Ham Supply House"

PHILADELPHIA, PENNSYLVANIA
Eugene G. Wile
10 S. Tenth Street
Complete Stock of Quality Merchandise

PROVIDENCE, RHODE ISLAND
W. H. Edwards Co.
32 Broadway
National, Taylor Tubes, Hallicrafters. Complete amateur supply house

RICHMOND, VIRGINIA
The Arnold Company
527 W. Broad Street
W3EHL—"The Virginia Ham Headquarters"—W3FBL

ROCHESTER, NEW YORK
Radio Parts & Equipment Co.
244 Clinton Avenue, North
Complete stock amateur-BCL parts. Standard discounts

SPRINGFIELD, MASS.
S. S. Kresge Company
1540 Main Street
Standard discounts, standard lines. Advisory service: W1JQ, W1FOF

You Are *Protected* When You Buy From *QST* Advertisers

¶ "Advertising for *QST* is accepted only from firms who, in the publisher's opinion, are of established integrity and whose products secure the approval of the technical staff of the American Radio Relay League."

Quoted from *QST*'s advertising rate card.

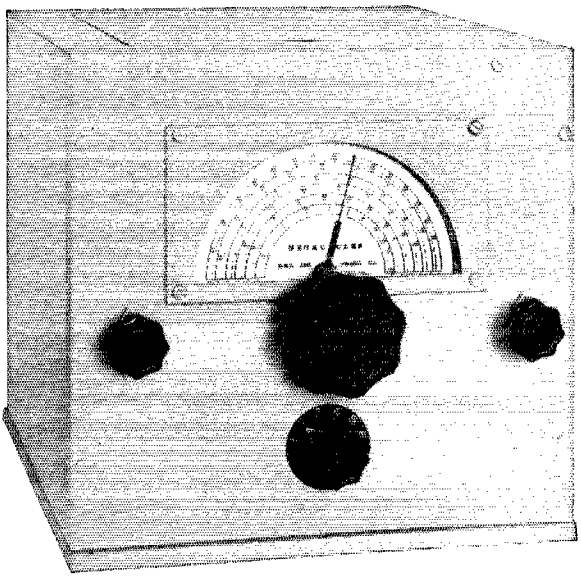
Every conceivable need of a radio amateur can be supplied by the advertisers in *QST*. And you will know the product has the approval of the League's technical staff.

The Advertisers

The DB-20 Preselector when connected to a superheterodyne receiver adds several valuable features to the performance of any receiver.

HERE ARE THE DETAILS

1. Frequency coverage is from 9 to 550 meters (550 KC to 32,000 KC) coinciding with the range incorporated in the RME-69 and other receivers.
2. Average gain of the two stages of tuned circuits is uniform between 20 to 25 db. when used in conjunction with the RME-69.
3. Signal to image ratio averages 50,000 to 1.
4. Power supply is self-contained, not depending on the power from the receiver.
5. Input circuit is so designed that either a single wire Marconi type antenna or one of the doublet types may be used.

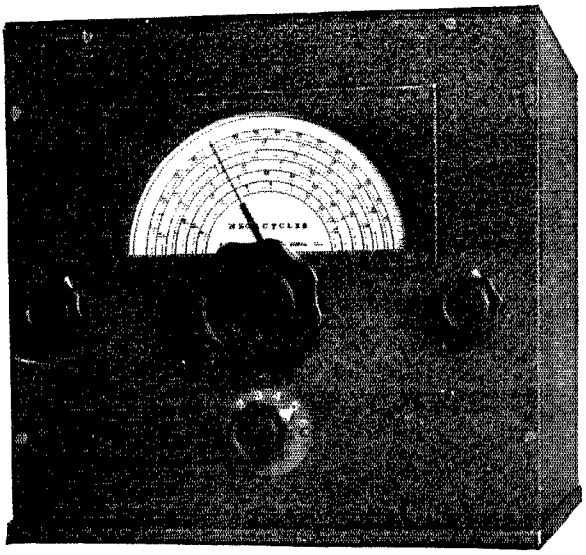


DB-20 *by* RME

SIGNAL AMPLIFIER AND IMAGE REJECTOR

6. Output impedance of the unit is approximately 300 ohms so that direct connection may be made to the input of the RME-69 without mismatch.
7. The DB-20 has its own gain control in addition to the regular six band switch and finger-tip control mechanism.
8. The cabinet is identical in design and finish to the regular RME-69 cabinet and matches it in every detail.
9. Cabinet size is as follows: 9¼" high, 9½" wide, 10½" deep, either black or gray crinkle finish.
10. The entire unit is rigidly built and tested to RME specifications.
11. The tubes used in the DB-20 are two 6K7 amplifiers and one 80 rectifier.

No matter what receiver you are now using, if you desire to boost the signal strength and at the same time decrease the image response of your present reception, give the DB-20 preselector a trial.



WRITE FOR CIRCULAR

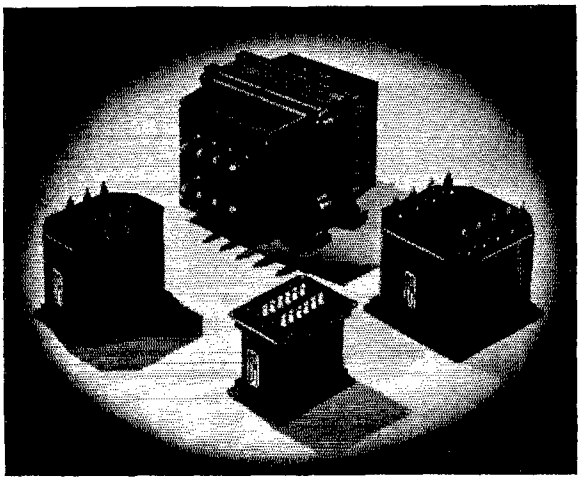
RADIO MFG. ENGINEERS

INC.

PEORIA ILLINOIS

UTC VARIPOWER

plate transformers will give you the WANTED VOLTAGE. THEY NEVER BECOME OBSOLETE. They can be used again and again if other voltages are required.



A wide range of voltages and currents are obtainable from UTC VARIPOWER plate transformers when used in various circuits. The chart below will facilitate in determining the one best suited for your general requirements.

PLATE TRANSFORMERS

Primary 105, 115, 220, 230 Volts A. C. 50-60 Cycles

PA-110 515 or 625 each side of center at 200 MA. 400 V.D.C. or 500 V.D.C. Your cost..... **$6.00**

PA-111 750 or 950 each side of center at 350 M.A., D.C. voltage 600 or 750. Your cost..... **$10.20**

PA-112 1250 or 1500 each side of center at 500 M.A., D.C. voltage 1050 or 1250. PA-6, List Price $32.00. Your cost..... **$19.20**

PA-113 1750 or 2100 each side of center at 500 M.A., D.C. voltage 1500 or 1750. Your cost..... **$26.10**

PA-114 1750, 2350, 3000 or 3500 each side of center at 500 M.A., D.C. voltage 1500, 2000, 2500 or 3000. Your cost..... **$45.60**

PA-154 3500, 4000 each side of center at 500 M.A., 3050 V.D.C. or 3500 V.D.C. Your cost.... **$60.00**

PA-155 1250 or 1500 each side of center at 750 M.A., D.C. voltage 1050 or 1250. Your cost..... **$30.00**

PA-115 C bias plate transformer for class B 203A's, 830 B's, 800's, or 210's using one or two 83 rectifiers. Your cost..... **$6.00**

PA-116 1250 or 1500 each side of center at 300 M.A., D.C. voltage 1050 or 1250. Your cost..... **$13.80**

PA-117 3500 or 3000 each side of center at 1 ampere, 2620 V.D.C. or 3050 V.D.C. Your cost..... **$69.00**

PA-118 1750 or 2400 each side of center at 325 M.A., D.C. voltage 1500 or 2000. Your cost..... **$21.00**

PA-119 1500 or 1750 each side of center at 1 amp. D.C. voltage 1250 or 1500. Your cost..... **$45.60**

Trans. No.	Full Wave—Normal		Full wave 110 V. on 220 V. Pri.		Bridge	
	Low V. Taps	High V. Taps	Low Taps	High Taps	Low Taps	High Taps
PA-110	400V–200MA	500V–200MA	200V–250MA	250V–250MA	800V–120MA	1000V–120MA
PA-111	600V–350MA	750V–350MA	300V–400MA	375V–400MA	1200V–200MA	1500V–200MA
PA-112	1050V–500MA	1250V–500MA	520V–600MA	625V–600MA	2100V–300MA	2500V–300MA
PA-113	1500V–500MA	1750V–500MA	750V–600MA	875V–600MA	3000V–300MA	3500V–300MA
PA-114	1500V–600MA 2000V–550MA	2500V–500MA 3000V–500MA	750V–600MA 1000V–600MA	1250V–600MA 1500V–600MA	3000V–350MA 3000V–350MA	5000V–300MA 6000V–300MA
PA-116	1050V–300MA	1250V–300MA	525V–350MA	625V–350MA	2100V–175MA	2500V–175MA
PA-117	2600V–1A	3050V–1A	1310V–1.2A	1525V–1.2A	5200V–650MA	6100V–650MA
PA-118	1500V–325MA	2000V–325MA	750V–375MA	1000V–375MA	3000V–210MA	4000V–200MA
PA-119	1250V–1A	1500V–1A	625V–1.2A	750V–1.2A	2500V–650MA	3000V–650MA
PA-154	3050V–500MA	3500V–500MA	1525V–600MA	1750V–600MA	6100V–300MA	7000V–300MA
PA-155	1050V–750MA	1250V–750MA	525V–850MA	2100V–450MA	2100V–450MA	2500V–450MA

UNITED TRANSFORMER CORP.

72 SPRING STREET • NEW YORK, N. Y.

EXPORT DIVISION 100 VARICK STREET NEW YORK, N.Y. CABLES: "ARLAB"

▸ QST ◂

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TO

VOLUME XXI

1937

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NC-81X

Even in lesser details the NC-81X is outstanding. For instance, take a look at the dial above. Each of five amateur bands covers one span of the dial with extreme and uniform bandspread. Calibration is direct and an indicator inside the dial points to the proper scale. The knife-edge pointer travels over a mirror scale to eliminate parallax. Logging markers, adjustable from outside the dial case, indicate at a glance the position of most-used frequencies. The tuning knob, with automatic ratio shift, is at just the right height for easy tuning. . . . The NC-81X is notable for convenience as well as for the circuit developments that make its performance possible at such low cost.

NATIONAL COMPANY, INC.

LOOK AT THE NEW RCA 809!

LOOK AT THE CONSTRUCTION

Husky electrodes, ruggedly supported in a large envelope assuring maximum heat radiation. Ceramic base and plate lead out of top for maximum insulation. Large plate cap for easy and low-loss connections.

LOOK AT THE RATINGS

	CLASS C TELEGRAPHY	
D-C Plate Voltage	750	max. volts
D-C Plate Current	100	max. milliamperes
Plate Input	75	max. watts
Plate Dissipation	25	max. watts
Full input to 60 megacycles		
Filament Voltage	6.3	volts
Filament Current	2.5	amperes
Amplification Factor	50	

LOOK AT THE PERFORMANCE

New design provides high efficiency and low driving power at moderate plate voltages. High-mu grid means low bias requirements. Heavy duty filament and large electrodes provide for safe, conservative ratings.

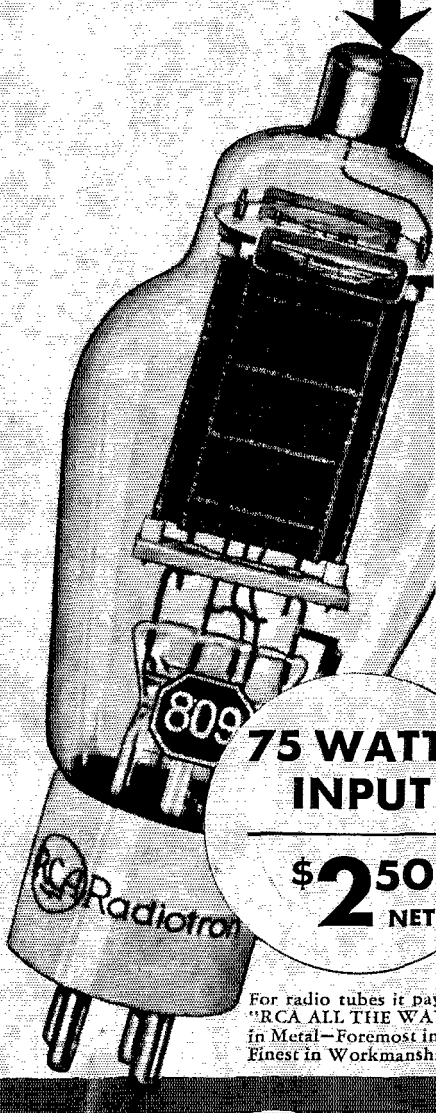
LOOK AT THE PRICE

Only $2.50 Net!

AND THEN YOU WILL BE SATISFIED ONLY WHEN YOU OWN A NEW RCA-809

Your distributor has them in stock. See him or write us for full technical information.

RCA presents the "Magic Key" every Sunday, 2 to 3 p. m., E. S. T., on NBC Blue Network



75 WATT INPUT

$2.50 NET

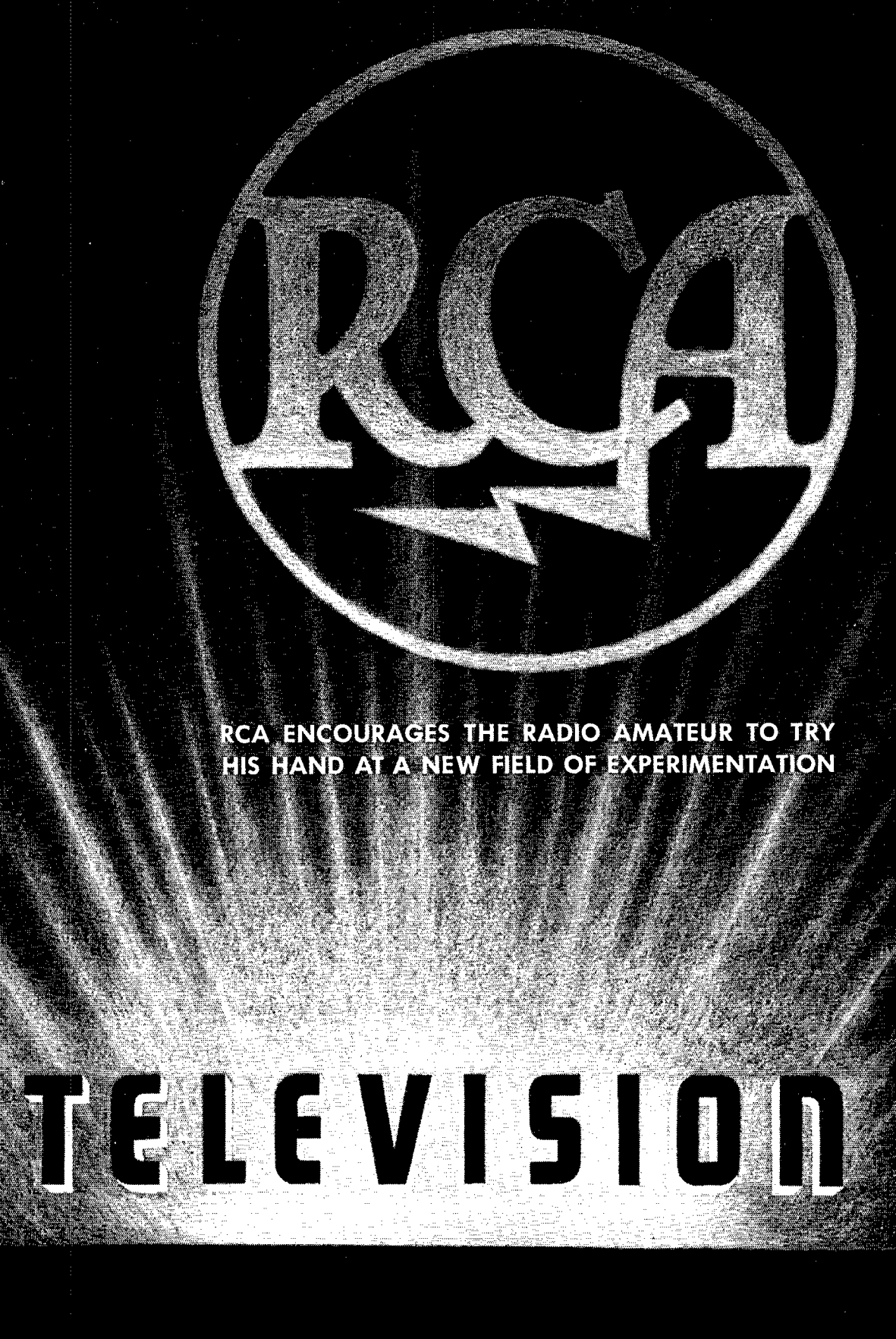
For radio tubes it pay
"RCA ALL THE WA
in Metal—Foremost in
Finest in Workmansh

RCA

for Amateur Radio

AMATEUR RADIO SECTION

RCA Manufacturing Co., Inc., Camden, N. J. • A Service of the Radio Corporation of America


RCA
RCA ENCOURAGES THE RADIO AMATEUR TO TRY
HIS HAND AT A NEW FIELD OF EXPERIMENTATION
TELEVISION

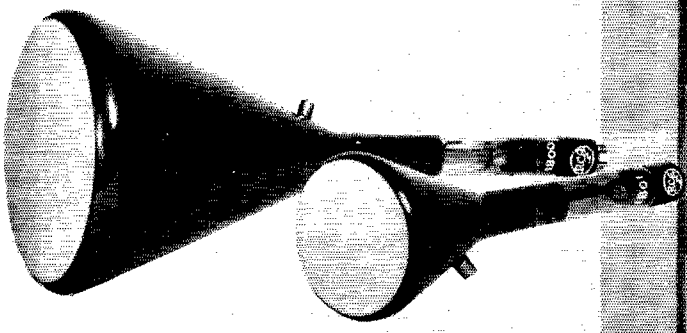
RCA ENCOURAGES THE AMATEUR IN

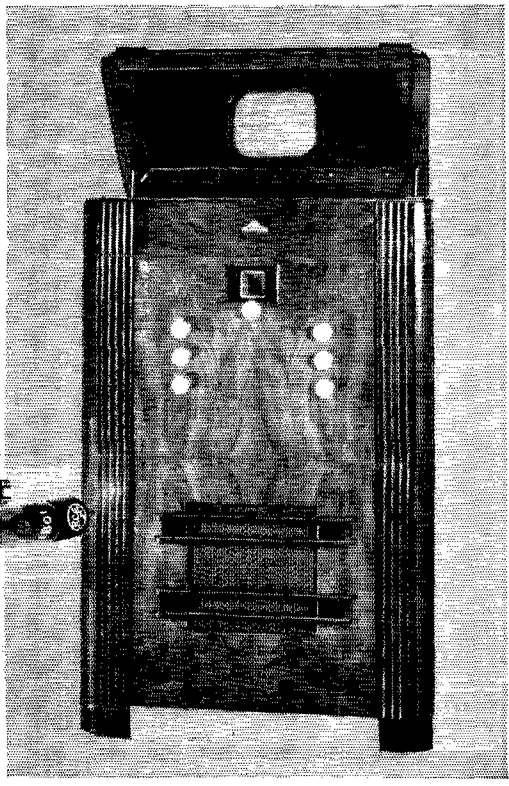
Two Television Kinescopes* Now Available for the Experimenter

RCA knows and is deeply appreciative of the radio amateur's contribution to the art of ultra-high frequency communication. The early development of television gave rise to problems best solved in the laboratory, but as the art slowly emerges from this status to the stage where field experiments can best answer the current problems, RCA believes that the amateur can and is eager to contribute to the perfection of this new art.

Right...Experimental RCA television receiver used in field tests.

Below...RCA Kinescope* tubes, 1800 and 1801.





Television Problems

Definition... Before television for the general public becomes an actuality, the picture must be sufficiently clear and detailed to hold the public's interest. Briefly, it must compare favorably with good printed illustrations or motion pictures.

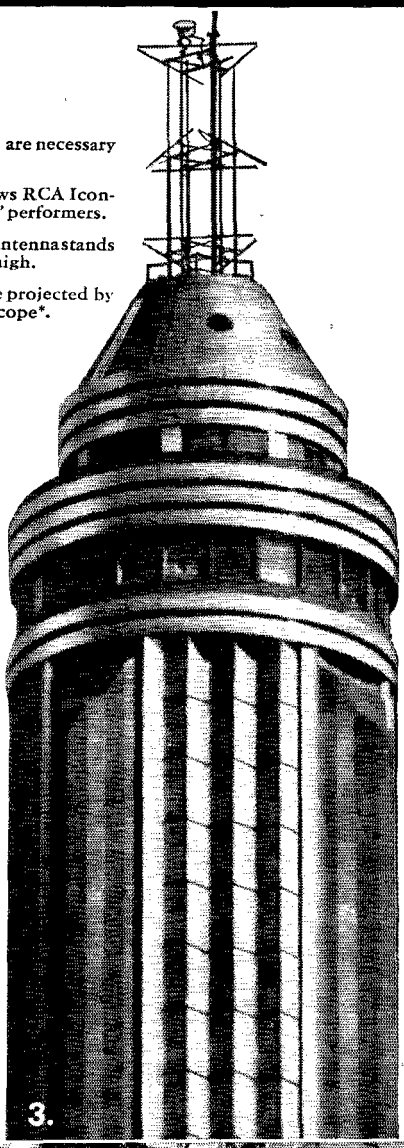
Geographic Coverage... Present television systems require exceedingly wide band widths —a channel six megacycles wide. Because space in the radio spectrum is not available at the low frequencies, ultra-high frequencies must be used. At present these are more or less limited to line of sight transmission distances, which means a multiplicity of stations to cover even one state. Building these stations and r laying television programs to them for broa casting is a tremendous commercial problen

Programs... There is no point in the ger eral public buying television receivers unt programs are provided. And there is no poin in putting a program on the air until there i an audience. This "cat chasing its tail" situa tion must be ended before television is read for the public.

Standardization... Television receiver must be designed to synchronize with the pa ticular transmitter whose programs the receive. Transmissions employing differen standards of definition than that for which a r ceiver is designed cannot be received. Thus n standardization should take place until satis factory definition is achieved because no grea change can be made in either the transmitte or the receiver without obsoleting the othe

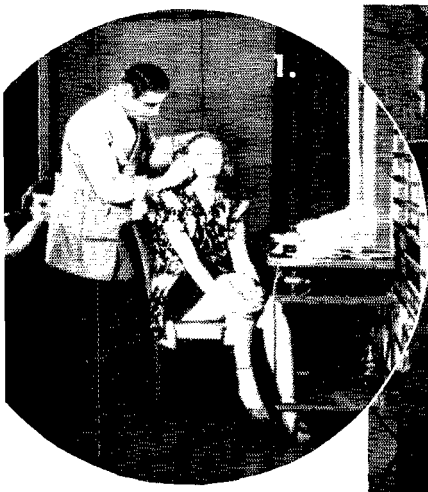
THE DEVELOPMENT OF TELEVISION

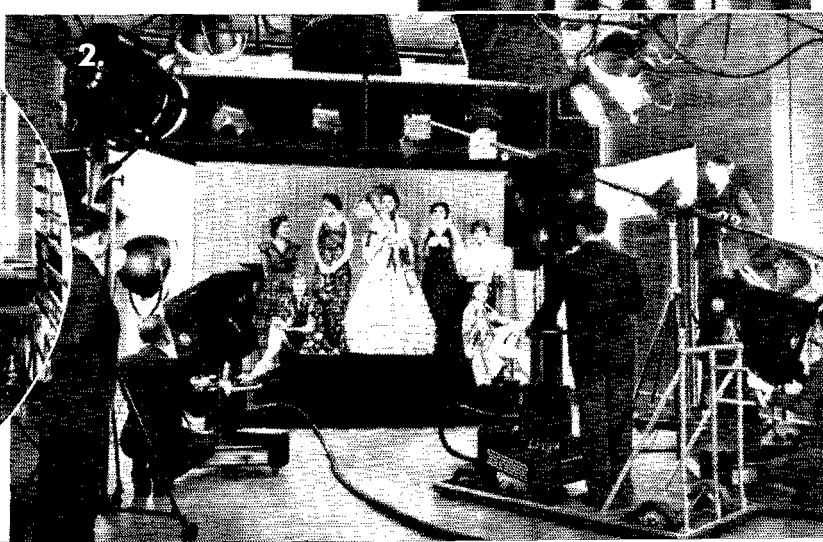
1. Make-up experts are necessary for television.
2. Stage scene shows RCA Iconoscope* "eyeing" performers.
3. NBC television antenna stands over 1,250 feet high.
4. Television image projected by new RCA Kinescope*.

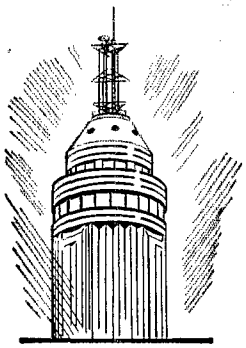


Present Status of Television

RCA's field tests in New York area have been well publicized. Other investigators are conducting experimental transmissions in several parts of the country. However, there may be lack of standardization between these transmissions so that receivers suitable for one system may be unsuited for others. No regular program service is being offered since stations are frequently off the air redesigning and rebuilding their equipment. These constant changes in transmitters during the field test work may make receivers designed for receiving experimental transmissions obsolete—or otherwise may require corresponding changes in receivers.







In Radio and Television it's "RCA ALL THE WAY!"

RCA will continue field experiments in the New York area. These experiments look toward the solution of many and varied problems, such as a satisfactory standardization of definition, suitable transmitter and receiver designs, and acceptable program technique.

RCA has designed and is manufacturing a television system for the Columbia Broadcasting System. CBS will also conduct field experiments with a view of having adequate experience when television is ready for the general public.

What this Means to the Amateur

As television gradually steps out of the laboratory... as the number of experimental stations on the air increases... the radio amateur has the opportunity to experiment with an entirely new kind of apparatus. Even more important, RCA believes that the radio amateur now has an opportunity to contribute valuable technique to an art which has been hailed as one of the greatest cultural forces ever created for mankind's use.

What the amateur's contribution can or will be no one knows, any more than the early television experimenters could predict current technique. However, using the past to predict the future, RCA believes the amateur's contribution will be considerable.

To enable the amateur to begin television experiments, RCA announces

RCA-1800 and RCA-1801

two Kinescopes* for television reception. Full technical information will be sent upon request. We invite those of you who are located in areas where television experimental transmissions are in progress to try your hand at this fascinating art.

RCA-1800 Kinescope* $60.00
RCA-1801 Kinescope* $40.00

A deflecting yoke for the operation of either of these tubes is also available.

Registered Trade Names of RCA Manufacturing Co., Inc.

RCA for Amateur Radio and Television

AMATEUR RADIO AND TELEVISION SECTION

RCA Manufacturing Co., Inc., Camden, N. J. • *A Service of the Radio Corporation of America*

To All Radio Amateurs

Greetings

Another year is drawing to a close! To myself and my associates it has been a good year, and we take this means of expressing our sincere appreciation to you, our many friends, who have made it so. To all Amateur Radio we extend our best wishes for a very Merry Christmas and a Happy New Year.

W. J. Halligan

The Greetings of the Season

from your hallicrafters dealer