QST
devoted entirely to
amateur
radio

In this Issue—
A New
Five-Band
Exciter

28-Mc.
Crystals
in Operation

More on
Television
The standard 32G Transmitter has met wide acceptance as a general purpose model and is widely used by amateurs and by commercial and government services. This particular size of transmitter finds many varied applications, and, to exactly meet each requirement, Collins Radio Company has expanded the 32 Series design to include specially constructed equipment. Arrangements have been made in the flexible and efficient Collins plant to build this type of set to order embodying combinations of features specified by the individual customer. The cost of such special 32 Series Transmitters is, of course, higher than that of the 32G standard model, but the use of standardized parts and sub-assemblies keeps the price to a very reasonable figure. Thus the user is able to write his own specifications in such detail as:

- A1 or A3 Emission.
- 20 to 50 watts output.
- Various frequency ranges between 1.5 mc. and 60 mc.
- Different frequency changing systems including semi-fixed tuning, plug-in coils and panel switching.
- Operation from AC power at various voltages and frequencies, or DC power at 12, 24, 32 or 110 volts with self-contained dynamotor.
- Master Oscillator, or “A” cut crystal frequency control, with or without temperature control.
- Connections for telephone type or high fidelity microphone or for telephone line.
- Operating controls on panel or with remote control.
- Antenna relay.
- Spray-proof cabinet and shock-proof mountings.
- Additional Instruments.

CORRESPONDENCE IS INVITED

COLLINS RADIO COMPANY
CEDAR RAPIDS, IOWA NEW YORK, N. Y: 11 WEST 42 ST.
Interior View of WFBF Mobile Transmitters showing 1938 Super Skyrider.

THE CONTROL BOARD OF WFBF, NBC station of Baltimore, Md., showing panel installation of 1938 Super Skyrider.

TED ROGERS—famous short wave radio columnist of the N. Y. World-Telegram spins the dial of his Super Skyrider.

HENRY HOFFMAN, operator for Rev. Father Paul Schulte, “Flying Priest of the Arctic,” writes from his post in the Arctic wastes—“With the Sky Challenge, low power transmitters were received over a surprisingly long distance, where all other receivers I used this summer in the Hudson Bay failed.” Hallicrafters receivers are also used in the MacGregor Expedition now in the Arctic regions.

THUMBING through the Hallicrafters’ Scrap Book, one cannot help being impressed by the widespread acceptance of Hallicrafters Communications Receivers. We are proud to show on this page a very few of the outstanding personalities who operate Hallicrafters receivers and their rigs.
ENRIQUE HIDALGO—Ciego de Ávila, Cuba—
Winner of second prize in the All-Wave B. C. DX contest with his new Super Sky­rider. He says: “The receiver has created a sensation here where it has astonished every new listener.”

WF7X—W. E. KELLEM, Washington, D. C., says: “I selected the Super Sky­rider because it is one of the best receivers on the market today including price and performance. In a little over a month, I have worked more DX than ever before and have had good receivers in the shack.”

W1KTG—BEATRICE HOLMAN, Belmont, Mass.: “The more I operate the Super Sky­rider, the better I like it and I am only too glad to add my word of praise. Am on 10 meters at present and have heard plenty of DX this morning that I never copied before.”

W2AMI—FRANK LESTER, Bergenfield, N. J., at the controls of his 1938 Super Sky­rider.

THE very fact that Hallicrafters receivers figure so prominently in leading amateur and scientific stations is in itself a testimonial to the merits of these outstanding receivers.

Say You Saw It in QST — It Identifies You and Helps QST
The Contents

Editorials ....................................................... 9
First A.R.R.L. QSO Party ................................. 10
Cairo — Part I ............................................... 11
A Five-Band Exciter with Front-of-Panel Band Changing
   Donald W. Esner, W8ZU .............................. 14
True North from Old Sol .................................. 18
The New PITC ................................................ 19
Directional Antennas with Closely Spaced Elements
   John D. Kraus, W8JK .................................... 21
What the League Is Doing .................................. 24
A.R.R.L. QSL Bureau ........................................ 25
56-Mc. Crystal-Control with 28-Mc. Crystals
   J. M. Wolfskill, W8OKT ............................... 26
Silent Keys ...................................................... 30
Circuit Elements in Modern Television Reception
   Marshall P. Wilder, W2KJR ............................ 31
The Strongheart Boys in the Pacific ................. 35
Army Amateur Radio System Activities .............. 36
The Cover .................................................... 37
The 809 ....................................................... 37
Hamdom ....................................................... 38
How Would You Do It? ...................................... 39
The CCC Takes to the Air ................................. 41
Hints and Kinks .............................................. 42
I.A.R.U. News ................................................ 45
Operating News .............................................. 47
Correspondence Department ............................ 55
Standard Frequency Transmissions .................. 94
Standard Frequency Transmissions from W9XAN to be
   Curtailed .................................................. 106
Hamads ...................................................... 107
QST's Index of Advertisers .............................. 110
The old year is done
A new year's begun.
And good resolutions
Are made by each one.

Your station works well
DX has been swell
One good resolution
Join your A.R.R.L.

BUILDING
AN AMATEUR
RADIODIALEPHONE
TRANSMITTER

An introduction to Amateur Radio-telephony. Written for the man who has a class C or class B license. A companion book to "How to Become a Radio Amateur"

CONTAINS simple description of the process of modulation and principles of good design for 'phone. Description of inexpensive low-power transmitter and modulator, with complete operating instructions plus some antenna dope of particular interest in 160- and 10-meter operation. It tells what a new or inexperienced ham should know before attempting to use 'phone.

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West Hartford, Connecticut
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All entries in our contest for amateurs are not in as this is written. Judges will decide on winners as quickly as possible after contest closes.

4 to 1 preference for RCA tubes revealed

4 out of 5 amateurs are reporting on their entries that they use RCA tubes in their transmitter. Some of the reasons for this overwhelming preference for RCA tubes follow. These appear on nearly every entry.

1. RCA quality is unquestioned.

2. RCA tubes give better service. Many amateurs say that even after years of "savage" use their RCA tubes are still giving excellent performance.

3. RCA performance is better. Many cases of balky transmitters being tamed with RCA tubes have been reported.

4. RCA tubes can take it. Many amateurs tell us they operate RCA tubes under conditions we do not recommend—yet the tubes perform perfectly. This demonstrates a healthy margin of safety between the ratings and the performance capabilities of the tubes. You get more watt hours per dollar when you use RCA tubes.

Thanks—

Thanks for your entries. The information you have given will enable us to render the amateur even greater service in the future.

When buying radio tubes, say "RCA"
— First in Metal—Foremost in Glass—Finest in Performance.

RCA presents the "Magic Key" every Sunday, 2 to 3 P.M., E. S. T., on NBC Blue Network.

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RCA-808 $7.75
RCA-866 $1.50

for Amateur Radio

AMATEUR RADIO SECTION

RCA MANUFACTURING CO., INC., Camden, N. J. — A Service of the Radio Corporation of America

Say You Saw It in QST — It Identifies You and Helps QST
Listed. Mail your S.C.M. (on the 16th of each month) a postal covering your radio activities for the previous 30 days. Tell the Section Communications Managers of the A.R.R.L. Communications Department or other appointments he can tell you about them, too.

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ONE of the chief sources of audio frequency distortion in the amateur transmitter is the class B modulator stage. By distortion we mean wave form distortion which comprises a fundamental frequency plus harmonics, or integral multiples, of this frequency. Besides giving a signal which is not clear and pleasant to listen to, the harmonics cause spattering over the band and interference. Thus when a tone of 5000 cycles is passed through a modulator giving a strong third harmonic, the carrier is modulated with fifteen kilocycles. The result of this is bad interference with other stations within fifteen kilocycles either side of the carrier. With good audio design such a condition might be entirely eliminated. With the bands as crowded as they are today no good amateur will allow his transmitter to add unnecessarily to the QRM.

To obtain a class B modulator having a low harmonic content, it is first necessary to drive it properly. In order to do this the proper driver tube-transformer combination must be selected. The use of a driver transformer from a low impedance line to the class B grids is not to be desired in most cases. When this type of coupling is used it involves the use of two transformers, one from the driver plates to line, and another from line to class B grids. Since in driver transformer design, every effort is made to keep at a minimum leakage reactance, any arrangement such as the use of two transformers where only one is necessary defeats the purpose of this design. This is because all transformers possess a certain amount of leakage reactance, any arrangement such as the use of two transformers where only one is necessary defeats the purpose of this design. This is because all transformers possess a certain amount of leakage reactance which adds when one is used following another. Class B grid circuits are of the low impedance type so it is permissible to run shielded leads for a reasonable distance from the driver transformer to the class B grids. If the distance is so great that a low impedance line is needed, by all means locate the driver tubes at the modulator. Then it is possible to couple the plates directly to the class B grids through the proper driver transformer.

The last tube of the voltage amplifier may be coupled to a low impedance line through a plate to line transformer. This line will be run whatever distance necessary to a line to grid transformer and so to the class A driver grids. By putting the transformers between two class A stages, instead of between a class A and a class B stage, the circuit is essentially effecting a voltage transfer involving no power. In the voltage transfer circuit leakage reactance is of relatively little importance.

Whenever possible it is best to follow manufacturers recommendations for driver tube combinations and to employ a well designed driver transformer. In cases where something new is being tried out it is always advisable to test the rig with an oscilloscope or listen to it with a monitor speaker to see how it sounds before going on the air.

F. P. KENYON, President
The American Radio Relay League

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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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West Hartford, Connecticut

General Counsel...........PAUL M. SEGAL
1026 Woodward Building, Washington, D. C.

Address all general correspondence to the administrative headquarters at West Hartford, Connecticut
IN another section of this issue (page 100) we undertake to spike a rumor which, as of this writing, had set a considerable portion of the amateur fraternity on its individual and collective ear. In consequence of this rumor and its aftermath, we would like to express a few thoughts on the general subject.

Of all the dire rumors that have arisen concerning amateur radio in the past, we'd say just about every one was founded on ignorance. The present one is no exception. An amateur—a new one, if his call means anything—saw a routine order of the F.C.C. Now, such orders are not always clear in their meaning to the casual reader; after all, they deal with a complicated subject. Our hero in the present case read the order and promptly came to the wrong conclusion regarding some of its statements. Let it be understood, however, that we are not panning him for that. What we do criticize is his subsequent action.

One would think that before “going to town” with the apparent bad news, he’d have undertaken to check with informed sources as to the exact meaning of the order; there were, incidentally, at least half a dozen more-experienced amateurs within telephone call who could have put his fears to rest. But did he do this? He did not. Instead, with the full power of a thousand watts behind his 160-meter ‘phone, he blazed the band with his erroneous interpretation, his citation of the F.C.C. docket number giving an appearance of authenticity to his statements, and in very short order indeed he had a great many amateurs upset to a marked degree. We might add that in his eagerness to be first with the bad news he “jumped” the release date given on the order, but we’ll let the F.C.C. settle with him for that.

At any rate, the resulting furor necessitated a considerable amount of correspondence, some telegrams and a special broadcast by the League, and the hard work of many saner amateurs before it was all quieted down.

We aren’t going to make mountains out of molehills on the subject of rumors. We’ve always had rumors; we always will. Were it simply that they caused a lot of annoyance, we’d not be too greatly concerned; unfortunately, about every once in so often somebody goes off on a tangent over a rumor and starts some real trouble before the true facts are brought out—and we can’t have that happening. For this reason, we’d like to offer a few suggestions for rumor-treatment. They won’t hinder the dissemination of real dope—we’d never want that to happen—but they will go far to stop the false in its tracks.

First, when you hear some awful rumor, take it easy; the rumor is probably untrue. Rumors have a pretty poor record of performance; about one in a thousand has some real basis in fact. Incidentally, the worse the dope sounds, the more likely it is to be fiction.

Second, remember that if anything of any real moment ever happens to amateur radio, it is dollars to doughnuts that the A.R.R.L. will have known about it plenty of time in advance, and will have issued an official broadcast on the subject, if such a thing is called for.

Third: All A.R.R.L. official broadcasts carry numbers and dates. If some ham says he has the dope “straight from Hq” and can’t supply the number and date of the official broadcast that carried the facts, stop right there until he comes across, or until somebody else does.

Lastly, if you stumble across some really alarming news, with all appearance of genuineness, and if you don’t at the same time know of some official A.R.R.L. broadcast on the subject, get in touch with your nearest A.R.R.L. director or S.C.M. or, perhaps preferably, with League Headquarters, before transmitting the news any further. We are always appreciative of such information and always glad to reply regarding its authenticity. The chances are, of course, that it results from misinterpretation on somebody’s part; but this method of checking will promptly bring you full and complete dope—by return wire, if necessary.

In closing, we’d like to make ourselves clear on one point: We have no criticism of any amateur anywhere experiencing sincere concern over any apparently genuine information which may come to his attention regarding amateur radio. We’d be concerned ourselves. We sometimes are, in fact, at rumors emanating from pretty high authority; officialdom is no exception to this rumor business. But we are and will continue to be insisted in our condemnation of anyone who undertakes to pass on anything of this sort without first checking with a reliable and informed source. That type of egg is no friend to his fellow-amateurs or to amateur radio.

A. L. B.
First “A.R.R.L.” QSO Party!

January 8th-9th (Sat.-Sun.)—General Call: “ARRL de . . .”—For All Members—To Get Acquainted with All Members—Distinctive Call Insignia Prize Offered in Each League Section!—Try Your Luck—Start a QSO List—Use Any or All Bands—Phone or Telegraph in This Activity

The idea is for members in each Section to chat with as many other A.R.R.L. members (anywhere) as they can. The leading member station in each Section will receive his own call in the attractive pin style illustrated as soon as results have been analyzed.

Only A.R.R.L. Members are eligible. It is a family party for all of us members, a brand-new opportunity to find who our fraternity brothers are. CQ calls are out! The way to show you are open for contacts in this party will be to let loose a few well sent calls of “ARRL de . . .” In the course of a contact members will tell each other two things, the name of their Section and the date their membership expires, month and year.

Special log forms (not necessary) will be sent free on request to Hq., or rule your own, just three columns listing calls, Sections, dates. In radiotelephone contacts the Section, month and year will be named. No special form is required or suggested, and it’s a small part of the conversation. Radiotelegraph members will abbreviate Section names and use four numerals to show membership dates. “Conn Call Pins with Personal Calls in the above style will be awarded in each of the 70 A.R.R.L. Sections and to the member leading each of the six continental areas. 0343” will mean “Connecticut Section, my membership good until March 1948” for example. Information to be exchanged in every case comes right off your own League membership certificate or pocket card. Members will not enter in either a radiotelegraph or radiotelephone classification. Many hams use both. Scores can be all by one mode, or part telegraph and part voice—any combination of frequencies you like. Advance entry is unnecessary. Just take part and send in the list of members you worked with claimed score.

Starting Time: Saturday, January 8th, 2300 11 P.M. Greenwich; 3 P.M. PST; 4 P.M. MST; 5 P.M. CST; 6 P.M. EST or the equivalent at any point.

Ending Time: Monday, January 10th, 0801 8:01 A.M. Greenwich; 12:01 A.M. PST; 1:01 A.M. MST; 2:01 A.M. CST; 3:01 A.M. EST or equivalent.

Operate any 20 hours of the 33-hour party. State contest hours you did not operate if your score is over 10,000.

Scoring: 1 point for each complete set of information sent; 1 point for each set of data received and logged. No member can be worked to get more than one complete exchange for 2 points. The sum of points will be multiplied by the number of different Sections (and continents outside field organization territory) in which at least one member has been worked and exchange effected. A convenient way to keep record of new and different Sections as you work them is to circle and number the name of the Section the first time it is written in your list.

A lot of fun assured. See how many members you can work on this January Saturday-Sunday weekend. And if you work anybody not a member ask him “why not.” We’ll make this one of the big annual events if you like it. Try it out and let’s have your suggestions, members.

—F. E. H.

1 See complete list of 70 A.R.R.L. field organization Sections, page 6 this issue of QST. A call insignia award is also available to the leading member in each continent (outside field organization territory). All members outside the field organization use the name of their continent instead of a section abbreviation. Note that CO-CM, K4-6-7, KA, and VO as well as W-VE members are in the field organization and cannot be also counted under a continental status.

2 The multiplier is the sum of the number of Sections and continents outside the field organization territory in which at least one A.R.R.L. member is contacted. But a single multiplier times the sum of points gives the score. Example: W6XXX has completed two-way contacts with 57 different stations located in 31 different A.R.R.L. Sections and Europe and Oceania. His multiplier is 35. Score? 2 x 57 = 114, 114 x 35 = 3990.
Cairo
How We Got Our Present Bands—What the Cairo Conference Means to Amateur Radio—How It Does Business
In Two Parts—Part I†
By A. L. Budlong*

To the average person, Cairo, Egypt, is a large city located in the general vicinity of the Nile and vaguely supposed to have something to do with the Pyramids. To the average amateur, it is the 1938 location of that periodic nightmare known as an international radio conference, a place where the "commercials" always triumph and where the amateur always gets gypped out of some more frequencies. There is no question about the gypping business because we now have to operate in certain narrow bands whereas once—as the fable goes—we had everything from 200 meters down, all for our very own.

These ideas are firmly implanted in the amateur mind; they are almost universally accepted as basic fact. Were we to say that we never lost a kilocycle at an international conference, that we still have precisely the same international assignments that we got under the first treaty dealing with high-frequency allocations, that no U. S. law ever gave amateurs an exclusive assignment of the territory from 200 meters down and that neither any U. S. law nor international treaty so much as mentioned amateurs or amateur radio until ten years ago . . . were we to say this and assert that these are facts, it would appear that explanations are in order.

And indeed we think they are. Certainly it is true that the average amateur has only a hazy idea of what we ever had, how we got it, why we have international conferences, and how they do business. What we propose to do here, therefore, is to give a brief factual account of amateur frequency assignments, both domestic and international, from the very first days, and to follow with a short description of the hows and whys of an international conference. Lest some readers see in the timing of the appearance of this article an attempt to pave the way for the acceptance of losses at Cairo, we want to say that this is being written because the Board of Directors ordered it, solely in the belief that the information would be valuable to all amateurs and because it felt it would be more widely read now than at some time when interest in such subjects is not so high. As for what may be done at Cairo, no one knows—if they did, there would be no point in holding the conference. Apart from that, we anticipate no losses as things look now. So much for that; now to business.

* * *

Part I
A History of Amateur Assignments

Why do we have to have international agreements on radio? Broadly speaking, there are three reasons:

1. Since stations of one nation are frequently in communication with stations of another nation, it is necessary to have agreements on such operating details as calling procedure, distress signals, call-letter assignments, methods of collecting tolls on radiograms, etc., unless utter confusion is to be encountered when any two stations try to do business over the air.

2. Because it is possible to operate radio stations throughout a wide range of frequencies, it is necessary to agree in advance where the various services will locate themselves in the spectrum, so that stations will know where to find each other.

3. Since radio signals are not confined to the borders of the country in which they originate, international agreements on allocations to services are also necessary in order to prevent chaotic conditions on the air and hopeless interference between services.

The first two were probably the major considerations in the early radio conferences. The third was not so vital in the early days of radio but to-day is extremely important.

Pursuant to the international agreements, each nation, both as a matter of common sense and agreement, arranges its own domestic laws so that they conform to the international commitments. Obviously, it would be silly if the various nations, after carefully working out solutions to their problems, disregarded the remedies by permitting the stations within their borders to operate on some entirely different basis.

Now let us trace the course of all the interna-

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* Assistant Secretary, A.R.R.L.
† Part II will appear in February QST.
nternational conferences and all our own national laws to see how the amateur got taken care of as the laws came along. We'll cover the international treaties first, and then cover our U. S. legislation.

INTERNATIONAL REGULATION

The very first international radio conference, though it doesn't really belong in this story, was held in 1903.

It was held in Berlin. It didn't say anything about wavelengths, operating procedure or anything of this sort and was held for only one reason: there was getting to be considerable trouble due to the fact that stations using Blotto Co.'s equipment would communicate only with other Blotto-equipped stations and would turn studiously deaf ears to calls from stations using Blifsky or other gear. Such nonsense obviously had to be stopped and this first conference, participated in by nine nations (including the United States, which was to participate in all subsequent conferences) was called solely for the purpose of putting an end to such short-sightedness.

The next conference was the one that really started things off. It was held in 1906.

Like the first, it took place in Berlin. Twenty-seven nations, or thereabouts, participated. Perhaps it would be well to say right now that the principal objective was the setting up of arrangements to deal with ship-to-shore work, that being the main thing radio was then used for. In fact, the only services defined in the treaty regulations were coastal stations and shipboard stations—a station, presumably, was either one or the other!

Judged by present standards, the conference resulted in a pretty simple treaty and an even simpler set of regulations to go along with it. However, it is of interest to us because it was here that we see the very first agreements of any kind on wavelength assignments. These agreements were exceedingly simple: coastal stations open to general public service had to be able to use both 300 and 600 meters; ship stations were to use 300 meters for a normal wavelength but could use others if they did not exceed 600 meters; small boats unable to "get up" to 300 meters were authorized to use "a shorter wavelength"; and finally—get this!—coastal stations, apart from their two specified waves could use any wavelength, so long as it was either below 600 meters or above 1600 meters. Had coastal stations in those days wished to use any of the territory represented by our present amateur bands, they were free to do it.

There was no mention of amateurs in the treaty and no provision for them except that if any nation had licensed amateurs at that time (none did, including our own United States) it presumably would have had to see to it that they stayed below 600 or above 1600 meters.

In addition to these matters, the treaty and regulations specified three-letter calls, limited shipboard power, normally, to a kilowatt, outlined details of hours of service for coastal stations, the posting of "wireless" telegrams, rates, collection of charges, etc., specified the use of the international Morse code for radio work, designated SOS as a distress call and outlined some very rudimentary regs on methods of calling and working.

This second Berlin gathering also decided on the principle of holding similar conferences from time to time and, as a matter of fact, the next was held six years later in London. So we came to 1912.

Fifty-two nations from all over the world participated in this London conference; our radio gatherings were beginning to amount to something! Not much was done to change the 1906 treaty and regulations but they were enlarged on somewhat. As before, general public service stations had to be able to use 300 and 600 meters, but now they could also use 1800 meters. Ship stations were 300 and 600 meters. A curious addition to wavelength specifications was that prohibiting stations used exclusively for sending signals designed to determine the position of ships from using a higher wavelength than 150 meters. Here was the first "short-wave" assignment, as such, and it was to radio-bearing stations! However, this was by no means an exclusive assignment, because, just as in the 1906 treaty, any station could use any wavelength (except that the compass stations had to stay under 150) as long as it stayed under 600 or over 1600 meters.

Ship power was still limited, normally, to a kilowatt; additional power could be used if needed, however, for distances over 200 miles or under unusual circumstances. The Q signals came into being. Revisions and additions were made to other operating details but not a great deal of change shows up in this treaty in these matters as compared with the earlier one. Our old friends the coastal stations and shipboard stations were still the only defined services.

At this gathering it was agreed to hold the next conference in 1917, but the Great War and its aftermath upset things so badly that it was fifteen years before another radio conference took place.

1927

The 1927 conference was held at Washington. Nearly eighty nations participated; as of that time, this was the largest international gathering ever held on any subject and the first since the advent of "short-waves."
The delegates were confronted with a perfectly stupendous task because of the tremendous strides made in radio development since the previous gathering. All the old concepts of radio had been discarded and new theories evolved; new uses for radio had been found with a resulting terrific enlargement in the number of services; telephony had been developed and had given birth to the broadcasting industry; the short waves had found use. As may be imagined, the conference regulations were numerous and detailed, bearing but little resemblance to those in the former treaties.

Radio services had segregated themselves into dozens of different distinct classes by this time, so the services mentioned in the list of definitions was considerably more detailed. One of the definitions was that of “private experimental stations.” There were two subheads to this definition: the first explained that the definition included stations of the kind we now recognize as “experimental”; the second stated that the definition applied also to “a station used by an ‘amateur.’” We had arrived.

More than that, the radio spectrum—heretofore virtually wide open to everybody—was now split up into channels, from 10 kilocycles to 23,000 kilocycles, and the various services allotted certain specified channels or groups of channels for their use. And in this table, we amateurs got bands at 1.7 and 3.5 megacycles (shared with the fixed and mobile services) and at 7 and 14 megacycles (exclusive to us). These bands were precisely the same width as those we have to-day. Since the regular table of allocations did not go above 23,000 kc. and since we amateurs wanted assignments still higher, special assignments were designated at 10 meters and at 5 meters, jointly for the use of amateur and experimental services; these, also, were the same we now have.

Licenses were required of all amateur operators and it was further stipulated that each such licensee would have to demonstrate ability not only to transmit the continental code but to receive it—“by ear.” The code speed required of licensees was left to each country to determine for itself, however.

Of course, the regulations also went into great detail on all other matters such as special signals, a revision of the Q signal list, calling procedure, rates, methods of collection, license requirements (commercial) etc., but we take it for granted that by now our readers are aware that each set of regulations in the international treaties includes those matters and we will not refer to them further. From now on we will treat only those portions of the treaties that deal with amateurs and amateur radio.

Following the Washington conference, came a five-year interval and then the second of the really “modern” conferences, in —. 1932

This was held in Madrid. Very little change was made in the previous treaty or its annexed regulations. Our amateur frequency bands were continued intact. However, we had not been satisfied in the Washington regulations with having the definition of an amateur included as part of a definition of the “private experimental station” class; at Madrid, therefore, we sought to have amateurs recognized as a separate and distinct class by themselves. The effort was successful and at Madrid, for the first time in an international treaty, we see the amateur service recognized strictly as such.

This takes us through all the international conferences on radio up to the forthcoming Cairo affair which, since it is still in the future, we will talk about later.

**NATIONAL REGULATION**

We have now shown, very briefly, what has happened from the early days up to the present time in terms of international regulation. During all this time, however, we were confronted with changing laws and regulations on amateur radio. During all this time, however, we were confronted with changing laws and regulations on amateur radio here in the United States under the terms of the United States laws, so let us go back now, see what those laws were and what kind of treatment we got under them.

The outstanding thing about early radio law in this country is that it was an awfully long time before we got the first one! There was no United States radio law in 1903 at the time of the first Berlin international conference already mentioned, nor was there one in 1906, at the time of the second Berlin affair. It might be thought that this country was obligated to have some sort of national law or regulations after the 1906 conference, in order to carry out the agreements made there to which the U. S. had been a party. The reason there wasn’t is that, although we had signed the treaty, our Senate didn’t ratify it until six years later; there had been quite a lot of squabbling and disagreement about that treaty, anyway.

So we see the years dragging on through 1906, ’07, ’08, ’09—and still no U. S. law on radio. This doesn’t mean that no law was needed; indeed, by the latter part of this period “wireless” was assuming considerable proportions in the daily life of the world. But with no laws here any station, whether amateur, government or commercial, could operate with whatever call, wavelength and power it wished, subject to no regulations whatsoever—and that is precisely what they all did!

In 1910 a very brief law was passed requiring ships of a certain size to carry radio equipment, but it said nothing more than that and has no real bearing in the present discussion. The act was subsequently modified slightly by another

(Continued on page 60)
A Five-Band Exciter with Front-of-Panel Band-Changing

Crystal Switching, Alternative E.C.O. Control, with Special Constructional Features

By Donald W. Exner,* W8ZU

Another universal exciter! Right! But here are some ideas if you are a gadgeteer who delights to think up things which add to convenience, flexibility and safety.

The design of a new exciter was the first step in the progress from the old breadboard to rack-and-panel. At the beginning certain precepts were set down as a guide in selecting a circuit and layout.

These are given in the author's own order of importance:

1. Safety.
2. Frequency stability.
3. 100% front-of-panel control.
4. Ease of adjustment.
5. Flexibility of circuit.

Safety comes first for obvious reasons. Even frequency stability is of no use to a dead ham. Economy was placed last only because the other items seemed more important.

It goes without saying that frequency stability is the prime object of crystal control. Yet many so-called crystal signals now on the air have as much chirp as a good self-excited rig, and almost as much drift. Crystals of the AT- or V-cut type help to reduce these effects, but the importance of the type of oscillator tube, the circuit and the power supply must not be overlooked. For best frequency stability the oscillator stage should have its own separate power supply, with screen and suppressor voltages tapped from the bleeder. This is better than the use of a dropping resistor for obtaining the screen voltage. Be sure that the 110-volt a.c. wiring has sufficient capacity so that load variations, when keying the final stage, do not appreciably affect the input voltage to the oscillator power supply. Frequently a slight chirp in an otherwise good signal can be traced to the use of a long extension cord carrying enough amperes to give the Underwriters heart failure.

If you take pride in your signal you must consider your oscillator as a frequency standard. Commercial frequency standards, almost without exception, employ a well-screened pentode as the oscillator, for excellent reasons. Good screening reduces the plate-to-grid capacity to the point where variations in plate loading, reflected through this coupling, have a relatively small effect on crystal frequency. Pentodes are universally easy to drive. Thus the crystal can loaf, minimizing its heating and the consequent drift.

Proponents of the use of triodes as oscillators

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claim greater output, but this is obtained at the expense of decreased frequency stability, due to higher interelectrode coupling and higher crystal stress. The function of the oscillator as a power-generating device is satisfied when it furnishes sufficient grid excitation to its doubler-buffer tube. Modern beam-type tubes for doublers and buffers have reduced this power requirement to a fraction of a watt, eliminating the power argument for triode oscillators even in portable rigs.

If we assume that this argument is logical, the choice for the oscillator falls on the 89 as a 6.3-volt pentode having sufficient power capability combined with quite good screening.

Among the several beam-power tubes the choice for the amplifier-doubler finally fell on the 6L6G, although the recently-announced RK49 should be better because of the ceramic base. In addition the greater prong separation of the six-prong base allows the use of a socket with better contact construction than that of the octal socket. The 807 was rejected in this case because the top plate lead interfered with a compact chassis layout.

For normal operation the Tri-tet circuit was selected, chiefly because of its ability to provide good power output on the higher harmonics of the crystal frequency. It also provides excellent frequency stability, and is well known for its reliability in starting a poor crystal. By means of a simple switching scheme it may readily be transformed into an electron-coupled oscillator circuit, or by shorting the cathode tank circuit it becomes the conventional "pentode" crystal oscillator.

Cathode coils for 1.75-, 3.5- and 7-Mc. crystals have been provided, as well as a 1.75-Mc. electron-coupled oscillator coil. A 14-Mc cathode coil was not included because the excellent frequency-multiplying property of the circuit makes it unnecessary to use a crystal of this frequency. There is really little excuse even for a 7-Mc. crystal, for that matter. By confining the financial investment to 1.75- or 3.5-Mc. crystals a greater range of operating frequencies is made available.

It was desired to avoid the nuisance of neutralizing the amplifier when driving straight through...
on the crystal frequency. This requires an untuned impedance coupling between the oscillator plate and the amplifier grid. By using parallel plate feed to the oscillator the plate radio-frequency choke may be used as the coupling impedance when the oscillator plate tank is open-circuited.

Suppressor grid regeneration windings were included in the 7- and 14-Mc. oscillator plate coils to get all the available output on these frequencies when using 1.75- and 3.5-Mc. crystals. This regeneration gives a definite increase in output on the fourth and higher harmonics and a slight improvement even on the second harmonic.

The amplifier-doubler stage is conventional. Because plug-in coils are used, parallel plate feed is called for in deference to Precept No. 1—Safety. Incidentally, the frame of the tank condenser may be mounted directly on the chassis. The 200-ohm cathode bias resistor keeps the plate current within reasonable limits during tuning operations without seriously affecting the d.c. efficiency.

A glance at the wiring diagram will show the switching scheme which allows rapid crystal- or band-changing. This band-switching is satisfactory because the oscillator supplies more power than is necessary to drive the 6L6G, and therefore the ultimate in efficiency is not necessary. Plug-in coils are used in the output tank circuit, however, because efficiency here is essential.

SPECIAL FEATURES

As can be seen from the illustrations, plug-in coils did not necessitate abandoning Precept No. 3, for the coils are changed from the front of the panel by lifting the trapdoor in the lower right-hand corner.

The bottom view, with cover removed, shows how the shielding pocket for this coil was formed. The shielding permits operating the 6L6G with "shorting" type to avoid interrupting the oscillator d.c. power between points. The plate coil and crystal switches may be non-shorting types, since the only d.c. circuit broken is the 50-volt suppressor supply on the plate-coil switch.

The bottom view also shows how the three meter jacks for each of the two tubes are mounted on Micarta angle brackets at a safe distance behind the panel. Access to the jacks is obtained by lifting the small trapdoors on the front of the panel. The size of the openings and the distance of the jacks back of the panel were chosen to make it virtually impossible to touch the plug tip to a jack sleeve when the operator's fingers are gripping the metal ferrule of the plug. The jacks are spaced from each other and from the chassis far enough so that they cannot be shorted by the tip of the plug.

The general chassis layout can be seen in the top view. The 89 oscillator tube with its cathode circuits and the crystal change switch occupy the tuned grid circuit on the lower frequencies if additional output is desired. It may tend to self-oscillate but will lock in with the crystal frequency.

This view also illustrates the details of the two bevel-gear drives which make it possible to locate the band-change switches close to the higher-frequency coil sockets. The switch mounting brackets were cut from 1/16th-inch thick half-hard brass with a hack saw and hand jigsaw. The cathode-coil switch should preferably be of the...
left-hand compartment. The electron-coupled oscillator coil has been removed for the sake of a clearer picture. Banana jacks for six crystal holders are mounted on a sheet of Micarta and project through cutouts in the end of the chassis. The desired crystal is selected by the switch shown near the top of the compartment. For electron-coupled operation one point of the switch connects a grid condenser into the circuit instead of a crystal. It was impossible to locate the control knob in line with the switch and allow clearance between the knob and the condenser handle. The first arrangement had the knob attached to a short length of \( \frac{1}{4} \) -inch shaft which turned in a panel bearing bushing, the shaft being connected to the switch through two ordinary disc-type universal couplings. The offset was so great, however, that the universals quickly broke. They were then replaced by a length of National flexible shafting, which does the job to perfection. The duty on the shafting could be reduced considerably by mounting the switch at a slight angle to eliminate the double curvature. A tip to follow when cutting this shafting: Solder the wires carefully before cutting or they will unravel, but do not let the solder flow too far away from the point of the cut or some of the flexibility will be lost.

The need for a tube shield on the 89 is debatable although, since one of the cathode coils is quite close to the tube, it probably adds some additional frequency stability. In the 89, of course, the screen grid does not shield the outer surface of the plate, which therefore has appreciable capacity to other nearby circuit elements. The use of the tube shield decreases the output slightly when the oscillator plate tank is open-circuited and the 6L6G is being driven at the crystal frequency. The reason for this will be explained later. In spite of this reduction in output, the power obtained at the crystal frequency is equal to or greater than that at higher harmonics, so that there is no need for increasing it.

The oscillator plate tank occupies the center compartment, with the higher frequency coils located closest to the condenser. The band-change switch is located directly beneath the 7- and 14-Mc. coil sockets. In these two band positions the suppressor feedback coils are connected in, but the other three positions connect the suppressor directly to plus 50 volts. When the 6L6G is operated as an amplifier on the crystal frequency the switch is turned to the open position. This opens the circuit to all of the plate

Although crystals are switched from the panel, they also can be plugged in on the side without removing the exciter case.

The homemade crystal holder is designed to reduce frequency drift through the use of an exceptionally heavy bottom plate which minimizes thermal fluctuations.

The mechanical construction is apparent from this bottom view. The band-changing switches are mounted vertically for short leads to the coil sockets. The gears connecting the switches and operating shafts are standard items, obtainable through practically any hardware store. They are made by the Boston Gear Works, North Quincy, Mass., Catalog No. G-481, 16-tooth pinion and 32-tooth gear, 32 diametral pitch. The \( \frac{3}{4} \) " holes are drilled out to fit \( \frac{3}{4} \) " shaft and the hubs are tapped for \( \frac{1}{8} \) screws.

January, 1938 17
True North from Old Sol

By A. L. Budlong*

WANT to know where true North is?

Simple! Exactly at noon, from your particular locality, the sun is due south and the shadow of your antenna mast or any other convenient vertical pole will lie true north. . . .

Hey, wait a minute! Come back here, durnit . . . you can't just dash out to the back yard like that, watch in hand. It's simple, but it's not that simple.

What time is your watch running on? Ah, we thought so—Eastern Standard. That means 75th meridian time. 1

If you are east of 75th meridian time, your "clock noon" occurs before the time meridian for your particular Standard Time; subtract the correction from EST noon, giving us 11:51 A.M., EST, when it will be true "clock noon" at West Hartford.

Hold it! . . . hold it! . . . we're still not quite ready to spot that shadow yet! One more very simple correction coming up.

"True noon" is the thing we want, because it is at "true noon" when the sun is at its highest point in the sky, and due south of us. What we've figured out so far is "clock noon" and it is unfortunately a fact, for reasons we won't explain but which we assure you exist, that "true noon" and "clock noon" are one and the same thing on only four days of the year. For the rest of the year, if you compared clock time with so-called sun time, you'd conclude that Mother Earth is a very erratic person indeed; sometimes she apparently goes whooping along and beats the clock to it by as much as sixteen minutes, and at other times she loafs behind and lets the clock get there first.

Well, we've got to have "true noon" in our business, so it looks like another correction. You can get it from the table herewith, where we have figured it out for every ten days throughout the year (you can estimate the correction for the days in between without any great difficulty).

Add or subtract according to the sign given; the result, in terms of your Standard Time, is when it is actually "true noon" at your location. Incidentally, the four days when no correction needs to be made are April 15th, June 14th, September 1st and December 25th. On those days, your Standard Time, corrected for the longitude difference, is also the time of "true noon"; but only on those days.

Continuing with our West Hartford example, and assuming we want to give this scheme a whirl on January 10th. We find we have to add 1 14/60 minutes to our watch time in order to arrive at "true noon".

(Continued on page 91)

* Assistant Secretary, A.R.R.L.

1 CST is 90th meridian; MST is 105th meridian; PST is 120th meridian.
The New PITC

Modern Radio Equipment for Pitcairn Island

By Lew Bellem,* W1BES

MOST readers will recall with interest the story of W8IGQ's visit to Pitcairn Island as related in these pages some months ago. Those familiar with the history of the rugged years following the settling of Pitcairn in 1790 by Fletcher Christian, Edward Young and his little band of mutineers from H.M.S. Bounty, will best understand the priceless inheritance of tenacity and perseverance handed down to this generation of islanders by their forebears. To avoid the punishment awaiting them for mutiny against the British Crown, they sought and found seclusion from the world on this rock-bound South Sea isle. So they remained, undiscovered for 18 years until a chance visit by an American sealing vessel revealed the fate of the Bounty and its crew. This period of isolation, broken only occasionally in the decades to follow by a visit from a passing ship, has served to mold a people endowed with a measure of fortitude and resourcefulness, the equal of which would be hard to find.

No real amateur surrounded by his modern radio equipment of to-day could have read that tale of Andrew Young's determination to keep his little island community in touch with ships that passed beyond the horizon without a feeling of pride in classing him as a true ham. Lacking both equipment and power facilities, the spirit of amateur radio has carried Andrew Young, alone and unguided these many years, over obstacles insurmountable to most of us.

Perhaps this story and the legends with which Pitcairn abounds fired the imagination, but certainly a responsive chord was touched by the use of such pitifully inadequate and antiquated apparatus, for then and there was the idea conceived of helping the islanders to obtain modern radio facilities as a tribute to Andrew Young from the American amateur.

With the simple plan to help these folks and a rough idea of what would be needed to build a suitable station for them, manufacturers who could supply the necessary equipment were contacted and the plan explained to them. Without exception, they agreed to make available the apparatus needed, and their enthusiastic endorsement and support of the project as a worthy one paved the way for laying actual constructional plans. Then, and only then, was the size of the job at hand fully realized.

* Chief Engineer, Coto-Coil Co., Inc.
† Euriel, "CQ PITC," QST, August, 1937.

Since a primary source of power is not available on Pitcairn Island and the use of gasoline is out of the question, the choices of possibilities narrowed to harnessing the wind for supplying energy. Storage batteries of ample capacity must be provided to take care of heavy current demands with sufficient reserve to avert a power failure in event of a period of prolonged low wind velocity.

As the transmitter and receiver must operate entirely from this battery, plate power in each case would have to be derived from dynamotors. Consideration was next given the frequency or fre-
frequencies on which the transmitter should be capable of operation. Since communication on 600 meters with passing ships has been an essential service of the islanders' present equipment, this frequency must be available in the proposed transmitter. Because of the remote location of Pitcairn Island, the choice of a second and third frequency would dictate the use of the 20- and 40-meter amateur bands. The use of 'phone on the two latter bands would be a desirable adjunct, suitable equipment was commenced in earnest.

A 12-volt battery system was chosen in preference to 6-volt to minimize the IR drop in feed wires which would have to carry comparatively heavy currents.

A special 12-volt Parris-Dunn windcharger was first procured to supply the initial power. This unit is capable of an 8-ampere charging rate in a 20-mile wind. Lower velocities produce proportionately lower charging rates, the cutout operating to protect the battery from discharge when the wind pressure falls below 6 m.p.h.

A 12-foot steel tower is included for raising the windcharger with its 8-foot impeller above surrounding objects which might act as windbreaks. Two Willard 6-volt 300-ampere-hour storage batteries provide the necessary reserve for 8–10 hours of continuous operation of both transmitter and receiver. Assuming average wind conditions and operating routine, it should be possible to operate in excess of 10 hours per day without fear of power failure.

The transmitter proper is a 36-inch steel cabinet affair utilizing standard 19-inch panels and chassis. The lower deck embraces an audio amplifier-modulator and a power distribution center for the 750-volt dynamotor and 12-volt battery supply. The audio system is comprised of a Shure Model 70S crystal microphone feeding three stages and transformer coupled to a pair of 6L6 tubes as modulators. Obtaining satisfactory performance from these 6L6's provided a real problem since they were to derive their 450-volt plate supply from a bleeder network and bias from a series cathode resistor. It was found that while poor plate-supply regulation was a hindrance to obtaining a reasonable level of audio output, the real stumbling block was the variable cathode bias. While casting about for a more stable bias supply, it was discovered that there were 12 healthy volts available from the main supply battery, but that the polarity was opposite to that needed since the original design specified grounding the negative battery terminal. Further investigation showed this to be an optional choice so a simple revision in wiring permitted running the 6L6 grid return to negative "A." This change, in combination with a small cathode resistor gave a fairly steady bias of 25 volts even when driving the amplifier beyond its capabilities. Separate 200-watt bleeder networks

THE COMPLETE SET-UP OF EQUIPMENT FOR THE NEW PITC

Power will be taken from wind-charged storage batteries of ample capacity, high-voltage being obtained by means of dynamotors. The receiver, a t.r.f., covers all wavelengths between 10 and 3000 meters. Testing equipment and plenty of spare parts are included.

providing the additional power demand was not excessive. A suitable receiver for use with such a transmitter would, of course, cover all transmitting frequencies. In addition, it should be sensitive, reasonably selective and include general coverage plus band-spread if possible. Last, but not the least important, it must be conservative of battery drain. All of this equipment should be as simple and foolproof as possible from the standpoint of hooking up and operating, since Andrew Young's experience with tube transmitters is nil and his familiarity questionable.

Through the cooperation of Carl Madsen, W1ZB, who has maintained a schedule with W1CFT throughout her world cruise, Mr. Eurich aboard the Yankee and bound for the Dutch East Indies, was apprized of the project afoot. In this way W8IGQ was able to furnish suggestions and information regarding conditions on the island as he had found them. Particularly did he stress the importance of high-grade insulation, since the salt air constantly sweeping this mere dot on the Pacific took heavy toll of materials ordinarily found satisfactory.

With these various requirements and restrictions constantly in mind, the job of designing

(Continued on page 76)
Directional Antennas with Closely-Spaced Elements
By John D. Kraus,* W8JK

ONE of the simplest and most efficient radiators used on short waves is the horizontal half-wave antenna.1 Offhand it might not appear that two such antennas would make a good radiating system, if placed parallel to each other a small fraction of a wavelength apart and fed with currents 180 degrees out of phase. It is true, however, that this arrangement forms a simple and very compact directional antenna...

Fig. 1 is a sketch of two half-wave radiators oriented in the horizontal plane as described and placed high above the ground. The spacing may be a small fraction of a wavelength. If the wires are not placed too close together, the pair will radiate the same power as would a single half-wave antenna with the same input. But, because of the close-spacing and out-of-phase currents, the direction in which the radiation takes place is profoundly altered. G. H. Brown2 was the first to point out the advantages of using such close spacing.

As indicated by the arrows in Fig. 1, the radiation from the pair is very small—theoretically zero—off the ends and also vertically. The radiation horizontally broadside is a maximum and is considerably greater than from a single half-wave antenna fed with the same power.

Fig. 2 shows the close spacing idea applied to a number of practical directive antenna systems. The type of Fig. 2-A is 32 feet long. It has two half-wave radiators spaced one-eighth wave-length and fed at the center. The cross-over feeds the two radiators 180 degrees out of phase. The feeders connect on at the middle of the cross-over. The radiation from the antenna is maximum in both directions broadside and minimum off the ends. The gain in both directions broadside is as much as or more than in the one preferred direction when a half-wave radiator is used with a relector one-quarter wavelength behind. Dimensions are given for fundamental operation in the 14-Mc. band. The antenna is actually a multi-band affair, giving approximately the same horizontal bi-directional pattern on 28 Mc. as on 14 Mc., or on any frequency between these two bands. When used on 56 Mc., the horizontal pattern has four lobes. For fundamental operation on 28 Mc, the dimensions of Fig. 2-A should be halved. This smaller array would have about the same bi-directional pattern on both 28 and 56 Mc.

An antenna of about the same size as the one of Fig. 2-A is shown in Fig. 2-B. This antenna is end-, instead of center-fed. An array having two sections, which uses four half-wave elements, is shown in Fig. 2-C. It is 62 feet long. The array of Fig. 2-D has 4 sections or 8 half-wave elements and is 112 feet long. The antennas of Fig. 2-B, C, and D have the bi-directional pattern only on their fundamental frequency—14 Mc. in this case. When operated on 28 Mc. their horizontal patterns will have four main lobes. For fundamental operation on 28 Mc. the dimensions should, of course, be halved.

CONSTRUCTION

To make one of these antennas as a unit so that it may be supported between two poles it is convenient to use spreaders, which, for a 14-Mc. antenna, are about 9 feet long. These may be either of bamboo or 1-by 1-inch strips of wood. A suggested arrangement for a two-section antenna is given in Fig. 3. Since the antenna bears a striking resemblance to one of the “T” or flat-top types popular a decade or two ago, it is called a “flat-top beam.”

The cross-over at the middle of the flat-top is made by using two 6-inch feeder-spreader insulators, one placed horizontally at the center and the other vertically half-way between the center and one end of the wooden spreader. The two-wire feed line comes up from below and con-

1 An excellent treatment of the characteristics of horizontal antennas has been given by George Grammer, QST, Nov., 1936, and March, 1937.

January, 1938

21
nects on to the cross-over at the horizontal center insulator. In order to get greater separation at the cross-over, the insulators may be made longer by fastening two 6-inch feeder spreaders end-to-end. The wire length at the cross-over is of necessity a few inches more than the spacing. Thus, the wire length at the cross-over of a 14-Mc. antenna (8 feet 8 inches spacing) may be about 8 feet 11 inches.

The line used to support the long wooden spreaders at each end of the flat-top should preferably be of rope. In case a 4-section flat-top is used, a method of accomplishing the additional cross-overs is indicated by dotted lines in Fig. 3. One vertical feeder-spreader insulator is used at the middle of the long wooden spreader. The recommended spacing lengthwise between the sections of the flat-top is about 2 feet.

**FEEDING**

The main characteristics of a flat-top directional antenna are the closely-spaced elements, about one-eighth wavelength apart, and currents 180 degrees out of phase. All the elements are driven. The spacing is not critical but one-eighth wavelength seems to be about optimum when 180-degree phasing is used, and is recommended. The mutual coupling between closely spaced out-of-phase wires is such that the impedance at the center of the half-wave elements becomes quite small and, inversely, quite large at the ends. Accordingly, the current flowing at voltage nodes is very high.

The dimensions are not critical and the values of Fig. 2 are recommended for use on any frequency in the 14-Mc. band. Compensation is made for any small variations when the antenna is tuned up.

Either Zepp feeders or a matching stub and 600-ohm line can be used to feed the antennas. The Zepp feeders or the stub connect at the center of the cross-over in the flat-top as shown in Fig. 3. The approximate dimensions for a stub to feed the antenna of Fig. 2-C are given in E. Where the line is not over a wavelength or two long, the Zepp type of feed is very practical. It is also convenient if one expects to use the same flat-top beam on a number of bands. For example, the antenna of Fig. 2-A may be series fed at the transmitter on 14 Mc. and parallel fed on 28 Mc. The feeders in this case would be either one-half or one wavelength long, approximately, since this antenna is fed at a current loop (voltage node) on 14 Mc. A matching stub for this antenna would also be either one-half or one wavelength long on 14 Mc. and about 8 feet either longer or shorter on 28 Mc. The other antennas, Figs. 2-B, C, and D, are all fed close to current nodes as used on 14 Mc. so that matching stubs to feed them should be either one-quarter or three-quarter wavelengths long. It is often convenient to use a three-quarter wavelength stub as one may be able to adjust it from the ground after the antenna has been pulled up into place. It is advisable to use good 6-inch spreader-insulators throughout the stub and 600-ohm line.

In adjusting the stub the antenna is shock-excited from another antenna or from an r.f. line...
coupled loosely to it. The shorting wire on the stub is then adjusted for a maximum of current through the short. The transmission line is next connected on the stub a foot or two above the short and adjusted up or down the stub until the standing waves along the transmission line are a minimum. A sensitive r.f. current meter (0-200 ma.) equipped with a single turn loop and an insulated hook can be used to slide along one side of the transmission line, so that readings may be made quickly at four or five points along the line spaced about an eighth wavelength apart. Insulation of the antenna and feeders from the transmitter plate supply voltages is, of course, important in any installation.

PERFORMANCE

Because of the out-of-phase currents, the vertical radiation from the flat-top antenna approaches zero. As a result, the maximum radiation in the vertical plane is lowered to a smaller vertical angle. In Fig. 4 the vertical radiation characteristics of a single half-wave antenna (dashed curve) and a 2-section or 4-element flat-top antenna (solid curve) are compared for a height in both cases of three-eighths wavelength above ground. The plane in which the radiation is shown is at right angles to the antennas. The relative field strength is plotted in arbitrary units, and the curves are calculated on the basis of the same power to both antennas. Perfectly conducting ground is assumed, but with horizontal antennas and the height being considered the patterns for ordinary ground would probably be quite similar.

It is apparent from Fig. 4 that the radiation maximum is lowered from about 43 degrees in the case of the half-wave antenna to about 32 degrees for the flat-top. The maximum gain of the flat-top over the half-wave does not occur at these angles, however, but rather at lower ones—15 degrees and less. It is these low angles which are frequently the most effective in long distance communication. The effect of lowering the vertical angle of maximum radiation from a flat-top beam is most pronounced at heights up to a half wavelength or so above ground. At greater heights the angle of the lowest lobe becomes nearly the same as that for a single half-wave antenna. For 14-Mc. DX a height of three-quarters to one wavelength above ground seems worth while.

Although much of the gain comes through vertical directivity, the horizontal gain is also important. This depends mainly on the number of sections used. Fig. 5 shows the measured horizontal radiation pattern for a single-section antenna (see Fig. 2-A). The maximum radiation is broadside and the minimum is off the ends of the antenna. The radiation is 3 db down at an angle of about 35 degrees off the center line of the beam (broadside). At 70 degrees the signal is 20 db down, representing a front-to-side signal power ratio of well over 100 to 1. The relative field strength is plotted in decibels, the minimum signal observed being taken as 0 db.

The power gain of a single-section flat-top compared to a single half-wave antenna is over 4 db. When used on its second harmonic the gain is about 6 db. The horizontal radiation as measured from a 2-section flat-top (Fig. 2-C) is only slightly narrower, the signal being 3 db down at about 30 degrees off the center. Thus, a 2-section flat-top puts out a very satisfactory signal over an angle of about 60 degrees in each direction broadside, and a usable signal over an even wider angle. The null off the ends, however, is very pronounced. Three 2-section antennas arranged at angles of 120 degrees with respect to each other should give good coverage over 360 degrees. The gain of a 2-section flat-top is over 6 db. A 4-section array would have over 8 db gain and a still narrower pattern than the 2-section type.

A pair of double-Zepp antennas, one stacked one-half wavelength above the other, is a familiar (Continued on page 57)

January, 1938
Election Results

When the Executive Committee of the A.R.R.L. met on November 1, 1937, to examine nominations in connection with this year's elections for director and alternate director, it found that four divisions had returned the former office holders or elected new ones without the necessity for membership balloting, while two divisions and Canada had nominated more than one candidate as director (or alternate) and perforce had to decide the issue by ballot.

Taking up the non-voting divisions first: In the Delta Division no valid nomination was found for any candidate for director, so Director E. Ray Arledge, W5SI, succeeds himself for the next two years under a provision in our by-laws which covers just such cases. For alternate, the only candidate nominated was E. H. Treadaway, W6DBK; he was found eligible and forthwith declared elected as the alternate.

In the Midwest Division it would appear that the gang will have none other than its present director, Floyd E. Norwine, Jr., W9EFC, for his was the only nomination received. He was declared reelected by the committee in the absence of other nominations. No nominations were received for alternate; the incumbent, O. J. Spetter, W9FLG, therefore continues during the next term.

In the Pacific Division, Director Culver, W6AN, who has served his division for the past three years, decided he would not be a candidate for reelection. In his place, the division nominated E. L. McCargar, W6EY, who has attended several board meetings as the Pacific Division alternate; there being no other nominations, “Mac” becomes the new Pacific Division director on January first. Elbert Amarantes, W6FBW, succeeds him as alternate, as the only candidate nominated.

The Southeastern Division seems to prefer its present director and alternate to the exclusion of all others and returned both to office as its only candidates named. Bennett R. Adams, Jr., W4APU, continues as director, therefore, with S. J. Bayne, W4AAQ, as his running mate.

Now for the voting divisions: In Canada an election is taking place for Canadian General Manager to decide between present C. G. M., Alex Lariviére, VE2AB, and John C. Stadler, VE2AP. Both being eligible, they were listed on the ballots. However, subsequent to the mailing of ballots from Headquarters, Mr. Stadler expressed his desire to withdraw. The Executive Committee determined through counsel that the proper procedure in this case will be to disregard the ballots for alternate C. G. M. when all ballots are opened and counted on December 20th, and to declare Mr. Lariviére elected as alternate Canadian General Manager, as the only candidate.

A three-cornered contest is currently taking place in the Atlantic Division between Roy C. Corderman, W3ZD, present director Walter Bradley Martin, W3QV, and Edward L. Thompson, W3CQS. For alternate director, nominations were received for four candidates: Gilbert Crossley, W8YA, Hunter J. Lohman, W5OC, Raymond E. Macomber, W3CZE, and Herbert M. Wallace, W8BQ. The Executive Committee was obliged to declare both Mr. Crossley and Mr. Lohman ineligible under the terms of the by-laws, but ordered Mr. Macomber’s and Mr. Wallace’s names listed on the ballots for voting by the membership.

Our old friend Carl Jabs had expressed a desire not to be a candidate this year in the Dakota Division elections. To succeed him, three others were nominated: Frank A. Vowles, W9BBL, Earl R. Thornburg, W9EU, and Fred W. Young, W9MZN. Mr. Thornburg was judged ineligible, so the contest is between Mr. Vowles and Mr. Young. For alternate, nominations were received for Adolph A. Emerson, W9ITQ, W. F. Soules, W9DCM, and Fred W. Young, W9MZN, Mr. Young withdrew his name in order to run for director and both Mr. Emerson and Mr. Soules were found ineligible, so there is no election for alternate in the Dakota Division this year.

Counting of the ballots for director and alternate director in the Atlantic Division, for director in the Dakota Division, and for Canadian General Manager, will take place on December 20th. The results will be announced in the February issue, but will also be made the subject of an official broadcast for the week December 20th–27th, so interested members should keep an eye out for the broadcast for immediate news of the outcome.

Habana Although the Interamerican Radio Conference at Habana was expected to last until December 10th before closing,
Secretary Warner had seen the amateur matters through all the initial stages by late November and returned to the United States on November 28th. His report on the conference will be in the next issue. In the meantime, it may be said that as of December first the following actions on amateur matters had been seen safely through committee and were merely awaiting final formal plenary confirmation:

First, everyone expressed complete agreement on the U. S. proposal (OK'd by our Board) to change our 1.7-Mc. band to read 1750–2050 kc. In addition, this and the 3.5, 7, 14 and 28-Mc. bands were affirmed as exclusive amateur through the Americas; the amateur subcommittee even went so far as to recommend that the nations of this hemisphere unite in holding out for the present 7, 14, 28 and 56-Mc. bands as exclusive amateur at Cairo!

The problem of 'phone on 7 and 14 Mc. for our South and Central American neighbors was a tough one, particularly when it came to 7 Mc. South and Central American countries, secure in the knowledge that they had every right to assign 'phone in the amateur bands entirely as they wished, refused flatly to listen to our suggestion that 'phone be barred from 7 Mc. Our efforts to get an agreement on a 100-kc. assignment (as directed by the Board) were met with resistance, initially, unless the assignment were made exclusive to 'phone! Similar resistance was expressed over initial proposals that a 7-Mc. assignment be at one end of the band. The result was a compromise whereby the assignment is 100 kc. at 7050–7150, but non-exclusive. It should be understood that this assignment is solely for the benefit of the South and Central Americans; there will be no 'phone at 7 Mc. for the U. S., Canada or Newfoundland. At 14 Mc. the outcome is an agreement on 14,100–14,300 available for 'phone in the Americas but with no change to be made in the present U. S. 'phone sub-band at these frequencies. The conference also dealt with 'phone in the 3.5-Mc. band, coming out with 3800–4000 designated as available for 'phone (thus confining Mexican 'phones, which now roam the whole band) but with no change contemplated in the existing U. S. assignment.

An outstanding accomplishment was the adoption of a third-party message-traffic agreement by an 11–0 vote in committee; Venezuela, Mexico and Argentina abstained from voting on this because of domestic laws prohibiting any kind of third-party traffic. This agreement, sponsored by the League, carefully steered through the initial stages of U. S. adoption prior to the conference, and further helped by pre-conference correspondence between the League and South American amateur societies, will at one blow make third-party traffic available throughout virtually the entire western hemisphere!

As of this writing, all these matters are still subject to confirmation in the plenary session; in fact, it is not yet apparent to what extent the participating governments will eventually pledge themselves to carry out any of the conference agreements.

Look for the complete story in the February issue.

(Continued on page 100)

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.
W6—D. Cason Mast, W6KHV, 423 East E St., Ontario, Calif.
W7—Frank E. Pratt, W7DXZ, 5023 So. Ferry St., Tacoma, Wash.
W8—P. W. Allen, WSGER, 324 Richmond Ave., Dayton, Ohio.
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 Oakdemean Blvd., St. James, Winnipeg, Manitoba.
VE5—E. H. Cooper, VE5EC, 2024 Caruarvon St., Victoria, B. C.
K4—F. McCown, K4RJ, Family Court 7, San­turce, Puerto Rico.
K5—Norman F. Miller, K5AF, 15th Air Base Squadron, Albrook Field, Canal Zone.
K6—James F. Pa, K6LIBH, 14161 Lunailito St., Honolulu, T. H.
K7—Leo E. Osterman, K7ENA, Customhouse, Wrangell, Alaska.
KA—George L. Rickard, KA1GR, P. O. Box 849, Manila, P. I.
56-Mc. Crystal Control with 28-Mc. Crystals
By J. M. Wolfskill,* W8QKT

WITH the development of high-frequency apparatus and the increased activity on the higher frequencies, the demand for greater frequency stability is rapidly increasing. The need for this stability has long been realized, but the difficulty of obtaining it was often so great that it offset the apparent advantages.

Most amateurs on the 56-Mc. band are still using the self-excited type of transmitter with its attendant frequency modulation; a few have graduated to m.o.p.a.; a smaller group is now using crystal control. The interference problem under these conditions is rather acute in the larger cities, and 56-Mc. reception at any great distance is almost impossible. With the development of 56-Mc. superheterodyne receivers, some of this difficulty is eliminated, but most signals are so badly frequency modulated that superheterodyne reception is unintelligible.

Crystal control is obviously the answer to this problem, and while the transition to it has been taking place for some time, it was only recently that the many advantages of crystal control at these high frequencies have been fully realized. It is now a well-established fact, proven in numerous tests, that greater distance and more reliable communication is possible with a given amount of power through the use of crystal control. The two most obvious reasons for this are: First, the concentration of carrier power on a single frequency has the result of increasing the transmitter's effectiveness several times over that of a self-excited modulated oscillator of equal power output; and second, the more sensitive and selective super-

heterodyne receiver can be effectively employed. Crystal control on 56 Mc. is no longer a luxury but a necessity, and with the recent developments in high-frequency quartz crystals, it is as easily attained as on 7 or 14 Mc.

The discovery of the principle of harmonic operation and the methods of processing the crystal to accentuate this type of vibration, made possible the development of the HF2 20-meter crystal about two years ago. It not only made possible this unit, but was the forerunner to practical higher-frequency crystals. Working further on this principle to develop a 10-meter crystal, another angle was found which possessed the necessary high activity for harmonic operation, and at the same time had a thickness coefficient sufficiently high to make 10-meter crystals of practical thickness. The new crystal which is cut at this angle has a drift of plus 43 cycles per megacycle per degree $C_r$, and will safely carry an r.f. current of 200 milliamperes before objectionable heating results. The scale diagram of Fig. 1 shows the relative thickness of the HF2 10-meter crystal compared to 20-, 40- and 80-meter crystals. Comparison is also made to X-cut thicknesses, the dotted cross-hatching showing that X-cuts in these frequency ranges are impractical.

The new 28-Mc. unit makes 56-Mc. crystal control so simple that it can readily be used in portable and mobile equipment. Even a single low-power tube such as the RK34 can be used, and with the resultant concentration of power on a single frequency, it will have an effective range

equivalent to a 10- to 15-watt self-excited transmitter.

OSCIILLLATOR CONDITIONS

The problem of developing crystals for use at 28 Mc. involved not only the crystal itself, but also the selection of tubes which had the proper characteristics for efficient crystal performance at these high frequencies. Many types of tubes tested were found to have such high input capacities that the crystal was effectively shorted out. Others having low feedback capacity and large electrode spacing were equally unsatisfactory. This was especially true of the high-mu and pentode types; pentodes in general are not to be recommended, although good output was obtained with several used in Tri-tet circuits. Best results, however, were secured with some of the newer high-frequency triodes such as the 955, 6J5G, 6E6, and RK34.

Standard triode crystal oscillator circuits are shown in Figs. 2 and 3. The 955 and 6J5G in Fig. 2 are excellent oscillators, giving 1\(\frac{3}{4}\) and 2\(\frac{1}{2}\) watts output respectively on 28 Mc. The 6J5G is to be preferred because of its higher output and lower cost, but either tube will give sufficient output at 28 Mc., in the circuit shown, to drive an 802, RK23, 807, RK39, or 6L6 tube as a doubler. The dual triode circuit shown in Fig. 3 can be used either with the 6E6 or RK34, giving respective outputs of 3 and 3\(\frac{1}{2}\) watts on 5 meters from the second section acting as a doubler.

Tubes used in the Tri-tet circuit shown in Fig. 4 which gave good output on 5 meters are the 802 and RK23. The coil sizes and circuit constants are shown in the circuit diagram. The output on 5 meters with the 802 is 2\(\frac{1}{2}\) watts, and with the RK23 3\(\frac{1}{2}\) watts. Slightly greater output can be obtained by using 45 volts positive on the suppressor grid. Beam-power tubes (6L6 and 6L6G) are not recommended for Tri-tet operation because of poor internal screening and tendency towards self-oscillation.

In the design of a high-frequency transmitter, careful consideration should be given to the general layout and construction, and parts being so arranged as to facilitate short direct leads and at the same time to permit maximum shielding and isolating of individual circuits. Grounds should be short and tied to a common bus, and the bus should be strapped to one point on the chassis to prevent closed loops and circulating currents in the ground system. All variable condensers must of necessity be mounted above ground to eliminate the need for a mica condenser in series with the tank circuit. Even low-loss mica condensers introduce considerable loss at the higher frequencies, when required to carry the high circulating tank current. Parallel feed should not be used, at least in the crystal oscillator, because of the difficulty of getting a good choke at these frequencies.

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\(^2\) Harry Gardner, "A Simple Breadboard Crystal-Controlled Transmitter for 56 Mc.," QST, July, 1937.
Practically any combination can be used thereafter so long as high-frequency design considerations are followed. The two transmitters to be described here are commendable because of their outstanding performance and higher power output with the small number of tubes used.

Fig. 5 shows the schematic of a portable 18-watt 56-Mc. crystal-controlled transmitter using two RK34’s in the r.f. end, with a 6C5 speech amplifier and a 6L6 modulator. The first RK34 acts as the crystal oscillator and doubler, and the second as a push-pull amplifier. The crystal oscillator tank is mounted on the left side of the shield in the photograph, the 56-Mc. doubler tank on the opposite side. The grid tank to the second RK34 is mounted below the sub-base close to the grid prongs, and the final tank above the sub-base on stand-offs close to the plate leads of the tube. This placement of tank circuits makes extremely short r.f. leads. The small neutralizing condensers are mounted on either side of the final tube, the discs being 1 inch in diameter and...
spaced about 3/8 inch when neutralized. These condensers are of special construction to conserve space; however, standard neutralizing condensers can be used. All coil sizes and element values are given in the diagram with the exception of $C_3$ and $C_4$. These condensers were altered slightly to reduce the capacity, since no small split-stator condensers were commercially available. The grid condenser, $C_3$, was a single-section single-spaced 7-plate Hammarlund. $C_4$ was a single-section double-spaced, 9-plate 35 $\mu$fd. Hammarlund. The mounting lugs on both these condensers were first securely fastened to metal mounting strips, and the side bars on the stator cut in two. This then gave split-stator condensers with about 15 $\mu$fd. per section.

The total plate current drawn by both r.f. tubes when delivering full output is 150 milliamperes, 70 ma. for the crystal oscillator and doubler and 80 ma. for the final amplifier. The heater voltage on these tubes is rather critical, and for proper performance, should be 6.3 volts at the socket. One hundred per cent modulation of the 18 watts r.f. is readily obtained with the 6L6, working as a Class-A amplifier.

A 60-WATT TRANSMITTER

Fig. 6 shows the circuit diagram and photo of a 60-watt transmitter consisting of a 6J5G as the 28-Mc. crystal oscillator driving a 6L6 tube as the doubler; the output from the 6L6 drives a 35T. Link coupling is used throughout on this transmitter, and about the only precaution to be taken in the tuning is to see that the 6L6 is not too closely coupled to the oscillator. As this tube is easily overdriven, its output will suffer considerably with excessive coupling to the oscillator. Capacity coupling between tubes was tried in an attempt to decrease the number of tank circuits, but as considerable difficulty was experienced in obtaining proper excitation, link coupling was finally chosen. Under these conditions the 6L6 furnishes ample drive for the 35T. Other tubes tried in place of the 6L6 which gave about the same output included the RK39 and 807.

Neutralization of the 35T presented no problem and all other adjustments were straightforward. The transmitter is metered by a single 0–1 milliamperere instru-
ment, switched across suitable shunts in the grid and plate circuits by means of a 2-circuit 5-position Yaxley switch. Input to the final stage is 100 ma. at 1000 volts with 60 watts output. Plate modulation is used for the final from a Class-B modulating system using T220's and 2A3 drivers.

In the article "Designing the First Stage of the Speech Amplifier" in December QST, the plate bypass condenser (C4) was omitted from Fig. 1 on page 34. It should be connected between ground and the junction of Rs, R6 and Re.

In "Hints and Kinks," page 44, Fig. 1, there should be no connection between the bottom of Rs and the 56 cathode. This resistor goes directly from the cathode to the switch. Incidentally, there is no Ra in the diagram; this designation should be ignored in the list of parts.

In the same issue, page 24, fifteen lines up from the bottom in the left-hand column, the reference to condenser C should read "C6."

**Corrections**

This transmitter has been in operation for several months, and results were exceptionally good, especially when compared to self-excited transmitters working at the same location.

The results of experiments on five meters with crystal-controlled transmitters of both high and low power, definitely prove that crystal-controlled signals are just about the answer to good 56-Mc. DX.

**Silent Keys**

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

Kenneth Anderson, Moline, Ill.
George E. Monroe, W1JWR, Auburn, Me.
B. C. Olson, W8BVQ, Erie, Pa.
Max J. Paulik, OK1XW, Praha-Hloubetin, Czechoslovakia
Lloyd E. Roath, W7GJA, Coeur d'Alene, Idaho
Earle L. Tooker, W6HVT, Lemon Grove, Calif.

A BCL aspiring to enter the amateur transmitting ranks recently wrote us asking if it were true that all amateurs must operate on spark for one year before being permitted to operate phone. He added that he thought it a good idea because he had observed that phone signals take up much more space than spark signals!

Speaking of ideal locations, W9YBV thinks that W9UWW rates pretty well—he lives on Signal Hill, East St. Louis. If height means anything, though, W4LU on Signal Mountain, Tenn., ought to be tops. All of which leads us to wonder whether San Francisco's Telegraph Hill is good only for c.w., as the name implies!

W9TWC and W9RFA have partially licked the QRM problem on 7001 kc. They zero-beat their crystal oscillators and, keying the oscillator, have perfect break-in operation. Going the break-in boys one better, however, they alternate words of a QSO or CQ. This procedure actually sounds like one station in operation, and has proved to be a novel way of breaking the monotony of ordinary QSO's.

**CHRISTMAS Greetings**

**TO ALL HAMS**

**from the Crew at Headquarters**

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**Strays**

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In the first article of this series the basic principles of modern television technique were discussed with particular emphasis on the character of the transmitted signal. The signal is, of course, an extremely complex affair and though one need not know at this stage exactly how it is transmitted one must have a clear concept of what it is like before attempting to understand how it is unscrambled in the receiver and eventually caused to produce the final picture. In addition to the general make-up of the transmitted signal one must have clearly fixed in mind the fact that it contains modulation frequencies as high as 2.5 megacycles. Since the receiver must pass frequencies up to this extremely high value, its circuit and values will differ very widely from the conventional sound receiver in which one is happy enough to pass frequencies up to 4000 or 5000 cycles.

This converter is then fed to a four-stage i.f. amplifier operating in the region of 10 Mc. This i.f. amplifier must pass a band of frequencies at least 2.5 Mc. wide and this requirement in practice means that very low stage gain will have to be tolerated. From the i.f. amplifier the signal is fed to a diode second detector (without automatic volume control) and from there to a two-stage video amplifier—this being the counterpart of the audio amplifier in a conventional receiver. The signal at this stage is the complete modulation which was impressed on the original carrier. It is, at this point, available for application to the control grid on the cathode-ray tube, to the d.c. restoring circuit and to the synchronizing impulse separator. The sound receiver which would ordinarily accompany this picture receiver may well be a conventional converter feeding a broadcast receiver serving as an i.f. amplifier.

These component sections comprise only the vision or video receiver. The companion sound receiver, for experimental work, might well be an entirely separate superhet of conventional design. The band widths given are required for maximum detail in the picture. The effect of any reduction from these figures results in restricted picture detail.

At this time we shall discuss the various circuits of a typical modern television receiver with the idea of clarifying the process involved in reassembling the transmitted pictures. The receiver through which we will follow the signal is outlined in Fig. 1. It is a superheterodyne with one or more r.f. stages ahead of the mixer unit in which conventional tubes may be used. As a mixer, a new type of hexode or heptode-triode may be used to advantage. The i.f. output from the mixer is applied to a four-stage i.f. amplifier which must pass a band of frequencies at least 2.5 Mc. wide. From the i.f. amplifier the signal is fed to a diode second detector (without automatic volume control) and from there to a two-stage video amplifier—this being the counterpart of the audio amplifier in a conventional receiver. The signal at this stage is the complete modulation which was impressed on the original carrier. It is, at this point, available for application to the control grid on the cathode-ray tube, to the d.c. restoring circuit and to the synchronizing impulse separator. The sound receiver which would ordinarily accompany this picture receiver may well be a conventional converter feeding a broadcast receiver serving as an i.f. amplifier.

For the time being our attention will be concentrated on the picture receiver alone.

We shall now follow the television from the antenna post through the receiver describing, as we go, typical circuits which could be used to perform the various functions. Later we will consider circuit values and their effects. We shall assume a carrier frequency of 45.6 Mc. The behavior of this signal in the r.f. amplifier is what one would ordinarily find in a conventional input amplifier except that the entire band of 5 Mc. occupied by the signal must be passed. This calls for tuned circuits which are heavily loaded with resistance and hence means considerably lower gain than is possible in r.f. amplifiers with which the circuit must operate.

FIG. 1—THE GENERAL LAYOUT OF A TYPICAL TELEVISION RECEIVER

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than that passed in a modern high-fidelity b.c.l. receiver. With tubes of the 6D6 type in an amplifier similar to that shown in Fig. 2 one could expect a gain of about 2. Tubes with a much higher transconductance and with low input and output capacities would permit considerably more gain. Such tubes would be available in the early future.

The converter section into which this r.f. amplifier feeds is shown in Fig. 3. This particular arrangement is one based on a new tube, soon to be available from several manufacturers. This tube is a hexode-triode with the triode-section obtaining its emission from an independent portion of the cathode. It is more suitable for this particular service than the conventional mixers but successful operation can be had with, for instance, a 6K7 and a separate oscillator tube. Since the intermediate frequency amplifiers are to be on about 10 Mc., the oscillator will be made to run 10 Mc. higher in frequency than the signal — that is, 55.0 Mc.

The intermediate-frequency amplifier into which this mixer feeds may consist of four stages, each arranged in the manner shown in Fig. 4. This amplifier must pass a band at least 2.5 Mc. wide and the necessary resistance loading across the transformer windings and the design of the transformers themselves inevitably results in relatively low gain. Here again, new tubes with very high transconductance and low input and output capacity are of great benefit in permitting higher amplification. The i.f. amplifier circuit can be seen to be conventional in all respects except in the use of loading resistors across the transformer windings.

Fig. 5 shows the continuation of the circuit from the last i.f. transformer. This transformer feeds a diode second detector and here again a special tube is called for if optimum performance is demanded. The ideal diode would have an internal resistance as low as 150 ohms. Such a low resistance is made desirable because the load resistance must be of a low value (say, 7500 ohms). This low load resistance is required to reduce the by-passing effect of the capacity of the diode elements which tends to eliminate the higher video frequencies.

The diode detector plate is seen to be connected directly to the grid of the first video stage, this tube and the second video amplifier following again being preferably high-transconductance pentodes similar to those indicated for the r.f. and i.f. amplifier.

In order to amplify the full video frequency band with constant amplitude and with minimum phase shift (the latter consideration to be discussed further), it is necessary to use a low value of plate resistance across the tube. In addition, there must be an inductance of the right value in series with the plate resistance to aid in maintaining the desired amplification at the higher video frequencies. When this inductance and the plate resistor are of the correct value, phase shift is negligible. In this video amplifier, shown in Fig. 6, it will be seen that relatively enormous by-pass condensers are used and that decoupling resistors are incorporated wherever possible.

Single by-pass condensers are indicated on the diagram but in practice it is usually necessary to provide smaller mica-type condensers in parallel with the large units to take care of the higher frequencies. This amplifier must be substantially flat to at least 2.5 Mc. if the full amount of picture detail is to be retained.

The plate of the final video stage is now

---

capacity-coupled to the cathode-ray tube control grid. Also connected to this grid is the cathode of a diode (preferably of low resistance and low capacity) and across the diode is a resistance of, say, 25,000 ohms. This diode is the heart of the d.c. restorer. Resistor and capacity values in this part of the circuit are of considerable importance and will be discussed in more detail later.

Also connected to the cathode-ray tube grid as shown in Fig. 7, is a triode amplifier feeding the two diodes which form the basis of the synchronizing impulse separator circuit. This triode serves to provide some extra amplitude before undertaking the synchronizing impulse separation and also avoids loading the d.c. restoring circuit. The diode which has its plate connected to the triode plate is so arranged that its cathode is sufficiently positive to prevent any current flow unless the plate is driven back far enough positive. This will only happen on the peak of the signal and as the peaks are the synchronizing impulses, only the synchronizing impulses will pass through this diode—the video signal being excluded.

The high-frequency pulses will appear across the load resistor \( R_8 \) and can be applied through \( C_7 \) to the high-frequency sweep circuit. Connected across the load resistor is a condenser \( C_8 \) which provides an RC circuit serving as a frequency selection or integrating circuit. When the frame synchronizing pulse comes along, the frequency of the synchronizing impulses double and in the serrated portion of the frame synchronizing impulse the charge in the RC circuit \( R_{13}, C_8 \) gathers too rapidly for the resistor to discharge the condenser between pulses. Hence the voltage across \( R_8 \) is built up to the point where the plate of the second diode becomes positive with respect to its cathode and current flows through the second diode loading resistor, \( R_{10} \). The resulting low-frequency pulse is then made available through \( C_4 \) for the synchronizing of the low-frequency sweep. The second diode is prevented from passing current during the high-frequency pulses by having its cathode connected through \( R_{11} \) to a point of slightly greater positive potential than that to which the first diode is connected. To reiterate, the high-frequency pulses are of just sufficient amplitude to carry the plate of the first diode sufficiently positive to permit current flow, the resulting drop across \( R_8 \) then being made available for synchronizing purposes. When the frame or low-frequency synchronizing impulse arrives and the signal has been integrated in the RC circuit comprising \( R_8 \) and \( C_8 \) the plate of the second diode will be driven sufficiently positive at this time, and at this time only, so that current will flow through its circuit and the voltage across \( R_9 \) be made available for synchronizing.

Now that we have some concept of the various sections into which a television receiver can be divided and the functions of these sections it would be well to proceed with an examination of the values of resistance, capacity and inductance used in the circuit which, together with the characteristics of the tubes used, have such an influence on the performance.

To return to the r.f. amplifier given in Fig. 2, and later to the other sections of the circuit, it will be interesting to outline those features which demand special consideration.
and to note the differences between these circuits and those utilized in conventional sound receivers. Firstly, there is no subtle consideration that demands two r.f. circuits. A single stage could serve—the only result being slightly less r.f. gain.

FIG. 6—THE CIRCUIT OF A REPRESENTATIVE TWO-STAGE VIDEO FREQUENCY AMPLIFIER

R\textsubscript{s} to Re—See screen dropping resistor of Fig. 5.  
R\textsubscript{b} to Re—See plate resistor used. See previous mention of cathode resistors.  
C\textsubscript{e}—50 µfd.  
C\textsubscript{a}—8 µfd.  
C\textsubscript{g}—2.5 µfd.  
C\textsubscript{f}—0.01 µfd.  
C\textsubscript{p}—0.03 µfd.

On the other hand, the receiver might not be of the superheterodyne type and could consist of four or five r.f. stages, feeding the detector directly. With conventional tubes, the values of cathode resistor, screen resistor, decoupling resistors and by-pass condensers will be similar to the usual sound receiver. The only essential difference is in the use of loading resistors across the tuned circuits to provide the necessary wide-band acceptance. As in the remainder of the receiver, the pentode tubes used are of considerable importance and such tubes as the 6D6 or 6K7 are rather limited in their performance. Really suitable tubes for the work would have a transconductance of better than 8000 and the sum of the input and output capacities of the order of 20 µfd. With such a tube it is possible to obtain a gain of four or five in each r.f. stage as against a gain of 2 with conventional tubes.

We have already mentioned the desirability of a hexode-triode in the converter as shown in Fig. 3. Should a conventional converter be used for preliminary experiment, there would be no essential differences in circuit values to those used for sound reception.

To proceed to the i.f. amplifier, we find the most important feature to be the use of a relatively high intermediate frequency. Special transformers such as the Aladdin type U200 and U100 are suitable. Both the primary and secondary windings must be loaded with sufficient resistance to give the necessary wide band pass. In other respects, the i.f. amplifier, with its by-passing and decoupling is similar to normal practice.

It is at and beyond the second detector that circuit values become unconventional and in many cases critical. Very special attention must be given to the reduction of phase distortion. This type of distortion is not considered of great consequence in ordinary receiving equipment because of the ear's inability to recognize it. The meaning and effect of phase shift is unfamiliar to many of us so it is perhaps best to explain the difficulties which arise if it is present. The difficulties result from any phase shift which is not the same at all frequencies being passed. This means that certain frequencies may arrive at the grid of the cathode-ray tube earlier and other frequencies may arrive later than they would if the shift were absent. This would result in some picture elements being displaced and would mean that the edges or outlines of objects may be turned black where they should be light, or even displaced from right to left as much as 8 or ten picture elements. To take as an example a profile of a face, one might find part of the nose moved four or five or perhaps several dozen picture elements to the left or right, a similar displacement throughout the image resulting in very bad distortion. It is not necessary that there be no phase shift. In fact, each stage of a video amplifier should cause a phase shift of 180 degrees. So long as this shift is proportional to frequency, no difficulty will arise. Phase shift can be caused (Continued on page 68).
The Strongheart Boys in the Pacific

Or

Amateur Wireless to the Rescue

PROLOGUE: The two Strongheart Boys, Horace and Clarence, on an attempted flight to the South Pole, have been forced down on a small island in the South Pacific. Their plane has sunk, but the two daring boys have swum ashore with an all-wave receiver, an all-wave transmitter (minus power supply), a case containing 1502 flashlight cells, provisions for two years and various other things which will be later mentioned. (When anything is described which has not been previously explained, the reader is to assume that it was also brought ashore.)

"Ah me," blithely exclaimed Horace, "a pretty pass we have come to, Clarence."

"Not so," said that worthy, his handsome features fixed (as they always are) in a determined expression. "We will yet escape from our perilous plight."

"But bow, dear brother?" asked the former, removing the 203A from the transmitter and playfully tapping the glass with a hammer. (As to hammer, reader refer to prologue.)

"Remember the time we were marooned in Madagascar?" (See "Strongheart Boys at the Sesquicentennial.")

"Of course, of course," said Horace excitedly, "the radio will save us. Even if our plane has failed us, due no doubt to the trickery of that bully Sam Snodgrass, radio will save us."

"Quick, then," exclaimed Clarence, "we must lose no time."

"But Clarence," protested Horace, "we have no power supply."

"Ah hah," said the former, "yes we have. Take the soldering iron and connect those flashlight cells together."

Horace took the iron and in short time had the cells all neatly soldered together. Just in time, as when he put the iron down he espied the smoke of a distant ship.

"Clarence, Clarence, we are saved. I see a ship. Quick, hook up the rig and give him a buzz."

Clarence sorrowfully shook his head.

"Courage, brother, I cannot call him."

"Why not?"

"My license expires to-day or to-morrow and I can't remember which."

"Then we are lost."

"Not so. Amateur radio will, yes, must save us."

In short order the two brothers connected the batteries to the transmitter. Horace, holding a burning glass in his hand, focussed the sun's rays on the filament of the 203A. The brilliant sun heated the filament to incandescence. Clarence pressed the key, and then quickly released it. Horace spoke.

"What is it, brother?"

"The plate current is one mil too high."

"What can it be?"

Clarence thought hard and then snapped his fingers.

"Of course. There are too many flashlight cells. There are fifteen hundred and two. That makes the plate voltage 2253, and the Handbook says 2250 is the maximum voltage."

The offending cells were removed and the rig again tried. It worked to perfection. Quickly they tuned it into the band with shaking fingers and called CQ. Upon tuning the receiver they heard an answer.

"Saved," said Clarence, "saved by amateur radio."

Again turning on the rig he called the station that just called. Explaining at length their predicament, he asked for help.

"What does he say, Clarence?" asks Horace anxiously.

Clarence turned with woebegone expression.

"He wants to know our QRA."

"Call him again. Tell him we're desperate. Tell him we have food for only two years."

Again Clarence sent forth his plea. Again they listened.

"What does he say?"

"Tell me, Clarence, what does he say?"

"He says 'Please QSL.'"

"It's no use, Clarence. The fates are against us, also the batteries are getting low. Send out an SOS."

With trembling hands Clarence, fighting against time, sent the desperate appeal. As he thumped the last letter the batteries died.

* * *

Two weeks have elapsed. The brothers are sitting on the sand munching chicken sandwiches when the sound of an airplane is heard. Horace springs to his feet.

"Clarence, Clarence, we are saved."

"Truly, dear brother, as I said, amateur radio has triumphed."

(Continued on page 37)
Around the Clock With WLM

In a remote corner of the War Department Message Center in Washington is located W3CXW-WLM. Its big brother, Station WAR, is in the same room. WAR is known as the solar plexus of the War Department Radio Net. W3CXW-WLM might be termed the nerve center of the Army-Amateur Radio System. The same standards of efficiency required of WAR are also required of W3CXW-WLM. Substantially the same message form and methods of operation are used. There are two transmitters, one on eighty meters, using 500 watts, and one on forty meters, using 900 watts. The transmitters are located at Fort Myer, Virginia, and operated by remote control. A gasoline-electric generator is available for emergency power. The receivers consist of an R.C.A. ACR-175, and two Comet Pro’s. A gasoline-electric generator is also available at the operating point for emergency power.

The operation of an amateur station is generally thought of as a hobby with no specific time arranged to get on the air. However, the principle means of training in the Army-Amateur Radio System is the handling of traffic according to Army methods. In order to handle traffic efficiently, regular schedules must be maintained. As most members of the A.A.R.S. operate their stations “in addition to their other duties,” there must be a key station that can be contacted each and every day at the appointed time. This duty has fallen principally on W3CXW-WLM.

Two qualified operators are usually assigned to the station. Tricks have to be arranged to run the station and to do the office work incident to the administration of the Army-Amateur Radio System.

One operator comes on duty at 8 a.m. He meets a schedule with an overseas relay station, usually W3ANT-WLMO, to take China, Philippine and Hawaiian traffic, received from a Hawaiian station at an early hour in the morning. After this schedule he turns his attention to office work, consisting of keeping records up to date, writing letters, decoding and encoding cryptograms and preparing the monthly bulletin “PDC” for publication. At 4 p.m. he is through, except on one or two nights when alternate stations take over W3CXW-WLM evening schedules. On these nights, he meets the alternate station at 4 p.m. and sends traffic on hand at W3CXW. This normally consists of twenty-five to thirty messages, which are often cleared within an hour.

The Armistice Day message which is the subject of a corps area competition each year was broadcast by WLM on November 11th. Complete results are not available at this writing. A matter of interest to all amateurs is the fact that this message was copied by a blind amateur using a Braille typewriter. He is Henry Lehman, W4DWI, in Orlando, Florida. The original copy in Braille was forwarded to the Chief Signal Officer. W4DWI actually constructs and maintains his own radio equipment. He asks a friend to describe a circuit to him, including all values, then he builds up the circuit from memory. The result would be a credit to most amateurs with two good eyes. A letter of commendation transcribed in Braille was forwarded to him by the Chief Signal Officer of the Army.

December QST gave the rules and printed an example of the proper manner to use in A.A.R.S.

Stations which have been acting as alternates are W8YA-WLMA and W3NF-WLML. W3CXW-WLM schedules usually start at 5 P.M. At this time the other operator reports for duty. He meets the following schedules:

<table>
<thead>
<tr>
<th>Time</th>
<th>Corps Area</th>
<th>Location of Representing Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>5:00 P.M.</td>
<td>I, II, V</td>
<td>Boston, Governors Island, Columbia, O.</td>
</tr>
<tr>
<td>6:00 P.M.</td>
<td>III</td>
<td>Baltimore</td>
</tr>
<tr>
<td>6:30 P.M.</td>
<td>Panama</td>
<td>Canal Zone (20-meter schedule)</td>
</tr>
<tr>
<td>7:00 P.M.</td>
<td>All</td>
<td>(Sends broadcast on Monday nights only)</td>
</tr>
<tr>
<td>7:00 P.M.</td>
<td>VI</td>
<td>Kalamazoo, Mich.</td>
</tr>
<tr>
<td>7:30 P.M.</td>
<td>IV</td>
<td>Atlanta, Ga.</td>
</tr>
<tr>
<td>8:00 P.M.</td>
<td>Panama</td>
<td>Canal Zone (40-meter schedule)</td>
</tr>
<tr>
<td>8:30 P.M.</td>
<td>VII</td>
<td>Omaha, Neb.</td>
</tr>
<tr>
<td>9:00 P.M.</td>
<td>VIII</td>
<td>Fort Sam Houston, Texas</td>
</tr>
<tr>
<td>9:30 P.M.</td>
<td>I, III, V, VI</td>
<td>Westfield, Mass.; Manhattan, N. Y.; Langley Field, Va.; Columbus, Ohio, and Glenellyn, Ill.</td>
</tr>
<tr>
<td>10:00 P.M.</td>
<td>All</td>
<td>Broadcast on Monday nights.</td>
</tr>
<tr>
<td>10:00 P.M.</td>
<td>IX</td>
<td>Twin Falls, Idaho, or Los Angeles, Cal.</td>
</tr>
<tr>
<td>11:00 P.M.</td>
<td>Hawaiian Dept.</td>
<td>Schofield Barracks, T. H.</td>
</tr>
<tr>
<td>12:00 M.N.</td>
<td>Any</td>
<td>Any</td>
</tr>
</tbody>
</table>
messages. Unfortunately the printer didn’t do a very good job of following the rules. We are reproducing the example in its proper form and repeating the description and hints for copying messages on a typewriter.

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 NEW YORK, as are all the 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.

The Strongheart Boys

(Continued from page 85)

The plane roars low over the island, drops a message, and flies on. Horace races to the spot where the note falls and, picking it up, reads. Clarence comes to a stop behind him, trying vainly to read over his shoulder.

“What does it say, Horace? Does it say that he is sending help? Maybe the U. S. Navy is on its way.” (See “Strongheart Boys with Uncle Sam.”)

Horace reads aloud.

“Dear OM. Heard you calling at 11:52 E.S.T. Your frequency was 7301. Would appreciate a note saying you will be in the band in the future. Yours for amateur radio. W1 gbgl gbgl.”

—Robert J. Black, W1 EEBK

Directional Antennas

(Continued from page 18)

bi-directional array of 4 elements. In many cases, especially where the lower double-Zepp is not very high off the ground, a 2-section flat-top should give somewhat improved performance, that is, if the flat-top is placed at the same height as the upper double-Zepp of the pair. A 2-section flat-top should also give more gain over a much wider horizontal angle than 4 co-linear half-wave antennas in phase and at the same height above ground.

The small dimensions of the flat-top antenna make it suitable for use in many locations. Through the use of close-spacing the gain is exceptionally good for an array of its size.

A New Transmitting Tube—the 809

A NEW high-µ, 25-watt plate-dissipation tube, to be known as the 809, has been added to RCA’s line of transmitting tubes for amateurs. It can be used at maximum ratings at frequencies up to 60 megacycles in r.f. service, and is designed to operate with good plate efficiency at relatively low plate voltage and driving power. The 809 also is suitable for Class-B audio service.

Tentative characteristics and ratings are given below:

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament voltage</td>
<td>6.3 volts</td>
</tr>
<tr>
<td>Filament current</td>
<td>2.5 amp.</td>
</tr>
<tr>
<td>Amplification factor</td>
<td>50</td>
</tr>
<tr>
<td>Inter-electrode capacitances:</td>
<td></td>
</tr>
<tr>
<td>Grid-plate</td>
<td>6.7 µfd.</td>
</tr>
<tr>
<td>Grid-filament</td>
<td>5.7 µfd.</td>
</tr>
<tr>
<td>Plate-filament</td>
<td>0.9 µfd.</td>
</tr>
<tr>
<td>Max. plate dissipation</td>
<td>25 watts</td>
</tr>
<tr>
<td>Max. plate input</td>
<td>75 watts</td>
</tr>
</tbody>
</table>

In Class-B audio service, two tubes are capable of delivering 100 watts output at 750 volts, using

(Continued on page 108)
DENVER is his home town, and he has lived there for most of his forty years. Now he represents it, and the rest of the Rocky Mountain Division, on the A.R.R.L. Board of Directors. When you stop to think about it, that's really quite a fitting thing, for Ed Stockman, W9ESA, knows ham radio from top to bottom and from beginning to end. He started in 1909, and in 1915 had a 1-kw. rotary spark plus an Audiotron. As 9ZD this was among the more famous of early stations. During the war he served in Military Intelligence. Back on the air in 1925, radio has been part of his daily life ever since. He has been O.R.S., S.C.M., A-1 op, TL, etc. As A.A.R.S. S.N.C.S. for Colorado he holds the call WLJF. Plus some DX, a little five-meter work, and a lot of all-around catch-as-catch-can hamming, his radio life is very full indeed—so full, in fact, that it doesn't leave much time for fishing. Which, we can tell you, is a break for the fish of the R.M. Division.

TIME was when 5ZA was a famous he-man station—winner of the first Hoover Cup for the most outstanding station in 1922, and all that. But now when you speak of W5ZA, you think of Eunice first and Louis second. We suppose it all goes to prove that old Chinese proverb which says that it's 90% operator and 10% station. Anyway, Louis Falconi got the bug in 1909 and from then on until the law clamped down in 1912 worked as "LF." The ½-kw. Blitzzen transformer was purchased and the spark gap was concocted by imitating ship installations. Just as he became legal with 3HU he got a job as commercial op and roamed the seas on old NLK. After the war came 5ZA. Always in the forefront of technical development, 5ZA had one of the first amateur 'phone rigs, in 1921—and after sixteen years he still thinks there's something to ham 'phone. We suppose that goes to prove that other old Chinese proverb which says that the voice is mightier than the fist.

WHEN you see the name "CQ Brand" on a box of potatoes or tomatoes, it's no accident. It's simply William Shearman Burkhart's way of saying that he's a ham and proud of it. And well may Bill Burkhart be proud, for as W4DLH he has done a number of notable ham things. Organizer of the first "all-continent round table," holder of the WAC-in-shortest-time-on-'phone record, his station is a subject for hamtalk wherever 10- or 20-meter 'phone men foregather. He got in the game in 1913, progressed through spark at 8DI, bloomed out on c.w. as 4AAQ—and then busy Florida boom days cancelled ham radio. For several years a real estate subdivision promoter, Bill saw a future in Florida Irish potatoes a few years back and now owns his own packing house. To normal folk, "CQ Brand" means "consistent quality" potatoes, and to hams it means the same in a clean kilowatt and a rotary beam that works the world.

IF you ask anyone around San Francisco who the best all-around amateur there is, the odds are 100 to 1 that they'll answer, "W6CIS." Ken Hughes started his brass-pounding with 6BHV's ½-kw. rotary, got on in 1922 with his own call and a 202 on 200 meters, and has been active ever since. He has been president of the Sacramento Club, has held every office in the San Francisco Club, was C.R.M. for four years in the U.S.N.R., has held down the western terminus of Trunk Line "B," and is now assistant S.C.M. of the San Francisco Section. He never misses an A.R.R.L. (Continued on page 68)
How Would You Do It?

Transmitter Monitoring Systems

All solutions to Problem Number 11 submitted fall into one of two distinct groups, both of which employ an oscillator auxiliary to the receiver. One group includes those systems in which the auxiliary oscillator beats with the transmitter signal to produce an audio beat which is fed into the audio system of the receiver, while the second includes those in which the auxiliary oscillator beats with the transmitter signal to produce an i.f. signal which is fed through the i.f. stages of a superheterodyne receiver.

While the first system is applicable to all types of receivers, the second method has the distinct advantage that the auxiliary oscillator frequency is so far removed from the operating frequency that no interfering signal results from this oscillator which is not true of the audio beat note system where the oscillator frequency is removed only 500 cycles or so from the operating frequency. In some superheterodyne receivers it is probable that care in introducing the auxiliary oscillator signal may be necessary to prevent a slight loss in received signal strength or detuning of the oscillator and mixer circuits.

First Prize Solution

By James S. Clarke, W2QL

The problem which now confronts our hero is one which the writer dismissed for an undue length of time by the well-known scheme of rapidly disabling the lead stage of the receiver and tuning to the transmitter frequency, then, at the end of transmission, reversing the procedure and hoping to find the other fellow before he had completed his identification. The inconvenience of this repertoire certainly needs no comment, nor does the exasperation that follows when he cannot be located, and yet, that many of us are monitoring in this manner can readily be verified over the air. The probable explanation, as in the writer's case, is that with the general adoption of commercially manufactured receivers, one does hesitate to cut into a well-assembled job and make drastic changes, particularly if he has sacrificed all but the staff of life to get it.

A system conceived under these circumstances and one which has proven to be completely satisfactory is now in operation at the writer's shack. The arrangement, as shown by Fig. 1, consists of an auxiliary oscillator which beats with the transmitter signal and feeds it through the regular i.f. and audio channels. During transmission it is only necessary to cut the plate voltage on the h.f. oscillator and sufficient r.f. stages to give a reasonable signal level. In most cases the existing standby switch may be used. Volume can then be controlled by R1 and the pitch by C1, both adjustments being independent of those in the receiver over normal operating ranges. For break-in operation, the switch may be omitted.

This system may be applied to the t.r.f. type of receiver in the manner shown by Fig. 2. The outstanding advantage of this scheme is that the transmitted signal is heard exactly as it is received and for this reason it was selected in preference to the system which simultaneously keys an
audio oscillator. Obviously no switching of the 'phones is necessary since the regular audio components are used for both monitoring and receiving.

In operation it is found that if the auxiliary oscillator is tuned to the opposite side of the transmitter frequency from the h.f. oscillator for the lowest frequency band used, the harmonics will be strong enough to permit operation on all higher bands without changing coils. In the case of the t.r.f. receiver, the monitoring oscillator will be tuned to the highest desirable transmitter harmonic. A switch in the negative B lead of the auxiliary oscillator may be used to eliminate picking up harmonics when covering the inter-band range if an all-wave superhet is used. A very neat installation will result if the monitoring unit is built within a small shield can and located inside the receiver cabinet with the controls for \( R_1 \) and \( C_1 \) brought out through the panel. A further refinement incorporated at this station has been to provide a changeover switch with an extra pair of contacts to turn the crystal oscillator on and off.

Second Prize Solution

By Gordon Havam, VE3AJB\(^2\) and William Motherwell, VE3BY\(^3\)

The scheme shown in Fig. 3 has been in use by both VE3BY and VE3AJB for about a month, and we are very pleased with it. It seems to answer all the problems of a keying monitor, and is very inexpensive to build.

The double triode tube replaces the usual triode first audio stage. One section works as a single triode amplifier for the receiver, while the signal from the frequency meter-monitor is fed through the other half of the double triode. The frequency meter is the one described in the Handbook using a 24-A and a 56. The mixer tube amplifies the signal from the frequency meter, making it quite strong and useful on all the bands required.

In this system there is no switching or coil changing required as the signal in the frequency meter is sufficiently strong on all bands. For break-in operation the scheme is ideal since both the receiver and frequency meter signals come through the audio circuit equally well.

A feature of this circuit is that the strength of the received signal and that of the monitor signal may be adjusted independently.

The great advantage which this scheme has over the ordinary audio keying monitor is that the signal heard is not merely a check on the keying, but also on the actual signal going out over the air. I think its use would do a great deal to reduce the number of bad notes on the air. Also, since the frequency meter is calibrated, off-band operation should not occur.

We wish to thank the following for their solutions of the problem: W2IFB, 3FFC, 3GJT, 6KMA, 8FU and VE3VC.

\[ \text{--- D. H. M.} \]

Problem No. 13

Our Hero frequently has need for a clip with which to make connections to transmitter coils of the space-wound wire type. To his great annoyance, standard clips made for wire coils have a habit of flopping over, short-circuiting a turn or two of the coil. He also finds that, when using standard "octagonal" ceramic forms, difficulty is experienced in getting the clip to stay on without falling off at the crucial moment.

He believes that surely someone has found a way around the difficulty.

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.

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\[ \text{--- QST for} \]

\[ \text{--- QST for} \]
The C.C.C. Takes to the Air

By William Haight*

PERCHED on a high bluff beside Lake Michigan there stands a little tar-paper-covered building like those found in Civilian Conservation Corps camps throughout the country. Reaching skyward from this humble place is a lead-in wire that unmistakably identifies it as a radio shack.

But it is much more than that. Through the thin wires of that particular lead-in, which looks for all the world like those found in thousands of ham stations, pulses the official business of the entire C.C.C. structure in the three states of Illinois, Wisconsin, and Michigan. That station, WUEL by call, is the Sixth Corps Area control station of Uncle Sam's great civilian conservation army. With a cleared channel on 4300 kc, WUEL maintains regular schedules with District stations at Fort Brady, Sault Sainte Marie, Michigan; Camp Custer, Battle Creek, Michigan; Sparta, Wisconsin; and Jefferson Barracks, Missouri.

Within each district is a net of subdistrict stations, situated out in the country in certain C.C.C. camps themselves. The Fort Sheridan District, for which WUEL serves also as District control station, has radio in its camps at Marseilles, Illinois; Madison, Wisconsin; and Honey Creek, Wisconsin. These are 20 watters; the big brother transmitter at Fort Sheridan uses 40.

Some time ago the C.C.C. radio shack at the historic old Illinois army post became an academy of higher learning for students of the fine arts of short-wave radio operation. Determined that, despite the shifting, changing personnel of the conservation corps, from which the operators of the radio stations are detailed, the radio net must continue to function smoothly, officials organized a school for operators. Under Lieutenant Louis Buttner, the Corps Area radio net officer, the C.C.C. headquarters at Fort Sheridan created a real radio short-course college, complete with dormitory, classroom and adequate faculty. Special selection of eleven enrollees from the 48 companies in the district insured a responsive and capable student body.

The picked students arrived, and were assigned a section of the C.C.C. Headquarters Company barrack in which to live, and to study their homework. They reported for class each day at the schoolroom in the radio shack, located in rear of the operators' room at WUEL. No common schoolroom was this, with twelve sets of head-phones and keys plugged in around a large table, and buzzer, batteries, and switches to make the setup an effective place in which to learn the code.

Graduate of the Marine Corps radio school at San Diego, California, and veteran of high seas wireless as operator aboard the U.S.S. Minneapolis, John Borek, WUEL's chief operator, became head professor in the school. Charles Walz, his assistant at the corps area station, and formerly a ham answering to W9MQH in Chicago, was associate professor. Lieutenant Buttner functioned as president of the faculty in this unique miniature radio university.

Learning via buzzerphone practice to take the prescribed 13 words per minute was not the only instruction imparted. Equally important parts of the course were the lessons in the theory of radio, designed to acquaint the enrollees with the operation of their equipment, and in C.C.C. administration. A well-rounded education as camp radio operators was the objective of the school.

Ex-ham Martin Olson of W9MPM, Chicago, delegate from the Skokie Valley camp, was no freshman in this school. He entered with advanced standing, being at least a sophomore with his 15 words a minute. His four ham years made him star pupil.

Declaring this first 1937 semester of the radio university of the C.C.C. a great success, the corps officials plan to open up another term shortly, training another class of operators for future use in radio net. Graduates will return to their own camps, not all of which are radio-equipped, to be available for duty wherever they become needed with the discharge of present operators. A preliminary trial of the radio school was held about a year ago when the radio net of the C.C.C. was first established.

The recent flood in the Ohio River Valley put (Continued on page 86)
Regenerative Detector Circuit for Reducing Interference

The dual detector circuit shown in Fig. 1 has been used for some time by J. Dawson, W4DNA, St. Petersburg, Fla., and when carefully constructed is capable of reducing interference from an unwanted station. It consists of two identical regenerative detectors so arranged that the currents in the plate circuits cancel when both are tuned to the same frequency. One detector operates in the customary fashion to pick up the wanted signal; the other is used as a "bucker" to balance out an interfering signal.

The two detector circuits are quite normal in every respect, and the usual circuit values are employed throughout. W4DNA's arrangement uses the cathode-tap circuit for regeneration. The grid coils and coupling coils must be exactly the same, as must also the coupling coils or primaries. The input circuit can be a tuned r.f. amplifier or an antenna. The two detectors must be carefully shielded from each other to prevent heterodyning. The condensers marked C are ganged for one-control tuning. C₁ is a vernier tuning condenser in the "bucking" detector, C₂ an equalizing or alignment adjustment in the "active" detector.

As to tuning procedure, W4DNA writes: "Set C₁ at full capacity and C₂ at minimum, then tune in a station. The regeneration control must of course be advanced until the detectors go into oscillation. Now turn C₁ to minimum, and if the signal is still heard adjust C₂ until it just disappears; then bring it in again with C₁. If the ganged condensers are well matched, no further adjustment of C₂ will be necessary.

"Both detectors work on the same half-cycle of the signal, i.e., if one is excited by the positive half-cycle the other grid must be positive at the same instant. One detector receives the desired signal and the other neutralizes the interfering signal. If the interference is on the low-frequency side, tune C₁ toward maximum until the interference is reduced to a minimum, and on the reverse side if the interfering signal is higher in frequency.

"The primary coils are shown connected in parallel, which I have found to be the best connection, although they can be connected in series if desired. There is nothing tricky about the circuit, the most important points being thorough shielding of the two detectors and duplication of circuit components throughout. The circuit itself is a modification of one proposed by Armstrong some years ago."

Curing Interference with Old-Style B.C. Receiver

Here is a change that can be made in certain old-model radios to reduce and in some cases eliminate interference caused by nearby ham transmitters. This change was made on three sets to try to reduce QRM, and it worked out 100 per cent in all three cases. In one case the radio was an old Temple that was getting a one-kw. 'phone all over the dial, and in both other cases the trouble was from c.w. transmitters, clicks and carrier all over the dial. In all three cases the receivers were very close to the transmitters. In one instance it was found that the interference could be heard just as well in the receiver (an old Philco) with the antenna and ground disconnected and the three r.f. tubes pulled out.

The trouble boils down to the fact that in the grid-leak type of detector shown in Fig. 2-A, the grid is practically floating above ground. This makes the tube and its associated wiring sensitive to the rather strong r.f. field when the receiver...
happens to be near a transmitter. The plate type of detector, shown in Fig. 2-B, is practically impenetrable to this type of pickup. In making the change from grid-leak to plate detection it will be necessary to have well-filtered d.c. on the plate of the detector or an increase in hum will result. An extra 8-µfd. filter condenser probably will be needed at the point where the high voltage is obtained, and in some cases it may be necessary to put an extra choke in the detector plate supply, along with the extra capacity. In the three sets fixed here all that was necessary was the extra 8-µfd. condenser.

After making this change, it will be necessary to peak the detector trimmer condenser, as the circuit revision will disturb the alignment slightly. It is a good idea to by-pass both sides of the 110 to ground inside of the chassis with condensers about 0.01 µfd. Most of the newer sets already have the 110 by-passed, but old-type sets such as the one used in the grid-leak type of detector very rarely have the 110 filter incorporated. The filter helps to prevent r.f. from getting into the chassis by way of the 110 line.

—Fenton Priest, W3EMM

46 as a Screen-Grid Tetrode

Transmitting tubes being expensive and hard to obtain in Latvia, amateurs in this country use the cheap receiving-type tubes, generally of U.S.A. manufacture, for their transmitters. Special attention is given to the 46, but they have found it to work much better if connected as a tetrode with some positive bias on the second grid. The idea is originally due to Olgers Resnais, YL2BB, who tried it in his transmitter. Immediately after trying it himself, he put it into work. The results are especially good on higher frequencies, 14 to 56 Mc. (This perhaps is partly due to reduced input grid to cathode capacity.) As a straight amplifier or doubler, the tetrode 46 gives better r.f. output with less excitation than the same tube in high-mu triode connection. Although neutralization is still necessary with straight amplification, it is easily accomplished with but a small capacity, two pieces of aluminum, ½ inch by ½ inch, spaced within a distance ¼ inch, being more than enough. No traces of secondary emission are ever observed if the "screen-grid" voltage is kept reasonably low, 80 to 100 volts being the best value at 400 volts on the plate. A dropping resistor of 100,000 ohms in the positive "B" supply lead may be safely used.

The idea is to create an audio tone in the speech amplifier and feeding it into the modulator. This may readily be keyed to provide type A-2 emission on the five-meter band. If it is not keyed, it offers a good method of testing where one spends many hours of talking into thin air while somebody else adjusts directive arrays and what not in an attempt to hear him. In my particular case, I have used it extensively in timing down-mountain ski races by five-meter portable rigs. As the timer

—Arv. Vitolins, YL8CD

S.A. or Audio Oscillator for U.H.F. Transmitters

FIG. 4 is a diagram of an arrangement I have used for some time and which I believe other hams might find useful. The circuit provides a means of creating an audio tone in the speech amplifier and feeding it into the modulator. This may readily be keyed to provide type A-2 emission on the five-meter band. If it is not keyed, it offers a good method of testing where one spends many hours of talking into thin air while somebody else adjusts directive arrays and what not in an attempt to hear him. In my particular case, I have used it extensively in timing down-mountain ski races by five-meter portable rigs. As the timer

January, 1938
at the bottom of the course presses the key and his watch simultaneously, the tone is heard by the racer at the start and he is thus given a very accurate signal for starting. The sets may then be given over to descriptions of the racer’s descent either by the operator at the start or at the finish.

![Diagram](image)

**FIG. 4—SPEECH AMPLIFIER OR TONE GENERATOR FOR 5-METER WORK**

L—Midget audio choke or primary of small audio transformer.
C—Small condenser to tune to desired tone.

The timer has merely to punch his watch as the racer passes over the finish line.

The s.p.d.t. switch shown provides normal input to the speech amplifier in one position. When thrown to the other position, it biases the speech amplifier grid 45 volts positive through a tuned audio circuit. This amount of bias causes the tube to operate on the negative slope portion of the E-I curve. Hence the grid circuit operates as an audio dynatron oscillator. This audio voltage controls the plate circuit in the normal manner. It will be found that different tubes require different amounts of positive bias to get them to oscillate properly. The idea, however, should be easily adaptable to any speech amplifier. Some tubes might not be adaptable as a result of too high grid current under the positive bias conditions, which would, of course, damage the tube.

---Millett G. Morgan, W8OTD

**Plate-Voltage Control with Combination Transformer**

Many amateurs are not blessed with an abundance of funds, and a nickel saved is that much more towards improving their sets. Most power-supply diagrams show a plate transformer with two or three separate filament transformers. At the same time, most of the low-voltage plate transformers already have two or three filament windings, but they are not used because the boys want separate filament transformers to heat their tubes before plate current is applied.

My plate transformer has several filament windings—enough to heat my two 66 Juniors, as well as the filaments of the tubes in the transmitter. For 25 cents I purchased a heavy-duty porcelain double-pole single-throw switch, which I mounted on the inside of the power pack near the transformer. I brought the two plate leads from the transformer to one end of this switch and from the other end ran two leads to the rectifiers (Fig. 5). I have an 8-inch length of one-inch wide bakelite strip fastened to the handle of the switch, with the loose end extending through a hole cut in the panel. When I shove in an inch depth on the bakelite strip, the plate switch is open. All I have to do is give the tubes a few seconds to heat up when I first start up the rig, and then pull the strip out, which closes the switch and applies plate voltage. This saves the price of an extra toggle switch for a plate transformer as well as that of an extra filament transformer.

---W. F. Worrell, W5AQD

**6L6 Screen Supply**

The 6L6 screen supply system described by W2ALW in March QST can be made still better if four neon lamps (without resistors) are used in series between screen and ground, as a simple dropping resistor can then be used between the high voltage supply and the screen. The original circuit provides no compensation for the regulation of either the power transformer or the screen-supply filter. If the neon lamps are placed between screen and ground, however, they will not only compensate for this regulation, but will actually eliminate the need for a screen supply filter, since the neon lamps act as a very large capacity. Current may be taken from either side of the plate supply filter. The value of the dropping resistor should be low enough to pass about 25 per cent to 50 per cent more current than is required by the screens, in order to keep the lamps glowing. The required voltage drop should be measured with full load on the power supply.

As an example, take the case of a power supply delivering 450 volts at no load and 400 volts at full load. The drop in the resistor should be 100 volts with about 30 mils current, which will pro-

(Continued on page 68)

1 Page 48, March, 1937, QST.
Members Societies

Iglesia Colombiana de Radio Amateuro

Liga Mexicana de Radio Experimenteradores

Masyarakat Radioaktivitas Amatör

Omskagiwak

Nederlandstalig Radiozendersbond

Nederlandstalig Radioelectriciteit

Nederlandse Vereeniging voor Internationaal Radioamateurisme

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New Zealand Association of Radio Transmitters

Norwegian Radio Relay League

Gesellschaft für Versuchsanordnung und Entwicklung

Polski Związek Krotkofalowców

Radio Club Venezolano

Radio Society of Great Britain

Reeuw der Amatoren Portuguesen

Receveur des Emissores Francos

Receveur des Emissores de Amateurs d' Undes Courtes

South African Radio Relay League

Societé des Amateurs de Radio des Pays Bas

Svenska Amatör Radioföreningen

Union de Radiomires Españoles

Unión de Radioamadores de América

Union Schweiz der Kurzwellen-Amateure

Conducted by Byron Goodman

Countries:

A year ago this column carried a list of countries, intended to be used by DX men who like to keep track of the number of countries they have worked. We acknowledged at the time that its adoption would depend entirely upon its acceptance by the majority and, surprisingly enough, there were very few criticisms. The average amateur was pleased to have a "yardstick" with which to measure his DX accomplishments, and the comments we did receive were favorable and constructive.

It was recognized, of course, that there had been a few ommissions, and that some revision was possible. With this thought in mind, we studied the comments we had on hand, discussed the list at length with representative DX men, got the west-coast slant by collaboration with W6QD, checked with several geographical authorities, and finally arrived at the list we now present. We trust that we have approached still more closely to a universally satisfactory standard of "countries worked." Your comment is invited.

<table>
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<th>Prefix</th>
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<td>Aden</td>
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January, 1938
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**Soviet Union**

- European and Russian Socialist Federated Soviet Republic: UI-3-4-7
- White Russian Socialist Soviet Republic: US
- Ukrainian Socialist Soviet Republic: ZB
- Transcaucasian Socialist Soviet Republic: UZ
- Transcaucasian Socialist Soviet Republic: ZS3
- Uzbek Soviet Socialist Republic: US
- Turkoman Soviet Socialist Republic: U6
- Spanish Settlements: V81
- Surinam: VP4
- Spanish Settlements: VP4
- Sweden: SM
- Switzerland: HB
- Syria: SY
- Taiwan (Formosa): J9
- Tanganyika Territory: VQ3
- Tangier Zanzibar: ZD3
- Tannu Tuva: ZB1
- Tasmans: VK7
- Tibet: VP4
- Timor, Portuguese: CR10
- Tonga, French: VP5
- Tokelau (Union Islands): VQ8
- Tonga (Friendly Islands): VR5
- Transjordan: ZG
- Trinidad and Tobago: VP4
- Tristan da Cunha: ZU9
- Turkey: TA
- Turk and Caicos Islands: VP6
- Tuvalu: VB1
- Uganda: ZS-2Z-VU
- United States: W[N]
- Uruguay: W
- Venezuela: YV
- Virgin Islands: RA
- Wake Island: ZG
- Wales: GW
- Windward Islands: VP2
- Wrangel Island: ZS4
- Yemen: ZS4
- Yugoslavia: YV-YU
- Zanzibar: ZS6
THIS month we call special attention to the announcement appearing elsewhere in this issue for the first “A.R.R.L.” QSO Party... to be held Saturday and Sunday, January 8th and 9th... call insignia prizes... only bona fide League members eligible. Look into this. See you there!

EMERGENCY OPERATING POLICIES

The season of the year when snow and flood hazards mount to considerable proportions, and when amateur radio communication must be ready to fill in to replace disrupted or overloaded wire communications circuits, is now upon us. Attention is called to the need for preparedness of all stations belonging to the amateur service. Emergencies due to individual isolation are important as well as the widespread general disasters which involve the necessity for public relief and welfare work as well as communications problems on a major scale. Be ready to stand by for a QRR, and note well that this is a call to be used in the amateur bands only by a station asking for assistance.

Progress is reported in the appointment of Emergency Coordinators in communities all over the U. S. A. and Canada. Section Managers make these appointments, and local studies and organization of the amateur service to meet local hazards and problems are going forward through committees of amateurs organized by these Emergency Coordinators wherever sufficient population and amateur activity warrants. Every active radio amateur is invited to register his equipment and availability in the League’s Emergency Corps which will be substantially expanded.

About the time you receive this QST, all amateurs now registered with the Emergency Corps will receive a re-registration blank. This is an important step in overhauling the field organization’s emergency system to give us names and data to refer back to the new Emergency Coordinators, but is the means of dropping from the roster those now inactive who do not re-register availability.

An important fact that should be kept in mind by every amateur is that full individual understanding and cooperation of each amateur is essential to amateur success in any kind of emergency disaster involving amateur radio communications. Interference levels must be kept down. Reserves of amateurs to operate the best stations in shifts must be organized. Many individuals must listen, that the best organized compact nets covering vital points may operate effectively on our low-frequency amateur bands. All amateurs are requested to cooperate to the fullest with the Emergency Coordinators and A.R.R.L. officials to bring about a condition of complete registrations, advance organization, and thorough preparedness. This applies now, in advance of emergency, as well as in time of emergency communication need itself.

All readers are requested to kindly study the following policies which have been recommended for very definite and obvious reasons, and will undoubtedly govern in our next major opportunities to serve the public in emergencies. Such organized planning is to give point to amateur efforts in attempting to establish and successfully handle communications during emergencies of any character and size. The recommendations of A.R.R.L. to the F.C.C. are included in our recommendations to amateurs, as follows:

1. That frequencies at the band edges be utilized for all emergency calls, with emergency present but not yet recognized or generally declared. The idea is to lend point and specification to builders of emergency equipment. This spot on all bands is well covered continuously by receivers. It gives each type of emergency operator that he can hear. Such frequencies are suggested as spots for all listeners to hunt for weak signals in any periods in general emergency for taking account of the isolated and making new station alignments.

2. That whenever F.C.C. shall have recognized and declared a general communications emergency exists, 2000–1975, 4000–3975, and 3500–3525 kcs. shall be reserved as emergency “calling” channels... prohibited to all emergency calls... all amateur stations observe a silent or listening period for the first five minutes of each hour (0000–0005) on all amateur channels (3500–4000 kcs., 1715–2000 kcs.), tuning through the emergency calling channels for any QRR or initial-important calls from weak or isolated stations previously unable to effect contact in the interference.

3. That in the designated and recognized emergency areas, all general amateur stations observe a silent or listening period for the first five minutes of each hour (0000–0005) on all amateur channels (3500–4000 kcs., 1715–2000 kcs.), tuning through the emergency calling channels for any QRR or initial-important calls

The widest understanding and cooperation is needed to systematize our amateur operating and secure relatively less interference (from unintelligent transmitting) for any future general emergency period. Copy the above numbered points, or cut them out and post in the shack along with other lists of emergency-operating practices that appear in the new A.R.R.L. Handbook, the new

January, 1938
booklet Operating An Amateur Radio Station (104 to non-members, on request to members). The application blanks for registering equipment in the League's Emergency Corps are available from your Emergency Coordinator, from the S.C.M. (address on p. 6), or from Headquarters. Every amateur licensed with an active station should "register." These blanks also contain valuable listed operating points and precepts and extra blanks will be sent any licensed amateur for the station record. Our purpose is to have every licensed operator fully aware of every emergency-operating policy so that superlative results can be again recorded when the situation arrives.

Not one amateur but wants to do his part in emergency. We call upon clubs and groups everywhere to discuss local organization, to reiterate policies and practices published for mutual information and benefit, and to conduct a local campaign of registrations of all amateurs (whatever frequency band or interest) in the Emergency Corps. Ask us for blanks or further information.

—P. E. H.

PRIZES FOR BEST ARTICLES

The article by Mr. George W. Chinn, W9EIZ, 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!

Notes on Contest Procedure

By George W. Chinn, W9EIZ*

THERE are certain helpful and considerate practices which make for more complete and satisfactory enjoyment of the various League contests. One should strive, first of all, to make the event a pleasant affair for everyone with whom he comes in contact.

One must participate in these contests to experience most fully one of the many facets of amateur radio experience. Low power and simple equipment should not be considered obstacles to the entry of your station in any operating event. The operator who hesitates to enter because he feels that he is not able to compete with the elaborate equipment used by some of the other contestants is passing up part of his prerogative as a radio amateur. He should be glad of the opportunity to test his equipment to prove that it is able to perform in the manner it should. While he may not run up one of the highest scores, there is, nevertheless, a certain satisfaction to be derived in the accomplishment of a creditable performance with limited time or equipment. Good judgment is a more valuable adjunct of pleasurable operating than is brute force and inconsiderate action.

From the standpoint of the lower powered station it is my firm belief that any amateur in this class should not send a single CQ during a contest. It is much more sensible to listen for signals he can copy well and contact these stations by calling them, rather than to work the ether with useless calls. You will always find a CQ to answer during every contest! How much better it is to be able to hear the fellow you're working on to try and pick your call (in answer to your CQ) from the mass of weak signals and QRMs that are brought to the oft-repeated but seemingly never-learned problem of needless CQ's, especially during the DX contest. Some fellows call CQ DX by the hour, covering up excellent DX. It is in this way that many amateurs acquire a "bad name." If they would spend more time listening and less time sending they would do themselves a great deal more good, and certainly make a lot of us happier!

Contests seem to bring out hidden faults in a station's character. Notes begin to sour, lists begin to stop, QRMs become to the front. I think the greatest cause of inaccurate metres during a contest is fatigue. After many hours of sending it is no disgrace for your arm to become tired, and naturally your sending may become sloppy as a result. You can do yourself a world of good by resting as soon as you become over-strained and tired. A lay-off for a short period, while both your body and mind are relaxing, provides a complete change from hard operating, and enables you to re-enter the fray refreshed and alert. It is surprising how fast the body can recuperate, so that you do not have to worry about the few points missed! You should enter the contest with an idea of enjoying yourself, rather than to just run up a lot of points in a hurry! Leisurely operating makes for greater enjoyment.

No matter what the results of your endeavor, report to the sponsors of the contest. The League makes the keeping of records as easy as possible. The checks between stations for the purpose of verification are reduced to a minimum and a neat orderly report is possible despite the untidiness of many of us participatants! Even though you do not want to be entered in the contest results formally, as a contestant, you should send in the efforts of your activity so that the stations you work can receive the credit due them. It doesn't hurt, either, to have your call published in QST, for it brings your call to the attention of other amateurs and serves to identify your signal on the air. It classifies yours with established and recognized stations.

Finally, there is the matter of QSL-ing. It should be accepted as a part of the contest, for remember that while a particular card may not mean anything to you, yours may be the one card that the fellow you contacted is breathlessly awaiting. In any event, one should always have the decency and courtesy to return the compliment of a card which is sent to him first. Even an "old-timer" may need your card to complete his file for some certificate. Take my own instance—while I have been a ham for quite a few years, I still need cards from about twenty-five states for W.A.S.

During the various contests throughout the year, let us attempt to secure the most enjoyment for ourselves by providing for good operation, sensible operating and satisfaction. More important, let us strive to bring that glow of friendship and contentment to the checks of the fellows we are fortunate enough to contact. Let our stations be friendly stations!

1 *EDITORIAL NOTE.—It has been proved time and again that operating ability is a tremendously more potent factor than the equipment itself, even though the best equipment and control arrangement is desirable. See "10% Station, 90% Operator," August 1933 QST.

* 7350 Dorchester Avenue, Chicago, Ill.

Brief

A Bowdon-Kent's Island Expedition party leaves Lubec, Maine, for Kent's Island in the Bay of Fundy on December 23, 1937. The purpose of the party will be to collect meteorological data, to take a bird census, and to cooperate with the National Broadcasting Company by transmitting several programs over one of the networks. The first broadcast will take place December 30th. The high-power, gasoline-operated amateur "phone station under the call VE1IN will be used for transmission of radio-telegrams on a special frequency of 4797.5 kc. The radio staff of the party consists of W1JDW, W2JKE and T. S. McCaleb. Amateurs are asked to look for VE1IN on 4797.5 kc, after December 29th. Weather permitting, the party will return home on January 4th.
Results, October O.R.S.-O.P.S. Parties

The new O.R.S. Party scoring system certainly sent the figures skyrocketing. Topping the list is W8KFC with close to nine million points! W4ABT at the key of W4NC is not far behind. The results of the “millions” are given below.

W8LUQ made a new high mark for O.P.S. Parties—an even 7000 points!! Other record scores: W6ITH 5712, W2HNF 5600, WTTPA 4686. See the complete list for details on the leaders.

The October O.R.S. and O.P.S. bulletins announced an All-Season Competition for each group. Activity is at a high level with apprentices plugging at the various factors. There's room for more, see your S.C.M.

**South African DX Contest**

Amateurs throughout the world are invited to participate in the second South African Radio Relay League's International DX Contest to be held on the second and third week-ends of January, 1938.

**Dates:** January 8th (0200 GMT) to January 9th (2200 GMT) and January 15th (0200 GMT) to January 16th (2200 GMT).

**General Call:** All stations outside of the U. of Bo, Africa will call "CQ S.A. Test." Bands: Any or all amateur bands may be used.

**Exchange:** An RST report followed by a selected serial number is to be sent to each contact. Only one contact per band with any one station is permitted on any week-end, but stations worked on the first week-end may also be worked on the second week-end. Schedules must not be arranged either between stations or for other stations.

**Scoring:** Two points may be claimed for “two way” exchanges, one point for “one way” exchanges. South African stations will multiply points gained by total number of countries (or subdivisions) worked. Other stations will multiply by the number of African Zones worked. (Contacts with ships off-shore will not be credited.)

** Zones:** Stations outside of the “Africans” will base their multipliers on the following Zones: ZS1-6; ZT1-6; ZU1-6; CR6; CR7; VQ3; VQ5; ZB; ZN1 (Rechuanland); OQ6 (Congo); FR8 and FB8. U. S. A., Australia, New Zealand, Canada and Argentina will be divided into their respective districts.

**Awards:** Through the generosity of Mr. G. Ross Kent, ZT6R, a trophy to be known as the “Ross Kent DX-floating Trophy” will be awarded to the member of the S.A.R.R.L. in South Africa who makes the highest score. This will be awarded each year to the highest South African. Certificates will be awarded to the winners (if S.A.R.R.L. members) in each of the African zones. The winner in each district of U. S. A., Australia, New Zealand, Canada and Argentina will receive a certificate, as will the winners in all other countries. No certificates will be issued on winning scores under 100 points.

**Returns:** These must reach the South African Radio Relay League Headquarters, P. O. Box 7028, Johannesburg, South Africa, not later than March 15, 1938. The logs should show Date, Station, Time, Freq., Zone, Nr. Sent, Nr. Received, W.P., Total.

**ARRL. Trunk Lines**

**ROUTE** your traffic via the A.R.R.L. spot frequency all-O.R.S. Trunk Lines. These lines are operating very efficiently, and the operators invite traffic. Each line has a "manager," whose duties are to make sure that each operator keeps schedules, arrange operation to speed message handling time, recommend changes when needed, etc. Each manager makes a monthly report to Headquarters so that necessary action may be taken and records kept up to date. Each A.R.R.L. Section Net has a connection with the Trunk Lines to facilitate deliveries and provide an outlet for the Section.

To make the possible the rapid exchange of traffic between the various Trunk Lines, a National Trunk Line Net is maintained on 2070 k.c., consisting of one station from each net. W6KWA is Manager of this net, which meets nightly at 10:30 p.m. E.S.T. Stations in this net are W6KWA (A), W4CX (B), W1IP (C), W5FSK (D), W5HD (E), W6IHV/W6JMD (F), W5WMN (G), W4TEG (H), W2E2LC (I), W9BAZ (J), W6KKY (K), W9HCS (L) and W9OFO (M).

Trunk Line operators deserve the highest commendation for their work. Theirs is not the "here-today-gone-tomorrow" type of amateur operation. Quite the opposite, they are on the job night after night, maintaining schedules, keeping a nationwide traffic system in operation. The A.R.R.L. Trunk Lines represent one of the finest examples of amateur cooperation in existence.

The stations on each line, and the frequency on which each line operates, follow:

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January, 1938 49
Trunk "A": 3805 kc., W5LSF, Manager-W2GWW W5KWA W5LSF W5PLL W5GWK W5PTU W5DM W7CRH W7PCG W7LD (Alternates: W2GCG W8QAN W9LIT W9TYH W9HHG W9ZRA W7CCG W7FDB)-New Jersey to Washington.

Trunk "B": 3795 kc., W5DI, Manager-W2BYR W5HHM W5EDQ W5KQ W6UOD W5DDI W5FYR W5FYR W5CWW W6JYJ ( Alternates: W3FEM W5LGE W5CDA W5XXY W5F0B W5E5QK W5MKN W5GRB W6MEB W6JOG W7IIL)-New Jersey to California.

Trunk "C": 3665 kc., W3AKB, Manager-W5GOJ W5IWP W5I1W W5F0Q W5WQ W5BBT W5GFC W5DWW V5DVO V5IDDY (Extra) (Alternates: W3IFR W5WLF W5WMP W5WCG W5DWB)-Maine to Florida.

Trunk "D": 3865 kc., W4DS, Manager-W4DS W5HFH W5SFAJ W5DAX W5ZM W5KOL W5SNSN (Alternates: W5DNE W5NEI W5UOD)-Alabama to California.

Trunk "E": 3870 kc., W5ED, Manager-W5CIZ W5HSD W5UAR W5KIE W5P0B W5TFQ W5FCW (Alternates: W3FSP W5OLY W5HBQ W5QQW W5QG A W5FDP)-Maryland to Washington.

Trunk "F": 3985 kc., W7WY, Manager-W5WFP W7FFQ W7LHD W7MFL W7QNY (Alternates: W2GGE W5BGC W5EGF W5SOT W8HCS W5EPT W5NFL W5LCX)-Quebec to British Columbia.

Trunk "G": 3925 kc., W7COH, Manager-W1ADG W5QTW W5BJW W5ICM W5RONM W5AAR W5COH W5NH W5YDF (Alternates: W1BFF W5CSE W5PLL W5QGE W5TFQ)-Massachusetts to Oregon.

Trunk "H": 3905 kc., W5CEZ, Manager-W5CEZ W5QBR W5QJW W5UOG W5AJJ W5SHF (Alternates: W9KLI W9FFW)-North Dakota to Mississippi.

Trunk "I": 3990 kc., W5CM, Manager-W5CM W5BYJ W5Y4Y W5AAW W5EIC W5EMQ W5FMJ (Alternates: W5ZBU W5ETQ W5CG W5BQW W5AVX)-Quebe to British Columbia.

Trunk "J": 3773 kc., W6BZ, Manager-W5BZL (extra) W5BPQ W5BZ B W5CQP W4AJP W4C0B (Alternates: W9AKT W9ARU W4APU)-Wisconsin to Florida.

Trunk "K": 3833 kc., W5CZE, Manager-W5KUY W5UTN W5CZJ W5MN (Alternates: W5RNR W5E6G W5W0V)-Illinois to Texas.

Trunk "L": 3915 kc., W5PAM, Manager-W5BCX W5CFG W5BMOT W5C8S W5EYP W5PNL W5LCL W5PAM W5BQW W5AKX (Alternates: W52GGE W520BC W52DN W52HLO W5KPA W5IVY)-New Jersey to California.

Trunk "M": 3855 kc., W5OF0, Manager-W5ZY W5BBZ W5OF0 W5VEST W5LZK W5WRW W5KLI W5ECP W5MITS (Alternates: W5EGE/W5EUG/W5WDE/W5DDC V5E301 W5SEN)-New Jersey to California.

Stations on most of the lines operate "as a net." "A" works as a net at 7:15 p.m. EST (eastern stations) and 8:00 p.m. EST (through to west coast). The eastern end (W5BR W5MNH W5EQG W5KQ W5HOU) meets at 5:00 a.m. EST. The western end (W5JVG W5C6C W5FYR W5HLY W5DNI) meets at 8:00 p.m. MST. A schedule between W5HOU and W5DI at 8:15 a.m. C.S.T. connects the two nets. "B": The northern end, Maine to Pennsylvania, works as a net at 6:45 p.m. EST. Southern end works individual schedules, but is arranged net operation. "D": 7:00 a.m. C.S.T. Net includes W5GCH W5FSK W5DXA W5ZM W5KOL 7:30 a.m. C.S.T. Net includes W4DS W5HFH W5SFAJ, "E": Eastern end meets at 8:00 p.m. EST. Entire trunk meets at 8:30 p.m. EST. "F": Trunk meets at 6:30 p.m. PST, 8:30 p.m. M.T. Coast to coast nets at 9:30 p.m. EST and 9:30 p.m. M.T. "G": Lines up as a net. "H": Functions on individual schedules. "I": Entire trunk meets at 7:00 p.m. C.S.T. "K": Schedules on this line-6:30 a.m. C.S.T. W5CEZ-W5MN; 6:40 a.m. C.S.T. W5CEZ-W5OW; 6:50 a.m. C.S.T. W5CEZ-W5DE; 7:00 a.m. C.S.T. W5CEZ-W5DFP-W5MG W5MG. "J": Eastern end works as a net. "M": Eastern end works as a net.

High Sweepstakes Scores

Although it is too early at this writing to announce any official results of the 1937 Sweepstakes Contest, we are able to pass along information on a number of high "claimed scores." It appears that W5ITH has for the second consecutive year worked all A.R.R.L. Sections by two-way radiotelephone during the SS! And this year there were 70 who worked W5ITH's excellent record will be confirmed when final results are presented, after all logs have been checked. He is the highest score submitted so far by "phone contestants-45,020; next high W60CH, 12,396. In the c.w.t. ranks, W3BES smashes through with a claimed 87,937!! 435 stations worked in 67 Sections ... this is the highest number of stations so far claimed in a Sweepstakes. Second high c.w.t. log is from W5FFU-35,504. A QSL from W2IOP states that his score will be between 70,000 and 80,000. 1936 scores were bettered right and left—everyone is enthusiastic over the '37 SS. Take a look at these claimed scores. Figures above show stations-worked sections worked:

W5BES 8937-439-67 W3GAU 10455-237-58
W5FFU 8304-386-18 W5IEP 3944-250-54
W5DON 5338-252-85 W5BG7 2574-605-58
W5GR 5424-309-62 W5YMV 1870-285-58
W5HSO 8900-285-65 W5OKC 3810-222-58
W5YKF 6450-303-60 W5HNI 2451-253-47
W5AJ 5210-239-60 W5QEY 2283-305-65
W5ALW 2230-250-56 W5DKP 3426-222-55
W6TS 4729-268-60 W5IEO 3435-222-55
W5LZ 4905-278-59 W6GPF 3885-155-61
W5MXU 4710-267-99 W5EJU 3384-217-52
W5CHI 4050-338-60 W5DJI 3228-213-52
W5HAL (Hall) 4082-382-60 W5YCY 3267-138-55
W5AHR 4524-230-66 W4ECZ 3205-199-50
W5BET 4736-284-54 W3ATR 3240-232-48
W5CRO 4299-293-51 W5GDI 2997-232-52
W5PY 4020-272-20 W5P2 2115-207-30
W5CWW 4192-220-63 W5BSN 3184-214-49
W5AQB 4099-244-56 W5GUP 3074-224-46

Phone

W6TH 4800-340-70 W6AM 3350-57-29
W6OCB 1256-140-46 W9BTC 1893-29-27
W5SIP 7272-86-34 W3GDX 1861-33-19
W5YQN 6856-68-36 W5BWW 1854-42-22
W5ITV 6401-80-40
W5JZX 4844-87-28

DX Century Club

This issue of QST carries a new A.R.R.L. list of countries. It is a longer list than that previously printed, including approximately twenty additional countries. Rule 4 for the DX Century Club is now amended to read: "(A) The A.R.R.L. list of countries (January 1938 QST) will be used in determining what constitutes a country. This should increase the totals of many a DX Century Club member. It may even put a few into the actual list of members. Check over your countries in accordance with the new list and send in your confirmations.

There are no new club members this month, but a number of new calls will be noted in the "runner-up" group. 46WY increased his total to 115 countries, W5CRA to 113. As soon as you can prove contacts with 75-or-more countries (Continued on page 65)
How's DX?

How:

In this modern world, there is only one thing you can be absolutely sure of, and that is that somewhere in a January issue of a magazine you’ll find someone that insists upon setting down some resolutions for the New Year. Maybe it’s because this New England clime is beginning to get us, or simply because it seems like a good idea, but we’re going to fall in line and set forth a few personal resolutions. There are of course a million things that could be mentioned. These just happen to be the ones we intend to work on.

This year I resolve that I will:

1. Be so nice and sweet to the DX I work that they can’t resist sending me cards. That will help towards the Century Club.

2. Ignore the locals on 7 Mc. to the point where all I’ll hear is DX. That will help me towards that 7-Mc. WAC. We’ll be at peak performance all of the time, not just for a week or so after they are put up. (And buy a rifle with telescopic sights to shoot down some of the branches that run too near the wires.)

3. Finish up that quick-frequency-change transmitter I’ve been thinking about for the past two years so that I can consider my station a modern one.

4. Try to talk WSCRA and some of those W4’s into going on 160 ‘phone so that some of the rest of us will have a chance.

5. Quit moaning about my poor location. I’ve been around long enough to know that plenty of fellows with much poorer locations than mine work rings around me.

Still, it would be nice to be out on a slight rise in the center of a flat plain, with a 2° horizon and room enough for several rhombics plus a rotatable on ten . . .

Where:

Just to prove that we have a mean streak, we’re going to give you the low-down on HZ6N1. (We didn’t work him!) Cards to the address he gave have come back marked with the Arabic equivalent of “Not Known,” so you didn’t work Yemen after all. (And buy a rifle with telescopic sights.)

Now what about the DX corner? Although 14 Mc. isn’t as solid for 24 hours each day as it was, there is still plenty of things and stuff hanging around. Were you on the evening ZPIAX (14,140 kc., T7) first got on the air? He let out a QSO and as many W’s called him up as he had to ask them to call him again, signing their calls often, and he’d give them group reports. We got tired counting the number of stations he reported. This type of operation brings up the point as to whether or not you can count contacts like that as “two-way.” We doubt it, but refuse to get into an argument about it. ZPIAX uses four-half-waves in phase and jumps in a beautiful signal, from the standpoint of volume . . . .

When:

We haven’t much dope on 7 Mc. this month except a rumor that W4DBH got 98 from J2NA on 40 the other morning, and a note from W2IOP reporting QSO’s with ZL3FP, G5FA, G5RL, G5DQ, G6VQ, G8CZ, VO4BA and K7CHE during two mornings before the SS Contest. Some more 7-Mc. reports would be welcomed with open arms, as would reports on 3.5-Mc. DX. Last year some of the boys like W2BGMX and W8CNWC were knocking stuff off right and left on 40 . . . . W4CYY is keen enough about 40 to have sent us a nice check to help buy back the band for the DX men. It runs about $200 a kilocycle, so we still need plenty of contributions.

On 28 Mc. you can just about write your own ticket. W8CLS reports ‘phone contacts with SP1HJ, FASJY, SMTYA, CN8AV, F6QA, and ZU5S, and keeps a regular schedule with the boys like K1LZ, K1AK, K1GZ, K1JJM, K1KL, K1Y5C and K1RFK.

W2BMX was on 10, working 632 different W’s to get it . . . . W2BFW heard VU2CQ (28,260 kc.) RST579 the other morning . . . . W2ITY reports HK1Z (28,110 kc.) on ‘phone around 2 P.M., and W8QPE gives W2CP (28,260 kc., T9), and LA4P (28,240 kc., T9). . . . . And to cinch the deal, W6JFJ worked 23 countries, had 33 European QSO’s, and made WAC during 20 days of operating on 10.

Although 14 Mc. isn’t as solid for 24 hours each day as it was, there is still plenty of things and stuff hanging around. Were you on the evening ZPIAX (14,140 kc., T7) first got on the air? He let out a QSO and as many W’s called him up as he had to ask them to call him again, signing their calls often, and he’d give them group reports. We got tired counting the number of stations he reported. This type of operation brings up the point as to whether or not you can count contacts like that as “two-way.” We doubt it, but refuse to get into an argument about it. ZPIAX uses four-half-waves in phase and jumps in a beautiful signal, from the standpoint of volume . . . .

W2BFW is really going after this DX business, and recently accounted for such items as W2EP (14,330 kc., T9), XU6HM (14,035 kc., T9), XU8RI (14,300 kc., T9) on sked, FIBAC (14,065 kc., T9), J2EQ (14,160 kc., T8), VS8AF (14,270 kc., T9), Z6CAJ (14,255 kc., T7), CRF9W (14,255 kc., T9), and UFOL (14,065 kc., T7) . . . W2AAL contributed J6CF (14,175 kc., T9) and XU8RL (14,035 kc., T9), and W2GZ jumps through with HS1BJ (14,000 kc., CN1CR (14,360 kc., PK1VX (14,360 kc.), KA1CS (14,200 kc.), and heard but not worked, XU1GC and XU8MK (14,100 kc.), XU7CK (14,293 kc.), and PK1AI (14,075 kc.) . . . . Out west, W3EMR has moved to a new QTH which he likes a lot, even if the DX does come through at odd times. New ones there include VO4CRO (14,080 kc.), CR7AK (14,085 kc.), CR7AJ (14,260 kc.), and FS8AD (14,300 kc.) . . . . W3EMM and W3FQP worked XU8AZ (14,475 kc., T9) one evening around 6 P.M., and rather doubt his authenticity. We’re inclined to think him OK, however . . . . W2CY9 drops in with XU2FS (14,350 kc., T9), VQ3FAF (14,400 kc., T8), KA1ER (14,350 kc., T9), YA1GU (14,025 kc., T9), and PK1RI (14,320 kc., T9) . . . . On ‘phone, the Holden Expedition, VP3THE (18,730 kc.) is scheduled by W2IYY, and comes through well between 8 and 10 P.M., EST . . . . W8EF gives VU2JY (14,125 kc.), K1A1N (14,150 kc., T9), K1D0O (14,170 kc.), FY8C (14,410 kc., T9), KA1ER (14,350 kc., T9), KA1AH (14,410 kc., T9), and KA1Y5C (14,293 kc., T9) . . . . Down South, W2EQQ worked J3D0 (14,250 kc., T9) at 4:45 A.M. CST, and says the UP’s (frequency you know where) come through from 9 P.M. to 2 A.M. . . . W8QGE has been busy with much stuff on YTT7FJ (14,430 kc., T7), XZ2DP (14,070 kc., T9), XU8UB (14,045 kc., T9), XU8MA (14,070 kc., T9) and FS8VX (14,430 kc., T9).

January, 1938
How:

W3EVT sends in some good points on EC oscillators. He says that the way to good stability is with at least 300 µfd in the cathode circuit, and keeping the cathode tap as close to ground as possible. Clem uses an 802 in his oscillator, and he finds that he gets better harmonic output by using a split-stator tank circuit in the plate.

Out around Los Angeles we found a tendency for the DX men (and there Plenty of Call of Interest is to go in for and call for efficient types of feels on simple v-waves antennas, strung up high as to how they can get them. The idea seems to be to get as good general coverage as possible, instead of focusing activity to just a few directions as is done with some of the sharp beams they used.

Who:

We had nine visits with W6QD, W6CUH, W6CXW, W6LYM, and a flock of others. Had a chance to operate at W6QD, and after we had pushed the microphone out of the way and dusted the cobwebs off the key we found that we couldn't work any farther east than W9. It's all right, because he's a fellow, potentially, of course, that he's working towards a W.A.N. (Worked All Nines) . . . . K7RT is old W7RT and is up around Goodnews Bay on the Bering Sea. He says it's a honey location for DX, with everything from 160 down check-full of stuff. He'll be back this month, so look for 1901 Atlantic City, W9. Seattle, W6BME. Johnny acquired a number of hard-handed ivory paper knives which he will be glad to exchange with foreign amateurs in return for representative gadgets. You know, a boomerang or kangaroo from V.K., a penguin from Antarctica, a diamond from ZU, etc., etc. . . . . W6KEY, the station of the 20-40 Club, made 7680 points during the recent VK/ZL Contest . . . . . . There is a certain insouciance about W2G VZ that gets us. Whereas "moot fellown 95th country KAI MD is back in this country, just as DUO had done! Apparently it was a long-legged DX men (and there are plenty out that way!) to just a few directions as is done with some of the sharp beams they used.

Contests:

Don't forget the S.A.R.L. Contest, to be held the second and third weekends in January. See the rules given elsewhere in this issue.

O.B.S.

The following is a supplement to the list of A.R.R.L. Official Broadcasting Stations in October QST (page 50):

W1GOJ, W1MYV, W1WENI, W6BYV, W6EBV.
(Continued from page 60)

(100 countries rates membership in the DX Century Club), send your confirmations so that you may be listed in QST. Those already listed should continue to send additional confirmations as received. With the advent of the new country-list we expect to keep busy checking claims!

MEMBERS, DX CENTURY CLUB

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<th>Different Countries</th>
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The following have submitted proofs of contact with 75-or-more Different Countries:

- W1TS: 85 W1DUX 80
- W2GTZ: 91 W3BES 79
- W2GW: 88 VE2EE 79
- W8OVL: 88 W6ZL 78
- E1F: 88 W8KEG 78
- HBD: 87 W5QG 78
- W6GAL: 86 W1R 77
- W9KA: 86 G5QY 77
- W1DF: 84 W2GZ 76
- W6KLM: 84 W9VZ 76
- W1ZI: 83 W3BYN 75
- W9EF: 82

STATION ACTIVITIES

CANADA

Vanalta Division

Alberta—Acting SCM, Jas. Smallley, Jr., VE4GD—LX has gone with family to the South in an attempt to cure his son of a leg injury. GQ is Acting S.C.M. during LX’s absence. LQ sends his usual fine report for the Edmonton gang. IZ says Calgary is PFX DX location. RT is spending a busy winter DXing. AF again proves the old saying, “The ‘phone bug will get you if you don’t watch out.” PH has returned with big tales of California Killowats. AG2 works East Coast with low power. AEA liked 56 Mc. but the B.C.’s didn’t. ADW and VI were heard working hard in SS Test. HI is getting the bugs out of a new rig. EA gave a talk at the club on NCOOQX. LQ visited the South gang and had a personal bug. LQ sent GC in Winnipeg. BB is using a 6L6 exciter unit and schedules GC in Winnipeg. AKG at Kirkcaldy had a pair of T-55’s plate modulated. OK with his 14-Mc. ‘phone is back on. QF is in Kansas City. RC is trying ‘phone for a change. SB has a pair of 35-Ts in the final. BR finds 28 Mc. better than 14 Mc. AG is heard nightly with 3.9-Mc. ‘phone. BB at God’s Lake puts the company rig on 14 Mc. quite often and keeps in touch with the gang in Winnipeg. DU is building another super. GQ operates a pair of T-55’s plate modulated. KX has been working plenty of DX on that new Collins rig. RO has been rebuilding power supplies. UX is permanently back in Winnipeg. ZR2 has been using ‘phone on 14 and 28 Mc. ZV has about finished building new rig. The St. James

Canada

ALL-VE CONTACT CONTEST

January 15, 16, 17, 1938

This contest is sponsored by the VE Operators’ Association, and is open to all VE stations. Contacts may be made on any band, either c.w.-c.w., ‘phone—‘phone, or c.w.—‘phone. For proof of contact each station shall transmit the frequency in kc. being used at the time of contact. No contact may be counted unless frequency is both transmitted and received. The station may make as many contacts more than once and count as a different station provided the contact is made on another band.

Scoring: For each contact with a station in the same province as yours, one point shall be counted. For each contact with a station in an adjoining province two points shall be counted. For each contact with a station in the second province away three points shall be counted. Thus, a VE3 contact with Alberta shall count four points. A VE2 contact with Alberta shall count five points. No contact shall count made with a station in the same town or city, or with a station within a radius of five miles of your town or city. For this contest Newfoundland shall be considered as a province adjoining Nova Scotia on the East. Prince Edward Island shall be considered as between New Brunswick and Nova Scotia. Thus a contact between VE2 and VO shall count five points. The total number of points shall be multiplied by the number of provinces worked, thus the maximum multiplier shall be 10. If not more than 75 watts input is used to the final stage of the transmitter your score after the province multiplier shall be multiplied by 1 1/2. Date, Time, Transmitting Frequency, Station Worked, Province, Frequency Received, and Points shall be the headings of each column on the log to be submitted. Logs must be postmarked not later than January 30th and should be sent to the Secretary, VE Operators’ Ass’n, VE3GT, 46 Dunvegan Road, Toronto, Ont. Members of the VE Operators’ Ass’n may take part in the contest but shall not be eligible for any prizes.

The contest shall run from 4:00 P.M. E.S.T., January 15th until 3:00 A.M. E.S.T., January 17th, 1938.

Radio Club held open house on Nov. 10th with a large attendance of Winnipeg and St. James amateurs. The M.W.E.A. held its annual meeting and is getting under way for a busy season. On Nov. 26th the Winnipeg Radio Club held dinner and dance. Amateurs in this district are requested to be on the look-out for VE6SY on about 14,000 kc. This is the Wilkins’ expedition searching for the lost Russian flyers. The rig is a Collins 45A and a National 100X receiver, operated by Hollock Kenyon, VE4YE. When opportunity permits he will be on this frequency looking for some more contacts. KPLF To keep his contact logs, etc. TLL has a new Super Skyrider receiver. TQ will re-build the broadcast lay-out in rack and pane. FN is using a 6L6 exciter unit and schedules GC in Winnipeg three times weekly. Winnipegosis is kept in touch by FN, using a 47 crystal driving a 250 final; he schedules Winnipeg three times weekly to AAW on the Trunk Line. AC was a visitor to Winnipeg recently.

January, 1938

53

SASKATCHEWAN—SCM, Wilfred Skaife, VE4EI—The Moose Jaw club had its first club meeting of the season Oct. 25th and will hold one every second Monday from that date. New officers: pres., Austin Capper; vice-pres., Arthur Chesworth; secy.-treas., Mervin Pickford; act. man., Fred Kroynash, AIE, TN is active on 14 Mc. EP is using grid modulation on 1,75-Mc. 'phone with 5 watts input. ES is on 14 and 3,9-Mc. 'phone with 40 watts input. WF will be on 14 and 7-Mc. e.w. in near future. FY is looking for vibrator power-supply to use with 6V6 crystal osc. ABE is getting on well with his new 14-Mc. vibrator supply. CC is going to use SS into '46. VZ is going to build Jonen exciter. CQ has been made Alternate Trunk Line operator. LY wishes to be O.P.S.; he uses 6A6 P.P. crystal osc. into '10 into P.P. 'phone. Our old timer, Val Mock, now VE6ACO, reports from Hyder, Alaska. "X" marks the spot where your report would have appeared if you had sent it in. UK gets out well on 14-Mc. 'phone but is going to use 6L6 osc. into 807 buffer into two '50's. EL gets out poor to fair on 14-Mc. 'phone. ACR still has a nice burlie on his modulation. XL gets out well with grid mod. 14-Mc. 'phone. Manly Haines, 5MQ, wants to be remembered to the old gang in this Section.

Traffic: VE4CM 130 CQ 83 EL 5 KJ 2 MX 1.

MARITIME DIVISION

MARITIME— SCM, A. M. Crowell, VE1DQ—Nova Scotia: MK, the local H.A.R.C. station, is now active. FY, Long Branch, South Africa, got contact. AY received some nice reports from VU land on his 14-Mc. 'phone. DB gets out well on 14-Mc. e.w. BK has been DX hunting in the wee hours. DQ completed the signal squisher, getting 28 from the first Q. EP was active in the SS. MF has been doing some brass pounding on 14 Mc. New Brunswick: Interesting dope on the Moncton gang via EV: LP is doing FB with 7 watts input on 3,5 Mc. JU changed QTJ to Hillsboro, N.B. We hear from GAY that GL has been putting the 14-Mc. Navy Spotted Bill J14-20 into 7 Mc. with a pair of '46's push-pull. LL is rebuilding. EV had a pleasant visit from W2JMI. GI and FF have been transferred to Ottawa. Sorry to lose you, boys, LO, at Woodstock, with 20 watts input from dynamotor to 6L6 tri-tet, jumps into the much-needed traffic breach and is now in line for O.B.S. Interesting dope from the VO boys via VO1W: VO1A has the All-Star 400-watt 'phone and e.w. kit nearly completed. 1B is experimenting on low-power 'phone. 1C's rig is 42 crystal and 6L6 with 55 watts. LD has new Super Skyrider. 1G expects to come back now that he is in town again. 1H has second Junior operator, Congrats, "Pop." 11 is doing portable mobile work on 28 Mc. from the car, also active on 14 Mc. ND on 7 Mc. 1B, 1J on 9 Mc. Portable-mobile, 1K is adding an 807 to his 6L6 crystal oscillator and heading for 28 Mc. 1L is now "Daddy." 1M is active on 7 Mc. 10 has gone to Newfoundland. Land Airport and expects to be on the air soon. 1P is active on 14-Mc. 'phone and 7 Mc. 1U has gone crystal-controlled with a 6L6. 1W is using a 6L6 crystal, 6L6 buffer and pair in P.P. final, 60 watts. 1X has 6L6 crystal, 6L6 buffer and pair '10's final, 80 watts on 14-Mc. 'phone. 1Y is working good DX on 14-Mc. e.w. with 10 watts input and Skyrider. 1Z is settling down to the building of a 6L6 oscillator, 2D expects to be on 'phone this winter. 23 is active on 'phone and 7-Mc. e.w. 2N is on 14-Mc. 'phone occasionally. 2S and 4D hold the highest QSO with each other on 3.6 Mc. 2T is catty extended to 2K on the death of his XYL. 1b of VO3P was in St. John's for a couple of weeks and visited the N.A.R.A. headquarters as well as the ham. 3X is to be congratulated on the sale of his 14-Mc. QRM line. 3W on 14-Mc. 'phone with his Grosa. 4C is on 7 Mc., working 11 daily. 6D (Six ducks) is active on 14-Mc. 'phone with 200 watts. 6S uses crystal-controlled 6L6, modulated by 6L6. The annual Convention of the N.A.R.A. was held at the Octagon on November 11th. All the local hams were present as well as 3X, who came to St. John's to attend. Also present was the Secretary of the Department of Post and Telegraphs. A swell time was had by all—1H drew the 807. Later in the evening he auctioned it off and 1P got it. The Committee elected to hold office for the following year: 1H, 1K, 1L, 1M, 1Y. At 12 o'clock the gang were invited to 1H.

Traffic: VE4MK 50 LO 14 KB 13.

ONTARIO DIVISION

ONTARIO—SCM, Fred H. B. Saxon, VE2BG—R. M.'s: 3DU, SGT, 3MB, 3QK, 3TM, 3WK. ABW is going to England as Marconi operator. The Toronto, Hamilton and Brantford gang will be very active in the coming months. UC, KW and 54 go on places on 3.5, 14 and 28 Mc., but seems to have no luck on 7 Mc. HT is working DX with new vertical antenna. ACO is on again after being off for a year. WM is rebuilding. ADO is on 14-Mc. 'phone. AQF, AQG, AGJ and AQK are new in London. Welcome, men, and greetings from the whole Section. WF has gone to 14 Mc. KC, TN, GV and AJE are active on 7 Mc. AEV is on 14-Mc. 'phone. DU was a visitor at V2, WK and SG, also Brantford Hamfast, while on vacation. Incidentally, gang, that Brantford Hamfast was a knockout! HV in Smooth Rock Falls is taking over the northern Ontario link in the Trans-Canada Trunk line. AJB is carrying a nice bunch of schedules. LB, HP, VU, AOC, AKG, AQF, AGJ, APX, ABF and 9AT are active in Chatham. HP sent in cards for AOC, and W.A.S. AMO has 95 crystal osc., 46 buffer-doubler, and 10 final. Latest O.R.S. appointment is "Daddy" Dawes, 3NM, ex-2BB. AMB has 35 crystal osc., 46 buffer-doubler and T20 final with 60 watts in. PE visits his friends at a hamfest and stayed overnight with BB. The MO moved over from Leamington for the hamfest. HD has been down to the MacGregor Arctic Expedition in Greenland. SS is in Toronto studying for commercial tickets.

Traffic: VE2VA 210 BS 39 AB 79 W6 14 TM 54 GJ 57 50 NM 29 AU 28 DH 24 VC 18 YD 12 CP-AND 9 QB 8 FE-ZS 7 Li 5 NC-LG 4 SS 3 DU 1 VEASAL 17.

QUEBEC DIVISION

QUEBEC—SCM, Stan Connach, VE2EED—The Division offers its condolences to VE2BG and family on the death of Tommy's father. New officers of Quebec Radio Club: pres.; AB; vice-pres., LE; secy.-treas., HL. AB and EY made a trip to New York and Philadelphia recently. HJ erected a couple of new poles. IT is back on the air. DU visited the Quebec gang. NT and his XYL also visited Quebec. DW is back on with increased power. HE was in contact with VEIGR for four and a half hours recently, while five chee players in Quebec tested their skill against five players of the Bluenose Chess Club. Congrats are in order for DX; Bill has a new XL op. The Produced in Canada Exhibition was held in Montreal, in the Dept. by two ham stations; VE2DN, the French Club, utilized the transmitter from JY, while the S.C.M.'s transmitter did duty for the M.A.R.C. Many messages were handled, and thanks are extended to those who assisted so nobly on the receiving end; they include CA, GA, BG, EX, BO, ID, HL, AG, CH, RT, AB, EC and CX. To the boys who assisted in operating both of the Sun Life stations we extend our thanks also. BU has completed new transmitter, band switching in all stages except the final. LU has been busy handling traffic. HP erected new 40-foot pole in an adjoining field. BO has put up an 8JK beam. EC visited his old home in Grand Mère. GBWQ was visitor at Bo, and Geoff brought him down to see the S.C.M. EM is on 14-Mc. with a nice new signal. EW built a new modulator. DJ is still getting more than his share of DX. IA is doing well by himself also. AA has a brand-new NC-100X. BV is doing well on 14-Mc. 'phone from Valois. AP has purchased a Gosset Super-3A. AX contemplates using 14-Mc. 'phone again. We understand that CUI is due to join the ranks of the Benedicts very shortly. Congrats, John. FY has been keeping schedules with 5NM, and Daddy visited LC and the gang some few weeks ago. 1Y hit four QSOs with two T20's. The doctor has granted HT a permit to operate once again. Traffic: VE2EED 210 ID 78 CA 27 BG 32 EC 20 AB 24 DH 42 IN 11 BU 9 JU 80 HIT 30 KF 25 LC 65. (Continued on page 84)
CORRESPONDENCE

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

I.F. and Images

74 Wood St., Pottsville, Mass.

Editor, QST:

Congratulations to George Grammer on his article in September QST, "Pick Your Spot on the Neighbors' Supers." He rang the bell, but did not go far enough. How about picking an i.f. which will not throw an image from any ham band into the b.c. band? It is a well-known fact that there are more amateur stations than any other type in the United States, and it seems that manufacturers should design receivers which would eliminate images from this widespread source.

A well-known manufacturer of communication receivers for amateurs has just announced a new receiver with 1560-kc. i.f. If the advantages of the higher-frequency i.f. are as outstanding as claimed, many manufacturers of all-wave receivers will soon be using it. When b.c. receivers come out with 1560-kc. i.f., may the F.C.C. have mercy on us, because most of the high-power boys on 75 and 80 meters will be tangled with the b.c. gang. Please don't let things get started that way.

An i.f. of 1725 kc. is not far removed from 1560 kc., but we will have no images to bother our neighbors with new receivers. Granted, we will still have harmonic beats, but that is better than beats plus images. I think A.R.R.L. should get this thought around where it will do the most good.

--S. W. Thomas, W1IXO

On the November Editorial

84 Cortland St., Norwich, N. Y.

Editor, QST:

One of the best editorials I have seen in a long time in the November issue.

I am glad someone has taken a new slant on the subject.

--J. B. Frye, W3IY

De Luz, Calif.

Editor, QST:

Just got through reading your editorial in November QST. Also have read "Adding Ideas to Ham Radio," by W6EP. I think the two go together very nicely. With these two articles as a foundation stone we should start a movement to put operating on a higher plane.

--E. C. Richman, W6MSN

1150 Bland St., Bluefield, W. Va.

Editor, QST:

Both the regular editorial and the one in the Operating News are extraordinarily good, but how many of the thick skulls are they really going to penetrate? You have probably already heard a mighty chorus of howls from guys incensed at the League ordering them to throw away their old equipment, not understanding the spirit in which it was written. Then, being an incurable pessimist, I can't see how you are going to beat any decent and up-to-date operating practices into the domes of most of the guys.

I read somewhere an editorial on something that made an unforgettable impression on me. It was to the effect that you can take almost any respectable, law-abiding citizen and upon placing him under the wheel of a high-powered automobile, he is automatically transformed into a homicidal maniac, with no thought for anyone else and very little for himself. Sometimes I suspect that a lot of the hams are much the same way when they sit down to their operating tables. Regardless of oft-repeated admonitions, they persist with long CQ's, long calls, no bk-in, overmodulation, highest power for local work, r.a.c. notes, and whatever else they think will bring them results, with no consideration for others and with no understanding that they are really getting nowhere.

Well, what am I going to do about it? Nothing of any importance, of course. The answer, as every intelligent person knows, lies in that (at present) unattainable panacea for crime, alcohol, sex relations, eugenics, religion, and all the other problems that beset humanity—"education of the masses."

For my own part, though, I might mention a few principles which I advocate, and follow fairly closely myself.

First, a realization that it is not necessary to spend a lot of money on a station. If more fellows would take pride in how good a signal they could get out of a few dollars' worth of junk, instead of how fine and powerful a rig they can own, they themselves would be much happier and the rest of the world a lot better off. (On second thought, maybe this doesn't apply to the radio manufacturers!)
Second, a bit of sensible operating. This covers a lot of territory, such as using judgment in calling, using abbreviations and forms where desirable, and at other times using a real conversational style, on voice or any speed code. It also covers another principle which might well stand out by itself. That is, knowing fairly well what is on the band in which you are operating, especially on your own frequency, and never deliberately causing serious interference with anyone. The bands may be pretty well crowded, but there should always be some place you can operate. This doesn’t mean a clear channel, but it does cover such things as calling CQ in the middle of an organized net.

Third, attending as many amateur meetings as circumstances can be stretched to permit. This includes belonging to a club if possible, . . .

—W. E. Meador, W8BMW

SWL QSL

1502 West Ave., Austin, Texas

Editor, QST:

Something should be said and done about the fast-growing nuisance of cards from short-wave listeners within the United States. What started as a legitimate and even laudable way for beginners to break into the game has now become a big-time way for every s.w.l. with an all-wave receiver to obtain a lot of QSL cards to impress his visitors. The s.w.l. card printer, not adverse to the situation, have made things worse by printing and widely advertising cheap, rubber-stamped cards.

There is still some excuse for foreign s.w.l. reports that might let an operator know his signals were getting into a DX point which he had been unable to contact; however, the “signal report” of the American s.w.l. is now merely an excuse for the aggressive demand for a QSL that invariably follows. In the first place, any operator on the higher frequency bands (14 and 28 Mc. are most used by s.w.l.’s) with a ten-watt transmitter and a piece of wire slung out to the back fence knows that his signals will, under decent conditions, reach each coast. Then, too, the s.w.l. always sends his card to the weakest signal he can hear, and it has been my personal experience that the majority of the s.w.l. cards I receive are from points closer than the station they report my contact with.

Granted, then, that in making a “report” the s.w.l. is simply asking the station operator to do him a favor and give him a QSL card. At first thought a one- or two-cent radio card seems a small enough thing to ask for. But consider my experience (which is only the experience of all other active amateurs) where I receive on an average of from five to ten s.w.l. cards from within the United States every day. Less than ten percent include any return postage, so it becomes evident that cards and stamps to answer all s.w.l. reports wouldn’t be from three to five dollars every month.

It seems to me that the logical thing to do is to discourage such s.w.l. practices by wide publicity in QST in order to prevent the unpleasantness associated with the amateur’s necessary refusal to answer such s.w.l. cards. Perhaps if the s.w.l. addict is made to realize just what he is asking he will have the courtesy to refrain from making pointless “signal reports!”

—W. T. Connell, Jr., W2BB

Lima Center, Ws.

Editor, QST:

Am I interested in reports saying I am QSA5 R9 in adjacent places? It is quite obvious that easily half of the cards sent are not for the purpose of helping the amateur concerned, but for the large collections. Only a very few are appreciated and they are not always the DX cards. A case in point: One amateur was trying to get on 20-meter ‘phone. He called many and called plenty of Q’s. Cards came in soon indicating that he had landed on 40 meters and that he was R9 in quite a few places on ‘phone. Unusual DX or any thing that may interest the amateur in improving his rig are appreciated but 95 per cent of the s.w.l.’s received help only Uncle Sam . . .

—Clifton E. Gates, W9KBT

53 East 7th St., Holland, Mich.

Editor, QST:

Recently there were a few articles in the Correspondence section regarding the use of SWL on the short-wave listener’s cards. I agree 100 per cent with the gang as well as the F.C.C. that this should not be used by short-wave listeners on their cards.

However, here is the entire solution to the matter for all concerned. If short-wave listeners desire to signify the call letter district in which they happen to live they should put on their cards “SWL-W9,” or whatever district they happen to be from. Notice the W9 comes last, not first. It is entirely wrong to put the W9 first but there can be no objection to it being placed after the “SWL.”

—Rus Sakkers, W2DBD

Manufacturers, Take Note

Wood St., Tuckerton, N. J.

Editor, QST:

In building a new rig one casts a look over available material in his junk box and among his unused parts. That’s where the trouble begins. You pick up a condenser and then you check to find its break-down voltage and its maximum and minimum capacity. You pore over the catalogues and look at the pictures, but when you find the condenser piece and look over the numbers you cannot tell which is which, whether it is 35 µfd. or 50 µfd. or 75 µfd. Ah, you will count the plates! But then when you know the number of plates the specifications in the catalogue give everything but that! The writer has now on the bench two Cardwells, three Hammond’s, two National’s and three Buras, but, armed with a book-shelf of catalogues, he has not been able to tell which is which. On the other hand he must find out before he goes ahead with the construction. Please, Mr. Manufacturer, stamp on the condenser—not on the box so quickly lost—the break-down voltage and its maximum and minimum capacities and, if you expect to keep the same system of numbering for more than one season, you might stamp the number also. But, some short-wave or long, magnetic storms or disturbing spots on the sun, please, Mr. Manufacturer, stamp on your condensers the capacities and the ratings.

—H. H. Lippincott, W2DH/3

1715—1800 Dead?

57 Strathcona Ave., S., Hamilton, Ont.

Editor, QST:

I have just finished reading another letter about what should be done with the 1715- to 1800-kc. part of the 100-meter band. There have been many lamentations about there being no activity in that part of the band. It would seem to me that it is about time that some of the kickers bought good receivers. Besides the e.w. that is allowed there the part from 1750 to 2000 is allotted to Canadian amateurs for ‘phone.

There are quite a number of fellows active in that part of the band. The fact that it has been branded as dead and that it is exceedingly difficult to contact an American station would lead me to believe that most of the fellows never tune there.

There are several very good reasons why we cannot compete with American stations in the power race, and therefore we feel that we are entitled to that part of the band. Two of the best are: The legal power limit in Canada is 500 watts, and the prices of equipment are much higher in Canada. So instead of declaring 1715-1800 dead, how about tuning

(Continued on page 88)
At this season it seems to be the custom for advertisers to show a picture of Santa Claus, preferably climbing down a chimney with a suitably labeled package in his pack. We have never done much along this line, partly because it is not at all clear to us how the Old Gentleman would manage to climb through an array of antennas at midnight, to say nothing of the reindeer. Yet he does, of course, and if the messages from those arrays tell us anything, he gets a warm reception. From all over the world on Christmas Eve we pick up messages of Christmas Greeting.

So although we do not appoint the Old Gentleman officially as our salesman plenipotentiary it is not because we lack the Christmas feeling. We appreciate his work deeply, and extend to him our best wishes and fullest cooperation.

The little stamp on this page expresses Christmas in print as well as any way we know. Amateur Radio, by eliminating the barriers of distance, expresses Christmas by the spoken word the best way we know. As in the past, we will be on the air Christmas Eve to greet as many of our friends as may be. To those we may not reach, we send our greetings now: Merry Christmas and Happy New Year.

JAMES MILLEN
Better Phone Quality — Free!

GROUND the cathodes of the high-gain tubes in your speech simplifier. Stop audio degeneration, lower hum-level and improve audio quality. Bias your voltage amplifier tubes with Mallory Grid Bias Cells!

The cost is less than the resistors and condensers required to give anything like equivalent performance with a self-bias circuit . . . so you really pay nothing for the improved phone quality!

Use one cell with tubes such as 75, 2A6 and 6F5. Two cells are recommended for tube types 1B5, 57, 77, 6C6, 6J7 and 6Q7.

Mallory Grid Bias Cells are priced at 30c each list. Convenient holders are available, at prices from 10c to 35c each list, for mounting one to four cells. Get them from your Mallory-Yaxley Distributor.

Send a note on your QSL card for a circular on this interesting device. Not recommended for biasing power tubes or oscillators.

P. R. MALLORY & CO., Inc.
INDIANAPOLIS  INDIANA

Correspondence
(Continued from page 56)
there and hearing what is there and giving us a chance to work you and enjoy 160, too.
—J. Camden, VESGZ

Reminiscing
110 N. Hoyne Ave., Chicago, Ill.

Editor, QST:
I have just fallen heir to a stack of historic QST's of the post bellum period, including the "re-opening issue" of June, 1919.

What a laugh one can get out of comparing the "latest spark-gap machine" with the ultra-modern streamlined console rigs of to-day. Also in comparing the organization and workmanship of the slightly amateurish monthly of that time with the ultra-modern professionally-styled magazine of to-day.

Personally I believe the ham of the home-made spark-gap days got more real enjoyment and real knowledge from his unartistic dust trap that was spread out in pieces on the work bench over half the time for repairs and new improvements, and his QST with semi-jumbled type and home-made pictures, than we new beginners of to-day do with our commercially-made receivers and transmitters that require no fixing and our QST of perfect type, retouched studio photos (Heaven forbid! No photograph appearing in QST is, as a matter of policy, in fairness to readers, ever re-touched.—EDITOR.) and draftmen's charts and working drawings.

Personally I am finding a much more human element in the QST's of the spark-gap period. Perhaps that is because I was not able to grow up with radio and my knowledge and thought processes are still on a par with the early days.

This is truly a revolutionary era since all the old standards have been discarded, not only in radio, but in all lines of science, art and government, and new ones are attempting to take their places. Psychologically we never remain at rest; we either retrogress or progress.

Radio has advanced as rapidly as any one of the other modern inventions and QST has kept up with.

—Inez de Lhorbe Miller

Good Fortune
P. O. Box 10, Castlemaine, Victoria

Editor, QST:
As a foreign amateur it makes me smile to hear the wrangling and arguing that goes on in the ranks of the hams in the U.S.A.

Just what do the fellows want over there? They seem to have everything that a ham could wish—splendid receivers, splendid transmitters and a kilowatt to play with. Within limits they can play merry hell with the neighbor's h.c.l. receiver next door, handle third party messages till the cows come home, and generally act the fool over 14-Mc. 'phone.

They all remind me of the two-year-old youngster who, having seen the moon one bright evening, howls, kicks and fights to get it.

It's a great pity that 85% could not he brought to some out of the way spot where radio parts were 150% dearer than they are in U.S.A., where at least 75% of the parts required were unobtainable, where third-party traffic was prohibited and the maximum input to the final stage was 25 watts. Then, perhaps, they would have something to moan about. Such places do certainly exist and the description is not mere imagination.

—Jordan Weynton, VE3XU

Another "Message From Garcia"
Calle 13, No. 97 Vedado, Habana, Cuba

Editor, QST:
Was very glad to do your acquaintance in Radio Club last night Sunday evening Mr. Warner. Tax vy for your kind words. Pse make me a favor when you back up to home. After my letter to Mr. Dixie Jones was impressed into pages of QST August issue mani hammers has wrote and messaged me to offering help to breaking and learn the English tongue. I appraise the kindness dully but wid present help I do fb.
NEW! We at IRC have decided to devote this page each month to a discussion of Ham problems in general and resistance problems in particular. Maybe you will get an idea from it sometime — or maybe you’ll give us an idea that can be worked out for the benefit of the whole gang. At any rate, we shall try to answer two questions in every Ham’s mind when he turns to this page:

1. Why do they make it that way?
2. What can I do with it?

WHY? Hams are an inquisitive bunch and are probably wondering why IRC Special Cement is used for coating Power Wire Wound Resistors.

We use it because its coarse finish dissipates heat and does not deteriorate under any reasonable over-load. Remember that, “to radiate heat best, a body must be dark in color and rough in finish.” A light color or glazed finish will run a higher temperature for the same heat dissipation. (Keep that in mind when you “pot” that new transformer you are winding; put it in a dull black case — not a shiny chromium can.)

Most glazed coatings contain ingredients which are chemically active in the presence of humidity and require high firing temperatures to harden them. Both of these are harmful to a resistor.

NEXT MONTH: A few Do’s and Don’ts for the Ham

INTERNATIONAL RESISTANCE COMPANY
401 NORTH BROAD STREET, PHILADELPHIA, PA.

Say You Saw It in QST — It Identifies You and Helps QST
Knew ebh in level tide of pocketbook impossible to give thank you to each one and so pse give thank you to you kindly.

—S. B. Garcia, OMAO

Xceptional YL

Editor, QST:

Just two years ago I became a licensed ham and like many newcomers made observations of what was said and done on the air. In most friendly fashion I would say that I took exception to the term "XYL," as it appeared to me to sound like "ex-XYL." I inaugurated the use of the term "Xceptional YL" and, each time I used it, I was asked for an explanation. I feel that if these girls who are our wives will tolerate what they have when the old radio bug bites, then they should be so termed...

In my particular case I am most fortunate that my Xceptional YL is Mrs. W2JZX in her own right, and she is as fully wrapped up in the art as I am. While writing I would wish to compliment you upon the efficiency of the organization. The longer I have been a member, the more convinced I am of the fact that the F.C.C. is the father of amateur radio and the A.A.R.L. is the mother who nurtures and cares constantly for her children.

—S. J. Grossman, WBDJG

WANTED

Used gas fired Arco boiler and hot water radiators, must be in A-1 condition. Reply P. 0. Box 272, Houston, Texas.

The above Want-Ad from a Houston paper came to me from the local fire kindler and has me in such a state of agitation that I hasten to inquire whence came this new ether walloper... I have been a ham for the past twenty years and have always paid my bill to the light company for juice consumed to run the rig, and here it seems you sorta get the gas company and the water works together and get all the power you need. How does this dern thing work? How many watts per gallon can a fellow put on the air and does the water hafta be boiling, or will just Luke-warm liquid throw it into a state of oscillation sufficient to put out a CQ? , , ,

I guess you wonder why all this intense interest on my part, but you see I work for a pipe-line company that handles natural gas, the Houston Pipe Line Company, and natchery they are interested in anything that is going to promote the sale of natural gas. If this here contrapshun is just as good as the electrical species, why I wanta go propisition all the brothers here. We must have more than a hundred and fifty hams in Houston from all the key thumps and harmonics a fella hears whenever he turns on his receiver, and if I could just buy up some of these here good A-1 secondhand gas-fired jobs and sorta get the boys in the habit of using gas instead of electricity, the boss might give me a $2.50 raise and I could subscribe to QST for another whole year.

Of course you guys know all about these calorific aqueous apparatii, and if you have any recent hookups please send me full instructions including what size pipe to use and what kind of a valve is best to key it with to stop chirp. It goes to show you how much of a rut a guy will get into. Here these hot-water jobs have been out long enough for them to have a secondhand value, provid'n' they are in A-1 condition, and I never heard of them before. In fact I never knew there was any connection between boiler tubes and radio tubes before. Anyhow, me 'an the gas-house gang are sure interested, and I can't blame that guy with the high-powered post office box from wantin' to buy one, if I find any myself I'll send 'em in so you will know just exactly what this is all about. Only trouble is I don't know when these hot water jobs are in A-1 condition and might send you sompin' that would blow up the lab before you could tell what you had.

—Dave Harrell, W5CVQ
"This receiver is truly an extraordinarily fine instrument," says Stanley Wolff, chief operator, New York Herald Tribune wireless station. Mr. Wolff adds, "We are located on the 21st floor — the very top of the building — next to all sorts of electrical machinery, and yet the 'Super-Pro' is at all times exceedingly quiet, bringing in the weakest signals with not only extreme clarity, but marked regularity. For instance, during the Amelia Earhart search, signals from the cutter Itasca on duty in the vicinity of Howland Island in the Pacific were heard with remarkable clarity throughout a continuous 12-hour schedule. At all times the signals came through on the loud speaker. The U.S.S. Lexington was heard from the start of her dash to Howland Island and thereafter, while she searched the vicinity of the Phoenix Island group, and still later on while she searched still further west in the vicinity of the Gilbert and Marshall Islands. The reception at all times was excellent. No other receiver has been able to bring in signals so regularly day and night, rain or shine, and continuously for two 8-hour shifts a day."

"Super-Pro" performance is so exceptional because of such outstanding features as two stages of R.F. on all bands; 4 air-tuned I.F.; electrostatically shielded input; electrical band spread; direct tuning; stand-by switch; relay terminal strip; variable crystal filter, etc. Crystal or standard models for table or rack mounting, or new console for 7½ to 240, 15 to 560, or 15 to 2000 meters.

Complete your quality installation by installing the new "Supr-Pro." Send for the "Super-Pro" bulletin and new "38" catalog for further data! Mail coupon below.

MAIL THIS COUPON!

HAMMARLUND MFG. CO., INC.
434-436 West 33rd St., N. Y. City

☐ Please send me "Super-Pro" bulletin.
☐ Please send me "38" catalog.

Name: ........................................
Address: ......................................
City: ............................................ State: ..............

Say You Saw It in QST — It Identifies You and Helps QST
NEW TUBES


ALSO A NEW 866:
Amateur Net Price $1.50

These new tubes, and complete data on them, are available now at your regular dealer—or write the nearest Raytheon office.

Briefs
56-Mc. Tests
In connection with the R.S.G.B. 56-Mc. International Contest (see page 53, Dec. '37 QST) W9FM suggests definite schedules in order to increase the possibility of DX contacts. 10:00 A.M. to 11:00 A.M. EST on each Saturday and Sunday from January 15th to February 27th is the schedule to be observed. G's and other DX stations will transmit during the first 15 minutes, W's during the second 15 minutes, etc. Your call should be transmitted often to aid identification. If QSO's become possible on any date, the schedule should be abandoned.

W9FM suggests the above mainly for Europe and Africa. He proposes that the Australian schedule be at about 4:00 P.M. (your local time) each Saturday and the South American schedule at 4:00 P.M. each Sunday.

W8QKC will run a series of tests on 57-Mc. c.w. every Wednesday during February at 3:00 P.M. EST. Transmitter will consist of a 6L6 ess., using a 28-Mc. crystal, a T220 doubling to 56 Mc., a T55 buffer and a pair of T56's with 450 watts input.

W1KH will transmit on 56.2-Mc. c.w. from 11:00 A.M. to 11:15 A.M. EST each Sunday for the next four months, according to the November T & R Bulletin. He will listen for c.w. replies from 11:15 A.M. to 11:30 A.M. EST.

W9FM suggests the above mainly for Europe and Africa. He proposes that the Australian schedule be at about 4:00 P.M. (your local time) each Saturday and the South American schedule at 4:00 P.M. each Sunday.

Hints and Kinks
(Continued from page 44)
vide about 10 mils keep-alive current for the lamps; the required resistance is then 3300 ohms; 3000 or 3500 ohms may be used. At no load, the current through the lamps will be approximately 40 mils with 3300 ohms dropping resistance; the screen voltage, however, will remain at 300 volts. The cost of this system should be even less, since no filter is required.

—Donald Carr, Yellow Springs, Ohio

Hamdom
(Continued from page 38)
activity, whether it’s a domestic or DX contest, has placed among the 25 high on the Navy Day broadcast, and still has time to be WAC and go after all the new countries he can get. Right now the rig has a pair of 211's in the final on 80-40-20-10, and just to ensure that he gets enough brass-pounding he holds down a commercial operating job during his spare time.

Circuit Elements in Television
(Continued from page 54)
by misalignment of the i.f. circuits or by improper choice of constants that form RC circuits, either between the internal resistance of the amplifying tubes with the internal capacity of its elements or in the coupling or decoupling circuits employed in the amplifier stages. The time constants of the circuit can be chosen so that they will be short enough or in some cases long enough
On the Way!!!

Soon RME will announce a new development in ultra high equipment. This new unit will be a decided step forward in the adaptation of a radio circuit to the reception of frequencies below 10 meters (above 30 megacycles).

We are not quite ready to announce deliveries on this unit nor to give you any details, but from preliminary laboratory reports, you may be assured that the operation of the equipment is far in advance of anything now available.

And this is the best news . . . ALL present owners of RME-69 Receivers will be doubly pleased that their selection of a receiver was a 69. They will be the ones to benefit most from the equipment to be announced. You, too, will want to own an RME-69 in order to take full advantage of the ultra high frequencies.

In the meantime, if you do not have an RME-69 and are contemplating the purchase of a new instrument, we would like to have you fully investigate this high-quality receiver. The RME-69 is always NEW, always UP-TO-DATE, always MODERN!
Beryllium copper — that new, exceedingly hard non-corrosive metal with high tensile strength, exceptional wear resistance, and unusually high conductivity — is now used for wiping contacts on the "MC" condensers assuring perfect contact and noiseless operation! To further increase conductivity, and as an added measure of non-corrosive insurance, the Beryllium contacts are silver plated. Thus, you receive double assurance of the tops in efficiency with every "MC" condenser. This and many other important "MC" features are described in the new "38" catalog. Send for your copy today! Mail coupon below.

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not to cause phase shift over the band which it is desired to pass.

Computation of expected phase shift and methods of experimentally determining its existence\(^2\) are matters of considerable complexity and discussion of them will have to be postponed.

To proceed to the video amplifier shown in Fig. 6, we find that almost all circuit values are of importance — most of them having a direct influence on the ability of the amplifier to pass the necessary wide band of frequencies with negligible phase shift. The plate load resistor and inductance must be carefully proportioned to take care of high-frequency response and phase distortion while the \(R\) and \(C\) values in the decoupling circuit have an important influence on the low-frequency response. The coupling condenser \(C_1\) must be substantially non-inductive up to the highest frequency to be passed and the placement of parts with respect to the chassis must be watched carefully to avoid unwanted capacities to ground. It might be mentioned that the decoupling resistors aid the low-frequency response because the reactance of the plate by-pass condensers rise as the frequency falls, adding, in effect, the decoupling resistance in series with the anode loading resistance for the low frequencies.\(^3\)

In the d.c. restoring circuit we find a characteristic of great importance in the time constant of the coupling condenser \(C_1\) and resistor \(R_1\) (Fig. 7). This time constant must be greater than the time required to scan one line and much less than the time to scan one field or half frame. The operation of this circuit could be described in this fashion: The signal appearing in the anode circuit or in the plate circuit of the last video stage will have pedestals riding above the video signal. These pedestals will be rising and falling with the average brightness of the transmitted picture. The higher the amplitude of these pedestals the more negative they will be. Therefore, they will bias the cathode of the diode sufficiently negative so that current will flow from cathode to anode, effectively charging the coupling condenser positive and with it, the grid of the cathode-ray tube. This charging of the coupling condenser will continue until the cathode of this d.c. restoring diode is no longer sufficiently negative to produce any current flow. At this time the average brightness of the background of the picture will have been set. This will require approximately 10 lines of the picture but as the average brightness does not change very quickly, this will be fast enough. Should there be a fall in the pedestal height due to a darker background being transmitted the charge in the coupling condenser will leak off through \(R_1\) until the diode again begins to draw current. Once more equilibrium is reached and the new average brightness of the picture set. So we find the resistor leaking off the charge from the grid of the cathode-ray tube when the amplitude of the pedestal falls and

\(^3\) R. L. Freeman and J. D. Schantz, Video Amplifier Design, Electronics, August, 1937.
A Real Champion in every class! Open for a battle to a long-life finish in any Transmitter. Wonderful records with a long unbroken string of victories over Kid QRM, Socko QRN, etc. Easy to excite to full battling strength. Although they are the true Champs they will do their stuff for you at most reasonable prices. Guaranteed to please all. Let the Taylor Champions do your battling and you'll win—every time.
AMATEURS — here is good news!

Now you can get — in one book — all the fundamentals of tube characteristics and performance you should know. For the Sylvania Technical Manual lists over 200 tube types, with circuit application information on each. Tells all about glass, metal, "G", "Ballast" and Majestic type tubes. Includes typical circuit diagrams, bias resistor charts, etc. Every amateur needs this book. Send coupon and 25¢ for your copy now!

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SET-TESTED RADIO TUBES

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Here is 25¢, Send me my copy of the new Sylvania Technical Manual.

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□ SERVICEMAN

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the diode charging up the condenser when the pedestal amplitude rises. Thus, in effect we toe up the pedestals to approximately the same point.

Since we have already discussed the operation of the synchronizing impulse separator circuit, it will only be necessary to mention that the various resistor values are important in maintaining the diode cathode at potentials suited to permit operation only when synchronizing pulses arrive and not during the time when picture detail is being received. The values of \( R_{13} \) and \( C_5 \) in Fig. 7 are important because the resulting time constant permits separation of the high from the low frequency pulses.

These details of typical circuits are, of course, intended chiefly to illustrate some of the methods available. A receiver built along those general lines might well be the basis of preliminary experimental work. It is interesting to note that irrespective of whether the d.c. is transmitted by a change in pedestal height, as in the present RCA transmissions from Empire State, or whether the average brightness is transmitted by modulating the carrier height, as is done in England and may be done experimentally here, the d.c. restoring circuit described can be made to function. Similarly, whether the synchronizing impulses are narrow, vertical or serrated, the synchronizing circuit described will operate with similar effectiveness. There remains only one other likely change — the polarity of the transmission. This change in polarity can be followed quickly by reversing the cathode for the anode in the diode second detector or, better still, by cutting in an extra stage of video amplification. In other words, the receiver would be capable of operation with all the possible types of transmission used in this country and abroad.

Cairo

(Continued from page 85)

similar act in 1912 but that, also, is of no concern to us.

Nevertheless, the year 1912 is highly significant from our standpoint, for in that year three things happened: first, our Senate finally ratified the 1906 Berlin agreement; second, we participated in the 1912 London radio conference and signed the resulting treaty (it was promptly ratified early in 1913); third, the United States wrote its very first radio legislation. This was the so-called 1912 Law, under which we were to operate for the next fifteen years.

Now, we want to direct particular attention to this law because this is the one of which it has been said that it granted amateurs all the territory from 200 meters down, for their own exclusive use. Did it? Let us examine that law and see.

To begin with general considerations, it may be said that the law required that henceforth all transmitting stations in the United States must be licensed. Authority to issue licenses was
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- PERFORMANCE
- ADAPTABILITY

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Demand "Power by Thordarson"

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delegated to the Secretary of Commerce and Labor. There were sections calling for the use of a pure and a sharp wave, etc., one requiring listeners to observe the secrecy of messages, provision for punishment of violation of the regulations or the transmission of false distress calls. No individual services were defined except our old familiar stand-bys from international treaties, the coastal stations and ship stations.

This is all fine, but what about wavelength assignments, and particularly that part of the law giving amateurs 200 meters and down? All right, here goes for the wavelength assignments: the 300-meter wavelength was specified for general public service work, per the international agreements of 1906 and 1912. Furthermore, with one exception, all stations were authorized to use any wavelength they chose, provided they stayed below 600 or above 1600 meters—this again, being simply a duplication of the international specification of the time. Now, plenty of readers have by this time noticed that phrase “with one exception.” Yep, that exception is the dusky gent in the woodpile about which there has been so much controversy; that exception is the one that is supposed to have given hams everything from 200 meters down. To end the suspense, we will quote that article, in full. Here it is:

“General Restrictions on Private Stations.

“Fifteenth. No private or commercial station not engaged in the transaction of bona fide commercial business by radio communication or in experimentation in connection with the development and manufacture of radio apparatus for commercial purposes shall use a transmitting wavelength exceeding two hundred meters, or a transformer input exceeding one kilowatt, except by special authority of the Secretary of Commerce and Labor contained in the license of the station: Provided: That the owner or operator of a station of the character mentioned in this regulation shall not be liable for a violation of the requirements of the third and fourth regulations to the penalties of one hundred dollars or twenty-five dollars, respectively, provided in this section, unless the person maintaining or operating such station shall have been notified in writing that the said transmitter has been found, upon tests conducted by the Government, to be so adjusted as to violate the third and fourth regulations, and opportunity has been given to said owner or operator to adjust said transmitter in conformity with said regulations.”

(Following this was regulation No. 16, stating that any station of the above class within 5 nautical miles of a naval or military station had to keep under 200 meters and under one-half kilowatt in power.)

Well, gang, there she is! And, it may be said, that’s all that was said on the subject, in the 1912 law.

Now, did this grant amateurs the exclusive use of the territory below two hundred meters? Alas, it did not! To begin with, this was not a grant of privilege to certain classes of stations; it was, instead, a restriction. Unless certain stations were engaged in transacting business, or developing apparatus in that connection, they couldn’t go above 200 meters.

Were amateurs the only ones so restricted?

1 The third regulation required the use of a "pure wave."
2 The fourth regulation required the use of a "sharp wave."
The Johnson Type "N" is the only neutralizing condenser for low C tubes that has all of these important features:

1. Extremely small mounting space.
2. Constant voltage rating over full capacity range.
3. 4 to 1 capacity ratio accommodating an extremely wide assortment of tube types.
4. May be mounted vertically or HORIZONTALLY permitting panel adjustment if desired.

Air-gap width is constant. No change in voltage rating over full range of adjustment. Changes in capacity are effected by moving the inner cup up and down on a micrometer screw.

New design saves space. Drawing shows comparative size of Type "N" and "pancake" neutralizing condenser of same capacity and breakdown rating.

Three sizes of the Type "N" accommodate every type of low C tube popular with the amateur. And look at the price!

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>To Neutralize</th>
<th>Spacing</th>
<th>Max.</th>
<th>Min.</th>
<th>Cup Diam.</th>
<th>List</th>
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<tr>
<td>N105</td>
<td>T20, T55, 25T, 808, etc.</td>
<td>.125&quot;</td>
<td>13</td>
<td>2.25</td>
<td>1.35&quot;</td>
<td>$3.25</td>
</tr>
<tr>
<td>N250</td>
<td>805, 100T, T255, etc.</td>
<td>.250&quot;</td>
<td>13</td>
<td>3.0</td>
<td>1.75&quot;</td>
<td>4.50</td>
</tr>
<tr>
<td>N375</td>
<td>250T, T260, 806, etc.</td>
<td>.375&quot;</td>
<td>13</td>
<td>3.5</td>
<td>2.25&quot;</td>
<td>6.00</td>
</tr>
</tbody>
</table>

Johnson offers other genuine transmitting condensers of small size. The Types "E" and "F" when used with the Type "N" and other suitable components, permit extremely compact construction as in the amplifier shown. Despite its small size, this amplifier will handle maximum rated input to such tubes as the T55, 35T, etc. All Johnson condensers have heavy aluminum plates buffed and rounded, phosphor bronze spring contacts, Alsimag 196 insulation, and many other expensive features . . . yet you'll find them priced with the lowest.

For satisfaction in Any Transmitting Condenser — Get Johnson!

Ask your Jobber or Write for Catalog 964J

"FREE—Bulletin 201J specifying correct Johnson condensers and other parts for all circuits in the STANCOR HAMANUAL and TAYLOR TUBE MANUAL. Ask your Johnson jobber or write direct."

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WEASECA · MINNESOTA · U.S.A.

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The 700-R is a new transmitter comprised of our standard 80-T and 700-A units assembled in a single rack cabinet. Such a combination is especially desirable for present 80-T owners who wish to increase power at nominal cost and for prospective 80-T purchasers who are assured that their first investment will be well protected when higher power is contemplated in the future. The price is very reasonable.

- **Power Output**
  - 250 watts, Phone, 750 watts CW.
- **R. F. Section**
  - 6L6 crystal oscillator, RK-20A modulated amplifier, two Eimac 250-tl as class B linear amplifier.
- **Frequency Range**
  - 1500 to 30,000 kilocycles.
- **Speech Amplifier**
  - Designed for single diaphragm crystal microphone input.
- **Instruments**
  - A complete complement of meters is furnished as well as built-in modulation monitor and carrier shift indicator for constant checking of transmission characteristics.

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Another Eimac Triumph!

A NEW TYPE Thoriated Filament

(Gives Greater Performance)

Tube failures led radio engineers to believe that high plate temperatures and high plate voltages placed certain limits upon filament emission. Eimac engineers exploded this myth by proving that poor vacuum was the cause for emission failures. The Eimac exhaust technique and proper use of tantalum, long ago lifted these limitations from thoriated tungsten filament.

But Eimac was not satisfied with this discovery, alone. Certain other negative characteristics still existed in the thoriated filament... low ratio of usable to "peak" plate current... "cranky" filament voltage... tubes going "flat" for no apparent reason. With the issue at hand, unclouded by "erratic getters" and poor vacuum, Eimac engineers soon discovered the "what and why" of these problems. Result... the new type Eimac thoriated filament, found in 35T, 100T, 250T, 450T, 750T and 1000UHF tubes. This filament, found in the many thousands of Eimac tubes produced during the past year, has definitely eliminated "premature" emission failures.

The unusual properties of this new type thoriated filament, allow Eimac tubes to carry higher ratings, more conservatively, than any contemporary tube of equal physical size. Specifically; the new type filament operates at a lower temperature than that employed previously, and all other forms of "cheating," such as under-processing, are avoided. This results in the highest possible thermionic efficiency plus longer filament life and uniformity. In addition, Eimac filament assemblies are distortion proof. Special construction makes it impossible for filament displacement to alter the characteristics of Eimac tubes.

Remember the "radical" Eimac design of three years ago? (Now copied by leading tube manufacturers.) And the use of tantalum? (An Eimac development now used by practically all tube companies.)

Well, this new thoriated filament still is exclusively Eimac, and is just one of the subtle engineering triumphs that make Eimac tubes so unusual in performance and stamina.

Distortion proof filament assembly of Eimac 250TH.

Eitel & McCullough, Inc. • San Bruno, California
“above 200” wavelengths were made available to outstanding relay stations.

We have said that the 1912 law was the only one we had until the Communications Act of 1927 was passed. Now, it is apparent that nothing in the 1912 law creates special bands for the various services (we have quoted all the 1912 law which applied to wavelength grants or limitations), yet it is a fact that, three years before the 1927 international conference, amateurs in the U.S. were assigned specific bands of frequencies in the short-wave spectrum.

How come?

All right—brace yourself, for we suspect this will be news to many—those assignments were not made under law, they had no legal standing, and we had them solely on the basis of temporary and informal agreement with the other radio services of the United States.

Here’s the story:

Following the 1912 law, nothing much happened to disturb the tranquility of two-hundred-meter operation until around 1923, when a small group of amateurs (and commercials, too, if we are to be truthful) began going to the wavelengths well below two hundred, to see if they were feasible for communicating purposes. As we now know, they most certainly were, but it took a transatlantic QSO to make the average ham believe it, at that time. An interesting sidelight here is that since all amateur stations at that time were required to specify their operating wavelengths, and since these were invariably of the order of 150, 175 or 200 meters, it was necessary for the first shortwavers to get special permission to operate on such wavelengths as 100, 90 and 60 meters—these not having been specified in the licenses!

At any rate, when the short waves began to demonstrate their worth around 1924, everybody in creation made a headlong rush for them. Remember: under the ancient 1912 law, still in effect at that time, every single service in the United States had equal rights with everyone else for the use of the short waves!

Now, keep a firm grip on everything up to this point while we backtrack a couple of years to 1922 to pick up some dope that is going to constitute part of our 1924 picture, when we finally unveil it.

Around 1922 it was apparent to the then Secretary of Commerce (Hoover), who was charged under the 1912 law with the duty of administering radio, that the law was hopelessly inadequate for existing conditions. A new law was badly needed, but Congress, with the same slowness which characterized its belated enactment of the original law, simply couldn’t seem to get around to making one. So Secretary Hoover called the first of what came to be known as the “Hoover Conferences” at Washington, participated in by representatives of all the radio interests in the country, to see if some mutual agreements couldn’t be worked out and some recommendations for the legislators evolved.
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This Electrocardiograph Uses Burgess Batteries

Heart diseases account for a great proportion of the deaths reported annually. Since early and positive diagnosis is of prime importance to successful treatment, this G. E. Electrocardiograph has been found of tremendous value to doctors everywhere. It is a delicate instrument that records on easy-to-read graphs all the complex actions of the heart.

Here, where variables can’t be tolerated, dependable power is absolutely necessary. A representative of the General Electric X-Ray Corporation writes, “For many years, we have used Burgess batteries and find them highly satisfactory for operation of our Electrocardiograph.”

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TYPE BDN

A companion unit to our smaller Disc Type Neutralizer for Low Capacity Tubes. Type BDN is for use with such tubes as 806, 833, 831, RK-38, RK-36, T-125, T-165, T-200, HK-354, F-108-A, HF-200, HF-300, 100-T, 250-T, 250-TL, 450-TL, etc. . . .

Height, 4⅛"; Width, 4"; Length, 5".

Capacity range: 2 to 12 Mfd.

¾" Ailsimag pillars; except for nickel silver extra long bearing, metal parts are of satin finish aluminum with fine screw adjustment to eliminate wobble. Convenient double lugs of husky proportions and knurled thumb nut for easy locking. Heavier construction throughout. May be sub panel mounted by using 2 small insulated pillars screwed to holes in top supporting plate, and adjusting the condenser through clearance hole in chassis.

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TYPE ADN

with ¾" Ailsimag pillars; for such tubes as 808, 834, 852, RK-30, RK-35, RK-37, RK-32, 304-A, 304-B, T-55, 35-T, 50-T, 100-T, 100-TL, etc. . . .

Construction similar to type BDN.

Height, 4⅛"; Width, 2½"; Length, 2⅝".

Capacity range: 5 to 4 Mfd.

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TYPE C Flexible Insulated COUPLING

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The first of these conferences, in 1922, didn't do very much so far as we are concerned, except that it recommended enactment of proper legislation to deal with radio, suggested certain amateur frequencies (of no interest to us, at the moment, since they were around 200 meters), suggested a definition for amateurs (the 1912 law had no such definition), and recommended that amateur status be defined by law and amateur wavelength assignments ditto. Another recommendation that will evoke hearty cheers even today was for the creation of amateur deputy inspectors, possibly at a dollar a year, to help out in amateur regulation! Unfortunately, although a number of radio bills were subsequently introduced in Congress, nothing was actually done in the way of legislation to carry out any of these recommendations. Perhaps it was for this reason that the recommendations of the succeeding Hoover conferences actually became regulations by reason of their adoption as such by the Department of Commerce—not with authority of law, however, but purely on the basis of mutual agreement among services. This curious status lasted until the "blow-up" of 1926, of which we shall speak shortly.

The second conference took place in 1923; the short waves had not yet opened up, and the conference recommendations for amateurs were all in the vicinity of 150-200 meters. Amateur radio would have kicked like the Dickens if they had been anything else.

The third conference was in 1924; between it and the second the short-wave business had split radio wide open! The 1924 conference was tremendously important, therefore. However, bear in mind that nothing any of these Hoover conferences did had any actual legal status. The recommendations were nothing more than recommendations; such agreements as were reached were on the basis of mutual understandings between services, temporarily (and illegally) incorporated into the regulations by mutual consent and thereafter observed by all until a new law came along. You see, by this time everyone in radio realized that the wording of the 1912 law was such that the Secretary of Commerce had been given no authority whatsoever to enforce any wavelength assignments other than those set forth in the law itself. When the short waves opened up, every service in the country—government, commercial, and amateur—could operate anywhere it wanted to in the short-wave territory, and did, with increasingly chaotic results. The 1924 conference represented an attempt to solve an otherwise impossible situation by means of mutual agreements to be voluntarily respected by all services until the law could come along and catch up. Everybody was perfectly aware that the "regulations" resulting from these agreements were not binding, but everyone knew also that some

Since the short-waves "broke" several months before the conference, the A.R.R.L. had negotiated several special low-wave bands for amateurs, pending the decisions of the conference. The resulting conference agreements were considerable expansions over the space made available by these temporary assignments.

4
August, 7, 1937

Mr. J. F. Campbell
Radio Service of Scranton, Pa.

Servicemen . . . jobbers . . . experimenters . . . manufacturers . . . all voice a preference for the smooth, certain, satisfactory service that Centralab Controls offer. For "100%" satisfaction specify CENTRALAB!

The standard radiohm offering accurate tapers — low noise level — longer life, and better power dissipation

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New RCA 809 in stock; net $2.50

A BIG SCOOP — The New Kenyon Transformer T-378

Designed for use with two 809's plus a pair of 807's or small size

GOOD REGULATION — Output voltages are independent of load.

SMOOTH CONTROL — The variac can be set to any predetermined output voltage — no steps.

HIGH EFFICIENCY — Very low losses at both no load and full load.

SMALL SIZE — Variacs are much smaller than any other control of equal power rating.

LINEAR OUTPUT VOLTAGE — Output voltages are continuously adjustable from ZERO to full output by a 320 degree rotation of the control knob. Dials are calibrated.

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SMALL TEMPERATURE RISE — Less than 50 degrees C.

ADVANCED MECHANICAL DESIGN — Rugged construction — no delicate parts — two or more units may be ganged on one shaft.

<table>
<thead>
<tr>
<th>Type</th>
<th>Load Rating</th>
<th>Primary Voltage</th>
<th>Current Rated</th>
<th>Output Voltage</th>
<th>Price</th>
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</thead>
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<tr>
<td>100 K</td>
<td>2 EVA</td>
<td>115 v</td>
<td>15 a</td>
<td>17.5 a</td>
<td>0-115 v</td>
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<tr>
<td>100 L</td>
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<td>115 v</td>
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<td>0-115 v</td>
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<tr>
<td>200 CUMH</td>
<td>115 v</td>
<td>15 a</td>
<td>17.5 a</td>
<td>0-115 v</td>
<td>$30.00</td>
</tr>
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</table>

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sort of order was essential in order to continue operating at all.

In many respects, this 1924 Hoover Conference was a modern international radio gathering on a small scale. Every service was present pushing for all the short-wave territory it could get. The "shorts" were so brand-new that nobody had a clear idea of which waves were good for what; for that reason, everyone was out to get all that could be got, from one end of the scale to the other. Without going into detail (details in past QST’s for those interested) we may say that the outcome of the 1924 conference was amateur bands as follows:

1,600-2,000 kc. 3,500-4,000 kc.
7,600-8,000 kc. (Whoops!) 14,000-16,000 kc. (Believe it or not!)
56,000-64,000 kc.

It was recommended that the Supervisor of Radio decide whether one license would permit the use of all these bands or whether multiple licenses would be necessary (it was later agreed that one would do the trick). Incidentally, it will be noticed that we here embarked on the idea of maintaining a harmonic relationship, so far as possible. The omission of any ten-meter assignment in the table, however, is not accidental; there was no assignment. The reason for this is that the Hoover series did not extend as far as the ten-meter territory. The 5-meter assignment was incorporated by special request solely because of the fact that a small group of experimenters wished to work there; the same reason applies to a subsequent 400-401 Mc. assignment for beam experiments, made shortly after the conference by the Department of Commerce by special request of the A.R.R.L.

Other bands were assigned to the various other services which wanted space in the spectrum and which, remember, were just as much entitled to it as we were.

Since the 1928 conference did nothing to alter this general set-up we will skip over it and say that during 1924, ‘25 and ‘26 we operated in the 1924 bands. By mutual agreement, of course.

In the meantime, Congress was being bombarded with requests and entreaties for a new law but was still doing nothing about it. How long this might have gone on no one knew had it not been that in 1926 the so-called "breakdown of the law" came about when a broadcast station which didn’t like its assignment on the mutual-agreement basis made a test case resulting in a court opinion denying the Secretary of Commerce the authority to compel stations to observe any specified wavelength assignments (outside the very broad limits previously mentioned in the basic law). Overnight, all the existing regulations which specified definite wavelength assignments were rendered inoperative. It was a tense moment! Would all the radio stations in the country jump their assignments? Well, they could have, but most of them didn’t; almost unanimously, the radio world in this country sat tight on its Hoover agreements, one of the most
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- Ten Meter operation
- Built-in power supply
- For operation on 10-20-40-80-160 meters
- 3 stages, 42 Osc, 6L6 buffer, 2-T20's in final

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Les tubes, meters, crystal — One set coils included in price

The "CP-55" uses the marvelous new T-20's in the output stage. These real transmitting tubes will give outputs and performance not possible with ordinary receiving tubes — their price is very low.

The ideal unit for the beginner, or the "Old Timer" desiring an additional Transmitter for operation on 10 meters, or any other band. In the CP-55 you have available an Xmitter having real power at a marvelously low price.

Compare the construction of the "CP-55" with units selling at many times its price. Only finest components are used such as Cardwell Condensers, Steatite Sockets, IRC Resistors, Cornell Dubilier and Aerovox Condensers, etc.

The CP-55 is converted into a fine RADIOPHONE TRANSMITTER by merely adding an available modulator unit.

CP-55 Bulletin gives details.

"CW-55" RF Unit only as used in the CP-55 including one set coils, less tube, switch. Kit $18.95

- Two full size surface type meters. Kit $7.00
- Coils, any amateur band listed in features, per set. 2.86
- Kit of Matched tubes for RF Unit. Kit $1.60
- One 8J3 Tube for power supply. .65

NEW! "CB-130"

Radiophone Transmitter. Floor Cabinet Model. 120 Watt Phone Transmitter.

"THE STANDBY" (2 to 2000 Meters)

3 TUBE A.C. AND D.C. RECEIVER

This excellent 2 to 2000 meter receiver is offered with full realization of the present-day need of the amateur for a dependable "stand-by" receiver which will cover practically all of the radio bands in use today. Super regeneration, which is the most efficient form of detection at these frequencies, is used from 2 to 15 meters. By throwing a toggle switch, straight regeneration and higher wave lengths up to 2000 meters may be had. Throughout the entire tuning range, there are no skips or dead spots. Loud speaker volume is available from practically every station received

- Power supply incorporated.
- Individual antenna tuning for high and low wave ranges. 1-76 super regenerative detector, 1-6JJ regenerative detector, 1-12A7 audio amp. and rectifier.

Complete kit of parts less coils, tubes, cab. $7.59
- 2-10 meter coils (set of 3) 1.95
1-15 meter coils (set of 3) .95
15-200 meter coils (set of 4) 1.30
200-10 meter coil .39
310-550 meter coil .64
550-1050 meter coil .60
1000-200 meter coil .60
Metal cabinet .90
- Kit of three tubes .75
- Wired and tested in our lab., additional .25

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51 VESY STREET NEW YORK

Cable Address: GROSSINC

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remarkable spectacles radio regulation will probably ever see.

However, this upsurge of the 1912 law had the effect of spurring Congress to the realization of the absolute necessity for a new law and so in 1927, the same year when the Washington International Conference was held (but before that affair), Congress passed the Radio Act of 1927 which not only defined amateurs for the first time in any law, foreign or domestic, but set up a Federal Radio Commission to administer radio matters and give it the necessary authority to make regulations that would stick. As soon as the commission was created, we got it to assign to us the same wave-bands that had been agreed upon at the 1924 Hoover Conference, except that we had a 10-meter band included.

We are now almost through with the story.

Discerning readers may at this point ask how we could get the Hoover bands assigned to us under the 1927 U. S. radio law when our government was a party to (and ratified) the 1927 international treaty which gave us somewhat different territory—specifically, narrower bands at 17 and 14 Mc. The answer is that the 1927 U. S. law went into effect before the Washington conference was held and, further, that the terms of the Washington conference did not go into effect until January 1, 1929. Until January 1, 1929, therefore, our government let the wider-band specifications stand as U. S. law. On January 1, 1929, however, it immediately amended our amateur regulations to conform strictly to the international agreements.

From that time to the present, through both national and international regulations, we have retained the bands first set up for amateur use in the Washington international treaty of 1927.

This concludes a very rapid and rather brief résumé of our amateur progress in terms of legislation. It is, needless to say, impossible in such an article as this to go into detail or to describe adequately the tremendous part played in all amateur matters by the A.R.R.L. ever since the League's formation. Those interested in details, as well as a thorough treatment of the League's part in amateur legislation are referred to the book "Two Hundred Meters and Down" by Clinton B. DeSoto.

In the next issue will appear a brief outline of the steps leading up to an international conference and a short description of how such a gathering does business.

The New PITC

(Continued from page 80)
WHEN the amateur sends his messages winging through space, he engages in a creative avocation—forms friendships with distant listeners—and prepares for future leadership in radio.

The interest of the "ham" has far-reaching effects. Ever on the alert for new developments, he is in constant touch with radio progress. Many of the leaders in the radio field today gained their early knowledge as amateurs—and in the ranks of today's amateurs will be found many of tomorrow's engineers and executives.

Like the engineer and executive, the amateur demands the utmost efficiency in his equipment. His transmitter is small compared to the giant broadcasters—but his voice reaches the far corners of the globe. Low-loss insulation is an important factor in his success—and Isolantite*, the choice of leading manufacturers of sets and component parts, gives him the efficiency he needs.

*Registered Trade-name for the products of Isolantite Inc.
"phone" position this bleeder is closed and the oscillator cathode keying terminals are shorted to ground, providing continuous carrier conditions. This method of switching has a further advantage since operation on c.w. would not be encumbered in the event of trouble anywhere in the audio amplifier, the high voltage being automatically removed from the entire system when keying.

The intermediate chassis carries an RCA-807 crystal oscillator tube, using cathode regeneration to give sufficient drive on all bands for high-level modulation. The operating frequency in the 20- and 40-meter bands and that on 600 is established by three Billey type VP4 crystals ground to 14,340, 7,245 and 478 kc. respectively. The selection of any one crystal and its associated tank coil is accomplished by means of ganged Ohmite band switches. The 50-µµfd. high-frequency tank condenser is wired from plate to ground so that it is operative on all three bands irrespective of the band switch setting. On 478 kc., however, a 150-µµfd. variable equipped with locking device is located behind the panel and permanently shunted across the tank coil, being automatically picked up by the band switch when choosing this frequency. The 50-µµfd. condenser is brought out to a front-of-panel control for tuning on 20 and 40 meters and provides sufficient capacity to effect resonance on 600 meters when placed in parallel with the 150-µµfd. loading condenser.

The final amplifier occupies the topmost chassis and utilizes an Amperex ZB-120. This particular tube was chosen because of its extremely high mu, necessitating very little bias and driving power. The same arrangement for padding the 600-meter circuit is incorporated in this stage as is used in the oscillator. In the case of the 20- and 40-meter channels provision has been made for individual doublet antennas. Both tanks are equipped with internal variable link coils terminated in Alsimag 196 bushings on the cabinet top. Two half-wave doublers cut to proper length for each band, with 75-foot lengths of Bassett concentric cable attached, are included ready for connection to their respective terminal posts. The 600-meter output is arranged for feeding a Marconi antenna by means of a shunt-tuned antenna pickup coil, coupling between antenna and tank being varied by loosening two wing nuts and sliding the antenna coil mounting. A Triplet Model 341 r.f. meter on the upper panel indicates antenna resonance, the external thermocouple being located in the antenna lead at the rear of the power-amplifier chassis.

All essential circuits are wired to the upper front panel carrying five 3-inch Triplette meters. From left to right in the photograph they indicate 807 plate current, filament voltage, antenna current on the 600-meter channel, ZB-120 filament voltage and plate current. The filament voltage for both these tubes is controlled by rheostats located on the lower power chassis panel, a red line on each voltmeter indicating the proper operating voltage. No series resistance is needed in connection with the 6.3-volt audio tubes since the six tubes are paired up and wired in series.
The New 1938 Edition of the RADIO AMATEUR'S HANDBOOK

T WELVE men, each a specialist in some phase of amateur radio, collaborated four months in the production of the 1938 edition of THE RADIO AMATEUR'S HANDBOOK. Virtually thousands of hours of effort have been expended in a thorough-going re-writing of the book. Larger than ever before and still more profusely illustrated, the HANDBOOK is without question the most comprehensive ever produced. Further, the selection of the material and its arrangement have resulted in the most understandable presentation. • Two entirely new chapters have been added — the first a thorough treatment of workshop practice covering the problems faced in working with raw material, assembling and wiring the component parts of station equipment. It includes designs for work benches and operating tables. The second new chapter is devoted to the ever-important field of emergency and portable equipment. Designs are given for the last word in emergency gear and special attention is paid to the power supply problem. • In response to wide demand, an entirely new chapter has been written on the general subject of fundamental principles. The new chapter is aimed at those individuals, young or old, who have absolutely no knowledge whatever of electrical and radio phenomena but who demand a painless introduction to the subject. • The remaining chapters have all been vigorously rewritten, involving an entirely new text. Those dealing with apparatus construction have benefitted from a three-months' laboratory program devoted to the design and construction of modern transmitters, receivers and power supplies, incorporating modern tried and proven circuits. In all these circuits and in the equipment built around them, a special attempt has been made to avoid anything freaky or unusual. Indeed, the work has been greatly that of selecting from the maze of good, bad and indifferent circuits only those which comply strictly with modern practice. In contrast to previous editions of the Handbook, many of the apparatus designs were prepared especially for the book and are exclusive to it.

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Keep the neighbors from pounding on your door at midnight. OHMITE Powerline Filter Chokes keep high-frequency out of the power lines. Hook one of these on the input of your rig with a couple of .1 mf condensers and pound brass right through all the crooners on the broadcast bands.

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Parallel across the 12-volt supply. This method effects a decided economy in battery drain. The 2-inch meter in the lower panel shows the total milliamperes consumed by the modulation unit while serving as a reference for percentage of modulation.

With a total input of 250 ma. at 750 volts, which is the maximum output of the Pioneer dynamotor used for supplying plate voltage, this transmitter is capable of a measured carrier output of 60 watts fully modulated. The filament-heating current consumed when all tubes are lighted for 'phone operation is 4.1 amperes while the dynamotor draws a total of 28 amperes under these conditions. Because of a saving of 100 ma. when the modulator is cut out for c.w. operation, the output may be raised to 80 watts by tightening the link coupling to the concentric-feeder cables.

Every precaution has been taken in design, construction and choice of parts to preclude the possibility of breakdown. All resistors and fixed condensers have been chosen so as to operate well below their ratings. Special attention has been given to the question of insulating materials. Mounting post insulators, bushings, terminals and inductor mountings are all made of Alsimag 196. The Cardwell variable condensers used throughout the set have Mycalex supports. Power circuits are carried to each successive deck parallel across the 12-volt supply. This method effects a decided economy in battery drain. The 2-inch meter in the lower panel shows the total milliamperes consumed by the modulation unit while serving as a reference for percentage of modulation.

With a total input of 250 ma. at 750 volts, which is the maximum output of the Pioneer dynamotor used for supplying plate voltage, this transmitter is capable of a measured carrier output of 60 watts fully modulated. The filament-heating current consumed when all tubes are lighted for 'phone operation is 4.1 amperes while

(Continued on page 90)
A MINIATURE OSCILLOSCOPE
AT A LOW PRICE

The Type CRM Oscilloscope employs the little RCA-913 tube having a one-inch screen. In spite of its small size, this new equipment is thoroughly practical and is quite satisfactory for routine measurements in the amateur station. The circuit includes a power supply with controls for brilliance and focus, a potentiometer for controlling the amplitude of the horizontal deflection, and a built-in 60-cycle sweep. This latter is particularly convenient as it permits checking transmitter operation with no connection other than a pick-up coil.

NET PRICE $11.10
Without Tubes

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ATLANTIC DIVISION

EASTERN PENNSYLVANIA—SCM, Jack Morgan, W3CQ—R.M.'s: 3AKB, 3AQN, 3EOP, 3ASW, P.A.M.: 3ROX. 3AKB has installed new antenna. 3AQN and 3DGC gave the O.R.S. party and something to think about. 3BGD reports Beacon Radio Amateurs building emergency Gas-electric plant. 2ECA now is recruiting officer for a new club. 3BWT is interested in formation of transcon net on 3629 kcs. 8NNC is pinch-hitting for WLM while the boys go YL-ing Friday night.

W3ADE 18 AKBK 283 3AQN 30 3BGD 4 3DCG 6 3DXC 3ECA 83 3EHE 7 3ETA 9 3ETM 4 3EWJ 185 3GJ 16 3GK 12 3NF 92 3EM 125 3DM 29 TTX/S 13 117 GBG 23 3GP 51 184 3ASW 18 3AXH 5 3DHT 2S-Mc. 'phone. 3CXE says SW station s-t-o-r-k QSP'd from QRA.

BIR is operating only on 13. 196 SEU 16 8FLA 266 SNNC 33 8CDT 19 8QXW 5. BQV, our popular P.A.M., enlists the aid of Mrs. CGU in running 200 watts on an 'O3A on 1.75-Mc. 'phone. QXW finds time to handle plenty of traffic. BIR, who is in the Navy, is back in Raleigh. ANU is trying to get a new station (HR5CJ) for the Navy. 8OML is a new ham at Anderson. EBR is active on 3.5 and 7 Mc. CPT is constructing a new rig with T2O final. CYB had HI5X as a visitor. EBR recently changed QTH to Clemson. BDT is active in A.A.R.S. and is alternating for KW A on both T.L. "A" and "B". EBR is active on c.w. and is interested in A.A.R.S. HUO is interesting in A.A.R.S. and the Floating Club was organized. Thanks, fellows. ESB went into the Sweepstakes on 1.75-Mc. 'phone, DBP finished new rig with 729 final. CYB had H18X as a visitor. BIR reports to the line cooperation and assistance you all continue to give. 8C.M., "Ed" Preston, W8CSE. 8C.M., Mrs. C.M., W3BAK.}

NORTH CAROLINA SECTION—SCM, H. S. Carter, W4OG—The Salisbury hams are to be congratulated on the fine meeting they had for the gang. Everyone is attending the next meeting, and attendance is already fine. 8R.C.M. is a new station (HR5CJ) for the Navy. ANU is trying to get a new station (HR5CJ) for the Navy. 8OML is a new ham at Anderson. EBR is active on 3.5 and 7 Mc. CPT is constructing a new rig with T2O final. CYB had HI5X as a visitor. EBR recently changed QTH to Clemson. BDT is active in A.A.R.S. and is alternating for KW A on both T.L. "A" and "B". EBR is active on c.w. and is interested in A.A.R.S. HUO is interesting in A.A.R.S. and the Floating Club was organized. Thanks, fellows. ESB went into the Sweepstakes on 1.75-Mc. 'phone, DBP finished new rig with 729 final. CYB had H18X as a visitor. BIR reports to the line cooperation and assistance you all continue to give. 8C.M., "Ed" Preston, W8CSE. 8C.M., Mrs. C.M., W3BAK.
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The C.C.C. Takes to the Air
(Continued from page 41)

the radio net to a real test. Tens of thousands of blankets and cots, and countless hundreds of trucks and men from the whole corps area were moved into the flood region. Messages kept the operators constantly at their keys, and the busy antenna wires fairly sizzled. This tremendous movement of men, equipment, and supplies was directed largely by short-wave radio. Some of the stations in the area were themselves sent into the flooded zone for emergency communication.

A real future lies ahead for these operators if the C.C.C. is made permanent, as President Roosevelt has suggested. And, at least, the training and experience these men are gaining will undoubtedly lead many of them straight into the ranks of the hams after their discharge from the corps. This system, now spreading throughout the country in other C.C.C. areas, is one of short-wave radio’s most interesting developments of recent years.

Briefs
If you receive some S.W.L. cards from South Africa headed “Natal Mercury Radio Competition” and reporting your signals during the month of December, you will help the S.A.R.R.L. if you acknowledge them. It is a S.W.L. contest conducted by the “Natal Mercury” to promote interest in amateur radio. You can send your verifications to A.R.R.L. HQ where they will be forwarded to the S.A.R.R.L.

Think you have trouble? Listen to this: The entire building housing the Black Diamond Radio Club of Logan, W. Va., was completely destroyed by fire at 9:38 a.m., November 28th. The big 1-kw. rig, which had just been finished the day before, lies in ruins! Total loss amounts to $5000.

The Twelfth Naval District N.C.R. organization recently held a contact party, believed to be the first such activity held within the N.C.R. ranks. It was a get-together similar to the SS Contest. Points were counted on the number of stations worked, number of N.C.R. Sections and Units worked, etc. A good time was had by all and many of the members of the N.C.R. in the 12th Naval District met their “shipmates” for the first time over the air.

W6QU, Buffalo, N. Y., announces a schedule for transmission of code practice on 1815.5 kc.: Each Wednesday from 7:30 to 8:00 p.m. EST. The radio division of the Buffalo Sea Scouts conducts this class with W6HIG operating.

W1BOY lives on Call Street—not a bad QTH for the First District QSL Manager!

In the 1937 August Low Power Contest W3FRB, manned by two operators, scored 150 points . . . 65 contacts, all operation being with self-powered equipment.

In the 1937 June Field Day, the Merrimack Valley Amateur Radio Assn. (Concord, N. H.), using the call W1BFT-1, made contacts with 29 portables and 51 fixed stations, all power obtained from auxiliary sources, total score of 1071. Operators were W1BFT, W1PAB, W1GKE, W1HOY, W1VU, W1JBA, W1JCA and W1JJD.

The Ohio gang heard of a fellow at London (Ont.) Prison Farm who wants to become a ham when he gets out, so they sent him a Handbook and QST subscription. That should start him on the straight-and-narrow path!
THE O Dial has always been distinguished not alone for its appearance, but also for the very thorough way in which the dial scale is insulated from the shaft on which it mounts. For some applications, as in instrument use, it is desirable to ground the dial. For this purpose a small multi-contact brush is now packed with each dial. This device also provides a smooth friction load that makes adjustments steadier.

Where a positive clamp is desired, the new Type ODL Lock is available at a small extra charge. It is positive in action, and tightening it does not disturb fine adjustments, nor mar the fine finish of the dial.

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<table>
<thead>
<tr>
<th>Model</th>
<th>MMF, Per Sec.</th>
<th>MMF, Series Sec.</th>
<th>Airgap</th>
<th>Length</th>
<th>Net Price</th>
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<tr>
<td>ABC2425</td>
<td>34</td>
<td>13</td>
<td>2</td>
<td>.250 In</td>
<td>$12.90</td>
</tr>
<tr>
<td>ABC3625</td>
<td>34</td>
<td>13</td>
<td>2</td>
<td>.250 In</td>
<td>$15.95</td>
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<tr>
<td>ABC15925</td>
<td>78</td>
<td>46</td>
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<td>.250 In</td>
<td>$16.50</td>
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<tr>
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<td>ABC7985</td>
<td>90</td>
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<td>$23.55</td>
</tr>
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ing was necessary for any receiving. BJW is on 14-Mc.
'phone mostly. DYY is "still rebuilding, studying and look­
ging for a receiver." BAA is on top sea on S.S. Malchace.
GWQ has a new receiver. AHX is rebuilding with 1002 TV
final. CFI has an 808 final. 91MZ/3 is operating portable
in Richmond. GOU is putting in a pair of HP-100's. GYV is
rebuilding. FMY made about 32,000 points in the 8S. FBL
is open for schedules with anyone. BFW is back on. GVY is
on 7288 kc. BFG is rag chewing and experimenting. GTS is
adding more of the East Coast National Net Control and
Third Corps Area A.A.R.S. Control Station; he is new
Route Manager. GBC is now D.N.C.S. A.A.R.S. for Va.;
he is looking for new members; if interested, write, him.
FJK is using parallel line in in 655's, 5S1, and 3000's.
Operating in Richmond, GWP worked OK2QY. UVA is using P.F. 808
on 3.5 Mc. DZW is back on with 802's with 33 watts. GPC is
busy with traffic schedules. GJP is on 3800 kc. February is
this month for the Virginia Floating Club to meet next.
Will this month extend an invitation? Write the S.C.M.
Traffic: WIGTS 270 (WJQE 149) (WLMQ 270) GPC
134 FJ 120 GBC 48 FMY 8 DYZ 4 GZF-GBL 3
BY-S-FQX-GPY 2 GBE-SIME/3 A 1
WEST VIRGINIA—SCM, C. S. Hoffman, Jr., W8BDH—
New officers of Mountaineer Amateur Radio Association
Pres., XO0; vice-pres., KGT; secy., KWV; treas., MIP.
Wheeling Radio Club elected D.YB Corresponding secy.
JRL has new rig. HGA, JQX, ORN, OLY, ONP have
new receivers. OXO built Rotary Beam antenna. HGA worked
93 countries on 125 watts; is now W.A.S. and W.A.C. LXF is
new W.A.S. KIU is preparing some papers for publication and "the
Franklin Insitute"; he also schedules VO1, PhY and RDG are building
1.75-Mc. 'phone. MLW is building emergency power supply
(Nov. QST.). LCN and HGA schedule KIAK. RMM and HDG are
new Mountville stations. OSI and KWI on 56-
Mc. 'phone mostly. DDY is "still rebuilding, studying and look­
ing for a receiver." BRA is op at sea
recently pounding brass on the high seas. Recently ap­
pointed his O.P.S. and Section Net appointments, and is
organizing rag chewing. ALP keeps busy as secretary for
S.S.A.R.C. GZI designed and built c.c. mobile rig for Hull
vanation rag chewing. GZI also gave a very interesting talk on the purpose and aims
of the New England Club Council, a new organization of
which he has been elected president. JTF, president of the
Parkway Radio Assn., spoke on the merits of the organiza­
tion and the success a similar council has had in the ninth
district. EUL is building a new receiver for 28 Mc. GOJ has
added O.B.S. to list of appointments, and made B.P.L. this
month. JPL's rig is now 80 Mc. AQL's new rig is a '47 crystal and '03A final operating on
3690 kc. KOU is a member of the A.A.R.S. Maine Net and sends first report. INW is
member of the Huddinger Net. EBY has organized radio patrol in Scout Troop and is able
to cover the entire troop on 56 Mc., giving code practice by i.w. and news of general interest by voice. Don't forget
the all-Maine QSO Party. Talk it up and every station enter.
Traffic: W1GOJ 511 CFO 165 FAP 151 INW 121 KOU
104 (1st-8th) 81 (9th-22nd) 43 (23rd-31st) 25
EASTERN MASSACHUSETTS—SCM, Sam Gross,
W1WC—HIH and AKS made B.P.L. both ways. JCK was
assigned WLOV. EMQ made B.P.L. on deliveries. ENE is
now O.R.S. and JCF is building new rig. JTM is back on
7265 kc. JYM is rag chewing. HXK obtained pilot's license and is now working portable-mobile. JXU has pair of T20's in new rig. KKO is
working for W.A.S. ALB is really rag chewing on 28 Mc. ALG has '10 perking on 7 Mc. BSI has new receiver. BSI built
new rig and receiver in time for S.S. ERH is finding crystal grinding quite an art. (25l is moving. HA says
"14-Mc. 'phone or busti!" INO has new rig on 3716 kc.
JXH is new rig on 56 Mc. JJB is spending vacation rag chewing. ALP keeps busy as secretary for
S.A.A.R.C. FJN designed and built c.c. mobile rig for Hull
Police Dept. R. J. Renton, W1CU, of the F.C.C. gave the
S.A.A.R.C. an interesting talk on equipment used at moni­
toring stations. JUN's QTH: Chelsea Memorial Hospital,
100 Bellingham St., Chelsea; drop him a card. FQI married
Pla. YL. IWP put up an "Our Hero" mast. HXE has 12-ft.
gong, so be careful when you work him on 'phone! The
Nuth Net operates in the vicinity of 3800 kc. It is primarily a rag-

MAINE SECTION QSO CONTEST

Dates: January 15, 1938, 1 p.m. to midnight.
January 16, 1938, 1 p.m. to midnight, EST.

Stations Eligible: Only stations located in Maine Sections are to be included. In cases of copies of logs with scores shall be
eligible for prizes.

Procedure: Those taking part in the contest shall call CQ MAINE de W1—

Scoring: Each contestant shall be allowed for each 'phone or c.w. contact with like station. Five points for 'phone-c.w. contacts or vice versa. Scoring to be
confined to contacts between Maine stations.

Frequencies: Any or all bands may be used. Either 'phone, c.w. or both.

Log sheets: Copies of log sheets showing type of emission and bandwidth used for each contact (this also applies to station worked), date, time contacted and
location of station worked, shall reach the S.C.M. not later than January 20th.

Prizes: There will be prizes for the first three high scorers. Everyone take part, and don't forget to get
the log sheets in on time.

NEW ENGLAND DIVISION

CONNECTICUT—SCM, Frederick A. Ellis, Jr., W1CTT—
R.M.'s: 1AFB, 1AXB, 1BHT, 1HSM, 1JX, 1JXF, P.A.M.: 1EAQ. CTI continues to serve as S.C.M. Many of the new station schedules which give
them full cooperation. On request of CJD, his appointments have been put on the inactive list for a year while he is pounding brass on the high seas. Recently ap­
pointed his O.P.S. and Section Net appointments, and will as liaison with A.A.R.S. UE heads the Section in traffic, making B.P.L. both ways. The Connecticut C.W.
A.A.R.S. Net consisting of AJB, KV, APZ, DMP, FAY, FE, GMR, HXK, X1J and Y3J operates daily at 7:30 p.m.
on 3640 kc. Reports below show this net handles plenty of traffic. DMP, State Representative, will be pleased to give
every assistance to any Connecticut amateur Interested in joining A.A.R.S. TJT has three schedules outside of Nutmeg Net
operating on 3660 kc. KOU is a member of the A.A.R.S. Maine Net and sends first report. INW is
member of the Huddinger Net. EBY has organized radio patrol in Scout Troop and is able
to cover the entire troop on 56 Mc., giving code practice by i.w. and news of general interest by voice. Don't forget
the all-Maine QSO Party. Talk it up and every station enter.
traffic: W1GOJ 511 CFO 165 FAP 151 INW 121 KOU
104 (1st-8th) 81 (9th-22nd) 43 (23rd-31st) 25

QST for
chewing new, but some traffic is handled. So many of the 
members of the HI-LQ Radio Club of Lynn, Mass., were 
seated at a conference table by the 28-Mc. audience 
that the chair decided he didn't have anything about it. They 
have started a code and theory class meeting before the 
regular club meeting. JXT is the prof. in charge of the 
theory, and JVB works the pump handle; 20 have regis-
tered; 18-20 reporting at each class. Those in the vicinity 
of Lynn, who are interested, get in touch with WIPS.

Traffic: WIIHS 190 7KS 846 IBC 390 JCB 392 (WLGY 
6) 544 BWD 214, 171 EPE 110 KX 104 QA 95 AGX 74 JFY 72 BW 34 IUQ 51 ASI 16 JT 15 BFB 13 XEB 10 AUA 8 HKY 6 GLS 5 HIL 
BCF-RE-JRF 3 CGB 3

EASTERN MASSACHUSETTS—SCM, William J. 
Barrett, WJIAT—IOT made B.P.L.; Heek reports Central 
Mass. A.A.R.S. Net working fine. IOR made B.P.L. 
on deliveries. Chet sends dope on Worcester gang: New 
hauls—KUE, KWO, KQH. New officer is former Rochester 
“AIR”-IOT, pres.; JWA, vice-pres.; JZV, sec. and v-rec. KQG and 
KKM joined A.A.R.S. AZW is keeping nice bunch of 
schedules. QUQ is new O.L.S. here transllng from Eastern 
Pa., and reports working K6 over 250 times this year. AJ 
is portable for A.E.C. work. How about some more of you 
building ‘em? EO9 got card from YL2B2 after only a 
and a half. KJF reports 2CQA moved to Springfield and is 
leaving Section to work in Nashua. Lots of luck, Ed, we’re 
Mass. A.A.R.S. Net working fine. ITF made B.P.L. on 
14-Mc. c.w. and 14-Mc. ‘phone. TVV has built a 
4-band band-switching exciter unit. IZO 

Traffic: WIIHS 1700 475 EWH 94 NB 225 AVP 1284 
AGX 94 ARU 142 JIN 124 AWF 93 EYK 82 KTV 78 JXQ 76 JNO 74 ILY 72 HP 70 HYK 66 JUV 64 JAK 60 AUL 58 GHT 56 JXO 54 DOG -52 IYR 50 JXZ 48 DQW 46 IHT 44 EC 42 AZV 40 EXR 37 EXV 35 DXO 33 JZX 31 DOG 29 JXQ 27 JXO 25 JXZ 23 EXR 21 JXW 19 DJW 17 DJW 15 BJW 13 DJW 11 DJW 9 DJW 7 DJW 5 DJW 3 DJW 1

Dutch/Division

EASTERN NEW YORK—SCM, Robert E. Haight, 
W2L2—AOB schedules Sat-DvD every Sunday at 10:30 
A.M.; he has been appointed Emergency Coordinator for 
Schenectady net. EDF is high traffic man. RVE says KHX 
has new NCI0EX. EOA, eng. at WOR, gave talk at West-
chester Amateur Radio Assn. meeting. ALP reported. Little 
Rock Radio Club and attended Kansas City Convention and 
Auburn Hamfest. GZ2 reports via T.L. IOR is building 
4-kw. rig. BDB is rebuilding. HUB is hunting DX. ITK 
is on 7 Mc. CTW reports 56-Mc. meeting held on air; CTW 
attended the Michigan State Fair contest. GLT visited 
the Shack of PQ5 at the fair. JGJ and JUW are a couple 
of good officers. BIT reports via B.G. he has a new 
“master mast raisers.” AJ 42 IZW-EOB 29

Traffic: WIIHS 1700 475 EWH 94 NB 225 AVP 1284 
AGX 94 ARU 142 JIN 124 AWF 93 EYK 82 KTV 78 JXQ 76 JNO 74 ILY 72 HP 70 HYK 66 JUV 64 JAK 60 AUL 58 GHT 56 JXO 54 DOG -52 IYR 50 JXZ 48 DQW 46 IHT 44 EC 42 AZV 40 EXR 37 EXV 35 DXO 33 JZX 31 DOG 29 JXQ 27 JXO 25 JXZ 23 EXR 21 JXW 19 DJW 17 DJW 15 BJW 13 DJW 11 DJW 9 DJW 7 DJW 5 DJW 3 DJW 1

January, 1938

89
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The Progressive III is now putting through QRM all over the world. You'll want yours for the big DX Con­test. It is built with standard parts, obtainable from your jobber. Panels and chassis come completely drilled, with sockets installed. Only a screw driver, pliers and soldering iron needed to assemble it. Complete, easily followed directions in AMATEUR TRANSMITTER MAN­UAL, 25c from your jobber or Amateur Press, 533 Throop St., Chicago.

GENERAL TRANSFORMER CORP.
1288 W. Van Buren Street
CHICAGO

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by means of plugs and sockets, allowing each chassis to be readily removed for repairs. All of the flexible wiring and cables use a specially-treated, lacquer-coated wire since ordinary fabric covered wire is often a source of trouble when exposed to moisture.

While all this care and forethought should make failures a remote possibility, it has been anticipated insofar as practical by the inclusion of spare condensers, resistors, brushes for the dynamotor and windcharger, a spare impeller for the latter, an extra crystal microphone and duplicate sets of tubes. To facilitate location of trouble when it inevitably occurs, a Triplett Model 665 Volt-Ohm-Milliammeter has been furnished, making it a simple matter to check the operation of any circuit.

As the receiver aboard the Yankee has proved itself capable of outstanding service in the face of adverse climatic conditions in maintaining a schedule with W1ZB, it was deemed advisable to supply a similar set for use with the new transmitter. This choice was further justified since Andrew Young had the opportunity of operating the ship's set during the Yankee's stay at Pitcairn. Accordingly, a Sargent battery-operated Model 11-MP, covering all frequencies from 30 Mc. to 100 kc., was procured. This receiver, with a total of four tubes, has one stage of r.f. amplification and adequate bandspread for communication work. A permanent-magnet speaker is built into the cabinet and jacks are provided on the panel for the use of earphones in either the first or second audio stages. The heater-type tubes are lighted from a 6-volt portion of the main battery, the required plate supply of 40 ma. at 200 volts being derived from a Pioneer Genemotor. The receiver and Genemotor add another 5 amperes to the total current demand on the battery. As in the case of the transmitter, spare parts including condensers, resistors, dialamps, etc., have been furnished so that repairs may be made when necessary.

With the assembly of the transmitter completed, it was subjected to a rigorous test on all bands in an endeavor to detect any defects that might exist. The station was then put on the air under actual operating conditions at W1BES using a frequency of 14,165 kc. and several stations contacted. Using the same antenna, signal reports averaged only two R's under the 1-kw. rig. on 14,166 kc. normally used at W1BES. Under ideal radio conditions such as exist on Pitcairn Island, and avoiding the QRM of the American 'phone band, PITC should have no difficulty in being heard in every quarter of the globe.

The task of arranging for delivery of all this equipment was quite a problem since there is no established freight or mail service, the island being unimportant commercially. Located midway between South America and New Zealand, 25 degrees south of the equator, it is avoided by cruise ships and freighters alike, because the rocky reefs and sheer cliffs, rising to heights of 1000 feet from the water's edge, provide little incentive for vessels to tarry long off shore. Since the occasional visits made to the island by passing
If you really want trouble-free crystal performance, put a B5 Crystal Unit in your transmitter. For 40 meters, the B5 low drift unit excels the world-renowned Bliley LD2 40-meter unit which it now supersedes. In the 20-meter band, the B5 unit combines low drift, high activity and full dependability.

$4.80 buys a B5 40-meter unit. The 20-meter unit costs only $7.50. See these superior crystal units at your distributor's. Bliley Electric Company, Erie, Pennsylvania.

BLILEY B5 CRYSTAL UNIT

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MASTER TELEPLEX teaches you to receive code exactly the way the world's best operators do—by sound. A heavy waxed paper tape, running through a machine, operates an automatic key which sends messages to you, at any speed you desire. As you improve in speed, the machine sends faster, gradually preparing you for top-sped amateur and commercial signals. With the new All Electric MASTER TELEPLEX you learn to send by sending, and the signals you send are repeated back to you, exactly as you sent them, thus enabling you to correct your own errors.

We furnish a complete course, lend you the All Electric MASTER TELEPLEX and give you personal instruction with a MONEY BACK GUARANTEE. Send for our new TELEPLEX FOLDER Q1 today. IT'S FREE!

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ships is a “courtesy” service and entirely contingent upon weather conditions, hopes of getting the equipment to Pitcairn depended upon the cooperation to be had from the steamship lines. The facilities of Rocke International Export Corporation were enlisted and through their efforts the entire shipment is being forwarded on a no-charge basis. Seven cases are scheduled to leave New York on January 8 from Pier 60 on the Panama Pacific liner Pennsylvania to connect with the New Zealand Shipping Company’s Aranikiki, sailing January 21st from Cristobal for Auckland. If conditions permit a stop at the island on this voyage, the apparatus should be at Pitcairn by the first week in February.

With the equipment on its way to Andrew Young, there remains little more to be told. It is sincerely hoped that the conclusion of this story may signal the opening of a new chapter in the colorful history of Pitcairn Island, a chapter recording pleasant memories of amateur radio friendships the world over. May the amateur in contacting PITC remember that he is treading the sanctity of 147 years of almost absolute isolation. Largely by his conduct will the rest of the world be judged by the islanders.


True North from Old Sol
(Continued from page 18)
at true noon. Adding this to our previously-arrived-at figure of 11:51 A.M., we get 11:58½ A.M., EST, as the time when it will be true noon at West Hartford on January 10th. At that time, the shadow of our vertical pole will lie true north from the pole’s base.

Author’s note: This article is intended only for the use of amateurs in the United States and Canada. As a matter of fact, amateurs in the southern portions of our southernmost States will be able to use it only during Winter, Fall and early Spring; elsewhere in the States and Canada it is a good any time the sun is out.

2 Although the fractions of minutes may seem like carrying things a bit far, it is best to include them. If they worry you, however, you can drop them without much harm, simply making the correction to the nearest whole minute.

3 But only if the pole is vertical in an east-west direction! If it isn’t—although most are, near enough, for practical purposes—mark the position of the shadow of the top; a line from this point to the actual top is the desired true north-south line. This line can be “righted” of course.
Two great holidays falling together... one a day of giving, thinking of the other fellow... the second, a day when men think of themselves, take stock, recognize the past year's mistakes and plan for better things in the twelvemonth ahead.

Our own New Year's resolution is very simple. We are resolved to improve our business by serving you better. Having more friends than a year ago, we are planning to have more of the same a year hence.

Insert this amongst your own Resolutions for 1938... to buy your parts and accessories here — to keep our catalog and printed matter where you can reach it when needed — to treat us as your headquarters without feeling that you have to buy every time you come in.

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✓ You need a binder for your 1937 QST's — and another for 1938.

JANUARY, 1938

Strays

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We have a limited number of Bound Volume XXI of QST. This volume is made up in two sections, each containing six issues of 1937 QST. Handsomely bound and gold imprinted the complete volume is priced at $6.00, postpaid.

Standard Frequency Transmissions

<table>
<thead>
<tr>
<th>Date</th>
<th>Schedule Station</th>
<th>Date</th>
<th>Schedule Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 7</td>
<td>A W9XAN</td>
<td>Feb. 4</td>
<td>A W6XK</td>
</tr>
<tr>
<td>Jan. 14</td>
<td>A W9XAN</td>
<td>Feb. 11</td>
<td>A W9XAN</td>
</tr>
<tr>
<td>Jan. 21</td>
<td>A W6XK</td>
<td>Feb. 25</td>
<td>BB W6XK</td>
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<tr>
<td>Jan. 22</td>
<td>A W9XAN</td>
<td>Feb. 26</td>
<td>BX W6XK</td>
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<td>Jan. 23</td>
<td>C W6XK</td>
<td>Feb. 27</td>
<td>C W6XK</td>
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STANDARD FREQUENCY SCHEDULES

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<thead>
<tr>
<th>Time (p.m.)</th>
<th>Sched. and Freq. (kc.)</th>
<th>Time (p.m.)</th>
<th>Sched. and Freq. (kc.)</th>
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<tbody>
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<td>8:00</td>
<td>3500 7100</td>
<td>8:08</td>
<td>4000 7000</td>
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<td>8:16</td>
<td>3700 7200</td>
<td>8:24</td>
<td>4200 7300</td>
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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.

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,
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PERFECT RECEPTION

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Say You Saw It in QST — It Identifies You and Helps QST
RESOLVED FOR 1938

During the next 12 months Sun Radio Company promises to sell only the highest quality, nationally known lines of merchandise at the lowest possible prices and to render the fastest possible service backed by personal attention to your individual needs. To our many friends and customers we pledge these things and extend heartiest greetings for a Happy and Prosperous New Year!

SUN RADIO CO.

SUN STARTS OFF THE YEAR WITH A BANG!

NATIONAL NC-80X and 81X
COMPLETE WITH SPEAKER AND TUBES, NET $88
We also have in stock for immediate delivery: National HRO, NC100, NC101X and HRO Jr.

RCA TMV 135 "V" Cut, Complete with holder, 3500 kc to 4000 kc Only. Limited quantity. Special at $3.95

HALLICRAFTER
1938 SUPER-SKYRIDER
Complete $123.00 net.

STANCOR
Filament Transformers
6.3 volts at 4A........ $1.25
2.5 volts at 10A....... 1.44

MILLER PRESELECTOR
With self contained Power supply, 12 to 200 meters, complete with tubes.
Net.................... $24.00

BLILEY CRYSTAL
Units in stock, A large variety of frequencies.
HC3 --- $1.35
B5 --- $4.80
HP1 --- $5.75
VF1 --- $7.50

WE CARRY
a complete stock of Stancor Transformers, Write for large quantity, Special at...

WARD LEONARD CHANGEOVER RELAY
110v. AC. Mycalox Insulation....................... $5.88 net

1938 DELUXE MACKEY $9.50

WARD LEONARD CHANGEOVER RELAY
110v. AC. Mycalox Insulation....................... $5.88 net

TEMCO TRANSMITTERS
In stock. Write for FREE Literature and our Time Payment Plan

A Five-Band Exciter
(Continued from page 17)

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.

The cam switch had not yet been added at the time the picture was taken, but the details are shown in the sketch, Fig. 2. The contacts should be silver so that future corrosion will not introduce high resistance at this point. Most jewelers can supply the silver and will be glad to do the soldering job for you if you prefer it. Be sure that he uses "soft" solder, for the heat when using "silver" solder will take the temper out of the wire. Take care to file any solder from the contact face, as it does not make a good contact material.

The panel is 8¾ inches high by standard 19-inch width, of ¼-inch thick hard aluminum sheet. Even with this thickness the door openings were cut out easily with a hand jigsaw. The chassis, of ½-inch thick half-hard aluminum, is 9 inches deep back of the panel and 14¾ inches long. As the back view shows, room was left at the left-hand end for the crystals so that they need not be unplugged before removing the exciter from the rack. This leaves room at that end of the panel where eventually two card holders will be mounted to contain tabulations of crystal frequencies and condenser settings.

The three doors over the plug-in coil and the meter jacks are hung on small "five and dime" store brass hinges. The hinge pins were knocked out and replaced with one length of bronze wire for each pair of hinges. Torsion springs were wound up from 0.019-inch diameter stainless steel spring wire and slotted over the new hinge pins. About 60 turns wound with tight tension on a piece of the hinge wire will give the right action when installed with a three-turn twist. Be sure to twist them in the direction to tighten the winding rather than to unwind it. For the final touch, file a fingernail groove into the inside edge of each door to assist in opening it.

Coil winding data is given under Fig. 1. Further to simplify the band-changing operation, the amplifier plate coils should be pruned so that each can cover two bands.

COUPLING IMPEDANCE

For operation in the 1.75-Mc. band it is not necessary to open the circuit to the oscillator plate tank condenser if it is turned to minimum capacity. On 3.5 Mc. and higher, however, it is essential. The reason why this is so becomes apparent when we calculate the impedance of the oscillator plate r.f. choke, shunted as it is by the capacities to ground of the associated circuit wir-
To give you SPECIALIZED PERSONAL SERVICE of genuine value that is not available from other jobbers.

To sell receivers, transmitters, and parts on TERMS arranged to suit you with less interest than heretofore charged.

To take your equipment in TRADE at a fair value.

To have the most COMPLETE stock of amateur equipment and give you quicker SERVICE, better TECHNICAL HELP, and more complete INFORMATION about equipment.

To allow you to TRY any receiver for TEN DAYS without obligation and to COOPERATE with you in every way I can to see that you are entirely satisfied.

**COMPARE BOB HENRY’S TERMS WITH OTHERS**

<table>
<thead>
<tr>
<th>Model of Receiver</th>
<th>Cash Price</th>
<th>Down Payment</th>
<th>12-month Payments</th>
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<tr>
<td>RME-69</td>
<td>$151.20</td>
<td>$30.24</td>
<td>$10.81</td>
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<tr>
<td>Sky Buddy</td>
<td>29.50</td>
<td>5.90</td>
<td>2.20</td>
</tr>
<tr>
<td>Sky Challenger</td>
<td>69.50</td>
<td>13.90</td>
<td>4.91</td>
</tr>
<tr>
<td>Super Skyrider</td>
<td>99.00</td>
<td>19.80</td>
<td>7.11</td>
</tr>
<tr>
<td>PR-15</td>
<td>169.50</td>
<td>31.90</td>
<td>7.50</td>
</tr>
<tr>
<td>Breting 14</td>
<td>182.00</td>
<td>35.60</td>
<td>7.75</td>
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<tr>
<td>ACR-155</td>
<td>74.50</td>
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</tr>
<tr>
<td>ACR-111</td>
<td>189.50</td>
<td>37.90</td>
<td>13.51</td>
</tr>
<tr>
<td>Super Pro</td>
<td>243.00</td>
<td>48.60</td>
<td>17.30</td>
</tr>
</tbody>
</table>

Similar terms on all Harvey, RCA, Temco, RME transmitters and Stancor, Progressive, All Star kits.

You can reach me by letter, telegram, phone, or visit nearly 24 hours a day, 365 days a year. Write for any information. Your inquiries are invited.

**HENRY RADIO SHOP**

211 North Main St.  Butler, Missouri

---

**RADIO ENGINEERING**

broadcasting, aviation and police radio, servicing marine radio telegraphy and telephony, Morse telegraphy and railway accounting taught thoroughly. Engineering course of nine months’ duration equivalent to three years of college radio work. School established 1874. All expenses low. Catalog free. DODGES INSTITUTE, Day Street, Valparaiso, Indiana

**PRECISION CRYSTALS**

Highest quality crystals, one inch square, carefully ground for frequency stability and maximum output. Be sure of your transmitter frequency — use PRECISION CRYSTALS.

Low frequency drift crystals (Type L T C) supplied within 0.1% of your specified frequency and calibrated to within 0.03% are priced as follows: 1750 and 3500 kc. bands — $3.30 each, 7000 kc. band $4.00 each. Holder $1.00.

(Holder as illustrated to fit G.R. jacks or round holder to plug into a tube socket can be furnished. G.R. jacks to plug illustrated holder into — $1.15 pair.)

"X" cut PRECISION Crystals carefully ground for maximum power supplied within 0.1% of your specified frequency and calibrated to within 0.03% are priced as follows: 1750, 3500 and 7000 kc. bands — $3.30 each. Add $1.00 if holder is desired.

"AT" cut crystals for commercial use quoted on your request. When ordering our product you are assured of the finest obtainable. Now in our seventh year of business.

**PRECISION PIEZO SERVICE**

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Baton Rouge, La.

---

Dependable and efficient communication is of vital importance to any expedition. That is why the MacGregor and MacDonald polar expeditions wisely chose COTO products. You too can have this reliability when you select COTO.

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COTO-COIL COMPANY, Inc.

229 Chapman St., Providence, R. I.

Export address — 100 Varick Street, N. Y. C.

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ENJOY BETTER RECEPTION NOW!

THE
1938
SUPER
SKY-RIDER

NO NEED TO WAIT WHEN YOU CAN BUY YOUR NEW RECEIVER ON HINDS & EDGARTON EASY TIME PAYMENTS

- Why be satisfied with inferior reception when, for a small down payment and easily met monthly payments you can enjoy the superior performance of modern communications receiver? You'll enjoy your dealings with Hinds & Edgerton. Here's what one of our customers says, "I can truthfully say I have never dealt with any company where I enjoyed the transaction as much as dealing with Hinds & Edgerton."

SEE HOW LITTLE IT COSTS TO OWN A NEW RECEIVER

Model
SUPER SKYRIDER
SKY CHALLENGER

Price
$99.00
$29.50
$18.00
$7.40

Payment
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$3.80
$2.30
$1.20

MAIL THIS COUPON NOW!

W9APY—HINDS & EDGARTON—W9WR
19 South Wells Street, (Est. 1914) Chicago, Ill.
Please send me details of your time payment plan and catalog.

Name
Address

BIRNBAUGH GOES TO TOWN
WITH MANY NEW PRODUCTS

Insulated Scrulk Pin Tip
No. 412. Small compact yet has all the features of old styles. Handle of phenolic resin; black, red, green, yellow, 1 5/16" overall.
List price each.
No. 406. Bakelite Pencil Type Test Leads, needlepoint prod and phone tip with Scrulk. List each.
No. 450. Banana Type Insulated Plug
No. 404. Features the Scrulk solidless connection and non-collapsible Birnbaum pin tip, black, red, green, yellow. Overall 1 5/8". List each.
No. 415. Test Prod Handles
No. 417. Features needlepoint tips. Scrulk type phenolic resin handle. Famous Birnbaum Scrulk principle. Red and black only. 4" long.
List each.
No. 418. Same as above only 3" long. List each.
No. 414. Bakelite pencil type test prod, Scrulk 6" long. List each.

Gone Standoff Insulators

No. 413. Red and black only. 4 5/16" long. List each.

HIG FREE CATALOG of 3000 Items
Lists these and many other every day needs.

BIRNBAUGH RADIO CO.
145 HUDSON ST. BIRCO NEW YORK, N. Y.

Say You Saw It in QST — It Identifies You and Helps QST

1 Actual figures probably are considerably less favorable, since the author's assumed capacities seem somewhat low. The input capacity of a 6L6G alone is nearly 12 µµfd. under static conditions; it will show a slight increase when the tube is operating. The 59 output capacity is not given by the tube manufacturers, but comparable tubes show values between 6 and 10 µµfd., so that the total capacity shunting the choke is probably at least 20 µµfd. under the best conditions. This will reduce the impedance figures by one-half or more. — Errone.
FIRST TO SOLVE ALL YOUR INDUCTANCE PROBLEMS!

B & W "AIR INDUCTORS"

✓ FIRST interchangeable plug-in coils!
✓ FIRST versatile band-switching turret ... combining all desirable features of plug-in coils and band switching!
✓ FIRST truly complete line of transmitting inductors for every application!
✓ FIRST fixed link coil!
... and B & W was FIRST to specialize in transmitting inductors exclusively! "AIR INDUCTORS" are ENGINEERED for greater efficiency!

TYPE HDL and HD coils for 1 KW. Type T and TL coils ... up to 500 watts.
Type BX and BXL coils ... up to 200 watts. Type B and BL coils ... up to 100 watts.
TYPE HDVL for 1 KW. TYPE TVL for 250 watts.
MODEL "B" TURRET COILS. Twenty types. Coils available for the five bands.
All ceramic materials used are Alstomax 196

Use Radio's Finest Coils!

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Two-Way Communication

List $15 per station

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UNIVERSAL MICROPHONE CO.
Microphone Division
Box 299, Inglewood, Calif., U. S. A.
Announces a new high power, low drift crystal by Bliley...the BS. At no increase in cost, the BS will deliver 35% more output than the popular LD2.

Our famous 6L6-T20-T55 kit (see November Harvey QST ad) can now be supplied for operation on 5 meters. Using one of the new Bliley HF2 crystals, this transmitter will put more than 120 watts of crystal controlled signal on 5.

NET PRICES

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
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<tbody>
<tr>
<td>Transmitter Kit</td>
<td>$39.95</td>
</tr>
<tr>
<td>Power Supply Kit</td>
<td>$39.95</td>
</tr>
<tr>
<td>Low Voltage Kit</td>
<td>$9.95</td>
</tr>
<tr>
<td>Taylor T-20</td>
<td>$2.45</td>
</tr>
<tr>
<td>Taylor T-55</td>
<td>$8.00</td>
</tr>
<tr>
<td>Bliley BS</td>
<td>$5.75</td>
</tr>
<tr>
<td>RCA 6L6</td>
<td>$1.00</td>
</tr>
<tr>
<td>RCA 83</td>
<td>$1.35</td>
</tr>
<tr>
<td>Bliley HF2</td>
<td>$4.80</td>
</tr>
</tbody>
</table>

IN STOCK! THE NEW CARDWELL TYPE ADN DISC TYPE NEUTRALIZER for LOW CAPACITY TUBES

such as T-20, T-55, 100-TH, 35-T, 50-T, HP-100, 800, 834, 882, RK-34, RK-35, RK-18, etc...CAPACITY RANGE: .5 Mfd. to 4 Mfd.

A sturdy condenser with fine screw adjustment to eliminate wobble and a knurled thumb nut for easy locking. CARDWELL QUALITY.

NET PRICE $1.80 TO AMATEURS

73 FROM — W2GWE — W2UL

cause weak self-oscillation when the crystal is removed. We suspect, however, that this degree of regeneration will have some adverse effect on the frequency stability, although we have seen no data to confirm this suspicion.

THE CRYSTAL HOLDER

An important item in reducing frequency drift is proper construction of the crystal holder, particularly when the crystal stage is turned off when receiving—a bad practice to follow if you want stable frequency. It is unfortunate that the great majority of the holders on the market neglect the fact that a crystal heats when in operation. Even a low-drift crystal rated at 4 cycles drift per Mc. per degree will produce an annoying beat-note change of 1000 cycles with a 10-degree rise in temperature when controlling a 28-Mc. rig. With X or Y cuts the effect is bad even on the lower frequencies. Most holders surround the crystal with plenty of good heat insulation, molded or ceramic. The holder illustrated with this exciter was modelled after one described in QST several years ago. The bottom plate is a block of brass 1 inch thick by 2 inches square upon which the crystal rests directly. The block was hollowed out somewhat underneath to reduce the weight, but plenty of heat conductivity and radiating area was left to keep the crystal near room temperature. The temperature of the average operating shack does not change appreciably during a QSO, and the heavy mass of the block retards the effect of any small changes.

This exciter unit makes a good start for a permanent rack job, since it covers all of the more popular bands with a twist and a plug. It furnishes enough output to use directly on the air as a low-power transmitter while the rest of the rig is growing. And it adds some of that “class” to the shack.

What the League Is Doing

(Removed from page 25)

Rumor During mid-November, misinterpretation of a routine F.C.C. order resulted in widespread circulation of a rumor to the effect that the Commission had inaugurated the principle of “spot frequencies” for all the amateur bands up to 28 Mc., these spot frequencies to be at varying intervals of from 5 to 15 kilocycles and resulting, therefore, in marked reduction of the territory available to amateurs.

The rumor is baseless. It arose, apparently, from inspection of a frequency table showing assignments from 10 kc. to 30,000 kc. in F.C.C.’s new Rule 229. Like all such tables for many years past, the spectrum is shown divided into channels, with assignments by services to specific channels or groups of channels. When the table reached our amateur bands it did not drop the channel system, simply because to have done so would have broken up the progression of the table. However, this does not mean, any more
Do You Know?

- That you may pay a few dollars more for that new receiver from other distributors of amateur equipment.
- That our down payments are the lowest in the country.
- That our finance charges are on a true 6% basis.
- That we have one of the largest stocks in the country.
- That we guarantee you will be 100% satisfied.

FLASH TO ALL AMATEURS . . .
IMMEDIATE DELIVERY ON THE NEWEST 1938
SX-17 SUPER SKYRIDER . . . . Complete $149.50
13 Tubes • 2 Stages Pre-Selection • Automatic Noise Silencer
12" P.M. Dynamic Speaker • Special Crystal Filter • 1000° Band Spread
DOWN PAYMENT ONLY $14.50
(Total Finance Charge only $6.75) — Ten Monthly Payments of $14.17
Don't Compare Our Terms with Others — You're Wasting Your Time
Send 3¢ in stamps for Complete Price List and Terms. National — RCA — RME — Patterson — Breting
— Harvey — Temco, etc. Taylor — Raytheon — Eimac — UTC — Thordarson — Utah

DELAWARE RADIO SALES COMPANY
WILLARD S. WILSON — W3DQ
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SELECTOSPHERE
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ELECTRONICS 
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YOUR POWER
Increase your power with this new voice transmissions type microphone. Model VT-73 is built for voice and emphasizes the frequencies which give intelligibility. You actually get more power and cut through ORM better with a VT-73. Here is a mike, stand, handle combination with anti-resonant cable and full R.F. shielding. High level means less amplification needed. Order now and enjoy broadcast quality reports. This and other turner crystal microphones in stock.
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At Last!
A Perfected AUTOMATIC SENDER
Patented
$12.50
Postpaid
in U. S. A.
$13.50
West of Rockies
& Canada

YOUR POWER
Increase your power with this new voice transmissions type microphone. Model VT-73 is built for voice and emphasizes the frequencies which give intelligibility. You actually get more power and cut through ORM better with a VT-73. Here is a mike, stand, handle combination with anti-resonant cable and full R.F. shielding. High level means less amplification needed. Order now and enjoy broadcast quality reports. This and other turner crystal microphones in stock.
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Say You Saw It in QST — It Identifies You and Helps QST
MICROPHONE CONTROL

In the Palm of Your Hand

As new as the New Year... Astatic Grip-to-Talk Model CD-104 Microphone. Responds to instant operation of palm-control switch, cutting microphone in or out, at will. Designed especially for air-way ground stations, inter-office, inter-factory, amateur and other high class communicating systems. This is the famous D-104 Microphone mounted on chrome desk standard with telephone black base. Full year guarantee.

LIST PRICE $27.50

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GORDON WORLD DX CLOCK

GMT and Standard Time AT A GLANCE!

Give yourself a real treat this Christmas. Get a GORDON World-Wide Electric Clock — the professionally styled lifetime instrument that tells you instantly GMT or the local time of stations you contact in any one of the 24 time zones around the globe. No charts. No guesswork. A practical necessity for every station owner. Genuine Waltham self-starting synchronous movement. Available for 110 or 220 volts; 25, 60, 50 and 60 cycle current. 24 hour, colored dials. Base removable for mounting flush in a panel. Only $9 net at your jobber's. Get yours today! You'll always be glad you did.

GORDON SPECIALTIES COMPANY
440 SOUTH DEARBORN STREET - CHICAGO, ILLINOIS

Say You Saw It in QST — It Identifies You and Helps QST

than it has meant on similar tables for the past five or six years, that we are restricted to such spot frequencies within our bands. In other words, the status of our bands is unchanged.

Financial Statement

The two "middle" quarters of the year are always the low ones from the League's operating standpoint. During the third quarter ended September 30th, the League showed a loss of some six thousand dollars from current operations. Nearly four thousand of this is attributable to extraordinary expenses incident to the expansion of our headquarters offices (we recently have taken over both floors of the entire building); the resulting loss is about normal for the quarter. At the direction of the Board, a detailed statement is presented herewith:

STATEMENT OF REVENUES AND EXPENSES, EXCLUSIVE OF EXPENDITURES CHARGED TO APPROPRIATIONS, FOR THE THREE MONTHS ENDED SEPTEMBER 30, 1937

REVENUES

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
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<tr>
<td>Membership dues</td>
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<tr>
<td>Advertising sales, QST</td>
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<tr>
<td>Advertising sales, booklets</td>
<td>700.00</td>
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<td>Newsdealer sales, QST</td>
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<td>Handbook sales</td>
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<td>Booklet sales</td>
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<td>Calculator sales</td>
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<td>Membership supplies sales</td>
<td>2,201.87</td>
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<tr>
<td>Interest earned</td>
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<tr>
<td>Cash discounts received</td>
<td>204.53</td>
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<tr>
<td>Bad debts recovered</td>
<td>20.17</td>
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$57,840.19

Deduct:

<table>
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<tr>
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<tbody>
<tr>
<td>Returns and allowances</td>
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<tr>
<td>Collection and exchange</td>
<td>80.31</td>
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<tr>
<td>Cash discounts allowed</td>
<td>357.36</td>
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$4,227.32

Less decrease in provision for newdealer returns of QST

Net Revenues                                      $4,018.54

EXPENSES

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
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<td>Publication expenses, QST</td>
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<td>Publication expenses, Handbook</td>
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<td>Publication expenses, booklets</td>
<td>975.35</td>
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<td>Publication expenses, calculators</td>
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<tr>
<td>Salaries</td>
<td>23,688.91</td>
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<tr>
<td>Membership supplies expenses</td>
<td>1,116.02</td>
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<td>Postage</td>
<td>1,808.13</td>
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<td>Office supplies and printing</td>
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<tr>
<td>Travel expenses, business</td>
<td>1,285.61</td>
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<tr>
<td>Travel expenses, contact</td>
<td>302.04</td>
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<tr>
<td>QST forwarding expenses</td>
<td>987.65</td>
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<tr>
<td>Telephone and telegraph</td>
<td>526.54</td>
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<tr>
<td>General expenses</td>
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<tr>
<td>Insurance</td>
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<tr>
<td>Rent, light and heat</td>
<td>930.31</td>
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<tr>
<td>Provision for depreciation of furniture and equipment</td>
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<tr>
<td>General Counsel expenses</td>
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<tr>
<td>Communications Dept. field expenses</td>
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<td>Headquarters station expenses</td>
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<tr>
<td>Alterations and repairs expenses</td>
<td>3,769.89</td>
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<tr>
<td>Bad debts written off</td>
<td>41.10</td>
</tr>
</tbody>
</table>

Total Expenses                                     $59,929.20

Net Loss before Expenditures against Appropriations $6,107.55
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 advertisement 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.

PORT ARTHUR COLLEGE • PORT ARTHUR (World-known port) TEXAS

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Greatest Handbook yet produced and the greatest dollar's worth in the field.

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$1.25 Postpaid Elsewhere • Buckram Bound $2.50

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Where to buy it

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**Ultra Skyrider**

**RCA Amateur Products**

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**Baltimore, Md.** Radio Electric Service Company 3 North Howard St.

**Boston, Mass.** H. Jappe Company 46 Cornhill

**Boston, Mass.** Radio Shack 46 Brighton Street

**Boston, Mass.** Wholesale Radio Service Company, Inc. 110 Federal Street

**Bronx, N.Y.** Wholesale Radio Service Company, Inc. 542 East Fordham Rd.

**Boston, Mass.** Radio Shack 46 Brighton Street

**Boston, Mass.** Wholesale Radio Service Company, Inc. 110 Federal Street

**Boston, Mass.** Wholesale Radio Service Company, Inc. 110 Federal Street

**Burlington, Vermont**

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**Jamaica, L.I.**

90-08 166th Street

**Newark, N.J.**

219 Central Avenue

**New York, N.Y.**

Bruno-New York, Inc. 460 W. 34th St.

**New York, N.Y.**

Safford Samuel Corp. 135 Liberty St.

**New York, N.Y.**

Wholesale Radio Service Co. 100 Sixth Avenue

**New York, N.Y.**

90-08 166th Street

**New York, N.Y.**

George D. Barbey Company 404 Walnut St.

**Springfield, Mass.**

T. F. Cushing 349 Worthington St.

**Washington, D.C.**

Sun Radio & Service Supply Co. 938 F Street, N.W.

**Baltimore, Md.**

Radio Electric Service Company 3 North Howard St.

**Boston, Mass.**

H. Jappe Company 46 Cornhill

**Boston, Mass.**

Radio Shack 46 Brighton Street

**Boston, Mass.**

Wholesale Radio Service Company, Inc. 110 Federal Street

**Bronx, N.Y.**

Wholesale Radio Service Company, Inc. 542 East Fordham Rd.

**Boston, Mass.**

Radio Shack 46 Brighton Street

**Boston, Mass.**

Wholesale Radio Service Company, Inc. 110 Federal Street

**Bronx, N.Y.**

Wholesale Radio Service Company, Inc. 542 East Fordham Rd.

**Boston, Mass.**

Radio Shack 46 Brighton Street

**Boston, Mass.**

Wholesale Radio Service Company, Inc. 110 Federal Street

**Jamaica, L.I.**

90-08 166th Street

**Newark, N.J.**

219 Central Avenue

**New York, N.Y.**

Bruno-New York, Inc. 460 W. 34th St.

**New York, N.Y.**

Safford Samuel Corp. 135 Liberty St.

**New York, N.Y.**

Wholesale Radio Service Co. 100 Sixth Avenue

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George D. Barbey Company 404 Walnut St.

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Sun Radio & Service Supply Co. 938 F Street, N.W.

**Baltimore, Md.**

Radio Electric Service Company 3 North Howard St.

**Boston, Mass.**

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Sun Radio & Service Supply Co. 938 F Street, N.W.

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A directory of suppliers who carry in stock the products of these dependable manufacturers.

<table>
<thead>
<tr>
<th>Location</th>
<th>Company Name</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington, D.C.</td>
<td>Sun Radio &amp; Service Supply Co.</td>
<td>938 F Street, N. W.</td>
</tr>
<tr>
<td>Concord, New Hampshire</td>
<td>Carl B. Evans</td>
<td>80 N. State Street</td>
</tr>
<tr>
<td>Jamaica, L. I.</td>
<td>Wholesale Radio Service Company, Inc.</td>
<td>90-08 166th Street</td>
</tr>
<tr>
<td>Newark, New Jersey</td>
<td>Wholesale Radio Service Co.</td>
<td>319 Central Avenue</td>
</tr>
<tr>
<td>New York, N.Y.</td>
<td>Harrison Radio Company</td>
<td>12 West Broadway</td>
</tr>
<tr>
<td>New York, N.Y.</td>
<td>Wholesale Radio Service Co.</td>
<td>100 Sixth Avenue</td>
</tr>
<tr>
<td>Washington, D.C.</td>
<td>Sun Radio &amp; Service Supply Co.</td>
<td>938 F Street, N. W.</td>
</tr>
</tbody>
</table>

**RME Receivers -- Pre Selectors**

<table>
<thead>
<tr>
<th>Location</th>
<th>Company Name</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albany, New York</td>
<td>Uncle Dave's Radio Shack</td>
<td>356 Broadway</td>
</tr>
<tr>
<td>Binghamton, New York</td>
<td>Radio Testing Station</td>
<td>25-27 Sturges Street</td>
</tr>
<tr>
<td>Buffalo, New York</td>
<td>Dynac Radio</td>
<td>516 E. Genesee Street</td>
</tr>
<tr>
<td>Hartford, Connecticut</td>
<td>Stem Wholesale Parts Company</td>
<td>210 Chapel Street</td>
</tr>
<tr>
<td>New York, N.Y.</td>
<td>Harrison Radio Company</td>
<td>12 West Broadway</td>
</tr>
<tr>
<td>New York, N.Y.</td>
<td>Terminal Radio Corp.</td>
<td>80 Cortlandt Street</td>
</tr>
<tr>
<td>Rochester, New York</td>
<td>Radio Parts &amp; Equipment Co.</td>
<td>244 Clinton Ave., N.</td>
</tr>
</tbody>
</table>

**Triplet Instruments**

<table>
<thead>
<tr>
<th>Location</th>
<th>Company Name</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albany, N.Y.</td>
<td>Uncle Dave's Radio Shack</td>
<td>356 Broadway</td>
</tr>
<tr>
<td>Boston, Mass.</td>
<td>Radio Shack</td>
<td>46 Brattle Street</td>
</tr>
<tr>
<td>Boston, Mass.</td>
<td>Selden Radio Company</td>
<td>28 Brattle St.</td>
</tr>
<tr>
<td>Boston, Mass.</td>
<td>Wholesale Radio Service Company, Inc.</td>
<td>110 Federal Street</td>
</tr>
<tr>
<td>Bronx, N.Y.</td>
<td>Wholesale Radio Service Company, Inc.</td>
<td>542 East Fordham Rd.</td>
</tr>
<tr>
<td>Jamaica, L. I.</td>
<td>Wholesale Radio Service Company, Inc.</td>
<td>90-08 166th Street</td>
</tr>
<tr>
<td>Montreal, Canada</td>
<td>Canadian Electrical Supply Co., Ltd.</td>
<td>995 Craig Street, West</td>
</tr>
<tr>
<td>Newark, N.J.</td>
<td>Wholesale Radio Service Company</td>
<td>219 Central Ave.</td>
</tr>
<tr>
<td>New York, N.Y.</td>
<td>Wholesale Radio Service Company</td>
<td>100 Sixth Avenue</td>
</tr>
<tr>
<td>Reading, Penn.</td>
<td>George D. Barbey Company</td>
<td>404 Walnut Street</td>
</tr>
<tr>
<td>Reading, Penn.</td>
<td>Sylvester Radio &amp; Supply Co., Inc.</td>
<td>104 North Ninth St.</td>
</tr>
<tr>
<td>Washington, D.C.</td>
<td>Sun Radio &amp; Service Supply Co.</td>
<td>938 F Street, N. W.</td>
</tr>
</tbody>
</table>

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DO YOU WANT TO LEARN
WIRELESS and TELEGRAPHY?

TWO BOOKS EVERY AMATEUR
SHOULD HAVE —

SEND NOW!

Hundreds of amateurs have learned
from these books, so

These books give you the fundamentals of
wireless and telegraphy. They contain the codes
and how to learn them. Mail your order now to:

SIGNAL ELECTRIC MFG. CO., Menominee, Michigan

ESTABLISHED 1892

OUR new type LMA Amateurs Crystal Unit employs a
precision cut low drift crystal
activity exceeding V cut and
capable of handling high RF
grids current. 1.7 3.5 7 Mc
bands — only $4.50
Illustration shows type LW20
high frequency unit — LMA employs same
mounting.
Complete description of entire line in
our new catalogue.
See your dealer or write direct.

THE VALPEY CRYSTALS
Holliston, Mass.

LEARN RADIO
— TELEVISION —

New Beginners’ Class Jan. 17th. Send for 48-page cata-
logue, explains fully, 500 licensed graduates placed in last
six years in broadcasting, shipping, police radio, aviation,
etc. Oldest, largest and best equipped school in N. E.
We teach all branches of radio. Tel. HAN. 8184.
Ten operators placed with Pan-American Airways in one
week.
Radio Service Instructions Given

MASS. RADIO SCHOOL
18 Boylston Street, Boston

Say You Saw It in QST — It Identifies You and Helps QST

(a plate-to-plate load resistance of 8400 ohms. Grid bias should be 0.8 volts; maximum-signal plate current (sine-wave signal) is 200 ma. The driving power required is 2.4 watts. The tubes may be operated at zero bias with 500 volts on the plates, and will deliver 60 watts output.

As a Class-C r.f. amplifier, a single 809 will deliver approximately 55 watts output with a plate input of 750 volts at 100 ma. The grid bias should be 0.8 volts, and the driving power required is 2.5 watts. For plate-modulated service, the maximum plate voltage rating is 600 volts and plate current 83 ma.; an output of 38 watts can be secured with slightly over 7 watts driving power. These ratings are for 100% modulation.

The 809 is equipped with a four-prong ceramic base and has the plate connection brought out to a top cap. The bulb is dome-shaped. Filament is thoriailed tungsten.

Standard Frequency Transmission from W9XAN to Be Curtailed

THERE past few years have seen such a marked
decrease in the number of reports on A.R.R.L.
Standard Frequency Transmissions that the fol-
lowers who have been performing this service at
W9XAN have about come to the conclusion that
the present level of amateur interest does not
justify much further expenditure of time and
effort on their part. Since 1933 the number of re-
ports received has dropped each year until it is
now a negligible figure. The same period has seen
a rapid growth in the use of crystal control and
with it, perhaps, lessened need for frequent fre-
quency checking. Whatever the cause, the effect
is this: Standard Frequency Transmissions from
W9XAN are going to be discontinued in the near
future unless there is an appreciable and immedi-
ate increase in the number of reports received.

For the next few months the “A” schedules
(50-meter band) will be continued by W9XAN on
Friday nights, all others being dropped. Calibra-
tions for other bands can, of course, be obtained
through the use of harmonics of the heterodyne
frequency meter. The response to these trans-
missions will determine whether or not further
operation will be justified. It takes time and work
to carry on this service, and the fellows who are
doing it ask nothing more than your assurance
that it is benefiting amateur radio. If you want
the transmissions continued, surely it’s worth an
occasional postcard. Current schedules for both
W9XAN and W6XK will be found elsewhere in
this issue.

The 809
(Continued from page 87)

Brief

W6LXY thinks there should be some system to indicate
that you are merely looking for a report on your signals and
do not care to chew the rag. He suggests, “CQ RO,” mean-
ing “CQ Report Only.”
HAM-ADS

(1) Advertising shall pertain to radio and shall be of nature of interest to radio amateurs or experimenters in pursuit of the art.
(2) No display of any character will be accepted, nor can any specific typographical arrangement, such as all or part capital letters be used which would tend to make no advertisement stand out from the others.

(3) Closing date for HAM-ads is the 20th of the second month preceding publication date.
(4) A space of not more than 8 words will apply to advertising which, in our judgment, is obviously non-commercial in nature, placed and signed by a member of the American Radio Relay League or authorized representatives of bona fide surplus equipment owned, used and for sale by an individual or an organization acting for the public good.

(5) A space of not more than 16 words will apply to advertising which, in our judgment, is obviously non-commercial in nature, placed and signed by a member of the American Radio Relay League or authorized representatives of bona fide surplus equipment owned, used and for sale by an individual or an organization acting for the public good.

(6) A space of not more than 16 words will apply to advertising which, in our judgment, is obviously non-commercial in nature, placed and signed by a member of the American Radio Relay League or authorized representatives of bona fide surplus equipment owned, used and for sale by an individual or an organization acting for the public good.

HAMS. Free samples. Printer, Corwith, Iowa.


SALES. Hilliard Controls, 68-109 Vosburg Ave., Jamaica, N. Y., are unable to vouch for their integrity or for the grade or character of the products advertised.
ALL makes of new and used receivers. WSANT.

BARGAIN in new filter condensers. WSANT.

USED air-wound coils. WSANT.

EQUIPMENT built to order. WSANT.

TRANSFORMERS—500-0-2500, a.c. WSANT.

ALL lines of new and used amateur equipment bought, sold, exchanged. Write to Southern Ohio's only amateur owned amateur radio magazine. J. N. Davies, WSANT-2767, 2767 N. Bend Rd., St. A., Cincinnati, Ohio.

SENSATION of radio field. Best articles extracted from all radio magazines. Six issues, $1; overseas, $1.25. Radio Digest.

CALL BRILEY Crystal! Patrohie WSBD.

QST or Radio magazine subscriptions accepted by WSBD. ($2.50 year).

QSI'S, 300 one-color cards, $1. Samples. 2143 Indiana Ave., Cincinnati, Ohio.

CRYSTALS: X cut, 150-90-+. five kilocycles, $1.50. Spot frequency, $2.50. Three semi-dish, 80 meter blanks, including carbonrub, $1.20. Holders, $1., 68 OR Jacks. William Threm, W8XQ, 4106 South Cheyenne, Colorado Springs, Colorado.

SELL: ACR126 $37.50; ACSW85, National power, 20 coils, RCA speaker $22.50; Super Seven $25; DB20 like new; W9A R, 4021 Miami Ave., Cheviot, Ohio.

COMPLETE one hundred watt phone station. Transmitter rectifier panels in crackle cabinet. Western Electric mike Hallicrafter receiver. Will sell separately—$150, takes all. W2FCQ, 24 Westview, White Plains, N. Y.


SELL: ACR138 receiver $35., 20 meter transmitter complete, 2x2AL, 6AM6 o.c., 210 buffer, 2x2AL, 210 buffer, 210 final, three power supplies, tubes, xtal and panel Job, $100. Come and see them. Forester, 8DGL, Moneenom, Pa.

SELL one kilowatt fone-CW transmitter at W8AKU, Write for pictures and description. Wm. Brown, 95 Ames St., Rochester, N. Y.

MOTOR-generator; 110 a.c. 50-60 cycles to 500 volts 75 milliamperes plus 7 1/4 volt 2.8 amperes. Ideal transmitter bias or plate supply, $1.10. Johnson, 3104 Lincoln Park Ave., Los Angeles.

WANTED: QST's before 1922; ultra-short-wave receiver, transmitter; Morse omnigraph; acoustics books; 17E field telephone. Give price, condition. W2ANB, 76 Brooke Ave., Albany, N. Y.

FOR sale: used tubes and parts. Write for free list. W8AX, Yankton, S. Dakota.

CRYSTALS: There is no substitute for T9 dependability, a tried and proven product, better than ever, satisfaction guarantee— you must be pleased. Now in our third year of business. Our special grinding process gives greatest harmonic output, results are incredible. Eidson T9 powerful X cut. 40 and 80 meters bands $1.80, 7301-7500 KC range $2., spot frequencies $2.50, prices postpaid. Commercial crystals supplied on order, inquire price. The T9 perfect holding price $1.10. T9's accepted. The crystals sold by: Hieronymus Radio, Butler, Mo.; Southwest Radio Supply, Dallas, Texas; Pemberton Labs., Ft. Wayne, Ind. Tx crystals or holders sold by: Hifonicsradio, 84-84 209 St., Queens Village, N. Y. or Eidson's Temple, Temple, Texas.

WANTED: 110 volt, 60 cycle, 2 to 5 kva, generator with exciter, or double-current generator. W4AHY, Box 287, College Sta., Durham, N. C.

SELL reconditioned RM595D entirely complete $80, Silverton auto transmitter $15, Harvey receiver $7.50, 1 k w, 2200y, a.c. power supply $15. 204A xmt $10. Frequency monitor $5. QST 92-93.

SELL: Collins 30 FHC W.A.G. on phone 27 times. Guaranteed by manufacturer. W2LXY.


DOUGLAS Universal Class B transmitters. Match all tubes—80 watts audio $4.55 pair—100 watts audio $7.70 pair. For details write W9IXR, Weyerhaeuser, Wis.

BUY any new receiver, transmitter, transmitter-kit, parts at lowest net prices on my own convenient 6% plan with terms arranged to suit you and less interest cost. Trade in your receiver. Any receiver shipped on ten day trial. Your inquiries invited. Bob Henry, W9ARA, Butler, Mo.

WHEN buying a new receiver, transmitter, or transmitter kit whether you pay cash, trade in your equipment, or buy on terms it is to your advantage to see my other advertisements in this QST and to write to me. Bob Henry, W9ARA, Butler, Mo.

SPECIAL: while stock lasts—brand new in factory sealed cartons—ACR175S $89., ACR-155E $59, W8ARA, Butler, Mo.

WILL ship on ten day trial: HRO $129.70, NC1000 $95, NC1000 $99, ACR-175 $69., PR16C $46., Breth $15 $46., ACR $49, 39 Super-Skyrider $39., ACR-130 $59, SX4 Super Sky­rider $34, FBX $28, FBX $28, All Star complete, $17.80, RSR Clipper $17.30, other used sets. List free. W9ARA, Butler, Mo.

YOUR up your power 3 DB. E-20 speak amplifiers—automatic volume compression permits actual hundred per cent output. No fear of overmodulation. Input crystal or other high impedance mike. Horizontal or vertical rack mounting. 500 ohms output—drives up to 1 k w. rig. Complete 8 tubes 616 output full 20 watt 67-80 net. Full technical dope. Write Line Engineering Co., Box 457, Cedar Rapids, Iowa.

SELL: Tubs receiver, 60 watt phone & CW xmr and equipment. W2IPB, 110 Highpoint Ave., Weehawken, N. J.


SWAP: radio gear for .35 MM sound pictures. Want musicals and comedies for my private collection. Can use advertising film if has music, story, or scenic with good sound. What do you need? Bob Smith, Radiolab, W9ID, 1515 Grand Ave., Kansas City, Mo.

SELL: ultra Skyrider with matched speaker, $80. f.o.b., perfect condition. Bargain for 8 and 10 meter phone operation. H04TE, Warrenton, N. C.

WILL someone give discarded receiver, transmitter, parts. Schweitzer, 4109-18 Ave., Brooklyn, N. Y.

P. O. No. 1254

Ad. No. 3

Here's How YOU Can Get Into

... RADIO ENGINEERING!

CREI home-study training is available to every ambitious man who realizes that Technical Training is the surest and quickest way to Success in Radio. Constant new developments in radio arts make Radio a profession of specialists... and affords the man with adequate training the opportunity to get ahead. CREI can help YOU as we have helped others out of routine jobs into well-paying positions with a definite future. Let us tell you how ...

WRITE FOR FREE ILLUSTRATED CATALOG

Every ambitious man who wants to get into the field will find the Tested Plan for a Future in Practical Radio Engineering... 4 pages — just off the press — send FREE on request!

Write for Your Copy Today!

CAPITOL RADIO ENGINEERING INSTITUTE
E. H. Hiedke, Pres.
NEW YORK CITY
Dept. Q-1, 44th and Park Road
WASHINGTON, D. C.

CAPITOL RADIO
29 Broadway

Say You Saw It in QST — It Identifies You and Helps QST
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
W80BK—Ham, service and sound equipment

### BUFFALO, NEW YORK
Dymac Radio
216 E. Genesee Street
Complete Line Ham and BCL Equipment Cl. 2080

### ELMIRA, NEW YORK
Miller’s Radio Shack
205 Railroad Avenue
Fine equipment for amateurs

### JAMAICA, L. I.
Wholesale Radio Service Company, Inc.
90-08 160th 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
597 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
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

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Rate Card Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerox Corporation</td>
<td>90</td>
</tr>
<tr>
<td>Aladdin Radio Industries, Inc.</td>
<td>103</td>
</tr>
<tr>
<td>American Microphone Company, Inc.</td>
<td>95</td>
</tr>
<tr>
<td>Atlantic Microphone Laboratory, Inc.</td>
<td>102</td>
</tr>
<tr>
<td>Atkins &amp; Brown</td>
<td>87</td>
</tr>
<tr>
<td>Barker &amp; Williamson</td>
<td>69</td>
</tr>
<tr>
<td>Birnbach Radio Company, Inc.</td>
<td>98</td>
</tr>
<tr>
<td>Bilby Electric Company</td>
<td>91</td>
</tr>
<tr>
<td>Burgess Battery Company</td>
<td>73</td>
</tr>
<tr>
<td>Candler System Company</td>
<td>95</td>
</tr>
<tr>
<td>Capital Radio Engineering Institute</td>
<td>100</td>
</tr>
<tr>
<td>Cardwell Mfg. Corp., Allen D.</td>
<td>74</td>
</tr>
<tr>
<td>Centralab</td>
<td>74</td>
</tr>
<tr>
<td>Chicago Radio Apparatus Company</td>
<td>97</td>
</tr>
<tr>
<td>Collins Radio Company</td>
<td>Cov. 2</td>
</tr>
<tr>
<td>Cornell-Dubilier Corporation</td>
<td>103</td>
</tr>
<tr>
<td>Cote-Coil Company, Inc.</td>
<td>97</td>
</tr>
<tr>
<td>Delaware Radio Sales Company</td>
<td>101</td>
</tr>
<tr>
<td>Dodge's Institute</td>
<td>97</td>
</tr>
<tr>
<td>Eitel &amp; McCullough, Inc.</td>
<td>71</td>
</tr>
<tr>
<td>Gardiner-Levering Company</td>
<td>101</td>
</tr>
<tr>
<td>General Transformer Corporation</td>
<td>90</td>
</tr>
<tr>
<td>Gordon Specialties Company</td>
<td>91, 147</td>
</tr>
<tr>
<td>Gross Radio, Inc.</td>
<td>78</td>
</tr>
<tr>
<td>Hallcrafters, Inc., The</td>
<td>1, 2</td>
</tr>
<tr>
<td>Hammersludge Mfg. Company, Inc.</td>
<td>59, 64</td>
</tr>
<tr>
<td>Harvey Radio Company</td>
<td>68</td>
</tr>
<tr>
<td>Harvey Radio Laboratories, Inc.</td>
<td>70</td>
</tr>
<tr>
<td>Henry Radio Shop</td>
<td>97, 101</td>
</tr>
<tr>
<td>Hinds &amp; Edgarson</td>
<td>68</td>
</tr>
<tr>
<td>Hiteow Crystal Company</td>
<td>99</td>
</tr>
<tr>
<td>Hygrade Sylvania Corporation</td>
<td>66</td>
</tr>
<tr>
<td>Instructograph Company</td>
<td>87</td>
</tr>
<tr>
<td>International Resistance Company</td>
<td>89</td>
</tr>
<tr>
<td>Isolantite, Inc.</td>
<td>77</td>
</tr>
<tr>
<td>Johnson Company, E. F.</td>
<td>69</td>
</tr>
<tr>
<td>Kenyon Transformer Company, Inc.</td>
<td>7, 94</td>
</tr>
<tr>
<td>Ken-Rad Tube &amp; Lamp Corporation</td>
<td>95</td>
</tr>
<tr>
<td>Leeds</td>
<td>76</td>
</tr>
<tr>
<td>Logan Company, Ltd.</td>
<td>95</td>
</tr>
<tr>
<td>Mallory &amp; Company, Inc., P. R.</td>
<td>58</td>
</tr>
<tr>
<td>Massachusetts Radio School</td>
<td>106</td>
</tr>
<tr>
<td>McGraw-Hill Book Company</td>
<td>86</td>
</tr>
<tr>
<td>Mims Radio Company</td>
<td>92</td>
</tr>
<tr>
<td>National Company, Inc.</td>
<td>Cov. 3, 57, 83, 87</td>
</tr>
<tr>
<td>Newark Electric Company</td>
<td>85, 87</td>
</tr>
<tr>
<td>New York Y. M. C. A. Schools</td>
<td>101</td>
</tr>
<tr>
<td>Omitite Manufacturing Company</td>
<td>82</td>
</tr>
<tr>
<td>Petersen Radio Company</td>
<td>83</td>
</tr>
<tr>
<td>Port Arthur College</td>
<td>106</td>
</tr>
<tr>
<td>Precision Pico Service</td>
<td>97</td>
</tr>
<tr>
<td>RCA Institutes, Inc.</td>
<td>99</td>
</tr>
<tr>
<td>RCA Manufacturing Company, Inc.</td>
<td>Cov. 4, 7</td>
</tr>
<tr>
<td>Radio Mfg. Engineers, Inc.</td>
<td>53</td>
</tr>
<tr>
<td>Radio Shack, The</td>
<td>80</td>
</tr>
<tr>
<td>Radio Supply Company</td>
<td>106</td>
</tr>
<tr>
<td>Radio Transceiver Laboratories</td>
<td>99</td>
</tr>
<tr>
<td>Raytheon Production Corporation</td>
<td>62</td>
</tr>
<tr>
<td>Scientific Radio Service</td>
<td>103</td>
</tr>
<tr>
<td>Selectophone Company</td>
<td>101</td>
</tr>
<tr>
<td>Signal Electric Mfg. Company</td>
<td>106</td>
</tr>
<tr>
<td>Solar Manufacturing Corporation</td>
<td>79</td>
</tr>
<tr>
<td>Speer Carbon Company</td>
<td>60</td>
</tr>
<tr>
<td>Spartneter Academy of Radio</td>
<td>91</td>
</tr>
<tr>
<td>Standard Transformer Corporation</td>
<td>68</td>
</tr>
<tr>
<td>Sun Radio Company</td>
<td>96</td>
</tr>
<tr>
<td>Taylor Tubes, Inc.</td>
<td>65</td>
</tr>
<tr>
<td>Telepost Company</td>
<td>106</td>
</tr>
<tr>
<td>Terminal Radio Corporation</td>
<td>92, 93</td>
</tr>
<tr>
<td>Throndsen Electric Mfg. Company</td>
<td>97</td>
</tr>
<tr>
<td>Transmitter Equipment Mfg. Company</td>
<td>111</td>
</tr>
<tr>
<td>Triplett Electrical Instrument Co., The</td>
<td>85</td>
</tr>
<tr>
<td>United Transformer Corporation</td>
<td>112</td>
</tr>
<tr>
<td>Universal Microphone Company, Ltd.</td>
<td>99</td>
</tr>
<tr>
<td>Utah Radio Products Corporation</td>
<td>72</td>
</tr>
<tr>
<td>Valpey Crystals, The</td>
<td>106</td>
</tr>
<tr>
<td>Vibroplex Company, The</td>
<td>83</td>
</tr>
<tr>
<td>Wilson, Willard S.</td>
<td>101</td>
</tr>
<tr>
<td>Vaxley</td>
<td>58</td>
</tr>
</tbody>
</table>
The consistently superlative performance of Temco Transmitters has led many to believe that such quality was beyond their financial means. But today many leading dealers chosen by Temco can tell you how you may purchase a Temco on a liberal time payment plan to meet your budget requirements.

Temco advanced engineering includes band-switching exciter units, automatic plug-in chassis, high-fidelity audio response, efficiency over entire wave-length range, etc., brings all the advantages of ultra modern transmitter design which insures the user against the hazards of premature obsolescence.

See your dealer today for complete details or write for complete illustrated technical information.

Partial List of Recent Temco Installations

<table>
<thead>
<tr>
<th>Models 100 and 350</th>
<th>Models 600 and 1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>G6WT</td>
<td>SM5SV</td>
</tr>
<tr>
<td>W3QQL</td>
<td>W8KBJ</td>
</tr>
<tr>
<td>G85HK</td>
<td>PYI1D</td>
</tr>
<tr>
<td>W36XO</td>
<td>W2JKO</td>
</tr>
<tr>
<td>HRJ</td>
<td>W2KRD</td>
</tr>
<tr>
<td>W2RR</td>
<td>W2AD</td>
</tr>
<tr>
<td>W3DBG</td>
<td>W2IW7</td>
</tr>
<tr>
<td>W2RIQ</td>
<td>WICND</td>
</tr>
</tbody>
</table>

Left — Rear view of Model '100'. A — Intermediate and power amplifier chassis of model '600' illustrating exclusive Temco plug-in chassis construction. B — underside view of A illustrating superlative wiring details and careful mechanical construction which is typical of all Temco Transmitters.
Year after year, UTC has led in many important new developments in transformer design. Of course they have been imitated. But only in UTC are you sure of getting these latest developments.

---

**1933**

**HIGH PERMEABILITY CAST SHIELD**
*(Top and Bottom Mount)*

**HUM BALANCED COIL STRUCTURE**

Used by UTC in practically all High Fidelity designs, hum bucking and hum balanced transformers and high permeability cast shields are now accepted as standard practice in the transformer field.

---

**1934**

**VARITONE**

The UTC VARITONE is an audio device permitting equalization, in any audio amplifier or receiver, of the low end—high end—or low and high end simultaneously. Amateurs also use the VARITONE for reception of CW and to reduce extraneous static or whistles.

---

**1935**

**ULTRA COMPACT AUDIO UNITS**

Developed originally for Aircraft and Hearing Aid Devices. In 1935 an entire series of these units were released for Broadcast and Amateur applications. Ultra Compact audios are Hum BALANCED—WEIGH FROM 4½ to 5½ OUNCES and are guaranteed ± 2 db from 30 to 20,000 cycles.

---

**1936**

**VARIMATCH**

The UTC series of VARIMATCH transformers released in 1936 were the culmination of three years of development following the UTC series of Universal Chokes. The six types of VARIMATCH units will match the plate load of any modulation tube to any RF stage. Due to the unusual design principles involved, imitations fall far short of the UTC VARIMATCH units in efficiency and frequency response.

---

**1937**

**TRI-ALLOY SHIELDING**

The combination of Linear Standard frequency response and internal TRI-ALLOY magnetic shielding is a difficult one to approach. That is why these units are used by G.E., R.C.A., Philco, Western Electric, Westinghouse, M.G.M., Walt Disney studios, other discriminating commercials, Broadcast Stations and leading amateurs.

---

**WRITE for the new UTC broadcast bulletin describing transformer, equalizer and amplifier components for every broadcast and recording application.**

---

**Imitation is the sincerest form of flattery**

---

**UNITED TRANSFORMER CORP.**

72 SPRING STREET • NEW YORK, N.Y.  
EXPORT DIVISION 100 VARICK STREET NEW YORK, N.Y. CABLES: "ARLAB"
In these few short months the NC-80X and NC-81X receivers have become part of the National tradition. Their advanced circuit details, including the wide-range crystal filter and high IF frequency for image rejection, have brought a new standard of performance to the low priced field. Their thoroughbred construction keeps that performance consistently high. And their convenience makes operation swift, accurate, and tireless.

NATIONAL COMPANY, INC.

NATIONAL NC-81X
Beam Power construction for high Power Sensitivity—Saves you money through the use of low-price tubes in the exciter.

No neutralization required with well shielded circuits—Saves you money through elimination of an expensive neutralizing condenser.

High power output with high efficiency—Saves you money in terms of antenna watts per dollar.

Rugged RCA construction—Built to take it—Saves you money by giving you a long, trouble-free life.

Full power input to 30 megacycles—Gives you flexibility for band-switching transmitters.

Features that will appeal to the discriminating amateur are described in RCA-814 Bulletin.

ASK FOR YOUR COPY

**RATINGS—CLASS “C” TELEGRAPHY**

- D-C Plate Voltage: 1250 Volts
- D-C Screen Voltage: 300 Volts
- D-C Grid Voltage: -300 Volts, Max.
- D-C Plate Current: 150 Ma.
- Plate Input: 180 Watts Max.
- Plate Dissipation: 50 Watts, Max.
- Filament Voltage: 10 Volts
- Filament Current: 3.25 Amperes

For those amateurs and experimenters who require moderate high power and desire the utmost in circuit efficiency, the new RCA 814 will be found to be unexcelled. It is a husky tetrode, the filament type for use as an r-f amplifier, frequency-multiplier, oscillator, and grid- or plate-modulated amplifier. Plate connection through a separate seal at the top of bulb and a ceramic body to insure low interelectrode capacitances and excellent insulation.

*For Class "C" Telegraphy conditions.

RCA presents the "Magic Key" every Sunday, 2 to 3 P. M., E.S.T., on NBC Blue Netw...