In This Issue—
New Amateur Regulations
Field Day Results
Coax on Tank Condenser Pacing
It has been some time since we have devoted this page to the 32G which continues to be a very popular transmitter, particularly with the discriminating amateur.

The original design of the 32G has been proved by experience to be basically sound. We have studied the set from time to time to see if anything should be changed, but the only modification we found desirable was the substitution of a level indicator calibrated in percent modulation for the oscilloscope. The 32G is another Collins Transmitter which has performance plus lasting value.

POWER OUTPUT: 40 watts, radiotelegraph and radiotelephone.

MODULATION: High level class AB. Modulation capability 100%.

AMPLITUDE DISTORTION: Less than 6% at any modulation level.

RADIO FREQUENCY TUBES:
1—CI00D, 1—6L6, 1—6L6, 2—6L6.

AUDIO FREQUENCY TUBES:
1—6J7, 1—6C5, 4—6L6.

RECTIFIER TUBES:
3—83V.

We suggest that you listen to some 32G's. They should not be hard to find—hundreds are in use.

AUDIO FREQUENCY RANGE: Plus or minus 1½ db. 50 to 10,000 cycles.

CONTROL CIRCUITS: Switches are provided for switching on each stage progressively for tuning.

ANTENNA TUNING: Collins pi tank matching network.

POWER SOURCE: 110 volt 50/60 cycle.

CABINET DIMENSIONS: Width 20", Depth 16", Height 10½".

Write for your bulletin.
In every state of the union, and on every continent of the globe, Skyrider receivers are providing dependable communications reception for amateur and commercial radio stations. The many testimonials received from far off lands are evidence that the Hallicrafters are achieving their purpose—to provide reliable communications receivers with a high standard of performance, built to suit every amateur need.

Because this performance so generally exceeds expectations, a world-wide preference for the Hallicrafter Skyriders has been created, and furthered by the generous praise of their owners.

Your Hallicrafters dealer will gladly show you the Skyrider receivers, or complete description will be forwarded upon direct request to the Hallicrafters Laboratories.

The Super Skyrider S-17

A 13-Tube Super with 2 stages of Pre-Selection, a built-in Noise Limiter, and complete coverage from 6 MC to 545 KC on 6 bands. 1000% of Band Spread, Maximum usable sensitivity and selectivity. Also available with single stage of Pre-Selection and without Noise Limiter.

The Sky Challenger II

A 9-Tube Super with a tuning range from 38 MC to 545 KC (includes 10 meter band), 1000% Spiral Band Spread and Infinite Image Rejection for the elimination of image interference.

The Sky Buddy

A junior communications receiver with full coverage from 15.5 MC to 545 KC, and all the essential controls for amateur reception. Built-in Speaker, Separate Band Spread Dial. A real amateur receiver at an unusually low price.

In every state of the union, and on every continent of the globe, Skyrider receivers are providing dependable communications reception for amateur and commercial radio stations. The many testimonials received from far off lands are evidence that the Hallicrafters are achieving their purpose—to provide reliable communications receivers with a high standard of performance, built to suit every amateur need.

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The Sky Champion

An 8-Tube Super that offers exceptional performance for its modest cost. Provides full coverage from 44 MC to 545 KC (includes 10 meter band) with good sensitivity and selectivity on all bands. Built-in speaker and separate Band Spread Dial.

the hallicrafters inc
2611 Indiana Ave., Chicago, U. S. A.
Cable Address: Hallicraft, Chicago

All Hallicrafters Receivers sold on liberal Time Payments.

See following page for Skyrider Diversity, Skyrider 5-10, Skyrider Marine.

WORLD'S LARGEST BUILDERS OF AMATEUR COMMUNICATIONS EQUIPMENT

Say You Saw It in QST — It Identifies You and Helps QST
receivers for every amateur need to fit every amateur's purse!

Regardless of which of the famous Skyrider receivers you might select, whether for a specialized service, as the Skyrider 5-10, or for general reception of the amateur and short wave bands, you can be assured of excellent value. For Hallicrafters receivers, while they represent the most advanced receiver design, and are built with traditional Hallicrafters quality and workmanship, are not high priced. Compare them, feature for feature! Judge their performance! Only then can you appreciate their value!

For the first time, Diversity Reception for the amateur! Short-wave reception with fading practically eliminated. Two receivers, each with its own antenna in a different plane, feeding into a common amplifying system, producing a constant signal level, with a stronger signal and lower noise level than any single receiver. Recognized as the highest development in short wave receivers to date, and as opening an entirely new era in short wave reception!

Designed especially for the amateur who wants the exacting performance required for superior ultra high frequency reception.

- Tuning Range 24 MC to 68 MC on two bands, 8 Tubes.
- Built-in speaker. A high order of selectivity makes even the frequency modulated clearly understandable. An excellent receiver for the ultra high frequency specialist.

An 8-Tube receiver designed especially for the commercial frequencies with especial emphasis on 600 and 700 meter operation, Easily adapted for marine work. Tunes from 16.4 to 2550 meters (18.5 MC to 140 KC) on 4 bands. Built-in speaker. Separate Band Spread.

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THE NEW 1
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Edition of the Amateur's Book is Ready!

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TO ALL OUR AMATEUR FRIENDS...

KENYON "T"-LINE TRANSFORMER

• FEATURES •

1. Completely dehydrated and specially vacuum-varnish treated units.
2. Hermetically sealed, fully poured in casings for protection against moisture and adverse atmospheric conditions.
3. All types in one attractive style casing for uniform, commercial-looking equipment.
4. Entirely shielded, core and all.
5. Universally mounted, upright or inverted.
6. Compact terminal board design permits convenient under chassis terminal connections in one-hole inverted mounting position.

In order to serve the multitude of our amateur friends who experience any difficulty, delay or inconvenience in obtaining KENYON "T"-LINE transformers in their particular locality, arrangements have now been made for them to obtain them direct from the factory at regular retail prices. Therefore, if your local jobber-dealer cannot supply you KENYON "T"-LINE from stock, send us your order direct together with your remittance covering same, and the name of your local jobber-dealer. Your order will be promptly shipped prepaid anywhere in the U. S. A.

Your local KENYON distributor will receive full credit on your order which will also enable him to serve your future requirements. Regular amateur discount is 40% off list prices shown in your KENYON "T"-LINE catalog. If you don't have a complete "T"-LINE catalog, write for your copy NOW!

Don't be misled to accept substitutes for genuine KENYON "T"-LINE transformers. Look for the KENYON Diamond-K trade mark and "T" line type number. A complete line for every amateur transmitter application, including sound and television equipment.

KENYON TRANSFORMER COMPANY, INC.
840 Barry Street • • NEW YORK, N. Y.

Export Department 25 Warren St., New York, N. Y.

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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.
We learned an interesting thing in a rag-chew with some Federal Communications Commission people recently. It seems that their off-frequency citations by the monitoring stations show an unbelievable number of amateur "repeaters" who apparently keep on using the same crystal after it has been shown to be outside a ham band and who get caught again and again for the same out-of-band operating. We have talked this over with several amateurs and haven't found one yet who could believe that there were amateurs that dumb but we have satisfied ourselves that the account is correct and we want to pass it on to you.

We suppose a few of these cases represent amateurs who think they are smart and who knowingly work slightly outside a band in the hope that they can get away with it. Amateur radio is so vast a body that there are almost bound to be a few such fellows in it. But most of these repeats certainly seem to indicate a species of dumbness that reflects no credit upon us. Consider, for example, the order of intelligence displayed by the ham operator who is cited for being out of the band, say on 14,404, when his arithmetic led him to believe that he was on 14,396, but who keeps on using the same hunk of rock. A short while later he gets simultaneous citations from two more monitoring stations reporting the same bad news of 14,404. Wouldn't you think he would know by then that his crystal wasn't a crystal that would yield him 14,396? Yet the F.C.C. say they have scores of cases where fellows "don't see how it could have happened," keep on using the same slab, and incur increasing penalties and the cascading inconveniences for successive violations of the same reg. They even get cited for being out of other bands and a little examination of the harmonic relationships shows that the same faulty crystal was still in use.

If there is any reasonable explanation for this course of conduct beyond the take-a-chance business, it must be that there are amateurs who regard the monitoring stations' measurements as less accurate than the alleged frequency rating of their pieces of quartz. Truth is, of course, that the monitors have apparatus of very high precision and are frequently able to measure a ham frequency to ten cycles; and when two or more of them intercept and measure the same amateur transmission, it is remarkable in what close agreement they are.

The mere employment of a piece of quartz bearing a magic figure a few kilocycles inside a band certainly does not assure trouble-free operation. The sooner we realize that the happier we shall be. That is one reason why the F.C.C. is now requiring all amateurs to possess themselves of means for separately measuring output frequency with at least sufficient accuracy to be sure of being within a band. The best of crystals have some drift, particularly in the conditions under which many of us use them. Obviously no crystal's frequency can be relied upon except in the holder in which it was calibrated. And even then it wouldn't begin to be reliable except under the same circuit conditions and temperature as had obtained when it was measured. Moreover, there are all kinds of quartz plates, some most indifferently cut and ground, many capable of wild drifting and hopping to frequencies many kilocycles removed from what the owner fondly believes. And didn't we ourselves join the Hq. Pink-Ticket Club a few months back from having pushed the edge of the band a little too hard with a rubber xtal in quest of an elusive FI? Two mornings later we received greetings from Mr. Grand Island—sock! Much ill-concealed glee around the Hq. Gang and no sympathy whatever for us while we sweated around cooking up the usual line to the F.C.C. on howcum it happened and how it wouldn't happen again.

Bright guys, aren't we?—ourselves included. Let's wake up. These monitoring stations are accurate. Crystal control doesn't assure freedom from trouble; we have to know where we're operating. And when citations show us stuck with a bad rock, let's not continue being saps and using the same treacherous stones. Experience shows it doesn't pay.

The recent invasion of New Jersey by the rocket-ships from Mars brought forth a comment from Chairman McNinch of the F.C.C. Said he, "Public reaction again demonstrates the force of radio and points out again the serious public responsibility of those who are licensed to operate stations." He wasn't talking about
amateurs, of course, but there’s a moral in it for our ‘phone men nonetheless. Apparently only about one BCL in a thousand knows that there is any amateur radio beyond the ‘phone operation he hears on his all-waver. ‘Phone stations therefore are our flag-bearers before the general public. The things that are said by voice aren’t always a credit to us—which is probably understatement. We’d like to appeal to ‘phone men to remember that theirs is the only operation that the BCL can understand; that they therefore have in their keeping the good name of all of amateur radio; and, to quote Mr. McNinch, we ask that they keep in mind “the serious public responsibility of those who are licensed to operate stations.”

In two other places in this issue we discuss our new regulations, which ought to be enough; but we feel that we are entitled to crow just a bit about our new emergency-communication regs. You have all seen the letter in last QST wherein the Red Cross says that amateur performance has definitely shown them that it is an essential part of disaster relief work and that their future planning will be more and more based upon cooperation with amateurs. At last we have some government rules with teeth in them that insure our ability to deliver a better job. The adoption of these rules by the administration is a real recognition of the public value of our services in time of stress. The proposals of the A.R.R.L. Board of Directors, originated by our Communications Department, were enacted by the F.C.C. without substantial change. From now on there is a new deal during emergencies; the regs mean something. Amateurs who participate in relief work will have protection from needless interference. Emergency stations in isolated communities will have potent assistance. Operators not intending to assist in the work must pipe down on the 1715-2000 and 3500-4000 bands whenever and wherever the Commission proclaims an emergency to exist. Increased opportunity, increased responsibility. On both counts, every amateur owes it to himself to become thoroughly familiar with the privileges and limitations set forth in the new emergency rules, and we recommend their careful study. We think you’ll agree with us that the increased public trust they put upon amateur radio is highly complimentary. To work, then, and let’s justly that confidence!

K. B. W.

Circulation Statement

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

This is to certify that the average circulation per issue of QST for the six months’ period January 1st to and including June 30, 1938, was as follows:

Copies sold ........................................ 42,851
Copies distributed free ............................. 408

Total ............................................... 43,259

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

Subscribed to and sworn before me
on this 12th day of September, 1938
Alice V. Scandan, Notary Public

Silent Keys

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

Fred S. Ambrose, W8QZF, Altoona, Pa.
Maurice N. Boutilier, WILDIH, Houlton, Maine
John Robert Dienes, W9QLP, Fort Meade, S. D.
Harold D. Edenfield, W0SJV, Edgerton, Kansas
George J. Quick, Jr., W3AZF, Philadelphia, Pa.
John J. Varisly, W9DSZ, Terre Haute, Indiana

Our Cover

IT’S old stuff to see curling irons and flat irons that looked positively white-hot in photographs. These shots were of the heat or infra-red rays, which are invisible to the eye but will record on special film. It occurred to us that our transmitters should be sources of interesting shots. The amateur photographers of the office were consulted and an interesting evening with the invisible rays resulted. Considerable experiment was necessary to arrive at the proper exposure, but the final result leaves little doubt that there was plenty of output and a bit of heat in the coil.

Now for the real low-down see page 42.

Strays

Add this to the cases of ham ‘phone stations picked up by motion-picture theaters, broadcast stations, and telephones:

W9YJS was recently picked up by the electric organ amplifier during a church service in Kansas City, Mo. No modern miracles!!

General Electric Bulletins GES-1996 and GES-1999 are azimuthal world projection maps centered on Schenectady, New York, and Oakland, California, respectively. These bulletins, printed on letter-size paper, should be convenient for use on the operating tables of DX men.
We Have New Regulations

New F.C.C. Rules Effective Dec. 1st; Many Important Changes in Apparatus Requirements, Operating Practices and Licensing Procedure

By Kenneth B. Warner,* W1EH

Just too late for us to publish the complete text last month, the Federal Communications Commission on October 4th adopted complete new amateur regulations which replace our existing rules on December 1st. This is big news. Every amateur now needs to know just what changes he must make in apparatus and procedure in order to comply.

On page 27 of last month’s issue we highlighted the important changes in the regulations. For a bird’s-eye view of the more significant amendments we refer you to that article. This month we propose to go serially right through the new text, pointing out the changes and endeavoring to explain their significance and the reasons behind them. We shall treat only the changes. And at the end of this article we print the complete new text of the regulations, which should be carefully consulted to get the exact wording on matters in which the reader is interested.

Known as “Rules Governing Amateur Radio Stations and Amateur Radio Operators,” our new regs constitute Chapter XII of the complete rewriting job in which F.C.C. is giving all its regulations. Ours are divided into three parts, with a decimal numbering system. All of our definitions are segregated into what is known as Part 150, while Part 151 deals with operators and Part 152 with stations. Let us now apply the microscope and examine our new rules seriatim.

PART 150—DEFINITIONS

Here we have no changes except in arrangement. Most of the text is exactly the same. Some of it has long applied to all the radio services and is here brought into the amateur regulations simply to make our set of rules complete.

PART 151—AMATEUR OPERATORS

The rules for licensing operators have been entirely rewritten, greatly clarified and arranged in logical sequence. There are only a few changes to point out, the numbers we use being the numbers of the rules themselves as found at the end of this article.

151.01. To be eligible for Class A, an applicant must have had at least one year’s experience as a licensed c.w. amateur. Note that this experience is now required to be within five years of applying for Class A.

151.06. When proving activity for renewing an operator license, the three stations communicated with must be amateur stations licensed by F.C.C. The Commission no longer accepts foreign DX for these QSO’s, because it has no way of verifying claims of DX contacts.

151.07. While it has long been provided that a person not duly licensed may speak over the microphone of an amateur phone station only if a duly licensed operator is in control, it is now specified that only this licensed operator may turn the carrier on and off when required and sign off the station at the end of the transmission. Don’t let your non-ham wife or unlicensed guests sign off for you and throw switches; and if you are working in the Class A phone bands, don’t even let a Class B licensed operator do it, for he is not “duly licensed” for the Class A bands.

151.18. One relaxation for Class C applicants: If the code examiner is not a Class A or B amateur, he may be a person who anytime within five years has held a professional radiotelegraph operator’s license or has been a government radiotelegraph operator; he does not necessarily have to be so licensed or employed at the time. One tightening up: The examiner for the written test, if not the same individual, must be a person of legal age; no more having your written examination monitored by your four-year-old son—hi!

151.19. Here is a real one. Whenever a Class C ham moves to a point where he would not have been eligible to apply for Class C in the first place, or whenever a new examining point is established so that its 125-mile circle includes him, he must take and pass the Class B examination within four months. This is a logical rule, as the Class C arrangement is intended exclusively for those who live beyond reasonable traveling distance. There are many Class C amateurs in large cities, holding licenses that they got when they lived at remote points. Let them now take note of this change.
that they must qualify under Class B before April 1st. A 125-mile circle is just being drawn around San Juan, P. R., and all K4 holders of Class C except in the Virgin Islands must qualify before April 1st.

151.20. The possession of a Class A license within five years preceding examination now eliminates the need for taking the theory part of any of the amateur examinations; only code and knowledge of regulations are tested. However, because it is now over five years since there were any amateur extra-first-grade licenses or any endorsement on normal amateur licenses for "unlimited privileges," the recognition of these old types to escape part of the examination is dropped.

151.21. The special arrangements for physically disabled applicants, long in practice, are now incorporated in our regs. One interesting provision is that if an applicant is physically unable to draw the required diagrams, he may instead make a detailed verbal description essentially equivalent.

151.23. It used to be that if an applicant failed an examination, he had to wait three months before trying again. This is now reduced to two months.

All amateurs are familiar with the fact that when a station license is modified, as in the case of change of address, the license is rewritten for a new term of three years. Not all amateurs have been aware that in the past this practice has not applied to modification of operator license, as for a change in class of privileges; and some confusion has resulted. To overcome this, the Commission will now start a new three-year term whenever either license is modified or reissued, when they have been issued jointly as they are in most amateur cases.

PART 152—STATIONS

Here again there is considerable rewriting and a logical rearranging.

An old restriction disappears: Rule 366a, requiring a person who applies for only an operator license to wait at least three months before applying for a station license, is repealed.

152.01. The old regs required an applicant to make a satisfactory showing of control or ownership of apparatus. Control is the important thing, and that is the only factor mentioned in the new text. It adds, however, a requirement for showing control of premises. And Section 152.03 requires that not only the station but the control point thereof, if remote control is authorized, must be located on premises controlled by a citizen.

152.02. Retaining the old provision that, except in the case of bona fide clubs, only individuals may hold station licenses, the language now becomes more specific and excludes schools by direct reference; moreover it says that such a license will not be issued to a school nor for its use. This is a desirable tightening up, because school stations masquerading as amateurs, and sometimes holding their licenses through dummy clubs, have long impressed us as improper occupants of amateur bands.

152.08. Maintaining the general principle that special requests for calls will not be honored except that one may be reassigned to the latest holder, F.C.C. now goes a little further and says that if the call has not been under license during the preceding five years, it may be reassigned to any previous holder. An amateur organization may also receive the call of a deceased member to be employed in memoriam to him.

152.10. Old regulations required the transmission of the station call at the end of each transmission and at least every fifteen minutes during transmissions of more than that length. This figure is now reduced to ten minutes; the station must sign oftener, to facilitate its identification. On the other hand, we now have a clarification of the practice to be observed in break-in operation: Amateurs have long wondered whether the requirement to sign "at the end of each transmission" meant each time they had simply said
“yes” or “OK” in break-in operation. It is now provided that stations employing break-in do not need to identify transmissions of less than a minute’s duration except by signing their call every ten minutes of operation and at the termination of the correspondence. If any transmission lasts over a minute, however, it must be signed—which everyone will admit is not unreasonable. Finally, in this section, we get a real break: the designer for portable operation is changed from the much-hated double break BT to the much more logical fractional-bar character DN.

The use of the double break has been extremely confusing and we finally sold the Commission on making the change to the diagonal mark. It simplifies logging and writing the calls also, thus, W1EH/1.

152.12. Concerning the notice to inspectors of intended portable operation, the old regulations required simply a statement of the approximate locations of operation but the new text requires the naming of the locations as specifically as possible. An addition to this section is the statement that portable operation will not be permitted for more than four consecutive periods of one month at the same location.

Sec. 152.13 contains the long-expected clarification of portable regulations, and is important. With two exceptions, the provisions for portable operation may not be applied to any non-portable station. We are thus forbidden to sign our own call at any other amateur’s ‘fixed’ station by going through the mental gymnastics of considering it our portable location. The portable provision is not thus to be abused; it is to be confined to bona fide portable stations with two exceptions that the F.C.C. wisely recognizes as being in our mutual convenience: (a) when an amateur moves and applies for modification, he may operate his regular station at the new address in portable status while awaiting the new license but for not over 60 days; (b) when an amateur is temporarily residing at a location other than his permanent one for not over four months, intending thereafter to return to his permanent address, he may operate his own fixed station in portable status. This provision (b) is to avoid the necessity of modifying licenses to change the address twice a year in the case of summer vacationers, students home from college for the summer, etc. However, in both of these cases the rules governing portable operation must be carefully followed.

152.14. Discussing the communication in which we may engage, an important concession has been gained from the Commission in the last sentence of this section which, under proper restrictions, authorizes one-way transmission to points equipped only with receiving apparatus—as the only exceptions to the general rule that amateur stations engage only in two-way amateur communication. (Our O.B.S. system is specially provided for.) The authorized one-way transmission is confined to emissions for the purposes of measurement, observation of transmission phenomena, radio control of remote objects, and similar purely experimental purposes. The Commission absolutely declines to authorize amateurs to engage in one-way ‘phone monologues. It is unfortunate that provision could not be made for the more-nearly legitimate case of amateurs desiring to talk to their own relatives equipped only with receiving apparatus, but it was felt that if the bars were let down on this, there would be inevitable great abuse and the air would be filled with one-way transmissions that have no relation to amateur work. Thus only the exceptions enumerated are to be permitted, and one-way transmission of any other nature will result in citation. Note, however, that we now have authorization for the radio control of model aircraft, for making field-strength measurements, and other purely experimental work.

As every amateur knows, the right to transmit music for bona fide audio-frequency tests has always been abused, its most common form being ‘phone stations playing phonograph records at each other or aspiring to be miniature local broadcasters for selected BCL friends. The new Sec. 152.17 now forbids the transmission of music. For amateurs genuinely interested in ‘phone experimental work, where audio qualities should be tested and measured under actual space-transmission conditions, single audio-frequency tones, selected at will, may be transmitted for test purposes of short duration. Which, of course, is the scientific way of doing it anyway.

We come now to an important group of rules dealing with the allocation of our frequencies and their subdivision for different types of emission. Sec. 152.25 assigns to us not only our familiar frequency bands but also two new u.h.f. bands, 112–118 Mc. and 224–230 Mc. These new bands were set aside for amateurs in the Commission’s extensive allocation studies for the ultra-highs but the general order allocating those frequencies to services does not take effect until next April. However, at the special request of the A.R.R.L., which pointed out that there were no conflicts concerning our u.h.f. bands to warrant delays, the F.C.C. is giving us our new bands on December 1st. Because the general u.h.f. allocation is not yet in effect, the F.C.C. is protecting itself meanwhile with a footnote reference opposite
these two bands stating that they reserve the right to change or cancel them without advance notice or hearing. It will be noted that this footnote appears opposite every reference to these two new u.h.f. bands. We regard this as purely a legal technicality; it will be dropped after next April. In the same fashion, another footnote reference appears opposite every reference to our 1715–2000 band stating that it is subject to change to 1750–2050 kc. in accordance with the Habana agreement; it is expected that this change will take place about the first of the year.

For the past several years, while u.h.f. allocation was under study, amateurs and all other experimental services have had a temporary joint right to operate on all u.h. frequencies above 110 Mc. Everyone has recognized that this was but temporary, pending definite allocation. In fact, in order to be able to find each other, we amateurs have confined ourselves to emissions commencing at 112 and 224 Mc. Now that we have the two new bands definitely allocated for our exclusive use, the temporary right above 110 Mc. is changed to a new figure, the new limit beyond which allocations are not being made. Sec. 152.26 gives amateurs the right to operate, with any type of emission, on any frequency above 300 Mc. without additional license. The two new u.h.f. bands are opened to radiotelephony by all classes of amateurs (152.27), to A-2 emission (152.32), to facsimile transmission, which includes “picture transmission” (152.30), and to television and radiotelephone frequency-modulation transmission (152.29). This last provision is a new one and provides opportunity for amateurs to experiment with phase-modulation methods such as Armstrong frequency-modulation. However, these types of emissions that occupy immense band width, including television, are now confined in Sec. 152.29 to the ultra-highs, and the right to make television transmissions in the 1715–2000 and 56–60 bands has been cancelled because the general use of these bands is now so great that television use could not be tolerated. This modification was requested by the A.R.R.L. Board.

A very important change occurs in the Class A phone allocations. The frequency bands remain the same but there is now the stipulation that these bands may be used for ‘phone only in the case of a station licensed to a person who holds a Class A operator license. As we all know, the old regulations contained a loophole which permitted a Class B amateur to bring into his station a Class A operator and have the latter operate the station in these special bands. This was in violation of the spirit of the regulation, which was intended to confine the use of these additional bands to those who demonstrated special aptitude by passing the Class A exam. Note that from now on the licensee himself must hold Class A privileges.

There is an addition to Sec. 152.31 (which gives amateurs the right to work anywhere in a band) now stipulating that side-band frequencies resulting from keying or modulating must be confined within the frequency band used. This is not a new requirement but it appears in our own regs now for the first time.

Under the heading of equipment and operation, several new requirements appear. One of these, in Sec. 152.40, requires that transmitters using over 900 watts input shall be provided with means for accurately measuring the plate power to the final stage. F.C.C. says there are too many cases of amateurs using “about” a kilowatt and not actually knowing, and they feel that a fellow who can afford a kilowatt rig can afford the necessary voltmeter and milliammeter to make sure that the input does not exceed the very generous legal limit. We ourselves feel that it is desirable for every amateur station to have measuring equipment, particularly since it is required to log the input power, but the legal requirement to own such equipment is confined to those who approach the kilowatt mark.

152.41 and 152.42. No more modulated oscillators and raw a.c. in the 5-meter band. The requirement to use adequately-filtered d.c. supply, have stable signals and to avoid over-modulation and frequency modulation is now extended to 60 Mc. The same rules now apply to this band that have previously applied below 30 Mc. QST recently took a poll of membership sentiment on this question and found about 87 per cent of the replies in favor of the change, so we are sure it will be generally acceptable. Simple transceivers and self-excited oscillators and other experimental apparatus of lower performance may still be used above 112 Mc.

We quote 152.43 in full: “Except for brief tests or adjustments, an amateur radiotelephone station shall not emit a carrier wave unless modulated for the purpose of communication.” No more of this abuse of turning on the carrier while eating dinner in order to blast a channel through the spectrum; no more alleged “duplex” by leaving the carrier on while receiving. These are selfish practices, causing twice as much interference as necessary. Their prohibition now is intended to give “the other fellow” a break.

We come now to a discussion of what is prob-
ubly the most important change in the regulations, 152.44. This requires each amateur station both to provide for the measurement of the transmitter frequency and to establish a procedure for checking it regularly. It is required that the frequency measurement shall be by means independent of the frequency control of the transmitter, and of sufficient accuracy to insure operation within the band chosen. There is still a great deal too much out-of-band operation. The new requirements will not be found arduous except for the chaps who wish to shave the edge of a band. Considering how important it has become in these congested days not to transgress upon the frequencies of another service, it is probably not unreasonable to require our edge-clippers to possess precision measuring equipment. We suggest that amateurs who work in the central portion of a band are already prepared to comply with this section simply by listening to their signal on their receiver, disconnecting the antenna if necessary—which simple procedure constitutes an independent means of assuring that the signal is within the band. For frequencies that begin to approach the hand limits, stable calibrated receivers or monitors should do. To work close to the edges, frequency meters probably will be necessary, and it is obvious that this will have to be precision equipment in the case of kilocycle-splitters. The rule applies also to 'phone stations confined to a portion of a band; it is as important for a 14-Mc. 'phone to be inside 14,250 kc. as it is for a c.w. station to stay under 14,400. See our next issue for more specific technical assistance on this subject. Note that ownership of measuring equipment is not actually specified; it may be borrowed or arrangements may be made with a cross-town amateur possessing precision equipment to make the necessary measurements, or a commercial laboratory might be engaged to do the job. It is necessary, however, to "establish procedure for checking the frequency regularly."

Sec. 152.45 introduces two new items concerning logs. Heretofore it has been necessary simply to log the name of the person operating the transmitter and the name of any other person who transmits by voice. Signatures are now required, including all persons who speak over the mike. You should have them actually sign the log. The other requirement is that the log shall be preserved for a period of at least a year following the last entry. Log-keeping is of increasing importance. Always valuable to the amateur himself as a source of data, it is now regularly called for by the F.C.C. when an amateur is in difficulty for any reason, and we have seen many a fellow in hot water recently because his log did not comply with the prescriptions. We recommend a full study of this section.

The last group of regulations is prefaced by an introductory statement (152.50) that amateur station licenses are granted subject to certain conditions and that licensees receiving notice to observe such conditions must immediately conform. Amongst these conditions is our old specification of quiet hours (152.51) in case of general BCL interference, the same figure for the quiet hours having been retained after quite a tussle. There is then incorporated in our regulations a detailed statement of the procedure to be followed by an amateur cited for successive violations of the same section. While this procedure has been standard F.C.C. practice for some years, it has not previously been recited in our regs. Sec. 152.52 deals with second violations in a year of the regulations prescribing amateur frequencies and the quality of signals and it puts the station off the air during the desirable hours from 6 p.m. to 10:30 p.m. until tests have been made with other amateurs, a report made to the Commission and the Commission's authority received to resume fulltime operation. In similar fashion, Sec. 152.53 deals with a third violation and denies the station the right to operate between 8 a.m. and midnight until a prearranged test can be made with an F.C.C. monitoring station and the Commission's permission received to resume operation.

There then follows, in Sec. 152.54, what is probably the most valuable addition to the regulations, the arrangements set up to govern amateur communication in emergencies. These provisions have been actively sought by the A.R.R.L. for nearly two years back and we are pleased to report that they now have the effect of law and that they greatly increase the power of amateur radio to contribute to the public welfare in time of
need. It is now provided that, whenever the F.C.C. declare a state of general communications emergency within a certain range the 1715–2000 and 3500–4000 bands may be used only for amateur emergency service in that region (although the other amateur bands are not affected). The portions 1875–2000, 3500–3825 and 3975–4000 kc. are designated as emergency calling channels. Amateurs in isolated communities should use these frequencies for first contacts to get assistance. All other amateurs operating in these two bands during emergencies are obliged to observe a listening period during the first five minutes of each hour. Provisions are made for the appointment of amateur monitoring stations to spread the word of the existence of the emergency, to pipe down non-participating stations and to report non-complying stations to the F.C.C. A more detailed explanation of the methods to be followed under this section will be presented by our Communications Department.

While this completes the examination of the specific amateur rules in Chapter XII, there are other F.C.C. rules that concern the amateur, appearing in chapters that apply to all services. For example, there is the list of examination points, the specification of the procedure for filing applications and appeals and arranging for hearings, the rules governing the use of remote control, etc. The F.C.C. intends within a few weeks to make available a printing of the extracts of regulations applicable to amateurs, including not only our own rules but those others that are binding upon all licensees. We present now the new text of Chapter XII:

RULES GOVERNING AMATEUR RADIO STATIONS AND AMATEUR RADIO OPERATORS

Sec. 150.01. Amateur service. The term “amateur service” means a radio service carried on by amateurs. A

Sec. 150.02. Term “amateur station.” The term “amateur station” means a station used by an “amateur,” that is, a duly authorized person interested in radio technique solely for personal and non-commercial purposes. It embraces all radio transmitting apparatus at a particular location used for amateur service and operated under a single instrument of authorization.

Sec. 150.03. Amateur portable station. The term “amateur portable station” means an amateur station that is portable in fact, that is so constructed that it may conveniently be moved about from place to place for communication, and that in fact so moved from time to time, but which is not operated while in motion.

Sec. 150.04. Amateur portable-mobile station. The term “amateur portable-mobile station” means an amateur station that is portable in fact, that is so constructed that it may conveniently be transferred to or from a mobile unit or from one such unit to another, and that in fact so transferred from time to time and is ordinarily used while such mobile unit is in motion.

Sec. 150.05. Amateur radio communication. The term “amateur radio communication” means radio communications between amateur stations solely with a personal aim and without pecuniary interest.

Sec. 150.06. Amateur operator. The term “amateur operator” means a person holding a valid license issued by the Federal Communications Commission authorizing him to operate licensed amateur stations.

LICENSES; PRIVILEGES

Sec. 151.01. Eligibility for license. The following are eligible to apply for amateur operator license and privileges:

Class A—A United States citizen who has within five years of receipt of application held license as an amateur operator for a year or who in lieu thereof qualified under Section 151.26.

Class B—Any United States citizen.

Class C—A United States citizen whose actual residence, address, and station, are the nearest point where examination is given at least quarterly for Class B; or is shown by physician's certificate to be able to appear for examination and to pass it; or is shown by certificate of the commanding officer that he is in the military or naval service of the United States; or is shown by certificate of the commanding officer that he is in the military post or naval station and unable to appear for Class B examination.

Sec. 151.03. Scope of operator authority. Amateur operators' licenses are valid only for the operation of licensed amateur stations; provided, however, any person holding a valid radio operator's license of any class may operate stations in the experimental service licensed for, and operating on, frequencies above 300,000 kilocycles.

Sec. 151.04. Posting of license. The original operator's license shall be posted in a conspicuous place in the room occupied by such operator while on duty or kept in his personal possession and submitted for inspection at all times while the operator is on duty, except when such license has been filed with application for modification or renewal, or has been mutilated, lost, or destroyed, and application has been made for a duplicate.

Sec. 151.05. Duplicate license. Any licensee applying for a duplicate license to replace such license which has been lost, mutilated, or destroyed, shall submit to the Commission such mutilated license or affidavit attesting to the facts regarding the manner in which the original was lost, mutilated, or destroyed. If the original is later found, it or the duplicate shall be returned to the Commission.

Sec. 151.06. Renewal of amateur operator license. An amateur operator license may be renewed upon proper application and a showing that within three months of receipt of the application by the Commission the licensee has lawfully operated an amateur station licensed by the Commission, and that he has communicated by radio with at least three other such amateur stations. Failure to meet the requirements of this section will make it necessary for the applicant to again qualify by examination.

Sec. 151.07. Who may operate on amateur station. An amateur station may be operated only by a person holding a valid amateur operator's license, and then only to the extent provided for by the class of privileges for which the operator's license is endorsed. When an amateur station uses radiotelephony (type A-3 emission) the licensee may permit any person to transmit by voice, provided a duly licensed amateur operator maintains control over the emissions by turning the carrier on and off when required and signs the station off after the transmission has been completed.

EXAMINATIONS

Sec. 151.15. When required. Examination is required for a new license as an amateur operator or for change of class of privileges.

Sec. 151.16. Elements of examination. The examination for amateur operator privileges will comprise the following elements:

1. Code test—ability to send and receive, in plain language, messages in the International Morse Code at a speed of not less than thirteen words per minute, counting five characters to the word, each numeral or punctuation mark counting as two characters.

2. Amateur radio operation and apparatus, both telephone and telegraph.


4. Advanced amateur radiotelephony.

Sec. 151.17. Elements required for various privileges. Examinations for Class A privileges will include all four examination elements as specified in Section 151.16. Examinations for Classes B and C privileges will include elements 1, 2, and 3 as set forth in Section 151.16.

Sec. 151.18. Manner of conducting examination. Examinations for Class A and Class B privileges will be conducted by an authorized Commission employee or representative at a place specified by the Commission.

Examinations for Class C privileges will be given by volunteer examiner(s), whom the Commission may designate or permit the applicant to select. An examiner giving the code test shall be a holder of an amateur license with Class A or B privileges, and have held within five

(Continued on page 98)
HE May issue of QST carried the following squib in the “How’s DX?” section: “G6WY and others report that PJ3CO (14,300 kc., T7) in Curacao is ex-PA0XX. You might send your card care of the Netherlands QSL Bureau, but don’t send it to Curacao. They don’t like amateurs down there!”

Gentlemen, there’s a story there. Here’s the story, and I hope it’s interesting enough to appear in your magazine.

The vacation I planned last January, a freighter trip to Haiti and Venezuela, included a three-day stopover at Curacao—an island which I had previously visited three times in the last five years. Before we (“we” including this SWL’s XYL) sailed from Brooklyn on August 26th, I spied the PJ3CO article in QST. Being fairly well acquainted with this tiny Dutch possession, I decided to try my luck at finding ex-PA0XX. I immediately sent an airmail letter to a Curacao SWL friend of mine whom I had met two years ago, telling him about PJ3CO. Two weeks later my friend airmailed the following: “Good news. I will meet you at the Hotel Americano on Thursday evening, September 8th, at 7 o’clock.”

From then on time dragged and dragged. I looked forward to our sailing.

Six days after leaving Brooklyn, we docked at Port-au-Prince, Haiti. Then came La Guaira and Porto Cabello, Venezuela, and finally Willemstad, the chief port of Curacao.

That evening as the XYL and I sipped rum punches on the broad, breezy veranda of the Hotel Americano, my friend hove into sight. After introductions, we settled down to enjoy the sea-breeze, refreshments and a QSO round-table that would put the best of rag chewers to shame. Here’s how the story seems to go.

PJ3CO, who was born in Java, is a husky Dutch youth, a six-footer about twenty-eight years of age. His grandfather was a Scot who settled in Java and married a maid from Holland. I mention this because ex-PA0XX’s full name is, believe it or not, Humphrey Arthur Crawfurd! (Can you imagine a Hollander having this 100% British name?) His parents left the Dutch East Indies and moved to the Netherlands where he grew up and became interested in amateur radio. After putting his first rig on the air he picked his own call letters (PA0XX) and went to work with a vengeance, specializing in DX.

Time marched on, and Humphrey could find no work outside of an occasional service job, replacing a tube or a new resistor in receiving sets of nearby friends. Conditions were far from good, so he enlisted in the Dutch army, chiefly because the government provides jobs to all those who leave Queen Wilhelmina’s service with an honorable discharge.

Being born and raised in the tropics he volunteered to serve in Curacao. He was unaware that experimenting with amateur radio was forbidden on the island until he arrived there last January. No one knew that in a wooden chest he carried a TNT rig, a home-made blooper, spare parts, antenna wire, a call book, log and QSL cards. For quite some time the radio gear remained intact under his cot in the fortress. However, the ham urge to pound a key finally got the better of him, and rigging up a “receiving” antenna he went to work with

(Continued on page 70)
A Simple Transmitter for Portable or Emergency Work

Crystal-Controlled Two-Tube Outfit with Single-Control Tuning

By Byron Goodman,* WIJPE

In designing this transmitter, a companion unit to the three-tube superhet described in August QST, full consideration has been given the same factors of low cost, light weight, compactness, low battery drain—and above all, simplicity of control and freedom from critical adjustments under the conditions usually existing during emergencies or in portable operation. The complete station assembly, with all necessary accessories, will be described in an early issue.

The design of portable emergency transmitters depends almost entirely upon the available power supply. Many well-organized groups throughout the country have complete portable-emergency stations built around 300-watt or larger gasoline-driven generators. With so much power available, the design of transmitting equipment entails only good standard practice with rugged construction and an eye to complete reliability. However, the majority have to content themselves with low-powered gear that can be operated from batteries or a 300-volt A SIMPLE PORTABLE-EMERGENCY TRANSMITTER

Using a 6CS6-6L6 combination, this diminutive unit runs 20-35 watts input on 1.7, 3.5 and 7 Mc. Provision is made for switching crystals—one coil is changed when shifting bands.

Vibrapack or Genemotor source and a 6-volt storage battery. There seems to be little doubt but that the 6-volt storage battery is the logical primary source of power for low-powered portable-emergency work, except in cases where extreme light weight is a major consideration. With this in mind, a unit was designed as a companion-piece to the three-tube receiver described,1 for 6-volt heater and 300-volt plate supply.

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

Except in rare instances, it seems desirable to use a two-stage transmitter rather than a single tube. The overall efficiency is about the same; it can be modulated more fully; and the plate meter can be used more easily for checking resonance and loading than in the case of a simple oscillator, where the minimum plate current is not always an indication of maximum output and best adjustment for keying. However, controls should be kept to a minimum, for ease in frequency-shifting and adjustment by unskilled operators. With these considerations, about the only line-up that will satisfy is the simple circuit used by W3EMM and his gang2 in their portable stations. For simplicity, it was decided to modify it slightly by using smaller tubes and crystal switching. Since one of the bugaboos of portable

A SIMPLE PORTABLE-EMERGENCY TRANSMITTER

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BENEATH THE CHASSIS OF THE PORTABLE

The tuning condenser is insulated from the panel by mounting through the front face of the condenser with small brass collars. The leads from the crystal sockets are brought through large holes or rubber grommets to the crystal switch. Coupling coils on the tank inductances are wound over the lower ends of the coils. Power and antenna leads are brought out the rear of the set through grommets.

operation is the antenna system, provision was made for incorporating simple half-wave doublets, fed by rubber-covered lamp cord, as part of the regular equipment. By using already-cut antennas and low-impedance lines, installing the antenna resolves itself into the simple process of finding suitable supports for the antenna and connecting the feed line. Any spare line can be coiled near the transmitter with no loss in efficiency. On the lower-frequency bands normally used during portable operation, the light losses with poor crystal or insufficient capacity are not desirable, and there is no need to neutralize it on any of the frequencies used. A 6L6G can be substituted but it takes up slightly more room and projects above the panel.

The transmitter is built on an aluminum chassis identical to that used for the receiver. It is folded from one piece of 1/16-inch thick aluminum and gives a chassis 4½ x 8 x 2 inches deep. A pattern for folding can be found in the article on the receiver. The panel is 8½ x 6½ inches. Sockets for the tubes and coil are mounted directly on the chassis; the sockets for the four crystals (these are the new Hammarlund SX-2 crystal sockets) are mounted above the chassis on the pillars supplied with them. The tuning condenser is mounted on the front panel but is insulated from the metal by mounting it with two small brass collars. The crystal switch is mounted directly on the chassis and panel and helps to hold them together.

The wiring is simple and straightforward, the only precaution being to see that every connection is thoroughly soldered (to avoid any later trouble) and that leads are well separated so that no short-circuits will appear at some inopportune time. The power-supply leads and a twisted pair for the antenna are brought out through rubber grommets at the rear of the set. Insulated tie-strips are used wherever necessary to add support to resistors, r.f. chokes and power-supply leads.

### CHECKING PERFORMANCE
When the wiring has been completed and checked, the power-supply leads can be connected to a 300- or 400-volt supply with 6.3 volts for the heaters. Remove the 6L6 and, with a crystal switched in, test the oscillator for keying by listening in a receiver or monitor. It should oscillate readily with a 1.7-, 3.5- or 7-Mc. crystal in the circuit, and the keying should be chirpless. Some experimentation with the value of $C_1$ may be necessary, although anything above about 30 µfd seems to be satisfactory. Without the condenser, there will be some difficulty in making all crystals oscillate and the output will be lowered, with poor keying. It is possible, by plugging-in the 6L6 and a tank coil, to make the oscillator work when it normally wouldn't by itself. However, this type of operation is not desirable, and the oscillator performance should be checked as described above.

The 6L6 and a proper tank coil can now be plugged in, and the amplifier performance checked. Open the lead between the grid leak $(R_2)$ and ground, and insert a low-range milliammeter. With the key down and the final tuned to resonance, the grid current should be between 1.5 and 2 ma., with 300 volts on the plate of the oscillator. If the grid current is less than this, it indicates a poor crystal or insufficient capacity at $C_1$.

With the coil data given, the low-frequency
ends of the 1.7- and 3.5-Mc. bands should tune with the tank condenser \( C_7 \) practically all the way in. With less capacity, minimum plate current and maximum output will not occur at the same point and it will be difficult to tune by means of the plate meter, although the operation is otherwise unimpaired except that more turns will be required for coupling to the antenna. The antenna coupling coil can be adjusted by putting on more turns than are necessary and removing them one by one until, tuning through resonance with the tank loaded by the antenna, the plate current dips about 5 ma. With 330

### A.R.R.L. Copying Bee—December 9th

To copy code accurately is the special mark of technique that distinguishes the real amateur. This is the annual opportunity to note our progress above the mere license requirement. The winner or as many as submit perfect copies will receive a striking bronze medal award from A.R.R.L.

As in the previous Bees, some unusual character and figure combinations and plain language groups will be sent in no particular sequence. The League will return all papers (except winners) with a copy of the transmitted texts to each participant with a confidential rating. Transmissions will all be 60 words in length. Each sending will be by tape at about 25 words per minute. It will be a test to copy what you hear.

The following stations, all using "automatic" equipment, have been selected in the different time zones. Care will be taken to make all messages equally difficult by different words, word order, errors, etc. We urge everybody that knows the code at all to take part. Send in whatever you get, however little that may be. Check on your proficiency and have some good fun too.

All participants will be mentioned in QST. The rules for taking part in the copying bee:

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

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

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

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

5. Copies must be mailed bearing a postmark in the year 1938 to be counted. Mail at once or within five days to make sure.

6. Every contestant must certify he has not been employed as a commercial or government radio, Morse or cable operator in the last year. This is strictly an amateur contest. The following exceptions, however, shall be eligible:

   a. Holders of commercial licenses without experience under same.
   b. Such holders (phone licensees or technical attendants) whose duties have not been telegraph operating within one year.

The transmitting stations will each send \( V \)'s ten minutes before scheduled times below. All amateurs are requested to note the frequencies listed and try to cooperate by keeping silence on these channels during copying bee transmissions. Write down just what you hear. Send in all you get so you receive credit and we can send you the official texts for examination.

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<table>
<thead>
<tr>
<th>Station</th>
<th>Frequency</th>
<th>K.S.T.</th>
<th>C.S.T.</th>
<th>M.S.T.</th>
<th>P.S.T.</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1AW (W, Hartford)</td>
<td>1800/3800/7150/14254 kc.</td>
<td>9:15 P.M.</td>
<td>8:15 P.M.</td>
<td>7:15 P.M.</td>
<td>6:15 P.M.</td>
</tr>
<tr>
<td>W2AYN (New York)</td>
<td>7200 kc.</td>
<td>9:15 P.M.</td>
<td>8:15 P.M.</td>
<td>7:15 P.M.</td>
<td>6:15 P.M.</td>
</tr>
<tr>
<td>W2WZ (New York)</td>
<td>3370 kc.</td>
<td>9:15 P.M.</td>
<td>8:15 P.M.</td>
<td>7:15 P.M.</td>
<td>6:15 P.M.</td>
</tr>
<tr>
<td>W6AM (Long Beach)</td>
<td>14306 kc.</td>
<td>10:15 P.M.</td>
<td>9:15 P.M.</td>
<td>8:15 P.M.</td>
<td>7:15 P.M.</td>
</tr>
<tr>
<td>W9UZ (Chicago)</td>
<td>7003 kc.</td>
<td>10:15 P.M.</td>
<td>9:15 P.M.</td>
<td>8:15 P.M.</td>
<td>7:15 P.M.</td>
</tr>
<tr>
<td>W6BAZ (Louisville)</td>
<td>3670 kc.</td>
<td>10:15 P.M.</td>
<td>9:15 P.M.</td>
<td>8:15 P.M.</td>
<td>7:15 P.M.</td>
</tr>
<tr>
<td>W6AM (Long Beach)</td>
<td>7200 kc.</td>
<td>11:15 P.M.</td>
<td>10:15 P.M.</td>
<td>9:15 P.M.</td>
<td>8:15 P.M.</td>
</tr>
<tr>
<td>W6CIS (W6ZP) (San Francisco)</td>
<td>3801 kc.</td>
<td>11:15 P.M.</td>
<td>10:15 P.M.</td>
<td>9:15 P.M.</td>
<td>8:15 P.M.</td>
</tr>
<tr>
<td>W6AM (Long Beach)</td>
<td>12:15 A.M. (10th)</td>
<td>11:15 P.M.</td>
<td>10:15 P.M.</td>
<td>9:15 P.M.</td>
<td>8:15 P.M.</td>
</tr>
<tr>
<td>W6CIS (W6ZP) (San Francisco)</td>
<td>3625 kc.</td>
<td>12:15 A.M. (10th)</td>
<td>11:15 P.M.</td>
<td>10:15 P.M.</td>
<td>9:15 P.M.</td>
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</table>
A Practical Television Receiver for the Amateur

General Design Considerations, the Superheterodyne Circuit and Part of the Constructional Details

By C. C. Shumard*

With regular television programs scheduled to start with the opening of the World's Fair at New York, this description of a modern television receiver should have special interest to amateurs, especially those living in metropolitan areas. If the circuit diagram looks formidable, take heart from considering that the average amateur transmitter circuit, if drawn complete with power supplies and control wiring, would be a fearfully complicated affair. Simplicity comes with dissecting and grouping—which the author does in this article, the second of the series inaugurated in October QST.

In a previous issue of QST, Mr. J. B. Sherman has described a scanning unit employing electrostatic deflection. The television receiver to be described here has been designed to operate with a scanning unit of the electromagnetic or electrostatic type, the choice depending on the type of cathode-ray tube or Kinescope to be employed. Provision is also made for simultaneously supplying sound transmissions from the converter plate circuit of this receiver to the antenna-input circuit of an all-wave or suitable short-wave receiver. This auxiliary receiver for sound reproduction must be capable of tuning to about 30 meters, or 9.75 Mc.

Several views of the television receiver chassis and the low-voltage power-supply unit are shown in the accompanying photographs. The schematic diagram of the receiver is shown in Fig.

* RCA Manufacturing Co., Inc., Harrison, N. J.


December, 1938
locations at various distances from the transmitter, and of various signal strengths from different transmitters. There is, of course, little need for a.g.c. on the ultra-high frequencies, so far as fading is concerned.\(^3\)

A reference to the block frequency chart of Fig. 1 will be of assistance in understanding the operation of various portions of the receiver, as well as of individual circuit components. A typical television signal, with the accompanying sound channel, is shown at A, B, and C.

This type of television signal is like that which is being transmitted by the NBC's experimental station from the Empire State Building in New York City. It is in accord with the television transmission standards as recommended by the Radio Manufacturer's Association. The video carrier frequency is 46.5 megacycles, with upper and lower sidebands (picture modulation) extending to 49 Mc. and 44 Mc. The sound carrier frequency is 49.75 Mc., which is 750 kilocycles away from the upper sideband of the video carrier.

The high-frequency oscillator (Type 6J5) operates at 59.5 megacycles. Because the i.f. stages are tuned to respond only to the upper sideband of the video carrier (section B of Fig. 1) and to the sound carrier (C), the output of the i.f. stages corresponds to E and F of Fig. 1. The i.f. band width shown is 10.5 to 13 megacycles. Because the difference between the video carrier and sound carrier frequencies is 3.25 Mc. and because some separation between the two must be provided, a video band about 2.7 Mc. wide has been maintained throughout the receiver. This is sufficient to provide good picture detail. After the i.f. signal (E) is demodulated by the 6H6 diode detector (V\(_3\)), the video signal (G) is applied to the video amplifier (V\(_9\)). The i.f. sound

\(^3\) See Bibliography. (Also M. P. Wilder, QST December, 1937, January and February, 1938—Editor.)

2. It should be stated at once that although the circuit itself seems to be somewhat complicated, it actually should present no insurmountable problems to the amateur set-builder who has had practical experience in building short-wave or ultra-high-frequency superheterodyne communication-type receivers. As the photographs show, the receiver itself is not as formidable appearing as the schematic circuit.

Limitation of space precludes much theoretical discussion; in addition, information of this type has been well covered in many previous papers.\(^2\) However, a brief, general discussion of the various parts of the receiver is desirable in order to explain their functions.

In general, the television receiver is quite similar to an ordinary superheterodyne, with variations and additions. In this particular set are included one r.f. stage, a mixer, three i.f. stages, a combination detector and background-control stage, and one video stage. The video stage corresponds to the first audio stage in a communications receiver, except that it feeds the picture or video signal, after it has been demodulated by the diode detector, to the control grid of the Kinescope. Also included are the high-frequency oscillator, the "sound buffer" the "sync separator" and the a.g.c. amplifier. The tube and circuit arrangement is chosen to provide good selectivity, sensitivity, and fidelity, using parts which are readily available to or makeable by the amateur constructor. Because of the band-switching, or rather, "channel-switching" design of the r.f. circuits, the receiver can be tuned to any one of three separate television channels between 40 and 60 megacycles. Thus, when several television stations come on the air in that frequency range, the receiver will not be limited just to one station. Automatic gain control is provided to take care of different receiving
carrier \((F)\) is demodulated and reproduced as \((H)\) in the auxiliary short-wave receiver previously mentioned.

Included in the modulation of the video carrier \((B)\) are two high-amplitude synchronizing signals, which must be properly separated from the video modulation and applied to the sync amplifiers (in the scanning unit) so that the scanning of the Kinescope screen will be correctly synchronized with the scanning circuits of the transmitter. The synchronizing signals are obtained from the output of the video amplifier by means of the 6F8G sync separator \((V_{10})\).

The video amplifier \((V_{9})\) supplies the video signal voltage to the control grid of the Kinescope, for the purpose of modulating the brilliance of the spot on the Kinescope screen as it scans the picture. The polarity of the potential changes on the Kinescope grid must correspond to the character of the video modulation at the transmitter. This modulation is such that an increase in carrier amplitude corresponds to black on the subject picture. Therefore, the Kinescope grid must be made to swing more negative as the video carrier increases in amplitude, and less negative as the carrier amplitude decreases. Otherwise, the received picture will correspond to a photographic negative rather than to a positive. The second-detector circuit and the number of video stages employed must be properly chosen, due to the fact that each video stage acts as a polarity reverser.

In this receiver, the detector arrangement is such that a positive potential (with respect to ground) is applied to the grid of the first video stage. Therefore, an odd number of video stages is required (one or three). The gain obtained from the output of the last i.f. stage, and permits the other diode unit to be used to bias the Kinescope Type 1800. Because slowly shifting or "low-frequency" scenes must be transmitted, direct coupling is used between the detector and \(V_{9}\) and between \(V_{9}\) and the Kinescope grid.

The high-amplitude synchronizing voltages included with the video modulation at the output of \(V_{9}\) are also applied to the Kinescope grid. In time sequence, they occur at the ends of the vertical and horizontal scanning lines. Thus, for the duration of each synchronizing impulse, the Kinescope grid is caused to go sufficiently negative to make its potential below the grid bias value corresponding to black. Therefore, the synchronizing signals do not show on the received picture because they are, in effect, "blacker than black."

**Video Amplifier**

A peak voltage of approximately 20 volts applied to the grid of Kinescope Type 1800 is required to swing the Kinescope from full brilliance to below cutoff, or to "blacker than black."

A plate load of 2500 ohms, properly compensated with inductance to take care of the 2.7-Mc. band width, is employed in the video stage. A peak signal input voltage of about 1.0 volt is necessary to develop the required 20 volts over the desired video band.

**Detector**

The detector load must be kept low and its capacitance effect must be compensated for, in order to pass the video frequencies. This compensation is accomplished by means of inductances \(L_{11}\) and \(L_{22}\) (Fig. 2). Only one diode unit of the 6H6 \((V_{9})\) is employed for the detector. With the detector-diode load (4300 ohms) employed and at the required output level of about 1.0 peak volt, the voltage drop in the diode is about 0.5 volt. Therefore, an i.f. input of approximately 1.5 peak volts is needed.

The use of only one diode unit as a detector helps to limit the capacitance and resistance load on the output of the last i.f. stage, and permits the other diode unit to be used to bias the Kinescope beyond cut-off while the Kinescope and the other tubes are heating, thus keeping the screen dark.

With single sideband i.f. operation, some undesirable overlapping of the low video-frequency modulation results. This necessitates a reduction in the i.f. gain on the high-frequency side of the i.f. band. The reduction in gain should be of the order of 40 percent.

**I.F. Amplifier**

The choice of intermediate frequency is necessarily a compromise between conflicting requirements. A high ratio of i.f. "carrier" to video...
band-width assists in obtaining a flat i.f. response over the desired range of video frequencies. A low intermediate-frequency permits greater gain per stage and better stability. The i.f. "carrier" value chosen is 13 Mc., which seems to represent a reasonable compromise for both band-width and gain considerations.

Ordinary i.f. transformers are not employed, because the type of i.f. response curve desired can better be obtained with coupling networks consisting of inductance, capacitance, and resistance. These coupling units, as well as those used in the r.f., mixer, h.f. oscillator, and sound buffer stages, are "hand tailored". Complete design data on the various units will be given later, in Part III of this paper.

The i.f. gain per stage is about 5 to 8 for a pass-band of 13.0 to 10.3 Mc. Three i.f. stages give sufficient overall gain.

An 1852 is used as the mixer (V2) in conjunction with a 6J5 h.f. oscillator (V3). Inductive and capacitive coupling is employed between the oscillator plate coil (L6) and the r.f. amplifier plate coil (L5), which is capacitance coupled to the No. 1 grid of the mixer in conventional manner. The oscillator is operated at a higher frequency than the video carrier in order to maintain less coupling discrimination throughout the wide video sideband range. For reception of the transmitter chosen as an example for this discussion, which is assumed to have a video carrier of 46.5 Mc. (see Fig. 1), the oscillator frequency is 59.5 Mc.

**R.F. AMPLIFIER**

The grid circuit of the r.f. amplifier stage consists of a band-pass network (L2, L3 and associated...
circuits) tunable from about 40 to 60 megacycles, with a pass band of nearly 3 Mc. The various tuned circuits, including the oscillator circuit, are fixed-tuned by means of adjustable, plunger-type, air condensers. Because there is not enough room in the oscillator-mixer shield can for more than four of the plunger-type condensers, $C_{11}$ and $C_{14}$ (not included in the present receiver) can be of the midget compression type, if the third channel is to be covered. A single-turn coil ($L_1$) couples the antenna to the grid circuit. This coil has a grounded center-tap, so that it is suitable for use with a doublet antenna employing a twisted-pair transmission line. The double-tuned input circuit, correctly adjusted, provides the familiar double-humped response curve of two over-coupled circuits and thus improves the overall band-pass characteristics of the entire receiver.

The r.f. amplifier plate circuit consists of a single, broadly-resonant tuned circuit supplementing the grid network. The output of the r.f. stage is capacitance-coupled to the No. 1 grid of the mixer tube.

The adjustable plunger-type tuning condensers are ganged for channel switching by means of switches $S_1$ and $S_2$. Only one set of condensers need to be adjusted if reception of only one television station is contemplated. It is highly desirable and economical, however, to make provision for the two additional channels, in order to save the trouble and work involved in rebuilding the "front end" of the set at a later date.

**SOUND BUFFER**

The "sound buffer," employing a Type 1853 ($V_2$), receives the i.f. signal with the sound modulation directly from the plate of the mixer tube. A tuned network ($L_7$, $L_8$, and associated circuit) helps to filter out the low-frequency end of the video i.f. carrier (approximately 10.5 Mc.) while it passes the sound i.f. carrier (9.75 Mc.). An important function of the sound buffer tube is to prevent interaction between the high-frequency oscillator (tuned to about 10.2 Mc.) of the sound receiver and the i.f. circuits of the video receiver.

The output of the sound buffer tube is resistance-capacitance coupled to a 50-ohm coaxial transmission line (see Fig. 2). The transmission line consists of a length of No. 18-16/30 "Shielded Nu-Cor," made by the Cornish Wire Co., New York City. Any other type of shielded wire of similar characteristics can be employed. The transmission line is terminated at the auxiliary short-wave "sound" receiver with a 50-ohm resistor, the leads from which go to the antenna and ground terminals of the sound receiver. The sound i.f. carrier in this example is 9.75 Mc., to which frequency the sound receiver must be tuned. This frequency setting does not have to be

(Continued on page 78)
Election Results

When the Executive Committee of the A.R.R.L. met on November 2, 1938, to examine nominations in connection with this year's elections for director and alternate director, it found itself faced with a number of unexpected situations resulting from the newly adopted directorship qualifications embodied in By-law 12. The upshot is that elections are being held in four divisions, while in four others the incumbents are either returned to office or single nominees have been declared elected in the absence of eligible opponents.

Taking up the non-voting divisions first, in the Central Division, there were initially six nominations; two nominees withdrew, one of the petitions was invalid and none of the remaining nominees was found eligible under the provisions of By-law 12. As a result, Director R. H. G. Mathews continues in office, under the terms of By-law 21. In the case of the alternate director, there were two valid nominations but only one of the candidates was found eligible. In consequence, E. W. Kreis, W9HRM, the only eligible nominee, was declared elected. Mr. Kreis is an old-timer, having been in the game since 1911. His original call was 9EI.

In the Hudson Division, the incumbent was found to he the only one eligible of two nominees for the directorship. Director Kenneth T. Hill, W2AHC, was therefore declared reelected. The present alternate director, Robert M. Morris, W2LV, was declared reelected by the committee in the absence of other nominations.

In the Roanoke Division, the two incumbents - Director H. L. Caveness, W4DW, and Alternate Director J. Frank Key, W3ZA - continue in office in the absence of competition. Apparently the Roanoke Division has no complaints concerning its present administration!

In the Southwestern Division, Director Charles E. Blalack, W6GG, continues in office in the absence of an eligible opponent. Although not himself nominated, John E. Bickel, W6BKY, continues as alternate, the only valid nominating petition for the post having been for an ineligible candidate.

Elections are being held in the remaining divisions. In the case of the New England Division the eligibility mortality was not so great, but one candidate for director failing to qualify. Three other nominees are competing for the directorship: Clayton C. Gordon, W1HRC, Percy C. Noble (the incumbent), W1BVR, and Dr. R. W. Woodward, W1EAO. There were three nominations for alternate director, but two were ineligible, so Russell Bennett, W1GTN, was declared elected.

The Northwestern Division has the unique distinction of being about the only division to offer none but eligible candidates. There are three in the directorship race: Stanley J. Bolliveau, W7AYO, Ralph J. Gribbons (the incumbent), W7KV, and A. L. Smith, W7CCR. There are three candidates for alternate director, as well: Niilo E. Koski, W7LD; W. L. Miller, W7AAN, and W. N. Wintler, W7KL.

In the Rocky Mountain Division, the present director, Edward C. Stockman, W9BSA, decided not to run, so the issue lies between Glen R. Gasseoeck, W9FA, and C. R. Stedman, W9CAE. There was but one nominee for alternate, so Charles W. Duree, W9EII, was declared elected. There was one invalid directorship petition, received after the close of nominations.

The present director of the West Gulf Division - Wayland M. Groves, W5NW - also decided not to run, leaving the contest to David H. Calk, W5BHO, and Wm. A. Green, W5BKII. The only nominating petition for alternate director was for Wm. H. Burt, W5BRC, who was declared elected. There was one invalid directorship petition, received after the close of nominations.

The elections will close on noon of December 20th, and that afternoon the Executive Committee will constitute itself a Committee of Tellers to count the ballots. The results will be announced in February QST, of course, and there will be special broadcasts over W1AW that night and through the week so that members may acquaint themselves with the results.

Phone Frequencies

Do you remember the QST poll, asking members whether they favored assigning the new frequencies 2000-2050 kc. to 'phone when our 1715-2000 band is shifted to 1750-2050? Well, 78 per cent of the replies were in favor, whereupon our Board of Directors immediately asked the F.C.C. to make this alteration at the time the band is moved. We are pleased to report that the F.C.C. has assented to this request and that the new 'phone band will read 1800-2050, an increase of 50 kc. for 160-meter 'phone. In Canada the band will read 1775-2050. This actual shift is expected to take place about the first of the year; watch for further announcements.

Our new emergency regulation mentions 1975-
2000 kc. as one of the emergency calling channels. It is supposed to be on the edge of the 160-meter 'phone band. When this band is shifted, as mentioned above, this emergency calling channel will also be moved to the last 25 kc. in the band, 2025-2050 kc.

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**Deputy Inspectors**

The A.R.R.L. Board asked the F.C.C. to establish an arrangement whereby selected amateurs would be deputized as special additional inspectors for the amateur bands. The Commission, although highly sympathetic, has advised the League that the terms of the Communications Act of 1934, as well as the statutes prohibiting the acceptance of voluntary services, prevent the deputizing of amateurs in the manner suggested. However, the Commission has invited us to confer with them in an effort to work out a procedure by which amateurs may be of more assistance in the detection and prosecution of illegal radio operation, and there may yet be news on this subject.

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**Puerto Rican News**

The F.C.C. has drawn one of its 125-mile circles around its new district office at San Juan, P. R., effective December 1st. After that date, all amateur applicants in Puerto Rico will have to appear at the San Juan office in person for amateur examination for Class B license, and there will be no more Class C. Moreover, all existing holders of Class C licenses in Puerto Rico are notified that they must appear at San Juan and qualify for Class B before April 1, 1939, or forfeit their Class C licenses.

The above arrangements are confined to Puerto Rico and do not extend to the Virgin Islands, where Class C will continue to be available.

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**Island Prefixes**

We are pleased to report that the F.C.C. has acceded to a request by the A.R.R.L. that special identifying prefixes be used in amateur calls in regions outside of the United States, to distinguish one region from another. Many countries, notably Great Britain and France, have long had such an arrangement but American amateurs have never been able to distinguish between our far Pacific possessions and Hawaii, between Puerto Rico and the Virgin Islands, etc. The new system will make that possible and will be of immense utility to us in identifying isolated stations, especially in emergencies of any nature. DX men will be interested to know that the new procedure will make possible the recognition of different island groups as counting separately for the DX Century Club. Existing amateurs in these outposts have been invited by F.C.C. to file applications to modify their calls in accordance with the new list. This list is not yet definite and we emphasize that the tabulation below is not entirely reliable; we publish it simply because we know you are interested and it is our belief (but not certainty) that it will take this form:

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Notes</th>
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<tr>
<td>K4</td>
<td>Puerto Rico</td>
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<td>KB4</td>
<td>Virgin Ids.</td>
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<td>K6</td>
<td>Territory of Hawaii</td>
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<td>KB6</td>
<td>Guam</td>
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<td>KC6</td>
<td>Wake group</td>
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<td>KD6</td>
<td>Midway Ids.</td>
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<td>KE6</td>
<td>Johnston Id.</td>
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<td>KB6</td>
<td>Baker Id., Howland Id., Am. Phoenix Ids.</td>
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<td>KG6</td>
<td>Jarvis Id., Palmyra group</td>
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<td>KH6</td>
<td>Am. Samoa</td>
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<tr>
<td>K7</td>
<td>Terr. of Alaska (including Pribilof Ids.)</td>
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**The New Regs**

We think we have a pretty snappy bunch of new regulations. Of course they are not perfect and there will be some things in them you do not like. But if you find items about which you want to howl in anguish, you should know of some of the proposals that were under consideration and which were rejected because of A.R.R.L. opposition. The list of things avoided includes reduction of power; extending quiet hours from 6 p.m. to midnight; language that would kill our Official Broadcast System and code lessons; prohibition of more than one portable; requirement of good character in licensees and denial on such grounds as the known moral turpitude of the applicant; requirement of the personal ownership of the apparatus employed; specially-reduced power for 'phone stations in apartment houses; requiring consent of landlords before licensing stations in apartment houses; and a great many more of the same sort. Almost any redrafting involves some tightening up. We just thought that if you found any of the items distasteful, it would be illuminating to consider some of those we ducked because of A.R.R.L. participation. As another example, the requirement of frequency-measuring means was first proposed to be applied only to stations working within 10 kc. of the edge of bands. A.R.R.L. opposed that as unfair discrimination against certain amateurs and an impracticable procedure. The Commission was insistent that something be done to improve the frequency-observance situation. So a compromise was reached, requiring all stations to employ means independent of the frequency control of the transmitter, but only necessarily of accuracy sufficient to insure operation within the bands. Taken by and large, we have the feeling that our new regs are superior to those of any other service.
FROM the standpoint of operator interest the A.R.R.L. Field Day is now definitely on a par with the DX and Sweepstakes Contests. There were 1060 participants (exclusive of YL's, YF's, junior operators, etc.) in the Sixth A.R.R.L. Field Day, June 11th and 12th, 1938!! Ninety-four groups, an aggregate 764 individuals, went into the F.D. in the name of their respective club organizations. 296 additional participants took part as members of ninety non-club groups.

The bands were alive with portable stations. The percentage of portables worked by participating stations ran usually high, in some cases exceeding 50 per cent of all contacts established.

That fact, perhaps, is the best word picture we could offer to describe the intensity of portable operation during that not-to-be-forgotten weekend in June.

The steady increase in Field Day activity from year to year is an encouraging sign. It indicates increased interest in the construction and operation of auxiliary equipment and procurement of auxiliary power supplies... definite steps toward emergency preparedness. Let us continue the forward-looking march!

We wish to thank all concerned for the splendid reports received. Would that we had the space to present them all in full! But space limitations permit us to hit only the highlights and representative portions of various accounts. Thanks also for the scores of photographs; here again we can present but a comparative few of these and have endeavored to pick the ones best suited to reproduction, and to show several phases of F.D. participation, regardless of size of score. And, Oh, Boy! did some of the scores have "size"!

The Egyptian Radio Club, using the club call W9AIU on Chouteau Island, across the Mississippi River from the northern city limits of St. Louis, Mo., established an all-time high in Field Day scores—3708—and led the F.D. for the second consecutive year. 317 contacts were made on 1.75-Mc. 'phone and 3.5-, 7- and 14-Mc. c.w. Contacts per band were 41 on 1.75, 28 on 3.5, 197 on 7, 51 on 14 Mc. 85 of the 317 QSO's were with other portable stations. A separate transmitter was available for each band, simultaneous operation on the four bands made possible by efficient

THE W2AIW-2 56-MC. LOCATION

Seventy-three of the Jersey Shore Amateur Radio Association's 165 contacts at W2AIW-2 were made on 56-Mc. from inside a fire tower of the New Jersey State Forest Service. The tower is about 60 feet high, with the base at the top of a hill about 250 feet above sea level and well above the surrounding country for a distance of about 30 miles! The antenna may be seen suspended from the tower at the left.
The Buckeye Short Wave Radio Association of Akron, Ohio, operating W8KG-8, placed twelfth among club groups. Here we see W8OQJ at the mike with W8GCI assisting; 112 stations were worked, 52 on 3.5 Mc., 46 on 36 Mc. and 14 on 7 Mc.

key click filters and proper placing of antennae. Each c.w. transmitter consisted of the Reinartz tetrode oscillator circuit using 802 tubes at 12 to 18 watts input. Phone operation started using a 6C5 Pierce oscillator and 6L6 final, modulated by a 6L6, with 10 watts input. This rig was later replaced by a three stage crystal job using an 807 final running at 15 watts input; modulation equipment for this outfit was a 6N7 in Class B.

Seven separate receivers were used. Antennas consisted of a half wave end fed for 1.75 and 3.5 Mc., two 7-Mc. doublets placed at right angles using EO1 cable for feeders, and two 14-Mc. doublets similar to the 7-Mc. wires. Antennas were supported by makeshift masts felled in a nearby forest. The masts were placed in an open field adjacent to the deserted farm building in which the equipment was housed. Power supply was a 1500-watt gasoline engine driven 220 volt, three phase alternator. Step down transformers were used on each phase to obtain 110 volt 60 cycle a.c. The alternator was placed 200 feet from the receivers to minimize noise. The generator provided power for lights, soldering iron, etc., as well as station operation. A crew of 19 operators participated at W9AIU-9. We have explained the Egyptian Radio Club's set-up at considerable length since such superlative performance rates detailed explanation. Congratulations, E.R.C.!

The Frankford Radio Club, W3BKX-3, is in second place with 2241 points . . . 156 contacts on 3.5, 7 and 56 Mc. 53 per cent (83) of all contacts at W3BKX were with other portables! Transmitter used on 3.5 and 7 Mc. was a 6L6 crystal and e.o.o. driving an 809, with under 20 watts input from a gasoline driven power plant.

W6GTM, MONUMENT BEACH, CALIF.

Left to right: W6SG, W6BBR and W6GTM . . . operated W6GTM-6 in a tent on the beach border of the United States and Mexico. They used one of the wires of the International Fence for receiving antenna.

SOME FUN, THESE F.D.'s!

VE2BV is apparently enjoying his participation at portable VE2KH, Dunany, Que. The rig, 6L6 e.o.-6L6 amplifier, 12 watts input, received its power from a 6-volt Genemotor. The receiver was a 58 r.f. and 58 detector.
A "MR. & MRS." FIELD DAY UNIT
W5MS and XYL W5BZW, together with W3DVK, operated W5MS-5 at Lake Corpus Christi, near Mathis, Texas; 69 contacts were made on 7 and 14 Mc.

Receiver was operated on B batteries. Antenna was 132 foot zepp fed. Five operators did all the operating. FB, Frankford!

A close third is W2AIW-2, the Jersey Shore Amateur Radio Association . . . 2178. Operation was on five bands, as follows: 1.75 Mc. (3 contacts); 3.5 Mc. (42); 7 Mc. (30); 14 Mc. (17); 56 Mc. (73). 67 of the total 165 contacts were with other portables. 56-Mc. operation from a fire tower of the New Jersey State Forest Service was particularly successful. Simultaneous operation on three bands worked well. The 3.5-Mc. and 7/14-Mc. transmitters were located in a tent about 130 feet from the base of the tower. The 1.75-Mc. (and later the 7/14-Mc.) transmitter was located in a large tent 260 feet from the tower. All power was obtained from 110 volts a.c. furnished by three gasoline driven generators. Input to all rigs was 20 watts or less. The "hi" light of the whole affair for the W2AIW-2 gang occurred about midnight when the log sheet of the 56-Mc. gang, containing the entire evening's work blew out the window of the tower and sailed far away over the tree tops into the blackness of the night! A few minutes later a shower arrived and the rain came down for two hours. It was thought the log would never again be seen. However, a searching party set out at daybreak and by 6:00 A.M. the sheet had been located about a quarter of a mile away, very wet but perfectly readable.

The York Road Radio Club, veteran of Field Days, placed fourth this year with a score of 2070 . . . 147 contacts (49 per cent of them portable-to-portable). Five units operated simultaneously on four bands under the call W3QV-3. Bands used were 3.5, 7, 14 and 56 Mc., all work being in the "20 watt" class. Once again Y.R.R.C. "returned to the scene of the crime," operating at the location used on previous F.D.'s, Ringing Rocks Park, two miles from Pottstown, Pa. Power supplies included several dynamotors and a 300-watt gas driven a.c. plant. One comment in particular in the W3QV-3 report is worthy of consideration: "It was proved conclusively that good emergency equipment does get out." And, brother hams, the Field Day is the opportunity to find out just how "good" your equipment is! Be sure to test your equipment next F.D.

Leading the non-club groups and fifth high among all stations is W2DKJ-2, operated in the tower at 40 Wall Street, New York City, by W2DKJ, W2IGK, W2BUK, W2LAH, W2KSZ and George Wies, ex-W2AHK. The score of 1971 is comprised of 1719 points on 56 Mc. (1) and 252 points on 28 and 14 Mc. Of the 226 total contacts 149 were made on "five meters." Thus does W2DKJ easily retain the title of leading 56 Mc. F.D. station. This new record will be hard to beat.

Top Canadian participant, sixth high among all stations is VE3AJV, the Frontier Radio Club, with eight operators. Operation was on 3.5, 7 and 14 Mc. with a separate 20-watt transmitter for each band. Power was supplied by a 60 cycle 110 volt generator belt-driven from the rear wheel of a '36 V8. This furnished juice for lights, receivers and transmitters. 74 per cent of the 121 contacts were with other F.D. stations . . . score: 1899. Second high VE is VE3KM, the Hamilton Amateur Radio Club . . . 1404.

Dozens of splendid scores were rolled up. The tally of results will show what each participating station accomplished. Whether the score is large or small the comments of Field Day operators are uniform, "We had a swell time and learned plenty about portable/emergency operation." Extracts from the reports of a number of stations follow; we know you will find them interesting. June, 1939, with another big A.R.R.L. Field Day is but six months away. Don't miss it! Get your portable equipment built and in operating condition NOW.

E. L. B.
W9DIR had charge of the c.w. encampment and W9RBI the phone. Considerable rivalry sprung up between the two groups several weeks before the Field Day and there was a close race for QSO honors. 82 stations were worked on 3.5- and 7-Mc., c.w. and 75 stations on 1.75-, 3.9- and 14-Mc. phone. Input was kept at 20 watts on both transmitters. The success of our F.D. participation can be laid to one thing . . . the "Bad Indian" beam. For those who have not worked W9RBI, the Vee beam is three 210-ft. legs spaced 60 degrees apart and fed with three 40-ft. sweep feeders, switching the two outside legs for N8 or EW beam. Several insulting gentlemen accused us of running anywhere from 500 to 2000 watts. Hi. Our location was a large cow pasture 4 miles east of Wisconsin Dells, perfectly level country—we couldn't see the gain in this big hill stuff. Hi! A good antenna on clear level ground and boy, you've got something. For our first field attempt we are well satisfied and serve notice on the rest of the country to look out for the D. double-R. C. next year—Delta Region Radio Club, W9RBI-9.

Operation was on all bands, including 56 Mc, and was from the club's permanent portable location in the Palos Verdes Hills. The club has raised two 80-foot towers on a ranch belonging to one of the members, and it is contemplated erecting a clubhouse thereon in the very near future.—United Radio Amateur Club, W6CL-6.

Our Field Day activities were a big success in spite of the pouring rain over most of the week-end. We had a 500-watt a.c. generator (real classy) and a 1-kw. rewound Dowd unit furnishing power for two receivers, three transmitters, and sufficient lighting to make operating a pleasure. Both units held up beautifully, we ran the rigs at 20 watts at all times, keeping the voltage drop due to keying at a minimum. We took moving pictures of the activity. Our location was near Clinton, N. Y., at Franklin Springs at a camp which the club has obtained for the year. Fifteen operators took turns at operating—Ultra Amateur Radio Club, W9U-8.

With typical Field Day weather (pouring rain) we got off to a poor start. The main generator broke down necessitating taking the magneto apart. The club was divided into three groups all operating under the call W9SRB-9. The main group was set up in the same abandoned pipe factory used last year. Group 2 was composed of some of the younger fellows who went out Friday morning and set up tents in the Forest Preserve. Group 3 (2 men) used some commercial a.c. and the Club's 300 watt generator the rest of the time. We didn't do much better than last year but watch out for us next year.—The Northwest Amateur Radio Club, W9SRB-9.

A 2KW. A.C.-D.C. EMERGENCY POWER UNIT

The South Hills Brass Founders and Modulators (Pittsburgh, Pa.) maintain this permanent power supply for emergency use. It is given a good work-out each Field Day. A 4-kw. generator (2 kw. at 85 volts, 60-cycle a.c. and 2 kw. 110-volt d.c.) is driven by a 1927 model Whippet motor mounted on the front half of the car chassis. The chassis is cut to "trailer proportions." The 85 volts a.c. is stepped up to 110 volts by means of a 5kw. auto transformer. The 110 d.c. is generally used for lighting purposes. Pictured here giving the unit the once-over are (l. to r.) W9FX, W9QFO, W9QVW, W9RC and W9QAN.

W9YKK-9 operated in a cabin located at the Orchard Grove Tourist Camp, which is owned and operated by W9YGC. If it had rained much harder we probably would have had an "emergency." We all had a fine time and expect to be back again next year. All the praise in the world to the "Pioneer" gas driven generator, and to the Indiana State Police, from whom it was borrowed.—Monument City Radio Club, W9YKK-9.

A good time was had by all, even tho' there was nothing to eat but plenty of chocolate cake for the full 24-hour period. We are eagerly looking forward to the 1939 Field Day Contest, at which time we believe we will be able to run up a nice score as we are now working on a portable 'phone rig as well as increasing the efficiency of the c.w. rig. With this in mind, the 1938 winners had better PREPARE, if they want to REPEAT.—W9EUC-4.

Although a large score was not made a swell time was had by all. Three rigs were used: (a) 6L6-6L6; (b) 6L6-6L6-T20; and (c) 6L6-120. The generator was furnished by a Homebuilt 1-kw. generator which ran 30 hours Fb. This was our first year and we learned lots, so tell the rest to look out for us next year and no foolin'.—Bridgeport Amateur Radio Association, W9UHT-1.

Our transmitters were located in Topanga Canyon, which is about 7 miles North of Santa Monica and about four miles inland from the Pacific Ocean. The gang enjoyed itself very much.—Mike and Key Club, WERR-8.

In spite of the threat of rain we set the outfit up in the open and got going—for one QSO it rained! We covered the junk with a tarpaulin and waited. When it stopped raining we uncovered and proceeded. This starting and stopping for the rain took the wind out of it really started to blow up badly about 9 P.M. so we moved everything except the power plant into W8NXX's car. This we covered with the tarpaulin and everything was lovely from then on. The little Kato power supply outfit sure delivered the goods. We are looking forward to the next F.D.—W8CUG-8.

Club members cooperated by bringing in refreshments, etc. for the operators and a good time was had by all. Thirteen operators were on hand during the twenty-six hour test. Change-overs were made regularly, giving all ample time on their shifts. Two operators were at the keys and a log-keeper was on hand at all times. Thus a very systematic layout worked with precision. A large furniture truck housed our outfits making conditions very comfortable. This year was the most successful and enjoyable we have had since

THE BUSINESS END OF W1AAJ-1

This is the method used by the Green Mountain Radio Club to generate power for W1AAJ-1, located on Mt. Pico, ten miles east of Rutland, Vt. The generator was a 2 kw. job, supplying 110 units, 60-cycle a.c., run by a Ford truck on a treadmill. The truck ran at an average speed of 19 to 20 m.p.h. and, according to the speedometer, covered 508 miles to enable the gang to roll up 1512 points!

December, 1938
our first Field Day four years ago.—Hamilton Amateur Radio Club, VE5KM.

Members of the St. Paul Radio Club, using the new club station, K8EK, participated in the Sixth A.R.R.L. Field Day Contest. W9FUZ’s trailer coach and transmitter were used together with three additional transmitters. The equipment was erected north of the City of St. Paul at Lake Phalen tourist camp. The source of power was a 1,000-watt Onsan plant which gave excellent voltage regulation. One transmitter and receiver was operated with a vertical antenna from W9IDB’s car and picked up contacts on 14-Mc. phone. All transmitters were operated within the limits of 20 watts input.—VE6UYC.

Field Day was for the Trenorton Radio Society an experience in operating under adverse conditions with thunder storms continually playing tag with our antenna masts. Nevertheless the event was a large success both in regard to the good time enjoyed by all and in regard to the apparatus, which showing the benefit of the experience from three previous field days, performed without the slightest failure. Furthermore, by courtesy of the New Jersey State Police, we placed our station on the grounds of their Headquarters at Wilburtha, N. J. Judging from the favorable comments of our hosts, we won their good will and effectively demonstrated our potentialities as an emergency communication system. Notwithstanding the roadblocks for games and other activities, as had been hoped, but pleasant diversion was had by the frequent exchange of visits with the members of the D.V.R.A., whose F.D. station, W63I/3, was located nearby. We are looking forward to next Field Day, when we hope to operate without obstructions and with a telephone system between them to prevent duplicate contacts (which were a waste of time this year).—WA81R-5.

Operated from 9:30 P.M. until 5:30 A.M. in car parked in back of the new W1AW station building in Newington, Conn. Used single 56L tri-tet with 7-Mc. crystal and doubled to 14,000 kc., ... input 18 watts. Hooked on to the W1AW 14-Mc. rhombic, giving it the first workout. Results: Two VE’s with reports of RST 55x6 plus, three W’s, three W6’s and one W7, all with good reports.—W6LO-1.

W5BRX/5 was operated by the Tulsa Amateur Radio Club on top of Turkey Mountain, some 10 miles south of Tulsa, overlooking the Arkansas River. The peak of the mountain (where we were located) is the highest point for miles around, and the trees show much damage due to lightning. Inasmuch as we had been having rainy weather accompanied by electrical storms everybody was prepared to vacate on short notice. W5BRX himself was equipped with a tent, completely diced to keep out the expected rain, but was happily disappointed by the lack of rain. Several other transmitters were operated from the back of cars, trailers, and on card tables, and one even on the ground, hence we had no operators sitting on our apparatus in any manner of a Turk or something. (HI.) The Field Day turned out to be a real party, and everyone went home tired but happy.—W6BRX-5.

The operation on 56 Mc. that we stopped trying to get the other rigs to work. The continuous barrage of 56-Mc. signals gave us plenty to do every minute of the day. It was not until the very last hour of the contest that we had difficulty in finding new contacts. Everyone here had a splendid time and all of us are looking forward to the next Field Day when we will apply everything that we learned on this one.—Skywire Radio Association, W4BKS-5.

Field Day, June 16th. In the evening, W3BTQ, W3GAU, W3DUK, W5DUD’s YF and Jr. op., and W63QG, arrived at White Crystal Beach, on the Elk River at the head of the Chesapeake Bay. Early Saturday morning we started to set things up; rig, receiver, and antenna. The antenna was 152 feet, end fed, strung between a sassafras tree and a stray telephone pole. The transmitter was a 6L6 crystal, 6A6 amp., running from a Mallory vibrapack; the receiver was an SW-3 running from a small dummymotor. About noon, the rig was working well. At about 11:30 a.m., the antenna came down with a crash. It took us exactly 17 minutes to climb the tree in the dark and get back on the air. About 4:45 P.M. Sunday a real storm, as only experienced on the Chesapeake Bay, came up and we were forced to stop operating. Here's to bigger and better Field Days; may they continue and prosper.—W3HTQ-5.

All operation was conducted in the field approximately one mile southwest of Kohler, Wis. Original plans called for the operation of 5 units, but after plenty of QRM trouble, only 3 were put on the air. The 3 outfits were located in approximately a straight line, with the distance between the two outer stations only about 100 feet. The antennas were equally crowded, all 3 ending on the same tree. The longest of these was a 260 foot center fed, with 130 foot feeders, supported on one end by a 75 foot tree. The other two were 133 foot seppa, supported by trees about 50 feet high. The power supply was a 100-volt a.c. generator, one of 1500-watt rating, the other an 800-watt unit. The gang agreed that the Field Day was very FB, and is already planning on doing big things next year.—Shibogann Radio Amateur’s Club, W9YX-5.

Featured from start to finish by the nastiest tricks in the weatherman’s repertoire, the 1938 Field Day was, indeed, one to test emergency facilities to the limit. Any gear which can be operated out of doors for 58 hours continuously without trouble under the conditions which ours had to face surely rates classification as emergency equipment. The location chosen for this year’s struggle was Steerage Rock, 1300 ft. O.L., Brimfield, Mass., and the operating position was the open porch of a small refreshment stand at the top of the mountain. Although we were equipped for ‘phone operation on all bands the high noise level caused us to use c.w. exclusively, except on 56 Mc.—W1HDD-1.

W1BB was operated from a high peak through 56 Mc. Location was Orient Heights, Massachusetts, on top of a “Drumlin” 150 feet above sea level, overlooking Boston Harbor. All power was from 6 volt storage batteries and generator. Had a wonderful time, lots of good operating, a big thrill out of working other Field Day stations, particularly at DX with low power. Fog came in during night so thick could not see antenna pole from car. Biggest thrill was getting message off solid first time to W1EH-1 who was also low power field day battery operated.—W1BB-1.

The five transmitters of WSAYH-8 were operating off field near Olmsted Falls, Ohio. This marks the third year of Westlake Amateur Radio Association’s participation in the field day contest. Of the 76 stations worked, 36 of them were operating portable. Equipment used for power included batteries, gasoline-driven generator, vibrapack.—WSAYH-8.

Rig was 6ICG triplex crystal oscillator powered from a vibrator pack, running 300 volts at 50 mls from a storage battery. Receiver was a 6 volt t.r.f. running from a generator. Antenna was a 7-Mc. Hertz off center fed, approximately 40 feet high. XU2AA was worked on 7 Mc. All contacts were the wedges. In the top of Ge11esse Mountain, 14 miles west of Denver, at an altitude of approximately 8300 feet.—W6RRS-9.

The Clearwater Radio Club operated portable at Weekie-ware Springs, Fla. Nine operators were contacted, twenty of them also on Field Day. All power for lights, fans, transmitters and receivers was obtained from a 1-kw. a.c. generator, gas driven. Fifteen different crystals were used on the 7-, 14- and 28-Mc. bands. The antennas were a 7- and a 14-Mc. doubles, a 28-Mc. Johnson Q, and a rhombic. The rhombic was 330 feet per leg and pointed ten degrees west of north. Quite a time was had putting up the rhombie, weaving it among the trees and all, and getting one end fastened to a tree in the middle of the field, which was somewhat the F.D. very much and are waiting for next year.—W1BQK-5.

Our location was provided by W6RPM: A cabin in the woods, several miles from either power or telephone lines, at the foot of Rib Mt. All equipment was operated from batteries, including the lights. The antennas and equipment were installed with the aid of smuggled fires and "Elit" guns of mosquito dope.—Wenau Radio Operators Club, W1FD-1.

The club operated in Palos Hills, near Willow Springs, Illinois. A total of 74 contacts results, 43 being with other portable stations. 18 states were worked. Frequencies (Continued on page 85)
Full-Range Selectivity with 455-Kc. Quartz Crystal Filters
A New Filter Circuit with Wide-Range Bandwidth Control

By D. K. Oram*

Here's a new 455-kc. quartz crystal filter which can be adjusted to give any desired degree of selectivity between normal i.f. and crystal maximum—continuously variable, if one likes. Its advantages for phone reception are obvious. One-knob control, substantially uniform output over the whole selectivity range.

The use of quartz crystal filters to increase the selectivity of intermediate frequency amplifiers in communications receivers has become almost universal. Starting with the original article by James J. Lamb, many pages of this magazine have been devoted to technical descriptions of such filters and their operating characteristics, together with such improvements and refinements as have been made from time to time. In addition, a complete review of the subject appears in The Radio Amateur's Handbook, 1938 Edition. From a perusal of this material one conclusion seems inescapable; crystal filters of to-day are sharp enough, but despite the many improvements made, the variable selectivity feature has not been carried far enough on the broad side to bridge completely the gap between "crystal" and "non-crystal" selectivity at 455 kc., which for obvious reasons is still the most popular frequency for intermediate amplifiers.

There is no denying the fact that such a complete range of crystal selectivity would aid materially in voice reception, regardless of receiving conditions. It is the purpose of this article to describe a

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FIG. 1—CIRCUIT DIAGRAM OF THE WIDE-RANGE VARIABLE-SELECTIVITY CRYSTAL FILTER

T—Permeability-tuned i.f. transformer with low-impedance secondary.
H—455-kc. crystal and holder.
C1, C2—Fixed condensers, 100 µfd. each.
C3—50 µfd. silvered mica.
N—Phasing condenser, see text.
L—Iron core i.f. coil, 1.14 millihenrys.
R1—25 ohms.
R2—50 ohms.
R3—300 ohms.
R4—2000 ohms.
S—6-point tap switch, with extra contacts for shorting crystal.

THE COMPLETE WIDE-RANGE VARIABLE-SELECTIVITY CRYSTAL-FILTER UNIT

The switch and resistors are in the upper left corner, with the crystal and holder to the right. The phasing condenser is at the lower left. Transformer T is in the lower right corner, with the output circuits, L2C1, in the can just above. The unit is approximately 2 X 3 X 5 inches.
The dotted curve shows, for reference, the selectivity of the two-stage i.f. amplifier without the filter; solid lines are crystal filter alone.

We now come to the load or crystal output circuit, which constitutes the most interesting feature of this new filter, since it provides the expanded control of selectivity which is admittedly so desirable. It consists of the permeability-tuned coil L and its associated fixed condenser C1.

**OUTPUT CIRCUIT OPERATION**

It will be necessary at this point to depart somewhat from routine description in order to consider the effect of this load circuit on the selectivity characteristic of the crystal filter unit as a whole. There is no doubt whatever that a higher load impedance results in wider filter response. There are, however, at least two ways of explaining this well-known effect. To date, the most generally accepted idea has been to regard the load impedance as an addition to the effective series resistance of the quartz crystal, thus decreasing its Q. In the present discussion, since the voltage feed to the crystal is essentially constant over the narrow band width involved, as previously explained, the crystal and its load circuit in series will be considered as the two sections of a voltage divider. The actual voltage in which we are interested is that existing at the junction of the two sections of this divider, which is directly connected to the grid of the succeeding i.f. amplifier tube (point A in Fig. 1). Since both sections are tuned circuits (although one is the quartz crystal) it is obvious that the impedance of such a voltage divider will vary considerably with frequency. Since the voltage across it remains substantially constant, it necessarily follows that the amplitude of the voltage at point A will depend directly on the relation of the impedances of the two divider sections, which in turn will depend on the impressed frequency. The

**FIG. 2—VARIATION IN CRYSTAL-FILTER SELECTIVITY WITH DIFFERENT VALUES OF RESISTANCE**

The dotted curve shows, for reference, the selectivity of the two-stage i.f. amplifier without the filter; solid lines are crystal filter alone.

new 455-kc. quartz crystal filter which does meet this variable selectivity requirement, and in addition affords several other operating advantages. Its circuit diagram is shown in Fig. 1. T is a permeability-tuned stepdown transformer having a high-impedance tuned primary to provide efficient loading in the plate circuit of the first i.f. amplifier tube. Its secondary is of relatively low impedance in order to deliver a substantially constant voltage to the quartz crystal and its variable impedance load. The secondary is center-tapped to ground by means of two matched fixed condensers, C-C, to provide a neutralizing voltage 180° out of phase with the voltage fed to the crystal. N is the neutralizing or phasing condenser, and is of the opposed-stator type. While the capacity of the rotor to each stator of this condenser varies in the normal manner as the rotor is turned, the capacity between rotor and both stators in parallel remains constant regardless of the angular position of the rotor. The importance of this feature will appear later. The crystal holder H is made of isolantite. Its unusual design reduces its capacity to a minimum and provides a uniform air-gap between the crystal and its electrodes, which are of stainless steel, surface-ground to insure flatness. The quartz crystal itself is of special cut, having a very high Q and complete absence of spurious responses within ± 40 kc. of its 455-kc. natural period.

We now come to the load or crystal output circuit, which constitutes the most interesting feature of this new filter, since it provides the expanded control of selectivity which is admittedly so desirable. It consists of the permeability-tuned coil L and its associated fixed condenser C1.

**FIG. 3—OVERALL RESONANCE CURVES (CRYSTAL FILTER PLUS I.F. AMPLIFIER) WITH PHASING CONDENSER SET TO NEUTRALIZE THE CRYSTAL-HOLDER CAPACITY**
constants of the two sections differ so enormously from each other that small changes in the impressed frequency produce correspondingly great differences in their respective voltage drops, with consequent changes in the potential of point A. To illustrate: if we assume that the phasing condenser N has been adjusted to neutralize exactly the capacity of the crystal holder, the quartz crystal can be considered as a series-tuned circuit having inductive and capacitive reactances, $X_L$ and $X_C$ (equal at resonance) of about 60,000,000 ohms, series resistance $R$ of 4000 ohms and Q of 15,000. Coil $L_1$ forming the lower section of the divider, together with its tuning condenser $C_1$, becomes a parallel-tuned circuit having reactances of 3200 ohms, $R$ of 24 ohms, and Q of 133. At precise resonance the crystal presents but 4000 ohms resistance, while the parallel tuned circuit presents a resistance of 428,000 ohms ($Q \times X_0$, or $\frac{Q^2f^2}{R}$). Therefore, at the frequency of crystal resonance, substantially all the voltage supplied to the crystal by transformer $T$ appears at point A and is applied to the grid of the second i.f. amplifier tube.

For frequencies slightly above or below the crystal resonance frequency, the impedance relations of the two sections of the voltage divider change appreciably. Because of the very high value of the reactance components of the quartz crystal, even a slight departure from its resonant frequency causes a relatively large increase in its net reactance. On the other hand the impedance of the parallel tuned circuit, due to its much lower $Q$, changes very slowly with slight departures from resonance. To give a clear picture of these impedance changes they are listed below for several degrees of departure from the frequency of exact resonance.

<table>
<thead>
<tr>
<th>Departure from Resonance</th>
<th>Quartz Crystal Impedance</th>
<th>Parallel Tuned Circuit Impedance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 cycles</td>
<td>4,000 ohms</td>
<td>125,000 ohms</td>
</tr>
<tr>
<td>± 20°</td>
<td>6,500 ohms</td>
<td>425,000 ohms</td>
</tr>
<tr>
<td>± 50°</td>
<td>13,600 ohms</td>
<td>425,000 ohms</td>
</tr>
<tr>
<td>± 100°</td>
<td>28,400 ohms</td>
<td>424,000 ohms</td>
</tr>
<tr>
<td>± 500°</td>
<td>132,000 ohms</td>
<td>408,000 ohms</td>
</tr>
<tr>
<td>± 1000°</td>
<td>294,000 ohms</td>
<td>367,000 ohms</td>
</tr>
<tr>
<td>± 1500°</td>
<td>395,000 ohms</td>
<td>320,000 ohms</td>
</tr>
<tr>
<td>± 2000°</td>
<td>528,000 ohms</td>
<td>277,000 ohms</td>
</tr>
<tr>
<td>± 3000°</td>
<td>792,000 ohms</td>
<td>211,000 ohms</td>
</tr>
</tbody>
</table>

*While not strictly the same on both sides of resonance, the differences are too slight to affect this discussion. For very great departures from resonance, the differences are significant.*

As the impressed frequency departs from the crystal resonance frequency its series impedance rises steeply and, due to the extremely high $Q$, is almost entirely reactive, even for the small departure of 100 cycles. On the other hand, the impedance of the parallel tuned circuit falls but slowly and the resistive component remains large even for departures as great as 3000 cycles. Therefore, it will introduce no great error to assume 528,000 ohms as the reactance of the crystal, and 277,000 ohms as the resistance of the load circuit at ± 2000 cycles from resonance. Since the total impedance of a reactance and a resistance in series is given by $\sqrt{X^2 + R^2}$, the total impedance of the voltage divider at 2000 cycles off resonance amounts to 596,000 ohms, and 596,000 or 46.5 per cent of the total voltage impressed on the crystal will appear at point A. This corresponds to an attenuation of slightly more than 2, or a little more than 6 db. Under these conditions the
selectivity curve of the filter will be strictly symmetrical, and the band width at an input ratio of 2 will be almost exactly 4 kc. This degree of selectivity is of the same order as that provided by a two-stage tuned i.f. amplifier designed for communications work. Consequently, if filter and amplifier are cascaded, the band width will be approximately 3 kc. at the same input ratio of 2. This degree of selectivity is just about ideal for the first step from "crystal out" to "crystal in." So much for the broad extreme of crystal selectivity.

PRACTICAL METHODS

From the above, it is apparent that the range of selectivity obtainable from a crystal filter unit is limited by but two factors. Maximum, or sharp, selectivity is limited only by the Q of the quartz crystal itself. Minimum, or broad, selectivity is limited only by the magnitude of the average load impedance into which the crystal works.

The Philco "Mystery Control"

SPECULATION has been rife in amateur circles concerning the "innards" of the much-publicized Philco remote-control unit. Guesses seem about equally divided between some sort of spark-coil scheme and an ultra-high-frequency system. Both are wrong. The remote-control box uses an oscillator, true enough, and the pick-up arrangement bears close resemblance to an ordinary receiver. The contention, however, is that the system is not worked by radiation from the oscillator but by induction between a coil in the control box and a similar coil in the receiver.

The distinction calls for a little explanation. Two types of fields are set up about any circuit carrying an oscillating current. The radiation field, the one which concerns us in radio transmission, travels outward from the source with the velocity of light and, with uniform conditions, its strength is inversely proportional to the distance. The strength of the induction field, however, is inversely proportional to the square of the distance, and for that reason is of negligible consequence at any distance from the source. It is, however, the predominant field very close to the source. We use induction for coupling between circuits in our transmitters and receivers, but radiation for communication over distances.

The limit of the induction field may be taken to be the distance at which its strength and that of the radiation field are the same. This distance is equal to the wavelength divided by 6.28 or, more conveniently, the distance in feet is equal to 157,000 divided by the frequency in kilocycles. At distances which are small compared to the answer given by this formula, the effect produced in a receiving device may be considered to be wholly the result of induction rather than radiation. Obviously, too, for remote-control devices designed to work over reasonable distances, the frequency chosen must be low, since the quotient will be larger as the denominator is made smaller.

In the Philco unit the maximum distance considered is 75 feet, and the frequencies used are in the vicinity of 375 kc. Amateur-band frequencies, even 1750 kc., are out of this picture because they greatly restrict the range.

There is, of course, radiation from the oscillator even though it is not used in the control system. It is small, however, for two reasons; the power in the control oscillator is very low, and the primary coil is very small compared to the wavelength so that it is an extremely inefficient radiator. Even within the induction field the oscillator should cause little interference with regular reception on the same frequency, because the electrostatic component of the field is horizontally polarized (the plane of the coils is horizontal), whereas radio waves at these frequencies are vertically polarized. Since the control unit is battery-powered, there is no possibility of leakage "through the back door" to permit possibly serious radiation from power lines.

The practical unit uses a Type 30 tube as an oscillator, with a 3-volt "A" and 45-volt "B" battery in the portable container. A telephonedial type "pulsed" permits a choice of any of eight stations to which the receiver proper is pre-tuned. The "A" battery is connected to the tube only when the dial is being operated. Volume also can be controlled from the dial. In the receiver, there is a four-tube control amplifier with a new thyatron tube (2A4G) in the output stage; a relay in its plate circuit controls the "stepper" switch which selects the desired station. The volume control is motor-driven, the motor also being controlled by the relay. The stepper assembly is a latching arrangement with a ratchet which moves one step for each pulse from the control unit. Details of the Philco installation are given in the current issue of "Radio Today" and in October "Communications." Since they are rather specialized they are not reproduced here. The general principles as outlined above can be applied readily to amateur remote-control work, however, particularly since the 2A4G thyratron will be available in the very near future.

If there is no radiation from this type of control unit it is not radio equipment and does not come under the Communications Act. Some radiation is inevitable, however, and pending a settlement of the legal questions, the F.C.C. tentatively has set up the requirement that the field from such devices shall not exceed 3 microvolts per meter at the distance 157,000/f(kc.). This does not imply that the radiation field from such a device, even though within the specified limit, can be used without a license.

—G. G.
How Much Condenser Spacing?

Circuits to Lower Voltage Across Condenser Plates

By T. M. Ferrill, Jr.,* W1JI

TWO disadvantages result from increase of plate spacing in tuning condensers; increased cost and increased size. In order to retain a required amount of capacity in a condenser of fixed plate size when spacing is doubled, the number of plates must be doubled and the length of the rotor assembly must be almost quadrupled. Furthermore, the peak voltage rating of variable air condensers is less than doubled by doubled plate spacing. From these facts may be seen the desirability of keeping the peak voltage across tuning condensers and tuning condenser sections at the lowest value for proper operation.

In the case of a type of plate tank circuit in very common use with push-pull r.f. stages and neutralized single-tube stages—that using a split-stator tuning condenser as shown in Fig. 1-A—the maximum voltage peak across a section of the condenser results from addition of the plate supply voltage (d.c. or d.c. with modulation) to the peak r.f. voltage existing across the condenser section. This is shown in A of Fig. 2 for the condition existing with telegraphy, and in B of Fig. 2 for the condition existing with plate modulation. These diagrams give the actual d.c., r.f., and a.f. voltages across a single section of a properly adjusted tuning condenser in a push-pull r.f. amplifier, with 1250-volt plate supply and 200-ma. plate current.

REMOVAL OF SUPPLY VOLTAGE

In order to “remove the plate supply voltage from the sections of the split-stator tuning condenser,” the circuit of Fig. 1-B has been used commonly. In this arrangement, the tuning condenser rotor is carefully insulated from all grounded objects and circuits, and is placed substantially at ground r.f. potential by means of a high-voltage blocking condenser. The capacity of this blocking condenser is usually of the order of 0.001 or 0.002 µfd. In case of a too-high voltage peak across the condenser section causing a momentary breakdown, this condenser prevents a complete path for the supply voltage directly through the arc between condenser plates, and thus limits the potential for this arc approximately to the r.f. voltage existing between the plates. In a circuit without this blocking condenser, once the high peak voltage has broken down the path between condenser plates, supplying initial cause for an arc, the voltage required to maintain the arc is only a fraction of that required to start it, and the supply voltage maintains a hot and continuous arc in the tuning condenser section, damaging the condenser and overloading the power supply and other equipment until the power is removed.

One badly erroneous general impression seems to exist regarding the function of the blocking condenser as ordinarily used—the impression that it completely removes the supply voltage from the tuning condenser. Contrary to this general impression, nearly all the supply voltage continues...
WITH TUNING CONDENSER CONNECTED AS IN A OR B OF FIG. 1

A

Total peak voltage across condenser section

Supply voltage

B

Total peak voltage across condenser section with modulation

Modulated supply voltage

Total peak voltage across condenser section with modulation

WITH TUNING CONDENSER CONNECTED AS IN C OF FIG. 1

C

Peak voltage across condenser section

D

Note that the peak voltage per section of the condenser in Fig. 1-B (and also that of Fig. 1-A) is more than double that of Fig. 1-C. Thus, the connection of Fig. 1-C saves materially in size and cost of the tuning condenser.

shown in Fig. 3. In the first two, the condenser rotor connection is added as described above. In the third — the circuit of a parallel-fed single tube amplifier — the plate coil is provided with a d.c. ground by connection of an r.f. choke between the center-tap of the coil and the negative high-voltage supply terminal.

It is extremely important in the circuits having positive high voltage applied to the condenser rotors (as well as in those in present use with blocking condenser separation of rotor from ground) that thorough and dependable insulation be used between the condenser rotor shaft and the tuning control. A serious hazard would otherwise exist.

to exist across each section of the tuning condenser and thus to contribute to high voltage peaks after the insertion of the blocking condenser between the “ground” wiring and the condenser rotor. The explanation of this fact is shown in the d.c. equivalent circuits beneath A, B and C in Fig. 1. As can be seen here, the sections of the tuning condenser are effectively in parallel, and in Fig. 1-B the parallel combination of these capacitances is in series with the blocking condenser across the supply voltage (d.c. or modulated d.c.). Since the usual capacity of the blocking condenser is in the neighborhood of 0.002 μfd. and the total capacity of the effective parallel condenser sections is usually 200 μfd. or smaller, the blocking condenser and the tuning condenser act as a voltage divider with nearly all — usually more than 90 per cent — of the supply voltage across the parallel sections (and thus across each section) of the tuning condenser, since the voltage across capacitances in series is inversely proportional to the capacities.

A simple remedy for this condition is shown in Fig. 1-C. Here, a connection is made from the positive supply voltage terminal of the amplifier to the rotor of the condenser. For d.c. and audio frequency currents, the effect of this is a connection from the rotor to the stators of the tuning condenser sections, a connection which definitely removes all except r.f. voltage from the tuning condenser.

Three split-condenser amplifier plate circuits with supply voltage removed by this method are
FIG. 5—OTHER CIRCUITS IN WHICH ONLY THE R.F.
VOLTAGE IS APPLIED TO
THE TUNING CONDENSER

FIG. 4—CHART FOR COMPUTING THE R.F. VOLTAGE
PEAK VALUE ACROSS A TUNING CONDENSER OR
SECTION OF SPLIT-STATOR CONDENSER

DETERMINING CONDENSER PEAK VOLTAGE

A chart for computing the r.f. peak voltage per section across single-section and split-stator condensers is given in Fig. 4. This chart applies to the circuits of Fig. 5 as well as to those of Fig. 3. If the circuit used in an amplifier corresponds to A or B of Fig. 1, the maximum value of supply voltage must be added to the r.f. voltage obtained from Fig. 4 to give the total peak voltage across a condenser section.

An interesting condition may be noticed in an amplifier using the tank circuit of Fig. 1-B, with keying. If the tank condenser spacing is computed without allowance for the supply voltage, the first contact of the key results in a flashover (and continued arc until the key contact is broken or the power is removed) of the tuning condenser. If the key is immediately opened when the arc occurs, and then pressed a second time, the arc is less likely to occur. After a few dots sent with the key, it is likely that no more condenser arcing occurs for an extended period. The explanation of this behavior is the fact that when an arc occurs in the tuning condenser, the d.c. voltage between the plates becomes smaller, and the voltage across the blocking condenser thus increases. As the charge of the blocking condenser approaches the supply voltage, the d.c. voltage across the tuning condenser sections

(Continued on page 78)
PROBLEM No. 21, announced in QST for September, is one of those which appear simple on the surface but which offer plenty of brain exercise when one gets down to practical application. One contestant suggested that Our Hero's problem was no problem at all, yet the solution submitted had limited application and offered little in the way of safety precaution. A few realized that a problem did exist and put their minds to work with gratifying results.

Those who submitted solutions were practically unanimous in the opinion that wires between units should be formed into a cable of some sort. Multi-conductor cable of the type used often in receiver service is satisfactory in low-power transmitters. Where voltages exceed five or six hundred, however, the positive high-voltage lead should have better insulation than that provided by the receiver cable. Automobile ignition cable is quite satisfactory for the purpose since it is insulated for several thousand volts.

The receiver type cable is also unsatisfactory for filament circuits carrying heavy current. Sometimes conductors in the cable may be paralleled to take care of moderately heavy currents. In general, it is usually preferable to make up a cable with the requirements of the job in mind. No. 14 to No. 10 wire with a small amount of rubber insulation may be used for filament circuits. A good grade of push-back wire may be used for all other wiring carrying less than 500 or 600 volts and wire such as the automobile ignition cable mentioned previously may be used for the higher voltages.

Manufactured multi-conductor cable is not so practical as cable made up for the job in many instances. It is common practice to place all meters in one rack unit and often it is necessary to make connections between one power-supply unit and two or more r.f. units. In cases such as these, the ready-made cable is rather difficult to adapt.

Various types of cable terminations which permit easy connection and disconnection of most transmitter units were suggested. One of the popular types of termination is the sort of plug which fits into a standard tube socket mounted on each transmitter unit. These plugs are obtainable with standard pin arrangements to fit any tube socket from the four-prong variety up to the eight-prong octal type. Discarded tube bases may be used for the same purpose. Insulation is sufficient for at least 500 or 600 volts. Pins may be connected in parallel for heavy filament currents. If the transmitter unit is mounted on a standard metal chassis, the socket may be sub-mounted at the rear or at one end. Since the plug is removed first, it does not interfere with removal of the unit from a rack of standard dimensions. With breadboard arrangements, the socket may be mounted on spacers and fastened to the baseboard with wood screws. This makes a neat and shock-proof arrangement for low- or medium-power transmitters.

FIG. 1—METHODS OF ELIMINATING EXPOSED POINTS ON PLUG CONNECTING STRIPS

A: Flathead screws are countersunk and the heads covered with an extra strip of insulation. B: Clearance holes are drilled in central strip and a third strip used to cover the exposed nuts when using the threaded type plugs. C: A metal shield is provided to cover exposed units.
Another type of termination which is more suitable for higher voltages consists of a strip of insulating material such as bakelite or masonite fitted with a series of phone tips or banana-type plugs which fit into a corresponding series of screws at the ends. The lower strip and the top strip which forms an insulating arrangement shown in Fig. 2. A clearance hole for each jack may be drilled in the chassis. If mounted at the end, it will be necessary to space the strip back from the surface of the chassis end so that the outside edges of the jacks will come flush with the end of the chassis. It is a good idea to do this anyway, to eliminate all exposed contacts. Both tip-jacks and jacks for banana plugs may be obtained with insulated grips and color coding. They provide greater flexibility than the strip-type mounting, since each wire may be changed at will. This arrangement is particularly handy for experimental hook-ups and works well in permanent wiring. A meter panel, in which each meter is provided with a pair of jacks, renders the meters immediately available for temporary use in external circuits.

Jacks for either tips or banana plugs may be mounted on each transmitter unit. If the transmitter is built up on standard chassis units, the jacks may be mounted on a strip of bakelite or similar material and the strip mounted in a cut-out at the rear or one end of the chassis, or a round clearance hole for each jack may be drilled in the chassis. If mounted at the end, it will be necessary to space the strip back from the surface of the chassis end so that the outside edges of the jacks will come flush with the end of the chassis. It is a good idea to do this anyway, to eliminate all exposed contacts. Both tip-jacks and jacks for banana plugs may be obtained with insulated tops and in a variety of code colors.

For exceptionally heavy currents, the “jumbo” type banana plugs may be required. For very high voltages, W6JTF suggests the unusual insulator arrangement shown in Fig. 2. A clearance hole is cut in the rear edge of the chassis to allow a stand-off insulator to be mounted backwards as shown. The jack in the top of the insulator is reversed so that the plug may be inserted from the outside. This arrangement completely eliminates any exposed “live” metal parts.

Standard 110-volt plugs and receptacles are favored for transformer primary connections and control wiring although it is quite possible that the tube-base plug and cable would fit into this service in some installations; 110-volt plugs and receptacles were also suggested by some for interconnecting units of the transmitter.

W8QED is responsible for the novel idea shown in Fig. 3. A horizontal row of plugs is mounted at the rear of the transmitter at the level of each transmitter unit. Vertical bus-bar wiring connects in parallel each plug at one level with corresponding plugs at the other levels. The
transmitter units are built to slide into the frame from the front on tracks fastened to the side of the frame. The rear edge of each unit is provided with jacks which make connections with appropriate plugs when the units are pushed into place. The jack arrangement at the rear of any particular transmitter unit will depend upon to which of the bus-bar circuits connections are desired. Voltages may be changed by altering the jack arrangement on the transmitter unit. Jacks are provided only at points at which connections are desired; at other points they are simply omitted. With this arrangement all voltages or external circuits are made available at each level.

Prize Winners
First Prize—Richard Ament, W6JTF
Second Prize—Earl V. Carlson, W8QED

We wish, also, to thank the following for their contributions: W1BLR, W1KKS, W1KWJ, W2HFB, W2IXQ, W2K0O, W3HHS, W4DFR, W5FWA, W8OMM, W8PUF, W9VQN, W9Y2G, G6TC, VE3SA, VE5UI, C. E. Schlosser.

Rules for the Problem Contest are repeated below:

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 April issue must arrive at QST before April 20th.) They must be addressed to 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, but must be neat and legible.

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 have the privilege, of course, of stating the supplies preferred.

—D. H. M.


Our Cover
(Continued from page 10)

Our amateur photogs were getting frantic as preliminary developments disclosed that the night of darkness was not going to be long enough for the necessary exposure. Seems as if maybe our tank circuits are pretty efficient these days. The amateur wireless men joined forces and suggested the "booster" shown above to cut down on the exposure time. That's how it was really done. The wireless men certainly produced more heat, but it's questionable about the increase in output!
AMATEUR radio in the U. S. differs considerably from that in New Zealand, and I am sure that other amateurs who have been privileged as I have to make a study of radio equipment and of technique here have been just as amazed and interested.

To my mind the comparative cheapness and accessibility of equipment in the U. S. is responsible for the most outstanding difference between stations in this country and elsewhere—the extremely high power in general use. I found that it is exceptional to find a station here not equipped with a fine communications-type superhet with e.c. oscillators, and more and more power. At the DX end, hams here have gone in receivers at the DX end, hams here have gone in crystal filter.

To force a signal through other competitive W signals and enable reception in the poorer receivers at the DX end, hams here have gone in extensively for such things as beam antennas, e. c. oscillators, and more and more power. Altogether one gains the impression that if the DX stations use still lower power, the American amateurs invest more dollars in their receiving equipment; and on the other hand, if the DX has difficulty in reception from U. S., he does not improve his receiver but rather waits for the American to improve his signal strength. This may seem quite unsporting on the part of the DX man, but is not necessarily so, for in N. Z., for example, equipment costs four times its price in the United States and, generally speaking, the amateur in N. Z. invests just as much in his equipment as his brother ham here. The resulting set-up is disappointing to the New Zealander when he reads QST and sees with envy the rigs in use here. He compares his set, probably full of makeshift gear, and, as he has already expended all the capital he can, he must, after improving his efficiency and operating to a maximum, be content to sit back and exploit the fact that he is in a DX country.
Coming Activities. Don't miss the following operating events:

- The A.R.R.L. Copying Bee, Friday, December 9th. See announcement elsewhere in this issue.

- A.R.R.L-Member QSO Party, week-end, January 7th-8th. The members in each Section who chat with most other A.R.R.L. members in the allotted time will receive a memento.

- A.R.R.L.'s Eleventh International DX Competition; Radiotelegraph Contest, March 4th-12th; Radiotelephone Section, March 18th-26th.

Use QMH-QHM-QML-QLM Plan of Operating. From a communications standpoint the crowding of scores of stations into a limited sector of any of the several bands of varying numbers of kilocycles is an unnecessary and unintelligent business. This is to call upon all amateurs, particularly those outside the U. S. A., to specify their method of tuning frequently to make all operating more pleasant and effective for everybody. To quote from a letter just received will make our point clear:

"During A.R.R.L.'s recent DX contests, QST advocated the intelligent use of QM1-LM-MH-HM * signals by the stations concerned. I have frequently made use of this excellent way of indicating how the receiver will be tuned after a CQ. To my astonishment many W stations have asked me the meaning of these new signals!"

"From Oct. 1st to 17th I worked 275 W stations, all operating between 14,300 and 14,400 kcs., approximately 27.5 stations per kilocycle! Many operators seem under the impression that unless they are right near the edge they miss a lot of DX. This is completely fallacious. Even on the most selective communications receiver it is impossible for all but the highest powered! Many U. S. A. stations are fortunate possessors of a selection of crystals, so why not use them?"

"It is to the interest of W stations wanting DX cards or new countries to spread their operation over their available territory evenly instead of crowding the band edge like sheep! I have called a non-existent W station "TO USE UR QTR FQY OF 14,320 KCS.' Then on that frequency, lo and behold, I often have found one or two stations piling there giving me a short call. From this I assume many DO have plenty of crystals or well calibrated master oscillators. This is a plea to U. S. stations on the 14-Mc. band to get off the high edge of the band. Also to bring into popular daily use the whole 'QHM' series of signals to indicate how the receiver will be tuned."

-F. E. Handy, Communications Manager

The above speaks for itself. The writer observes in his letter that there should be more occupancy between 14,235 and 14,380 kc. in this band, and we observe that improvement ought to be effected similarly in other amateur bands. "SS" and ORS contest operating make other cases in point just as important as the excellent example. The remedy is to use all our frequencies, to use and insist that others use the convenient tuning indicators suggested. We again earnestly recommend them to your attention for use by all amateur operators—to make results for each one of us better, good QSOs easier.

-Briefs

For code practice at the higher speeds W1HRE offers transmissions at 4:00 A.M. EST, each Friday, 5585 kc., 15 to 30 w.p.m.

- W6OFD took some time out to examine W8MYK's log of the 1937 Sweepstakes Contest and he brings to light what is probably a record for "Working All States." During the '37 SS, W8MYK contacted all states, plus Alaska, Hawaii, P. I., and all Canadian districts, in 29 operating hours 11 hours and 30 minutes of operation found all states worked with the exception of Nebraska, Georgia and Louisiana. Also during the '37 SS, W9LEZ claims a "worked all W districts" record; on November 21st, between 1:42 and 2:36 A.M., he worked on Q's, in order, W3NF, W5FZD, W9FFU, W7EUY, W4DAR, W2JCB, W1APA, W927ST and W9CXX ... but the real satisfaction for W9LEZ came from the fact that he wasn't making any attempt to work all districts in record time.

W3EWE makes the observation that it is quite possible to Work All States without a W2 QSO!
The article by Mr. John Allan Bryant, W4DGC, 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, fraternization, 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 today!

For Sick C.W. Operating
By John Allan Bryant, W4DGC*

It SEEMS that something has happened to the quality of c.w. operating in Amateur Radio. A listen to the c.w. frequencies will soon prove that the above statement is true.

About 2:00 A.M. one morning while listening on 7 Mc. in hopes of a little DX or a good rag chew I heard a fairly weak signal, MODERATELY slow, about 10 or 12 w.p.m., and wasn't exactly like tape sending; in fact, quite a few c.w. operators in Amateur Radio. A listen to the c.w. frequencies will soon prove that the above statement is true. The fast demon he is going too fast if you can't copy the speed.

4. Avoid unnecessary repetition of reports, QTH, etc.
5. Avoid long transmissions; who knows, QRM may have covered you up and you may just be wasting electricity.
7. Use "R" when you have received the other fellow's transmission completely, not when you haven't.
8. Use ham bands for pleasure and not for profit.
9. Remember that the age of mental telepathy is not yet here, so the only way you can get your dope across is with good clean cut sending.
10. You are in ham radio for the pleasure in it—so is the other fellow. Help him get pleasure from working you and you will get yours automatically.

O.R.S./O.P.S. '37-'38 All-Season Competition Winners

Vic Clark, W6KFC, was first-prize winner (NC-81X receiver) in the O.R.S. All-Season Competition for the best overall performance in the seven-month period, October '37-May '38. Scores were based on a consideration of (a) Traffic totals; (b) quarterly party scores; (c) number of A.R.R.L. "official list" stations (ORS, OPS, Directors, SCM's, R.M.'s, PAM's, etc.) worked between the dates of quarterly parties, and (d) consistency of reports to the S.C.M., new appointees enrolled, contributions to QST, etc. W6KFC's points totalled 1216.

Second high was W2JHB with 1002 points, third high W4DWB, 728, followed in turn by W4PL, W6IOX, W6LMD, W8OFQ, W1JOT, W5EOE and W7CCQ, comprising the "high ten." W4PL led in Traffic with a total of 12,563, handling more traffic during the seven-month period than any other single-operator station which was second in Traffic. W4DWB made the best showing in the quarterly parties, W2JJB was well out in front in QST contributions, etc., and W6KFC worked the most stations "between parties." Congratulations to all winners!

In the Official Phone Station group, George R. Stray, W61WU, won the All-Season award for the best performance, choosing as his prize a D-5-T high-impedance dynamic microphone. Scoring was for (a) station data submitted; description of equipment, operating points, etc.; (b) quarterly O.F.S. test performance; (c) number of "official list" stations worked between quarterly tests, and (d) work in various A.R.R.L. activities, enrollment of new appointees, article contributions, etc. The arrangement for low power operation, and good engineering features brought to be 590 and the receiving operator is extremely egotistical if he hasn't received your QTH the first two times he probably won't get it the next two times you repeat. Another thing: you may want to become a member of the celebrated "Rag Chewer's Club," but don't try to get the required half-hour QSO in one transmission! I've stood by for as long as 45 minutes while some guy proceeded to elucidate to his heart's content. And the amazing thing is that I still had strength enough to reply, although I had already forgotten most of what he said.

Those of you that use self-excited rigs with frequency wabbulation and T1 notes might have taken wrong something I once read in the April 1933 issue of QST. It went something like this: "Show your independent spirit—R.A.T., forever, etc." Yeah, but brother remember—"for everyone person that is admiring your "independent spirit" and R.A.C. signal, there're 10 guys cursing your 10 kc. wide QRM and flea bitten hide. That little gem was published in the April Fool section of QST in case you didn't notice. It was under the caption "Goof Operating."

Here are my '10 commandments of ham radio.' Give 'em a try and see how well they work:

1. Avoid CQing without signing your call frequently. The A.R.R.L. method of sending CQ three times and signing your call three times is best.
2. Avoid sending "combinations" of letters, thereby helping yourself to get the idea across to the other fellow easily.
3. Tell the speed demon he is going too fast if you can't copy the speed.
4. Avoid unnecessary repetition of reports, QTH, etc.
5. Avoid long transmissions; who knows, QRM may have covered you up and you may just be wasting electricity.
7. Use "R" when you have received the other fellow's transmission completely, not when you haven't.
8. Use ham bands for pleasure and not for profit.
9. Remember that the age of mental telepathy is not yet here, so the only way you can get your dope across is with good clean cut sending.
10. You are in ham radio for the pleasure in it—so is the other fellow. Help him get pleasure from working you and you will get yours automatically.

* 1579 Southern Ave., Memphis, Tenn.

December, 1938

45
out in W6IWU's report of arrangements and attention helped him to lead the first classification (a). His total score was 1302.

W8LQG was second high O.P.S. with 1239, W7TWA third with 547. W8LQG, in addition to Section leadership of quarterly tests for three consecutive times, made two national records heard W7THY and W8DLYX. Made the "second", made highest (c) under classification (b). W8IWU won most points under classification (c). W8TWA being second in this factor. It was a well fought contest, with splendid rivalry. Congratulations, all!

Aircraft Warning Service

While on duty at Fort Bragg, N. C., October 2nd-15th, in connection with the Joint Antiaircraft-Air Corps Exercises, Capt. David Talley, Sig-Res., W2PF, organized a network of amateurs in the eastern part of North Carolina to function as an Aircraft Warning Service Radio Net. This net was used in conjunction with the 375 civilian and Reserve Observer officers to report sighting or hearing aircraft. Some two dozen amateur operators participated and were of considerable value. When a "blackout" was ordered on the night of October 12th, amateurs were used to notify many towns which had no telephone observers.

L. I. Railroad Emergency Net

George F. Gaynor, W2AZM, A.R.R.L. Regional Emergency Coordinator, has organized an emergency network for the Long Island Railroad. Operation is in the region 3550-3590 kc. Organization is by counties and by towns. Stations are needed in every town where there is a Station Master of the L. I. R. R. Volunteers are requested and should apply to W2AZM, 214 B, 117th St., Rockaway Beach, N. Y., for complete details.

Glacier Park District Convention

One hundred and fifteen licensed amateurs, and more than 200 persons, including YF's, YL's and friends, attended the Glacier Park District Convention at Two Medicine Camp, Glacier National Park, Montana, July 16th and 17th. It was a busy week-end, thoroughly enjoyed by all. Amateurs were present from such outside points as Canada, North Dakota, Idaho, Pennsylvania, Michigan, Nevada and Washington. Saturday activities featured short speeches, a lost treasure hunt with 86-Mc., sech, community ring around the campfire, and motion pictures of the Park and the 1937 convention. 1.75- and 3.9-Mc. rigs were operated from the Park and on the Continental Divide atop Going-to-the-Sun Pass until daylight Sunday. Sunday morning found the gang engaged in taking advantage of a boat trip to the upper end of Two Medicine Lake, from there hiking to view the Twin Falls. A tug-o-war, soft ball game, an auction sale, bingo for the ladies, and much general hamfesting made the day pass quickly. The affair was climaxed, as are most successful hamfests, by the prize distribution. Plans are already afoot for the 1939 gathering, to be held at Avalanche Basin Camp, the third week-end in July. Those at this year's affair will surely be back for more.

Briefs

Here is one of those "things that couldn't happen but did." One afternoon during September W1JRW and W2KFA heard W2HYY and W8DLYX on opposite ends of the 7-Mc. band calling the same station (WSLQY) at the same time, with the same signal strength, note, speed, fist, etc.!

W3EP and W3FIS on June 6th/6th had a rag-chew lasting 4 hours and 5 minutes (9:24 P.M., 5th to 1:39 A.M. 6th). This was on 3.6-Mc. c.w.

For the fourth consecutive year amateur radiophone operators cooperated with the Los Angeles Fire Chiefs and Junior Chamber of Commerce members during National Fire Prevention Week. Fire officials, gathered at various amateur stations, swapped yarns and told what they were doing along educational fire-prevention lines, W8AM, Long Beach, Calif., this year acted as key station. Others participating in the hook-up on October 13th were W3DGW, Washington, D. C.; W5FDD, Dallas, Texas; W9URK, Chicago; K6NZEQ, Honolulu; W9UUS, Denver, Colo.; and W6DXX, Salt Lake City, Utah. Also cooperating were W6MYO, W1LI, K0ILW, and V4AEQ.

Communications Act Violations

A series of cases involving violation of the Communications Act of 1934, as amended, are now under investigation by the F.C.C. or pending in the Federal courts throughout the United States. A recent case to be completed is that of Harry W. Smith, who entered a plea of guilty on October 18, 1938, in the United States District Court, Boston, Mass., to an indictment on two counts charging unlawful radio operation in violation of Sections 301 and 318 of the Communications Act of 1934, as amended. On the first count the defendant was fined fifty dollars. On the second count the Court sentenced defendant to be imprisoned for six months but suspended such sentence and placed the defendant on probation for a period of one year. Smith, an unlicensed operator, had been bootlegging amateur calls and using objectionable language on the air.

In Australia, a citizen who talked to relatives in England through an amateur station was convicted and fined £20 and the ham (VE2YQ) had his license cancelled. The charge was "use of an amateur station for purposes other than those of an experimental nature."

Andean Anthropological Expedition

The Andean Anthropological Expedition is a non-profit organization incorporated for the advancement of science. The Expedition is sponsored by the Arizona Anthropological Association and the University of Arizona, and has the endorsement of twelve other universities, nineteen governmental agencies and eleven museums, besides many leading scientists. Under the Directorship of Dr. Robert E. Soroloth, F.R.G.S., the Expedition will conduct its investigations on the eastern slopes of the Andes mountains on the headwaters of the Amazon River in Ecuador and Peru. The first base headquarters in Ecuador will be established at an altitude of 3500 feet. Here permanent headquarters will be constructed to house the Expedition personnel. Radio equipment will be installed to maintain communication with the United States and the various field parties. Lloyd M. Denmick, W7TLX, is in charge of the radio set-up. He writes that they expect to depend a great deal on amateurs to handle traffic "back home." Radio equipment will include a 15-watt portable with hand-cranked generator for power, and a 100-watt rig powered by a gasoline driven generator. The exact Expedition sailing date has not been set but this information, together with the call letters, frequency and operating times, will appear in QST as soon as available.

On or about December 10th the S.S. California, KDRC, while off boat, will leave Port Arthur, Texas, for the Antarctic Ocean, on a voyage of about four months. Radio operator Ishea Johnson, W9AM, will have a rig on 28-Mc. phone and c.w., and hopes to make many contacts with amateurs from the Antarctic. Watch for W9AM on 28 Mc.

American Emergency Net

W1PI, Hyde Park, Mass., is Net Control Station of the American Emergency Net, a group of amateurs who are
training themselves for emergency operation. A second district 7-Mc, section of the A.R.E.N. drills every Wednesday at 9:30 p.m. and Sundays at 10:30 a.m., with W2JVK, Brooklyn, N. Y., as control station. W2JVK operates on 7282 kc. and covers the entire band for calls from new members. If interested, tune to 7282 kc. at the specified times and listen for instructions.

**Amateur Service**

The B.P.L. list in QST each month tells only a part of the story. There are a number of outstanding operators, particularly on the West Coast, whose available time is so used up in message work that they have time for little else. Ask their wives! These men, together with those who find time to report their monthly activities, form a group as outstanding as the Emergency Gangs which step into catastrophe pictures from time to time. The DX-TFC group, however, is slightly different in that it operates full speed all the time and never stops.

To those who enjoy traffic work above all else, finding a place in the DX-TFC group is a natural step. In rendering a continuous service of this sort, more than usual accuracy is necessary all along the line. For really fast service, the ideal is to have a minimum number of relays, with immediate distribution. DX-TFC volume generally allows little time to run other schedules.

Of the two types of circuit, DX and Local, the DX also appears to be the most accurate, probably due to an increased feeling of responsibility on the part of the men involved. However, too often those working DX-TFC are inclined to feel too “highhat” to ask for repeats where there is the slightest doubt. Pride in working this DX-TFC cannot be justified if personal feelings are allowed to creep in and interfere with accuracy. The man who will not “work like a dog” to get it right, is a millstone around the necks of everyone else working the circuit. A service, like a chain, is as strong as its weakest link, and cannot be entirely successful unless every link is above reproach.

Whether we acknowledge it or not, there is in us all a latent urge to serve others. Those of us who are hams have a magnificent medium for so doing. But to be really satisfactory, and not just “mess around,” our whole hearts must be in it FOR THE SERVICE AND NOT FOR THE SATISFACTION.

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**1.75-Mc. DX**

(G2PL advises via WIBB that he will be on 1730-ccc., e.w., Sundays, between 0000 and 0050 GT [Midnight EST. Saturdays to 1:00 a.m., EST, Sundays] beginning October 9th and continuing every Sunday through January, 1939. He will be looking for DX contacts, both phone and c.w. G2PL also reports V8SRD on 1.75 Mc. at odd hours, attempting DX contacts. A series of 1.75-Mc. tests for February, 1939, are being arranged by G6FO and WIBB. Full data later.)

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**Club Broadcast—1310-kc.**

The San Joaquin Valley Radio Club of Fresno, Calif., is presenting monthly broadcasts over KARM, 1310 kc. These broadcasts are on the Wednesday before the club meeting, which falls on the second Friday of each month. The time is 11:30 a.m. to Midnight, PST. The program consists of club news, A.R.R.L. news, announcements, interviews, chatter, etc. Everyone is invited to listen in and, if possible, attend the broadcast at KARM.

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**O.B.S.**

The following is a supplement to the list of A.R.R.L. Official Relay Stations in October QST (page 71): W1DWP, W3GCU, W4RCG, W5GNV, W7BOZ, W7CZY, W7GFH, W8AIA, W9AUH, W9IAW, W9YVE, W6MIK.

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**BRASS POUNDERS’ LEAGUE**

(September 16th—October 15th)

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**MORE-THAN-ONE-OPERATOR STATIONS**

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**W1TR (W9HMA)** made the B.P.L. on 102 deliveries.

**MORE-THAN-ONE-OPERATOR STATIONS**

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**A.R.S.**

**W1TR (W9HMA)** made the B.P.L. on 102 deliveries.

**Police Operators Net**

3715 kc. is the official gathering-place for those amateurs who by profession are operators of Police Radio Stations. “QPO” is the general call of the Police Operators Net, now being organized on that frequency. The primary purpose of the net is fraternalism, to afford police operators the opportunity to more easily contact one another and exchange the word of the day. A secondary purpose is to provide a auxiliary emergency network, one which would coordinate police facilities with amateur facilities. One of the leading lights in the organization of the P.O. Net is Ken Conroy, W8DYH. He invites all police operators to get in touch with him by mail at 18030 Waltham Ave., Detroit, Mich., or on 3715 kc. and call “QPO.”

**Banquet-Hamfest**

On Saturday evening, December 10th, the Mid-Hudson Amateur Radio Club will hold the Fourth Annual Banquet and Get-Together of Hams of the Hudson Valley. The Place: Nelson House, Poughkeepsie, N. Y. The Time: 5:00 p.m. Registration: 6:30 p.m. Banquet. The cost is $1.50 per fellow (stag). George Brown, W2CVV, of the Radio Department of the General Electric Co., Schenectady, will be the main speaker. There will be a turkey dinner, a number of door prizes and plenty of good fellowship and ham spirit. Reservations should be sent to Don Love, W2EX, 308 Church St., Poughkeepsie.

December, 1938
A.R.R.L. DX Century Club Rules

The following have submitted proofs of contacts with 75-or-more countries:

(1) All contacts must be made with stations working in the authorized amateur bands using amateur calls.

(2) In cases where countries where amateurs are licensed in the normal manner, credit may be claimed only for stations using regular government-assigned call letters. This shall not militate against claimed credits for contacts prior to publication of this section that might otherwise have been claimed earlier.

(3) All contacts must be "land stations" contacts with ships, anchored or otherwise, cannot be counted.

(4) All contacts must be made from the same state or call area, where such areas exist, or from the same country in cases where there are no call areas.

(5) The A.R.R.L. list of countries, printed periodically in QST, will be used in determining what constitutes a "country." (January, 1938 QST, will contain the revised updated list.)

(6) In cases of countries no longer in existence, credit will be allowed for these, if they were recognized as separate entities at the time of contact.

(7) Confirmations must be submitted direct to A.R.R.L. Headquarters for all was the same.

(8) Sufficient confirmations of other types must be submitted with the application. In order to insure that enough postage be sent to make possible their receipt as received, and the original listing will be changed in sub­sequent lists.

(9) The Century Club award and QST listing for confirmed contacts with 75 or more countries is available to all active amateurs, everywhere in the world.

(10) Following the first listing of any station in QST, confirmations from additional countries may be submitted as received, and the original listing will be changed in sub­sequent lists.

(11) Stations reaching the 100-confirmations mark will automatically be enrolled in the DX Century Club.

(12) Sufficient postage for the return of confirmations must be forwarded with the application. In order to insure the safe return of large bunches of confirmations it is suggested that sufficient postage be sent to make possible their return by First Class Mail, Registered.

(13) Address all applications and confirmations to the Headquarters for all countries claimed. Confirmations, from foreign contest logs may be requested in the case of the A.R.R.L. International DX Competition only, subject to corrections, DX Contest Results

In the November QST list of scores, 1938 A.R.R.L. DX Competition, W9PWH's call appeared erroneously in the Wisconsin C.W. tally as W9PWH. In the Monthly C.W. C. list, W3FEEW was shown as W3EWEW. W9CIS, shown as using more than 500 watts, should have been reported in the 100-to-500-watt classification. W9DM, Northern Texas C.W. winner was listed as W9DN.

as they now stand are effective with publication of this issue of QST.

MEMBERS, DX CENTURY CLUB

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The following have submitted proofs of contacts with 75-or-more countries:

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Corrections, DX Contest Results

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QST for
How’s DX?

How:

We don’t intend to turn this into a cooking column, but we ran into a recipe the other night that is worth passing along. It was originated by some of the lads out on the west coast a few years back. We got our first taste of it just recently—it was the first time anyone had prepared it here in the hurricane belt—and liked it a lot. The ingredients for this “DX Cocktail,” as it might be called, are simple and readily available: an active radio club with a predominance of DX men, to sponsor the thing; invitations to the DX men within a hundred miles or so, a program devoted to DX subjects like antennas and such, and a suitable meeting place and a popular chairman to handle the thing. Toss the ingredients together and prepare to enjoy yourself. It’s as easy as that. You’ll notice that this recipe differs from most in that there’s no mention of “mix well.” That’s one thing you don’t have to worry about. Just get a hundred or more DX men together, and they mix from the word “hello.”

The only thing you might not like about the DX Cocktail is that there’s no mention of “mix well.” That’s one thing you don’t have to worry about. Just get a hundred or more DX men together, and they mix from the word “hello.”

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Where:

We learn that the F.C.C. is beginning to assign the new Pacific Island prefixes, and naturally we’ll want to know what they are. To simplify, we’ll give you all the possessions prefixes.

K4 Puerto Rico
K8 Virgin Islands
K5 Canal Zone
K6 Territory of Hawaii
K8 Philippine Islands
K6 Guam
K6 Wake group
K8 Midway Islands
K6 Johnston Island
KF6 Baker Island, Howland Island, Am. Phoenix Islands
K6 Jarvis Island, Palmyra group
K6 America Samoa
K7 Alaska (Including Pribilof Islands)

Incidentally, this will explain to you why we haven’t mentioned which Pacific Islands are grouped with which for the Century Club—we wanted the grouping consistent with the F.C.C. grouping. The countries list (we’ll repeat it again next month) will group them as above . . . . . . G6Wy says that the genuine ZB2A (14,500 T9) operated from September 26th to October 14th, at which time he returned to England. So if you got him during that time you got a real one.

We tasted the thing at Edgeport—they call them “DX Round-Ups,” too (as though you hadn’t guessed!). They’re “nechy stuff!” if we may be allowed to coin a phrase, and are recommended highly.

When:

Take off the phones a minute and look out the window. Yes, it’s getting near winter, and that means 3.5-Mc. DX. To start the cards rolling, G2Pls says, via W1B, that he’ll be on Sundays at 0500-0600 GMT through to February; looking for W6, W9 and W3. W5GUL worked G1B6K on 80 last week, and G5T6IM says, via W2LA, that he got cards from ZBICT via QST.

There’s a lot of good stuff to be picked up on 40. W3JSU knocked off YS6NJ (7175 T5), VP2LZ (7175 T5) and HZL2D (7130 T5), and W6GPGL got ZS3B (1970 T9), KA4LH (7050), KA1AX (around 7170) and P4A4KS (7025). W8LZ worked KA1AX at 7035 ks., and says 1AX looks for DX every night around 1130 GMT . . . . W7SNW kept a nked with LUTA4X on 40 with good signals both ways . . . . W3ATR says Europeans are a cinch, since apparently none of those 40 cards after DX, and he’s raised ‘em in all parts of the band from the low end. Europe’s best around 6 p.m. or 1 a.m., and South America comes through around 10-11 p.m. . . . So there’s our case, gentlemen. Give it a whirl.

And don’t pass up 10. Africa and Europe is coming through from Maine to California, with stuff like ZElJI, YS2LR and TF5C, according to W6MCQ, W4MR and W2GMM. W8VSL and V4Q1S, according to W0M6C, W4MR and W2GMM, are on the air who says to QSL via A.R.L.L. because he’s undercover. We haven’t heard from him yet, however . . . . The N. J. gang has been knocking off XU4AX (14,280 T9) during the evening. The story is that he’s about 1500 miles inland over there.

December, 1938
ELECTION NOTICES

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

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

In cases where no valid nominating petitions have been received from A.R.R.L. members residing in the different Sections in response to our previous notices, the closing dates for receipt of nominating petitions are set, and the date given hereunder is the deadline for receipt of nominating petitions and the holding of an election by ballot.
Tribute

Hartford, Conn.

The death of Ross A. Hull is deeply regretted by the members of the Hartford County Amateur Radio Association, many of whom were personal friends of Mr. Hull. By his friendly cooperation in helping many of us solve our problems, technical and otherwise, we have been placed under an indebtedness to him which we shall never be able to repay. Mr. Hull's untiring research has benefited, in one way or another, not only the radio fraternity but mankind in general. We of the Hartford County Amateur Radio Association extend our sympathies to his associates at the American Radio Relay League Headquarters and to Mr. Hull's family.

—The Hartford County Amateur Radio Ass'n

HOUSTON, TEXAS

PLEASE CONVEY OUR DEEPEST SYMPATHY TO FAMILY OF OUR LATE ROSS HULL. HIS DEATH IS A GREAT LOSS TO AMATEUR RADIO.

—HOUSTON AMATEUR RADIO CLUB

ST. PAUL, MINN.

PROFOUNDLY SORRY TO HEAR OF YOUR GREAT SORROW. SINCERE SYMPATHY.

—THE ST. PAUL RADIO CLUB

Columbia, S. C.

At its last meeting The Palmetto Amateur Radio Club, Inc., adopted the following resolution:

"Be it resolved that the Secretary of the Club extend to the Executive Committee and members of the Headquarters staff its deepest regrets at the untimely death of the Editor of QST, Mr. Ross Hull. His loss, coming as it does at the beginning of the season's activity, will be felt most keenly. His contributions to amateur radio, the League and to QST have made his name well known among amateurs, who mourn his passing."

—The Palmetto Amateur Radio Club, Inc.

Ridgewood, L. I., N. Y.

We wish to express our deepest sympathy at the untimely death of Ross A. Hull. A gap has been left in the ranks of "ham" radio that will be difficult to fill.

—The Queens Radio Amateurs

CAMDEN, N. J.

THE SOUTH JERSEY RADIO ASSOCIATION SENDS SYMPATHY ON THE BEAVERMEATH OF ROSS HULL, TECHNICAL EDITOR OF QST, WE REQUEST THIS TELEGRAM BE FORWARDED TO NEAREST RELATIVES.

—THE SOUTH JERSEY RADIO ASS'N

CHICAGO, ILL.

WE AND ALL OTHER CHICAGO AMATEURS EXTEND SYMPATHY IN THE UNTIMELY DEATH OF ROSS HULL.

—SOUTHTOWN AMATEUR RADIO ASS'N

Baltimore, Md.

We are very sorry to hear the bad news of Ross' death and send our condolence. Amateur radio has lost a great friend.

—Mike and Key Club

CONCORD, N. H.

OUR TENDER DEEPEST SYMPATHY IN THE LOSS OF ROSS HULL.

—MERRIMACK VALLEY AMATEUR RADIO ASS'N

ROCHESTER, N. Y.

TO THE QST STAFF WITH THE DEEPEST REGRETS ON THE UNTIMELY PASSING OF ROSS HULL. A GREAT AMATEUR AND A GREAT GUY, HE DIED WITH HIS BOOTS ON. PASS OUR SENTIMENTS ON TO HIS FOLKS.

—ROCHESTER AMATEUR RADIO ASS'N

SYDNEY, AUSTRALIA

HULL'S LOSS INESTIMABLE. DEEPEST SYMPATHY.

—ZERO BEAT RADIO CLUB
MARICKVILLE, N. S. W., AUSTRALIA
WE DEEPLY REGRET UNTIMELY DEATH ROSS HULL, A GREAT LOSS TO AMATEUR RADIO.
—N. S. W. DIVISION W.I.A.

Rapid City, S. Dak.
The members of the Black Hills Amateur Radio Club wish to convey to the Headquarters staff their deepest sympathy for the recent tragic death of Mr. Ross A. Hull. We know that his loss is a severe blow to the A.R.R.L. and to the amateur fraternity throughout the world. Although it was not our privilege to know him personally, we were well acquainted with him through his work. His passing leaves a gap in the amateur ranks which will not soon be filled.
—Black Hills Amateur Radio Club

Milwaukee, Wis.
The Milwaukee Radio Amateurs' Club wishes to extend to Headquarters its deep regret in the loss of so fine a man as Ross Hull. Will you please convey to his family our condolences and sincere sympathy.
—The Milwaukee Radio Amateurs' Club

New York City, N. Y.
At our last regular meeting, the writer was instructed to convey to you our sincere although somewhat belated condolences on the death of the Editor in Chief and Business Manager of QST, Mr. Ross A. Hull. The passing of Mr. Ross A. Hull will be keenly felt by amateur radio and by the members of the radio manufacturing industry. It was my pleasure to know Ross personally and I know many members of our group were familiar with his achievements and we all keenly feel our loss.
—Sales Managers Club, Eastern Group

Montreal, P. Q., Canada
We have learned with deep regret of the recent death of Mr. Ross A. Hull, Editor of QST Magazine. On behalf of our club which is affiliated with your League, I wish to express our heartfelt sympathy, and would greatly appreciate it if you would be kind enough to convey same to the family of the late Mr. Hull.
—Les Amateurs Canadiens Francoises de la T. S. F.

Brooklyn, N. Y.
The Radio Club of Brooklyn at its first Fall meeting held Friday, Sept. 23rd, instructed me to extend to you the sincere sympathy and condolence of each and every one of the membership. The ranks of amateur radio operators and experimenters have lost a highly regarded companion and friend.
—Radio Club of Brooklyn

Vancouver, B. C.
It is with the deepest regret this association learns of the tragic death of our mutual friend and fellow amateur, Ross Hull. In expressing our condolences to all who were his personal friends, we know we join thousands of world-wide "amateurs" in paying final respects to a gentleman, a genius and a friend, whose place in American Radio Relay League will be, not only difficult, but impossible to fill.
—Point Grey Amateur Radio Club

The news of the sad death of Mr. Hull came to hand just before the date of our Annual General Meeting; and at that meeting I was instructed to convey to you the profound grief of the Radio Transmitters' Union of Northern Ireland at the loss of such a distinguished Radio Amateur and illustrious experimenter, together with our sincere sympathy with his relatives and with A.R.R.L. in their loss.
—Radio Transmitters Union of N. Ireland

It was with great regret and sorrow that we learned of the death of Ross Hull. He was truly the amateur's friend and we are on common ground in the loss of a great man. He leaves us with the memory of a life's work well done.
—Union County Amateur Radio Ass'n, Inc.

Toronto, Ont., Canada
I have been requested by the Executive and Members of the Club to write you expressing our deep regret of the passing of Ross Hull. The announcement caused a rush to fall over our last meeting which expressed better than any words the loss suffered by his family and the A.R.R.L. Please express our deepest sympathy to all concerned.
—Toronto Short Wave Club

Percy Berry, Sec'y

Victoria, B. C., Canada
We learn with deep regret of the sudden passing of Ross Hull, with whom we all felt in close touch, through his many articles in QST. Permit me to extend to you the sincere sympathy of our members for the loss of a brilliant member of your staff.
—Victoria Short Wave Club

Henry R. Hough, Sec'y, pro tem.

Berlin-Dahlem, Germany
I just learned from Mr. Slawyk the bad news of the accidental electrocution of OM Ross Hull. The D.A.S.D. with all its members wishes to express the deepest regret to the passing of this most extraordinary amateur.
—Deutscher Amateur-Sender-u. Empfangs Dienst e. V.

H. Gebhardt, President

Environ's Norm.—Several hundred messages of sympathy concerning the death of Ross A. Hull have been received at the headquarters establishment from individual amateurs and members of the radio fraternity the world over. These are gratefully acknowledged on behalf of the Hull family and his friends and associates.

Visiting Ethics

Belleville, Kansas

Editor, QST:
Many articles have been written on the operation of ham rigs and the way a ham should conduct himself on the air. Even the ham's code tells of how a ham should conduct himself at school, work, home and other places. But how many books tell us how to act when visiting some other ham whom we have known on the air? After building up a friendship with another ham in some distant part of the country, perhaps we get a chance to meet him unexpectedly. Of course he is delighted, and greets us with all the warm friendship and hospitality that it is possible for one friend to hold for another. Being interested in precisely the same thing, we both head for the shack where he proudly exhibits the apparatus that has made our friendship possible.

Now, whether you realize it or not, right then is when you will either form a lasting friendship or—no. Doubt you will want to keep him for a friend, so here is an example to follow:

It stands to reason that the ham is fond of his equipment even if the transmitter is old and antiquated, and he should be. If he weren't just a little bit that way about his equipment, would he be a true ham? No. .

The visiting ham should, on entering the shack, let the host do the talking while the guest listens. Doubtless the host will have plenty to say about his rig, so remain quiet and attentive until he has finished before starting on a tour of inspection. When he has shown you the more "elaborate" details, it is usually safe to start the inspection tour. But whatever you do, don't act as if you own the rig. By that I mean don't throw every switch you come across to see what will happen.

(Continued on page 64)
A COIL is the one thing that about every amateur makes sooner or later. He may buy almost everything else that he needs ready-made, but if he does any experimenting at all he will have to wind a coil some day. Most likely he will have to wind a lot of coils. Such being the case, we are going to make a few observations on coils and resonant circuits this month. None of it will be new, and much of it will be rule of thumb, but we think it will be useful.

First of all, make the coil as large as you conveniently can, for large coils have higher $Q$ than small ones. This applies particularly to the coil diameter. When the coil is inside a shield, the latter should clear the coil everywhere by a distance at least equal to the coil radius. Such a shield will reduce the inductance not more than 10 or 15 per cent, and will reduce the $Q$ even less.

The length of the coil is not particularly critical. The statement is often made in handbooks that the ratio of diameter to length should be 2.46 to 1, because this ratio gives the highest inductance for a given length of wire. However, the coil diameter is usually the limiting dimension in practical cases. For a given coil diameter, the $Q$ increases rapidly as the length is increased up to the point where the length is about equal to the diameter. Beyond this point the improvement is less marked.

A number of experiments have been made to determine the best wire size. Various investigators do not agree exactly, but it is pretty well established that the spacing between the turns should be slightly less than the diameter of the wire. The table above gives wire sizes in relation to turns per inch, and comes very close to giving the optimum values.

All of the above applies to single layer coils (solenoids).

Recently there has been a growing trend away from crystals in favor of stable master oscillators for controlling transmitter frequency. This is very convenient for shifting frequency, and is FB if it is carefully designed and operated. For any such purpose as this, the oscillator *must* be stable. We often hear the statement made that it is not necessary to design oscillator tank circuits for high $Q$, the idea being that it does not make any difference how many watts are used provided that the tube can supply them. This is not the whole story, for stability depends largely on the circuit $Q$.

Without going into the matter too deeply, it can be said that all losses (and load) on the oscillatory circuit should be kept at a minimum if constant frequency is the goal. This is why electron-coupled oscillators and MOPA systems are used for stability, —they remove the load from the oscillatory circuit. It is why grid current should be low. It is why plate resistance should be high.

Of course, the calibration of an oscillator is affected by such things as temperature, ageing, interelectrode capacity in the tube, etc. These effects are of a mechanical nature, and can be minimized by good mechanical design. The main point we want to make, however, is that frequency is also affected by plate voltage, filament voltage and the like. The amount it is affected by them is inversely proportional to the circuit $Q$. So use the best coil and condenser you can get.

JAMES MILLEN
Rugged! Dependable! 
Conservatively Rated!

MALLORY 
Vitreous and Varlohm RESISTORS

Mallory Fixed Vitreous Resistors, type HI, provide a standard unit for all transmitter, amplifier, and industrial applications. The small-sized resistors, 1HJ (10-watt) and 2HJ (20-watt), are furnished with pig tails and lugs for mounting or connection. The larger resistors, 5HJ (50-watt), 10HJ (100-watt), and 20HJ (200-watt) have connecting lugs only, and are supplied with convenient mounting brackets. Mallory Vitreous Enamelled Resistors can be depended on to provide long, uninterrupted service.

Mallory Varlohm Adjustable Resistors, type AV, incorporate all the quality features of the Mallory HI type of fixed resistors. Because of their adjustable feature these resistors are valuable for use in radio transmitter power supplies and general experimental work.

The adjustable clip supplied with each resistor is specially designed for ease of adjustment, and to prevent injury to the resistance wire while providing proper electrical contact. Additional clips are available. Two convenient mounting brackets are supplied with each varlohm resistor.

P. R. MALLORY & CO., Inc. 
INDIANAPOLIS, INDIANA
Cable Address — PELMALLO

Portable or Emergency Rig

(Continued from page 20)
volts on the plate, the current will run between 65 and 70 ma., loaded. Unloaded it drops down to 5 or 10 ma.

There is no reason why the unit should be set aside for emergency use only. It makes an excellent exciter unit, drive for the following stages being taken from the antenna leads. Using a plug on the end of the power-supply cable, the unit can be unplugged from the regular transmitter and put into operation with the emergency supply at very short notice. If 14-Mc. output from the unit is contemplated, it is advisable not to key the oscillator but some following stage, because the keying chirp becomes magnified and objectionable at this higher frequency.

The final amplifier is practically as efficient doubling as it is working straight through, and thus two bands can be worked with any crystal—the crystal frequency and the second harmonic. This permits a good range with the four crystals the set accommodates.

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Correspondence Dept.
(Continued from page 58)

Don't wiggle every tube, turn the dials or in short get everything out of whack. It seems to be every visiting ham's ambition to click the telegraph key and turn on the receiver. Another serious thing is the tendency of the older and more experienced ham who has higher power, better facilities, etc. to lord it over his lesser friend. Usually he does this unconsciously, but the other ham is sure to notice it, as he naturally feels smaller in the presence of one he admires. This is where the guest who is supposedly more important or more established in the ham world should move carefully if he wants many more pleasant QSO's. He should act to make his host feel at home... make him feel that his homemade rig is just as good or better than one's own. This can be accomplished by praising the features of the rig that seem to be original and yet benefit the operator in some way. There is no need of flattery; simply emphasize the better points...

If you see something that you do not approve of and would like to give him some instructions for improvement, that can be arranged, too. For example, you see a plate switch on the rig. It is nothing more than a d.p.s.t. light switch. The switch is sticking out at a convenient place on the rig but has high voltage going thru it and could very easily be "tangled" with. Rather than tell your host that you don't like it and then ask for some tape to fix it up with, you might ask him had he ever been "bit" by it. No doubt he will have a humorous incident to tell concerning it. You can then tell him how you have yours fixed, give its good points, and feel safe in suggesting away to eliminate the danger.

When you have left, the ham will think to himself, "There is a real ham." He will like you and his respect will be doubled if you have conducted yourself right. You did not take charge of his shack and act as if you knew about all the apparatus that he had on the table, and you made him feel he was on the same level as you even if you had been high man in the DX contest, had W.A.S. and about forty or fifty countries to his eighteen states. If you respect his shack, he will admire yours. Otherwise, he will not admire but be jealous.

It is not for me to tell you how to act but rather to give you an example. Common sense will tell you how to act when you go to visit a fellow ham. If you use caution, common sense, and above all let him know that you respect him, you will give him something to respect in you. True friendship is not built on familiarity alone but rather on respect and admiration.

Try it sometime.

-Kern Chadwick, W9ZJA
The RK63, a triode, was designed by Raytheon's engineers to meet definite amateur requirements as a power amplifier, oscillator or frequency multiplier.

The new tri-plane construction permits very low interelectrode capacities, thus making neutralization easier, avoiding parasitics, and greatly improving high frequency operation.

Its amplification factor of 37 makes it easy to drive and protects the tube in case of failure of excitation.

The tantalum plate and grid give it long, gas-free life even with high momentary overloads. Price $22.00

CLASS C OPERATION
Plate Volts ... 3000 volts Filament Volts ... 5 volts
Plate Current ... 250 ma Filament Current ... 10 amp.
DC Grid Current ... 45 ma Plate Dissipation ... 200 watts

Don't forget your copy of the "Handbook of Amateur Uses." It is just the thing to help you improve that old rig or build a new one. Your jobber or the nearest Raytheon office has a copy for you. Price 50c.
NEW F.C.C. Regulations
FOR 5-METERS

Effective December 1, 1938, F.C.C. rules 381 and 382 concerning the stability of signals and their freedom from spurious radiations, harmonics, overmodulation, etc. for frequencies below 30,000 kc. are broadened to include all amateur frequencies below 60,000 kc. Directly modulated oscillators, unstable signals, wobbulation and over-modulation are no longer acceptable in the 5-meter band.

An assured method of obtaining proper transmitter stability is to use quartz crystals. The Bliley HF2 10-meter crystal unit, designed primarily for 5-meter work, affords economical frequency control. Because only one doubling operation is required, construction is simplified and parts cost is kept at a minimum. With this dependable unit, portable high stability 5-meter transmitters are just as practical as higher powered equipment for home use.

Your Bliley distributor will show you how to build an effective simplified 5-meter crystal controlled transmitter.

Type HF2 — 28.0 to 30.0 mc., drift 43 cycles/ mc./°C. within 50 kc. of specified frequency, or choice from dealer's stock.... $5.75
OUTSTANDING FEATURES

- Continuous range from 31 to .54 mc.—12 tubes.
- Antenna compensating control for maximum signal-to-noise ratio and image rejection.
- 310 degrees band-spread on all amateur bands.
- Noise limiter follows A.V.C. for quiet reception.
- Variable band width crystal filter for phone reception.
- Calibrated "S" meter on all models.

FROM INPUT to output terminals, this receiver is different. Conventionalities have been thrust aside and radically new ideas have been engineered into the new and remarkable "HQ-120" communications receiver. Special antenna compensating control on panel permits a wide selection of antennas and insures maximum sensitivity—New technique employed in the R.F. circuits provides uniform gain in each amateur band—Electrical band-spread and improved tuning control design result in 310 degrees spread. The dial is calibrated in megacycles from 80 to 10 meters inclusive. Calibration of the band spread dial is made possible by the extreme accuracy maintained in the tuning unit. The main tuning control is also calibrated in megacycles over the entire range of the receiver from 31 to .54 megacycles.

A new variable band-width crystal filter circuit is employed in the "HQ-120." A switch on the panel allows the selection of six different degrees of selectivity. The voltage-regulated power supply maintains a high degree of stability. Line voltage fluctuation will not affect the calibration of the receiver. The "HQ-120" also has a very effective noise limiter. This circuit is designed to faithfully follow the A.V.C. action and has no delicate panel control; a switch cuts it in or out.

Constant R.F. sensitivity, uniform crystal filter output coupled with a new and efficient meter circuit, provide accurate "S" meter readings and more worth-while signal reports. The "S" meter is calibrated in units up to "S-9" and also up to 40 db above "S-9". Other features are: beat oscillator; A.V.C.; stand-by switch; phone jack; relay connection; beautiful etched panel.

Write Dept. Q-12 for 16-page booklet
Peculiarly apropos for Heterodyne Frequency Meters in connection with new F.C.C. Regulations, Section 152.44, effective December 1st, 1938.

Very important to observe that whether Xtal controlled or not, you now need a device for "measurement of Xmtr. frequency by means independent of the frequency control of the transmitter..."

Build your frequency meter around a Cardwell Band-Spread Trim-Air and be safe!

<table>
<thead>
<tr>
<th>Type</th>
<th>Tuning Capacity</th>
<th>Tank Capacity</th>
<th>Depth Behind Panel</th>
<th>List Price</th>
<th>Amateur Net Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU-25-100-AF</td>
<td>25</td>
<td>100 mmfd.</td>
<td>9¾&quot;</td>
<td>$3.00</td>
<td>$1.80</td>
</tr>
<tr>
<td>EU-50-100-AF</td>
<td>50</td>
<td>100 mmfd.</td>
<td>3¾&quot;</td>
<td>3.25</td>
<td>1.95</td>
</tr>
</tbody>
</table>

THANX A MILLION


FEX is a FOUR-IN-ONE condenser. Four split stator ranges of effective capacity as shown.

Amateur Net $15.00

XE-160-70-XQ is a THREE-IN-ONE condenser. Three effective split stator ranges as shown.

Amateur Net $13.20


THE ALLEN D. CARDWELL MANUFACTURING CORPORATION
63 PROSPECT STREET, BROOKLYN, NEW YORK

By far the best conclusion to any description and discussion such as the foregoing is a complete set of data showing the actual performance of the device. One very interesting characteristic of this new filter is the extremely slight variation in output throughout the six steps of selectivity. This was investigated by means of constant c.w. input to the receiver, the output being recorded by a microammeter in series with the load resistance of the diode second detector. The sensitivity control was adjusted to produce a reading of 100 on the microammeter with the selectivity switch in the "off" position (crystal out), after tuning the receiver accurately to the signal with the selectivity switch on position No. 5. Readings were

ment, rather than by a panel control that would have to be adjusted during the stress and strain of actual operating. For the same general reason it is felt that six accurately adjusted and definite degrees of selectivity, each instantly available by the flick of a switch, would prove highly desirable from the practical operating standpoint, although it has undoubtedly occurred to most readers that a continuously variable resistor could be used in place of R1, R2, R3, and R4. After being accurately tuned, this most important load circuit must remain in exact resonance during the varying conditions of actual operating. Since the grid of the second i.f. amplifier tube is directly across the circuit, certain precautions should be taken to prevent variations of the tube input capacity when the receivers, sensitivity control (either manual or a.v.c.) is altered. Otherwise optimum crystal filter performance will be obtained only at that setting of the gain control where the original tuning adjustment was made. The phasing control presents a similar problem, which was solved by the use of the double-stator condenser previously described. Since the capacity between its rotor and both stators remains constant, variations in its setting have no effect whatever on the tuning of the crystal load circuit.

The phasing control works very symmetrically in this new filter circuit. Its action is absolutely independent of the setting of the selectivity switch—another important advantage to the practical operator. When set to the center of its scale the crystal holder capacity is exactly neutralized, and the selectivity characteristics of the filter are truly symmetrical regardless of the position of the selectivity switch. When turned either side of center the familiar rejection dip is introduced in the filter response curve, above or below resonance depending on whether the control is turned above or below center scale. These rejection settings are equally independent of the position of the selectivity switch. For example, if the phasing control is set for rejection of a 1000-cycle beat note from an interfering transmitter, the degree of selectivity of the crystal can be altered at will with no effect whatever on the frequency of rejection, although the rejection dip in the response curve of the filter is deeper at the more selective settings of the selectivity switch.

PERFORMANCE DATA
CERAMIC DIELECTRIC FOR LOW POWER FACTOR. COMPOSITION ALLOWS COMPLETE CONTROL OF CAPACITANCE-TEMPERATURE COEFFICIENT

ADEQUATE PROTECTION AGAINST BREAKDOWN AT 1000 Volts

CERAMIC DIELECTRIC FOR LOW POWER FACTOR. COMPOSITION ALLOWS COMPLETE CONTROL OF CAPACITANCE-TEMPERATURE COEFFICIENT

HEAVY COPPER COATINGS MAKE TUBULAR CAPACITOR PLATES

SOLDER COATING FOR CONNECTING END LEADS

CROSS SECTION OF A CERAMIC CAPACITOR

We repeat “by popular demand”

THE interest in this new and unique member of the Centralab family prompted a “re-run” of this advertisement. Thousands of these capacitors are already in use in the current automatic tuning receivers . . . and are delivering satisfactory and trouble-free performance.

For automatic tuning . . . negative temperature coefficient . . . to stabilize oscillator frequency in automatic tuning systems . . . also available with zero temperature coefficient where capacity values must stay constant over wide temperature range.

A single capacitor will provide any desired capacitance-temperature coefficient from 0 to a negative coefficient of 0.0007 mmfd. per mmfd. per degree C.

Ceramic dielectric has zero porosity. Capacity and power factor unaffected by aging or humidity.

Low mass allows capacitor temperature to follow the chassis temperature closely.

Capacitance remains constant at any frequency.

Low power factor resin coating prevents moisture bridging between capacitor plates.

Engineers and Set Designers: Write for Engineering Bulletin Form 630.

Division of GLOBE-UNION INC., Milwaukee

Say You Saw It in QST — It Identifies You and Helps QST
“Beating around the bush” and bring your station up to date with a new Harvey 100-T transmitter. Don’t compromise with make-shift changes and costly additions. Make yours a profitable investment with a transmitter which is modern, has a high trade-in value, and guarantees performance and satisfaction.

LOOK at the cabinet — modern from every angle — rounded corners, chrome trim and gray wrinkle finish. Best of all, the cabinet is only 19 inches high by 14 inches deep.

LISTEN to its signal on the air and you’ll agree that the 100-T delivers the goods. The reason — Harvey engineering backed by five competitive years in the radio transmission field.

For Time Payments on the 100-T write to Henry Radio Shop, Butler, Missouri; Delaware Radio Sales Co., Wilmington, Delaware, or your local dealer. Our latest catalogue is ready if you’ll write to Harvey Radio Laboratories, Inc., 25 Thomdike Street, Cambridge, Massachusetts.
DX CONTEST RESULTS

CW winners:
1. Ralph E. Thomas W2UK
2. Fenton J. Priest, Jr. W3EMM
3. Clement M. Goo On W3EVT

PHONE winners:
1. Fenton J. Priest, Jr. W3EMM
2. Robert Hecksher W4CYU
3. Dave Evans W4DHZ
   (operating "Doc" Stuart's W6GRL)

All of the above amateurs used Eimac Tubes.

The supreme accomplishment of amateur radio is to win the international DX contest. With ten's of thousands of contestants it takes more than mere luck to win. Thorough knowledge of the most advanced principles, expert operation and above all, keen judgement in the selection of equipment are the important factors.

It was not an accident that the winners of this DX contest came out victorious...neither was it an accident that Eimac tubes were used in the transmitters of the first three winners in both the phone and CW contests.

Amateurs who are confused in the selection of equipment will do well to follow the lead of these experts.
under the same conditions as B except that the phasing control has been set to provide a rejection dip at 1000 cycles below resonance. Curve C is therefore the audio fidelity curve of the i.f. end of the receiver when its selectivity is as shown in the No. 1 selectivity curve of Fig. 4. It is interesting to note the slight difference between curves B and C in view of the great difference in their corresponding selectivity curves as shown by Curve No. 1 of Fig. 3 and Curve No. 1 of Fig. 4.

Of course, many of these performance curves depend on the choice of resistors, \( R_1, R_2, R_3 \) and \( R_4 \). Other values than those used will result in different band widths for Curves 2, 3 and 4. However, the resistance values actually chosen result in what is considered an ideal selectivity range for a communications receiver.

New Regulations
(Continued from page 16)

years a license as a professional radiotelegraph operator or have within that time been employed as a radiotelegraph operator in the service of the United States, and the examiner for the written test, if not the same individual, shall be a licensed professional radiotelegraph operator. The Commission may require a license holder to appear for Class C privileges to appear at an examining point for a Class B examination. If such licensees fails to appear for examination when directed to do so, or fails to pass the examination, the license held will be canceled and the holder thereof will not be issued another license for the Class C privileges.

Whenever the holder of Class C amateur operator privileges changes his actual residence or station location to a point where he would not be eligible to apply for Class C privileges in the first instance, or whenever a new examining point is established in a region from which applicants were formerly eligible for Class C privileges, such holders of Class C privileges shall within four months thereafter appear at an examining point and be examined for Class B privileges. The license will be canceled if such licensee fails to appear, or fails to pass the examination.

Sec. 151.21. Examination procedure. Applicants shall write examinations in longhand—code tests and diagrams in ink or pencil, written tests in ink—except that applicants unable to do so because of physical disability may type write or dictate their examinations and, if unable to draw required diagrams, may make instead a detailed description essentially equivalent. The examiner shall certify the nature of the applicant’s disability and, if the examination is dictated, the name and address of the person(s) taking and transcribing the applicant’s dictation.

Sec. 151.22. Grading. Code tests are graded as passed or failed, separately for sending and receiving tests. A code test is failed unless free of omission and other error for a continuous period of at least one minute at required speed. Failure to pass the required code test will terminate the examination. (See Sec. 151.23.)

Sec. 151.23. Eligibility for examination. An applicant who fails examination for amateur privileges may not take
OFTEN-TIMES we do something a certain way "just because Grandpop did." We use articles every day which are made about the same as they were in the "horse and buggy days." Then a new way is tried that is so simple and logical it's a wonder nobody ever thought of it before.

Take small Power Rheostats for instance — for years they have been made using a ceramic base to which the resistance wire is attached, usually with a vitreous cement. This makes a good substantial assembly but they do get hotter than Billy-be-damned (if you want to be exact, we would judge B.B.D. to be about 250 to 300 degrees C. temperature rise at the hottest spot for full load). Like a hot potato, high temperature is not necessarily harmful to the unit itself, but is fatal to one's fingers, transformers, oil-filled condensers, etc. which might be around close.

Our new job, dubbed PR-25, is conventional in size, but not in design. We kept in mind its basic function of dissipating heat.

The metals are, of course, the best heat conductors, and aluminum is one of the best of metals in this regard. So, the shell of our new job and the core on which the resistance wire is wound are both of aluminum.

This results in a hottest spot temperature rise of only 140 degrees C. when 25 watts is applied to the element. Most important — the full 25 watts can be applied to as little as one-fourth of the winding with a rise of only 155 degrees C. Such treatment would severely overload the ceramic type.

The rest of the design, too, has been given customary care. The winding is insulated for 1000 volts to ground with electrical mica and specially treated asbestos. The terminals and shaft are insulated with ceramic. Current is carried direct to the rotor arm through a flat clockspring type connection — no sliding contact. The contact shoe is self-aligning and made of beryllium copper. Rotor contact pressure is furnished by a spiral steel spring separate from the current carrying spring. The unit is supplied complete with bakelite knob in all standard ranges from $\frac{1}{2}$ ohm to 5000 ohms.

We recommend it for filament control of the power stage in your transmitter. The filament voltmeter should be connected directly across the socket terminals so as to eliminate any error due to voltage drop in the filament leads. Operation of your power tubes at the correct filament voltage is extremely important.

This unit has three terminals, so it can also be used as a potentiometer voltage divider. It makes a really deluxe adjustment for bias voltage where the wattage is within 25 watts and where the voltage to ground does not exceed 1000 volts. The adjustment can then be made by a knob from the front panel with no danger of contacting high-voltage circuits.
**TYPE 866**
Half-Wave, Mercury Vapor Rectifier

- Filament Voltage (A.C.) 2.5 volts
- Filament Current .30 amp.
- Max. RMS A.C. Volts 2650 max.
- Peak Inverse Voltage 7500 max.
- Peak Pl. Current .250 max. amp.
- Tube Voltage Drop 15 volts

**HEAVY DUTY**

$1.50 NET

---

**TYPE 866 JR.**
Half-Wave, Mercury Vapor Rectifier

- Filament Voltage (A.C.) 2.5 volts
- Filament Current .30 amp.
- Max. RMS A.C. Volts 2650 max.
- Peak Inverse Voltage 1750 max.
- Peak Pl. Current .250 max. amp.
- Tube Voltage Drop 15 volts

**GERMANIC BASE**

$1.05 NET

---

**HYTRONIC LABORATORIES**
76 Lafayette St.
Salem, Massachusetts
A Division of Hytron Corp.

---

another examination for such privileges within two months, except that this rule shall not apply to an examination for Class B following one for Class C.

---

**LICENSES**

SEC. 152.01. Eligibility for amateur station license. License for an amateur station will be issued only to a licensed amateur operator who has made a satisfactory showing of control of proper transmitting apparatus and control of the premises upon which such apparatus is to be located; provided, however, that in the case of an amateur station of a bona fide amateur radio society the station license may be issued to a person in charge of such a station although not a licensed amateur operator.

SEC. 152.02. Eligibility of corporations or organizations to hold license. An amateur station license will not be issued to a school, company, corporation, association, or other organization; nor for their use, provided, however, that in the case of a bona fide amateur radio society a station license may be issued in accordance with Section 152.01 to a licensed amateur operator as trustee for such society.

SEC. 152.03. Location of station. An amateur radio station, and the control point thereof when remote control is authorized, shall not be located on premises controlled by an alien.

SEC. 152.04. License period. License for an amateur station will normally be for a period of three years from the date of issuance of a new, renewed, or modified license.

SEC. 152.05. Authorized operation. An amateur station license authorizes the operation of all transmitting apparatus used by the licensee at the location specified in the station license and in addition the operation of portable and portable-mobile stations at other locations under the same instrument of authorization.

SEC. 152.06. Renewal of amateur station license. An amateur station license may be renewed upon proper application and a showing that, within three months of receipt of the renewal application by the Commission, the licensee thereof has lawfully operated such station in communication by radio with at least three other amateur stations controlled by the Commission, except that in the case of an application for renewal of station license issued for an amateur society or reserve group, the required operation may be by any licentiated amateur operator. Upon failure to comply with the above requirements, a successor license will not be granted until two months after expiration of the old license.

SEC. 152.07. Posting of station license. The original of each station license or a facsimile thereof shall be posted by the licensee in a conspicuous place in the room in which the transmitter is located or kept in the personal possession of the operator on duty, except when such license has been filled with application for modification or renewal, or has been mutilated, lost, or destroyed, and application has been made for a duplicate.

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**CALL SIGNALS**

SEC. 152.08. Assignment of call letters. Amateur station calls will be assigned in regular order and special requests will not be considered except that a call may be assigned to the latest holder, or if not under license during the past five years to any previous holder, or to an amateur organization in memoriam to a deceased member and former holder and particular calls may be temporarily assigned to stations connected with events of general public interest.

SEC. 152.09. Call signals for membership in Reserve. In the case of an amateur license whose station is licensed to a regularly commissioned or enlisted member of the United States Naval Reserve, the Commandant of the naval district in which such station is located may authorize in his discretion the use of the call-letters prefix W or K, assigned in the license issued by the Commission, provided that such N prefix shall be used only when operating in the frequency bands 1715-2000 kilocycles, 3500-4000 kilocycles, 56,000-60,000 kilocycles, and 400,000-401,000 kilocycles in accordance with instructions to be issued by the Navy Department.

SEC. 152.10. Transmission of call signals. An operator of an amateur station shall transmit his assigned call at the end of each transmission and at least once every ten minutes during transmission of more than ten minutes’ duration, provided, however, that transmission of less than one minute duration from stations employing break-in operation need be identified only once every ten minutes of operation. In the case of amateur personal or portable-mobile radio-telephone station shall transmit immediately after the call letters the character of the station the character (DN) followed by the number of the amateur call area in which the portable or portable-mobile amateur station is then operating, as for example:

Example 1. Portable or portable-mobile amateur station operating in the third amateur call area calls a fixed amateur station: W1ABC W1ABC W1ABC DE W2DEF DN3 W2DEF DN3 AR.

1 Subject to change to "1,750 to 2,050" kilocycles in accordance with the 'Inter-American Arrangement Covering Radio-communication,' Havana, 1937.
There's a "HALL MARK" on INSULATORS, too!

There's a "Sterling" mark on silver—and the "Johnson" name on insulators—each with the same quality significance. And nowhere in your rig is quality and correct design more important.

Johnson insulators are made of highest quality, low-absorption ceramics, designed strictly according to modern engineering practice for best dielectric value and mechanical strength.

Smooth glazed surfaces prevent the accumulation of dust, dirt and moisture and minimize leakage.

You can be sure, when you purchase a Johnson part, whether it's an insulator, condenser or any equipment that bears the Johnson name that you are getting top quality and modern engineering design.

Your rig will operate more efficiently with Johnson equipment.

E. F. JOHNSON CO.
WAUNA, MINNESOTA
EXPORT: 23 WARREN ST., NEW YORK, N. Y.

"MANUFACTURERS OF RADIO TRANSMITTING EQUIPMENT"
This Multi-Range Tester is a "Natural" for every Laboratory Engineer and Amateur.

**PRECISION Series 842-L**

A.C.-D.C. VOLT-OHM-DECEL-MILLI-AMPERE-METER

with 2500 Volt A.C.-D.C. RANGE and 1000 M.A. and 10 AMP. RANGES

Features of the Series 842-L

- **Five AC Voltage Ranges** at 1000 ohms per volt: 0-10; 0-50; 0-100; 0-250; 0-500 volts.
- **Five DC Voltage Ranges** at 1000 volts per volt: 0-10; 0-50; 0-100; 0-250; 0-500 volts.
- **Six DC Current Ranges**: 0-1; 0-5; 0-25; 0-125; 0-600; 0-250; 0-10 AMP.
- **Four Resistance Ranges**: 0-100 ohms (100 ohms center) SHUNT METHOD, 0-100,000 ohms (100 ohms center), 0.1 Megohm (1000 ohms center), 0.1 Megohm (10,000 ohms center).
- **Input Connections**: Provisions for mounting ohmmeter power supply (4½ and 45 volt batteries) on inside of case. No external connections necessary.
- **Five Decimal Ranges with BOMBER**: 0 to +10; 0 to +50; 0 to +100; 0 to +250; 0 to +500 volts.
- **Five Output Ranges**: 0-10; 0-5; 0-25; 0-125; 0-600; 0-250; 0-10 AMP.
- **Accuracy**: Maintained with wide wound shunts and matched multipliers, both of 1% tolerance.

**842-L SIZE** 7½" x 8 ¼" x 4". Housed in walnut finished wood case with removable lid. Lees Batteries and Test Leads. Net: $21.95

**842-D SIZE** 4½" x 6" x 3". Housed in walnut finished wood portable case with removable lid. Lees Batteries and Test Leads. Net: $23.95

**Available at Leading Distributors**

Following is a partial list.

**All branches**

- WHOLESALE RADIO SERVICE CO., Belleville, Ill.
- LIRRT ELECTRIC INC., Boston, Mass.
- THE RADIO SHACK, Chicago, Ill.
- CHICAGO RADIO APPARATUS, Columbus, Ohio.
- DIXIE RADIO CO., Denver, Colo.
- INTER-STATE RADIO & SUPPLY CO., Detroit, Mich.
- BAY CITY RADIO SUPPLIES CO., Hartford, Conn.
- WATRO, IND., Indianapolis, Ind.
- RADIO DISTRIBUTING CO., Jamaica, La.
- AEOLUS RADIO DISTRIBUTORS, Los Angeles, Cal.
- KIEROFF & CO., New York, N.Y.
- SIN RADIO CO., Norwalk, Va.
- RADIO PARTS DISTRIBUTING CO., Portland, Ore.
- RADIO SUPPLY CO., San Antonio, Texas.
- UNITED RADIO SUPPLY INC., Seattle, Wash.
- NORTHERN RADIO CO., South Bend, Ind.
- RADIO DISTRIBUTING CO., Springfield, Mass.
- SPRINGFIELD 800 CO., Texarkana, Ark.

**PRECISION APPARATUS COMPANY**

821 EAST NEW YORK AVE., BROOKLYN, N. Y.

EXPORT DIVISION—458 BROADWAY, NEW YORK

Cable Address: "Morhanex"
THAT'S the news about C-Ds. And it's news too big to hold. Cornell-Dubilier has combined Super Performance with New Economy to bring you a capacitor HIGH in quality, HIGH in efficiency, voltage and dielectric strength, yet down-to-earth in price. Take the shortest route to your jobber today. Ask for C-D—the capacitor with more abundant life at no extra cost.

Here are two of the popular amateur capacitors in the complete C-D line.

**DYKANOL TRANSMITTING CAPACITORS**

- Are genuine Dykanol, FIREPROOF transmitting filter capacitors that can be mounted vertically or inverted by means of the mounting ring supplied. Equipped with neat porcelain terminals. Available in a complete range from 2 mike 600 to 2 mike 2000 v., at new low prices. Type TQ is specified in the new Thorderson 100 watt x-mitter. Be sure to send for new Catalog No. 161 today.

**TYPE TQ**

**DYKANOL TRANSMITTING CAPACITORS**

Type TQ Dykanol capacitors are among the most dependable units offered to the radio trade—amateur, broadcast and commercial. Beautifully designed, compact, light-weight, safely rated, furnished with universal mounting clamp, well-insulated terminals, fire-proof and attractively priced. Fully guaranteed. From half mike, 600 to 2 mike 5000 volts (and up to 25,000 v. d.c.).
New
LICENSE
MANUAL
incorporating
FCC
REGULATIONS
Effective
December 1st
NOW Available
25 CENTS
POSTPAID
(No stamps please)

AMERICAN
RADIO RELAY LEAGUE
West Hartford, Connecticut

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

Frequency above 300,000 kilocycles without separate license therefor.

Sec. 152.27. Frequency bands for telephony. The following bands of frequencies are allocated for use by amateur stations using radiotelephony, type A-3 emission:

<table>
<thead>
<tr>
<th>Band</th>
<th>Lower Limit</th>
<th>Upper Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,800 to 2,000 kc</td>
<td>112,000 to 118,000 kc</td>
<td></td>
</tr>
<tr>
<td>28,500 to 30,000 kc</td>
<td>224,000 to 230,000 kc</td>
<td></td>
</tr>
<tr>
<td>56,000 to 60,000 kc</td>
<td>400,000 to 401,000 kc</td>
<td></td>
</tr>
</tbody>
</table>

Sec. 152.28. Additional bands for telephony. An amateur station may use radiotelephony, type A-3 emission, in the following additional bands of frequencies; provided the station is licensed to a person who holds an amateur operator's license endorsed for Class A privileges, and actually is operated by an amateur operator holding Class A privileges:

<table>
<thead>
<tr>
<th>Band</th>
<th>Lower Limit</th>
<th>Upper Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,900 to 4,000 kilocycles</td>
<td>14,150 to 14,250 kilocycles</td>
<td></td>
</tr>
</tbody>
</table>

Sec. 152.29. Television and frequency-modulation transmission. The following bands of frequencies are allocated for use by amateur stations for television and radiotelephone frequency-modulation transmission:

<table>
<thead>
<tr>
<th>Band</th>
<th>Lower Limit</th>
<th>Upper Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>112,000 to 119,000 kilocycles</td>
<td>224,000 to 230,000 kilocycles</td>
<td></td>
</tr>
<tr>
<td>400,000 to 401,000 kilocycles</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sec. 152.30. Facsimile transmission. The following bands of frequencies are allocated for use by amateur stations for facsimile transmission:

<table>
<thead>
<tr>
<th>Band</th>
<th>Lower Limit</th>
<th>Upper Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,715 to 2,000 kc</td>
<td>112,000 to 118,000 kc</td>
<td></td>
</tr>
<tr>
<td>56,000 to 60,000 kc</td>
<td>224,000 to 230,000 kc</td>
<td></td>
</tr>
<tr>
<td>400,000 to 401,000 kc</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sec. 152.31. Individual frequency not specified. Transmissions on any frequency within the bands above assigned. Sideband frequencies resulting from keying or modulating a transmitter shall be confined within the frequency band used.

Sec. 152.32. Types of emission. All bands of frequencies allocated to the amateur service may be used for radiotelephony, type A-1 emission. Type A-2 emission may be used in the following bands of frequencies only:

<table>
<thead>
<tr>
<th>Band</th>
<th>Lower Limit</th>
<th>Upper Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>56,000 to 60,000 kc</td>
<td>224,000 to 230,000 kc</td>
<td></td>
</tr>
<tr>
<td>400,000 to 401,000 kc</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

EQUIPMENT AND OPERATION

Sec. 152.40. Maximum power input. The licensee of an amateur station is authorized to use a maximum power input of 1 kilowatt to the plate circuit of the final amplifier stage of an oscillator-amplifier transmitter or to the plate circuit of an oscillator transmitter. An amateur transmitter operating with a power input exceeding nine-hundred watts to the plate circuit shall provide means for accurately measuring the plate power input to the vacuum tube, or tubes, supplying power to the antenna.

Sec. 152.41. Power supply to transmitter. The licensee of an amateur station using frequencies below 60,000 kilocycles shall use adequately filtered direct-current plate power supply for the transmitting equipment to minimize frequency modulation and to prevent the emission of broad signals.

Sec. 152.42. Requirements for prevention of interference. Spurious radiations from an amateur transmitter operating on a frequency below 60,000 kilocycles shall be reduced or eliminated in accordance with good engineering practice and shall not be of sufficient intensity to cause interference on receiving sets of modern design which are turned outside the frequency band of emission normally required for the type of emission employed. In the case of A-3 emission, the transmitter shall not be modulated in excess of its modulation capability to the extent that interfering spurious radiations occur, and in no case shall the emitted carrier be amplitude-modulated in excess of 100 per cent. Means shall be employed to insure that the transmitter is not modulated in excess of its modulation capability. A spurious radiation is any radiation from a transmitter which is outside the frequency band of emission for the type of transmission employed, including any component whose frequency is an integral multiple or submultiple of the carrier frequency (harmonics and subharmonics), spurious modulation products, key clicks, and other transient effects, and parasitic oscillations. The frequency of emission shall be as constant as the state of the art permits.

Sec. 152.43. Modulation of carrier wave. Except for brief tests or adjustments, an amateur radiotelephone station shall not emit a carrier wave unless modulated for the purpose of communication.

Sec. 152.44. Frequency measurement and regular check. The licensee of an amateur station shall provide for measurement of the frequency of the transmitter and establish procedure for checking it regularly. The measurement of the transmitter frequency shall be made by means independent of the frequency control of the transmitter and shall be of sufficient accuracy to assure operation within the frequency band used.

Sec. 152.45. Logs. Each licensee of an amateur station...
WHAT MORE CAN A COMMUNICATIONS JOB HAVE?

EVERY FEATURE amateurs have told us they want is incorporated in this 14-Tube TRAFFIC MASTER. Read them!

- 14 Octal-Base Tubes
- 530 KC to 32.8 MC (9.25 to 555 Meters)
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- Electrical Band-Spread Condenser
- Band Setting and Band Spreading Controls
- Amateur Bands Located at Optimum Points on Various Ranges
- Large Full-Vision Dial, with 9° Linear Scales
- Separate Pointer on 0-100 Scale for Electrical Band Spread
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- 3-Gang Precision Tuning Condenser
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- Fully Shiled Switch Assembly
- Mono-Unit Crystal-Filter Assembly with Phasing Control and Shorting Switch for Panel Operation
- Noise Silencer Circuit Built In
- Beat Frequency Oscillator with Panel Pitch-Control for CW Sigs
- Air-Tuned "R" Indication Meter
- Carrier Level Indicator Calibrated 1 to 9 for Signal-Strength Reports
- Two Stages Ferrocar (Iron Core) I.F. Amplification
- "Air-Aligned" (Air-Tuned) I.F. Transformers
- Full Automatic Volume Control
- Maintains Constant Volume Level Under Severe Fading Conditions
- Doublet Antenna Connections
- Diode Second Detector
- Manual Volume Control
- Tone Control
- Headphone Jack
- Stand-by Switch
- 6GBG Phase Inverter, Resistance-Coupled to Output Stage
- Push-Pull 6v6 Output Class A
- 5 Watts Undistorted Power Output.

The TRAFFIC MASTER comes to you in COMPLETE KIT FORM—everything as illustrated except the tubes.

$81.90

ASK YOUR PARTS JOBBER

New 120 PAGE INSTRUCTION BOOK

Packed full of invaluable information, both theory and technical data. With graphs and charts, pictorial diagrams, schematics, alignment data. Constructional data for 20 of the new Meissner Kits.

Meissner

MT. CARMEL, ILLINOIS

"A FAMOUS NAME FOR TWO DECADES"

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

69
LOW-DRAIN BATTERY TUBES
an important achievement

BRINGING new economy of space and operation to the battery radio field ... Sylvania’s recently-announced line of five low-drain tubes fills the needs of every amateur interested in battery radio sets.

These tubes are a complete complement for the design of any battery radio — ideal for that compact set which you’ve wanted to build. They give twice the normal battery life, with no C battery needed — and reception is free from line noise and A.C. hum.

Every amateur should have full information on these new tubes — so write today to the Hygrade Sylvania Corp., Emporium, Pa., for FREE technical data.

shall keep an accurate log of station operation, including the following data:

(a.) The date and time of each transmission. (The date need only be entered once for each day’s operation. The expression “time of each transmission” means the time of transmission only and need not be repeated during the sequence of communication which immediately follows; however, an entry shall be made in the log when “signing off” so as to show the period during which communication was carried on.

(b.) The signature of the person manipulating the transmitting key or the radiotelegraph transmitter key by the radiotelegraph operator, or the signature of the operator of a station which possesses an amateur station license in official capacity (type A-9 or A-4 emission) with statement as to type of emission, and the signature of any other person who transmitted voice or radiotelephone transmitter (type A-8 emission). (The signature need only be entered once in the log provided the log contains a statement in the effect that all transmissions were made by the person named except otherwise stated. The signature of any other person who operates the station shall be entered in the proper space for his transmissions.)

(c.) Call letters of the station called. (This entry need not be repeated for calls made to the same station during any sequence of communication, provided the time of “signing off” is given.

(d.) The input power to the oscillator, or to the final amplifier stage where an oscillator-amplifier transmitter is employed. (This need be entered only once, provided the input power is not changed.

(e.) The frequency band used. (This information need be entered only once in the log for all transmissions until there is a change in frequency to another amateur band.

(f.) The location of a portable or portable-mobile station at the time of each transmission. (This need be entered only once, provided the location of the station is not changed. However, suitable entry shall be made in the log upon changing location, showing the type of vehicle or mobile unit in which the station is operated and the approximate geographical location of the station at the time of operation.)

(g.) The message traffic handled. (If record communications are handled in regular message form, a copy of each message sent and received shall be entered in the log or retained on file for at least one year.)

The log shall be preserved for a period of at least one year following the last date of entry. The copies of record communications and station log, as required under this section, shall be available for inspection upon request by an authorized Government representative.

SPECIAL CONDITIONS

SEC. 152.50. Additional conditions to be observed by licensees.

An amateur station license is granted subject to the conditions imposed in Sections 152.31 to 152.54 inclusive, in addition to any others that may be imposed during the term of the license. Any licensee receiving due notice requiring the station license to observe such conditions shall immediately put them in conformity therewith.

SEC. 152.51. Quiet hours.

In the event that the operation of an amateur station causes general interference to the reception of broadcast programs of receivers of modern design, such amateur station shall not operate during the hours from 8 o’clock p.m. to 10:30 p.m., local time, any Sunday during the additional period of 10:30 p.m. to 11 p.m., local time, upon such frequency or frequencies as cause such interference.

SEC. 152.52. Second notice of same violation.

In every case where an amateur station license is cited a second time within the six months for the same violation under Section 152.53 or 152.54, the Commission will direct that the station remain silent from 6 p.m. to 10:30 p.m., local time, until written notice has been received authorizing full-time operation. The license shall arrange for tests at other hours with at least two amateur stations within fifteen days of the date of notice, such tests to be made for the specific purpose of aiding the licensee in determining whether the emissions of his station are in accord with the Commission’s Regulations. The license shall report under oath to the Commission at the conclusion of the tests as to the observations reported by amateur licensees in relation to the reported violation. Such report shall include a statement as to the corrective measures taken to insure compliance with the Regulations.

SEC. 152.53. Third notice of same violation.

In every case where an amateur station license is cited the third time within a year for the same violation as indicated in Section 152.52, the Commission will direct that the station remain silent from 8 A.M. to 12 midnight, local time, except for the purpose of transmitting a prearranged test to be observed by a monitoring station of the Commission to be designated in each particular case. Upon completion of the test the station shall again remain silent during these hours until such time as may be directed by the Commission to resume full-time operation.

The Commission will consider the results of the tests and the licensee’s past record in determining the advisability of suspending the operator license and/or revoking the station license.

SEC. 152.54. Operation in emergencies.

In the event of widespread emergency conditions affecting domestic commun
THE 600-WATT TRANSMITTER

The National 600-watt Transmitter is so thoroughly engineered that the newcomer can proceed with confidence, yet the units are so flexible that they allow the constructor almost complete freedom in building to suit his own particular requirements. The basis of the 600-watt Transmitter is the set of Foundation Units, panels and chassis completely finished and ready for assembly, supplied with the necessary special parts and hardware. The power supply and modulator chassis are punched to receive standard Thordarson CHT Units, combining convenience and reliability at low cost. More complete information on this efficient and economical transmitter will be found in the National "600-watt Transmitter" Booklet, newly revised, and in the National Catalogue, both available from your dealer.

NATIONAL CO., INC.       MALDEN, MASS.

Say You Saw It in QST — It Identifies You and Helps QST
A Practical Television Receiver

(Continued from page 27)

changed for different video carrier frequencies, because the sound i.f. signal is of fixed frequency, as in an ordinary superheterodyne receiver.

SYNC SEPARATOR

As has been previously mentioned, the output of the video amplifier includes the video signal and the two synchronizing signals. The function of the sync separator is to separate the high-amplitude horizontal and vertical synchronizing signals from the video signal. The sync separator employs a Type 6PSG twin triode (V10). A small amount of signal from the video amplifier plate circuit is obtained from a resistance-capacitance voltage-divider network and amplified by triode unit "A" of V10. Triode unit "A" also serves to reverse the polarity of the signal, so that the synchronizing pulses appear as large positive-peak voltages at the grid of the second triode unit, "B." Due to these high-amplitude positive peaks, triode "B" becomes partially blocked — the action being similar to that of a grid-leak detector under large-signal conditions. The grid-leak and grid-condenser values are selected so that triode
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A NEW RECTIFIER
249-B

Filament 2.5 Volts 7.5 Amp.
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The 249-B is a half-wave mercury vapor rectifier tube for 1KW to 3KW Transmitters. When used in a single phase full wave circuit with choke input, two 249-B's will deliver up to 1.25 amps at 3,300 volts. Has standard UX base and uses NONEX glass. Ceramic insulator under plate cap.

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"B" conducts just for the duration of the synchronizing signals, and allows only these signals to appear as plate-current pulses in the output circuit. In this manner, the video signals are rejected and the two synchronizing signals are passed. The synchronizing signals are later separated from each other by the sync amplifiers, which are designated by the term "frequency separator" in the block diagram shown by Mr. Sherman in Part I.

A.G.C. AMPLIFIER

A Type 6F8G (V11) is used for the automatic-gain-control stage. A small portion of the output of the video amplifier is applied to the grid of triode unit "A" of V11. This signal, after amplification by triode unit "A," is applied to triode unit "B," connected as a diode. Triode "B" operates like a peak vacuum-tube voltmeter. That is, due to the relatively large time constant of resistor R51 and condenser C72, the d.c. voltage developed across R51 is held near the peak value of the applied a.c. voltage. The peak a.c. voltage depends not only on the amplitude of the synchronizing signals, but also on the average amplitude of the video signals. The a.g.c. voltage developed across R51 is filtered in the usual manner and applied as negative grid bias to the r.f. and i.f. amplifiers.

The a.c.-coupled a.g.c. system employed in this receiver does not provide as effective gain control as a direct-coupled a.g.c. system. However, the latter arrangement involves additional complications in the power supply and other circuits.

POWER SUPPLY

The power supply includes a full-wave, high-vacuum rectifier (Type 574) and a conventional, low-resistance, two-section filter. A choke-input type of filter is used to provide good voltage regulation. The output of the filter is rather heavily loaded in order to keep the d.c. plate load of the 1952 video amplifier small. It is essential to minimize the voltage variations across R90 caused by fluctuations of d.c. load current with a.g.c. voltage. Front and back views of the supply, mounted on a 5¼ by 19-inch relay-rack panel, are shown in the photographs.

CONSTRUCTURAL DETAILS

The various parts of the receiver are mounted on a standard panel of one-eighth inch sheet aluminum, 35¼ by 19 inches, designed for relay-rack mounting in a cabinet. Some details of the mounting of the different units which go to make up the complete television receiver can be seen in the photographs. The receiver chassis mounts vertically, at a distance (depending on the length of the Kinescope) behind the front panel of the cabinet. Although these photographs show the receiver with the 9-inch Kinescope, Type 1800, they will serve to illustrate the method of assembly, which is equally suitable for smaller cathode-ray tubes such as the 902 and 906. The scanning unit (third from bottom) is of the electromagnetic type, and is not the same as the electrostatic scanning unit described by Mr. J. B. Sherman.

Also shown are photographs giving front and
Here is performance of the highest order: a transmitter with 100 watts input and outputs of 65 watts on 10 meters or 73 watts on 20 meters — by actual measurement. Even higher efficiencies are obtained on the other bands. Investigate the Thordarson 100 watt “Multi-Band” Transmitter. Let it prove itself!

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Are We Right?

You should have at least two of them—one for your complete 1938 file of copies, and one for each 1939 issue as published.

With each Binder is furnished a sheet of gold and black gummed labels for years 1922 through 1941. The proper one can be cut from the sheet and pasted in the space provided for it on the back of the binder.

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THE AMERICAN RADIO RELAY LEAGUE
West Hartford, Conn.

back views of the receiver chassis with all parts mounted, but with the shield cans removed from units of differing construction. The front view shows the r.f. and oscillator-mixer units (in the shield cans) with the ganged, channel-changing switch mechanism at the tops of the cans. The two potentiometers located near the top of the chassis in the rear view are (right) the a.g.c. control ($R_4$) and (left) the Kinescope cathode-bias control ($R_9$). The latter serves to adjust the brilliance of the picture on the Kinescope screen.

In the back view of the receiver chassis the "hand-tailored" units from which the shield cans have been removed are as follows: bottom left, i.f. coupler No. 4; top left, video-amplifier input compensating unit; top center, video-amplifier output network; top right, i.f. coupler No. 1; and bottom right, sound-buffer input network. The lower shield can contains i.f. coupler No. 3; the upper shield can, i.f. coupler No. 2. The holes through which the variable condensers in an i.f. unit are tuned can be seen in the shield can at the lower right-hand corner.

Constructional details of the various coupling units, filter networks, and compensating networks, as well as a description of the alignment, adjustment, and operation of the television receiver, will be given in a subsequent issue.

(Note.—In the design of this receiver, a great deal of care has been given to the selection of components, both electrically and from the standpoint of suitable physical size, and their placement. To aid the constructor, manufacturers' names have been given in each case where the choice of a component is important. A complete chassis layout will be given in the subsequent article.—Editor.)

Bibliography


Hamdom

(Continued from page 17)

very crude apparatus sending out CQ's and working DX right from the fortress—of all places!

It wasn't long before the government caught up with PJ3CO and relieved him of his transmitter and receiver. His standing in the Dutch army is still as good as ever, but at this writing the officials have not as yet decided whether they will confiscate his gear and relieve him of his call letters.

Say You Saw It in QST — It Identifies You and Helps QST
The beginner in amateur radio will find this an easy rig to build and to operate, and a perfect transmitter with which to gain operating experience.

It is unquestionably a most economical transmitter for any amateur to build, enabling him to “get on the air” with the least possible expenditure for an efficient, versatile rig.

Although complete from power supply to antenna tuning circuit, parts have been held to a minimum and tuning procedure has been greatly simplified.

All the amateur bands from 10 to 160 meters can be worked, with suitable crystals, simply by changing a single coil for each band.

As in all Utah Transmitter Kits, quality has been maintained in all the parts — it’s a rig any beginner will be proud to own and operate. See your UTATH Jobber or write direct for complete description and schematic diagram on this and other models.
The New 3-Element General
Rotary Beam Antenna

Gives an increase in forward gain over the 2-element General and with reduced QRM. No Tuning Necessary. Elements with correct lengths, and impedance match furnished for your frequency.

Complete 20m. Generals / 2-Element, $38.00
Now as low as 1-Element, $34.00
Direction indicators, ohmmeter and synchronous motor types.
Sets of elements only, arrays for your rotating head, motors, reducing gears, shock absorbers, control cable.
Prices subject to change without notice. Shipments F.O.B. Factory - Ohio. Write for full information to

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GENERAL ROTARY ANTENNA CO.
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"Eventually a GENERAL Rotary Beam"

NEW
"PEE-WEE" INDUCTORS
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50 Watt capacity wound on threaded Abnag No. 196 forms. Available for 10-160 meters with or without link—any type. Miniature plug-in base available for bandswitch, condenser or chassis mounting. All type coils, $1.90 List. Mounting base, $.60 List.

COTO COIL CO., INC.
PROVIDENCE, R. I.

In view of this story I vowed I'd appeal to the American hams, through QST, to write to Holland and try to intercede for him. I'm no ham myself and I sincerely hope the radio amateurs are not thinking that an SWL is trying to butt in on their affairs.

Humphrey Arthur Crawford still has several years to serve as a soldier and traffic cop on the Island of Curacao, and unless he can return to his one and only hobby, it will seem like a lifetime to him. Am I "out of order," hams, and what's the answer? You have his full name. His address is Waterfort, Willemstad, Curacao, N. W. I.

—William D. Watkins

There is a sequel to this story. On October 24th P.J3CO stood trial before a military court martial in Curacao. Although details of the outcome are not available at the time this issue of QST goes to press, a reliable source indicates that the maximum penalty of Fl. 1000 (about $670) will not be imposed. Nevertheless, Mr. Watkins still urges all amateurs, not only in the United States but elsewhere, to write letters of intercession to the N.V.I.R., Post Box 400, Rotterdam, Netherlands, in his behalf. It is believed that, under the circumstances, such letters can be of great use to P.J3CO.

How Much Spacing?
(Continued from page 89)

...diminishes to almost none, and the circuit of Fig. 1-B then behaves as the circuit of Fig. 1-C. Of course, this does not justify the omission of the connection between the tuning condenser rotor and the positive plate supply terminal, because damage is done during the period of arcing; and in addition, a delay in attaining proper operating conditions is incurred.

With plate-modulated 'phone operation using the circuit of Fig. 1-B, even more trouble is caused in placing the circuit in operation. Before the blocking condenser is charged to the power supply voltage, an arc occurs which is likely to continue until the plate supply voltage is reversed from the amplifier.

RESULTS OF TESTS

A study of the four diagrams in Fig. 2 shows the comparison between ratings of peak voltage per section for four circuit conditions with split-stator tuning condensers. The diagrams show the maximum peak voltages across a single condenser section for a push-pull transmitter of 1250-volt plate supply, with 100-per cent plate modulation applied for the diagrams of Fig. 2-B and -D. The upper diagrams apply to a section of the tuning condenser connected as in A or B of Fig. 1, while the lower ones show corresponding voltages existing across each section of the condenser with the connections of Fig. 1-C. It will be noted that in the latter, the maximum peak voltages are less than half those of the upper diagrams, with the result that the condenser spacing may be much less than half that required for the arrangements of Fig. 1-A or -B.

Actual tests bear out the above statements.
Buy Now
and Pick your Price!

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HAMMARLUND and RCA AMATEUR
COMMUNICATION RECEIVERS

$29.50 to $261.00

Plan NOW to have
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No matter what set you want, or whether
your budget says "splurge" or "go easy," NEWARK has just the receiver for YOU at the price you want

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YOU at the price you want
to pay. You can buy ON EASY TERMS if your order totals $60 or more, sets and parts. A small down payment
will deliver your receiver promptly... and you can take up to
one full year to pay the balance.

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Only

CASH That's all you pay for
HALLICRAFTER SKY BUDDY, MODEL S-19. Every Ham
can afford a new receiver when even the leading makes are priced so low. No time
payments. $29.50 is all you pay, now or ever!

$49.50 YOUR CHOICE
Only

CASH NATIONAL'S NEW NS-44 or HALLICRAFTERS SKY CHAMPION, Model
S-20 can be yours complete at this low price! Take your choice. Both are wonderful values. Send $10 with order and we'll ship
C.O.D. for balance. Or select $10.50 worth
of parts and supplies from our catalog and buy on easy payments.

PAY ONLY $19.00 DOWN
HALLICRAFTER SKY RIDER 5-10
Complete with tubes and speaker, the cash price is $99.50. But with a small
down payment as above, you can take 9 months to pay the balance at $6.25
per month. Or pay $9.33 monthly for 6 months. Order direct from this ad.

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Illustrations, prices and full details on thousands of separate items, sets, tubes, parts
and supplies MAKE UP A $60 ORDER and Buy All that supplies you need at present
low prices AND PAY ON EASY TERMS. Write for this Big 16-page Catalog Today.

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$14.50 down buys the HALLICRAFTER SKY RIDER MARINE complete with tubes and speaker. Then you pay $9.32
monthly for 6 months or $6.26 for 9 months. Cash Price $64.50.

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TIONAL'S NS-66X. NS 81X (complete with tubes, crystal and 8" PM speaker in

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HALICRAFTERS SKY CHALLENGER II complete with tubes, crystal, and speaker. Monthly payments are
$14.36 for 6 months, $9.66 for 9 months, or $7.30 for 12 months. Either set priced at $99.00 Cash.

Your Call Letters in Gold
Ham's look at this! Your Call letters in
impressive three dimensional style. Big 2@".92 high! Use your call letters
nearly TWO INCHES high. Put them on your HAM SHACK door, auto
window, etc. Send dime for yours to­
day. Be sure to give your call letters.

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is waiting for
Your Job!

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CREI training insures your future

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  men... that’s why your boss can afford to be
  “choosy” in selecting men for better jobs. He knows
  that there is always another man waiting for your job...
  but, DO YOU? Right now is the time to insure your
  future in Radio. You must be technically trained to hold
  and improve your present position.

GOOD men have the GOOD JOBS!
Modern improvements demand men with advanced
technical training who can step into the new jobs that
are constantly being created. There’s always room at the
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future and the success of every Radioman — send for
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Introduces a new rotary antenna unit built to meet the requirement of the most exacting operator. The powerful compact mechanism is enclosed in an aluminum alloy housing which affords complete protection from weather. All working parts are bathed in oil. A new antenna feeding arrangement permits continuous rotation with any type of feeder or matching system. The speed of rotation is 1 1/4 of 1 r.p.m. The synchronized direction indicator timer is an integral part of the gear reduction and is so designed the indicator clock can be connected at any time. The weight of the main unit is 17 lbs. The supporting framework is made of cypress.

AMPLEX ENGINEERING CO.
New Castle, Indiana

One specific instance taken was an 808 series-fed single-tube amplifier with split-stator plate circuit to provide for neutralizing. For proper 100-per cent plate-modulated telephone operation with this stage, with 1250 volts at 100 ma. (125 watts input), the proper tuning capacity per section was found to be 1.1 µµfd. per meter wavelength. Using this value with the chart of Fig. 4, the watts-input ratio was found to be 114, and the r.f. voltage per condenser section was found to be approximately 680 without modulation, or 1360 with 100-per cent plate modulation.

From these figures, an unusually small spacing for the tuning condenser, 0.05 inch, was indicated, since this spacing, intermediate between the receiving condenser spacing of 0.03 inch and the old “double spacing” of 0.07 inch, is rated at 1500 volts. A condenser of 180-µµfd. maximum capacity per section (Cardwell MO-180-BD) and 0.05-inch spacing was obtained for the 808 amplifier. With the amplifier loaded to 100 ma. plate current at 1250 volts, provided with adequate excitation for linear 100-per cent modulation, and fully modulated, no arcing occurred while the condenser was connected as in Fig. 1-C, but 100-per cent modulation could not even be closely approached with the circuit of Fig. 1-B before arcing stopped the transmitter.

Corresponding tests were conducted with the condenser as in Fig. 1-B in a 2500-volt amplifier with telegraphy operation. Arcs were maintained throughout the first dots of keying until the blocking condenser became charged nearly to the supply voltage, after which proper operation ensued for a time. With the rotor of the tuning condenser connected directly to the positive high-voltage terminal as in Fig. 1-C no arcs resulted.

The comparison in Fig. 2 between the telegraph and modulated peak voltages across each section of a split-stator condenser in the circuit of Fig. 1-B and the corresponding peak voltages of Fig. 1-C clearly shows the importance of the d.e.-shorting circuit between the rotor and stator sections of the condenser, for a 50-per cent reduction of the required peak voltage rating of the condenser usually results in a reduction greater than 50 per cent in required plate spacing, and an accompanying reduction in the total condenser plate area, so that a much more economical and compact condenser may be used.

OTHER TUNING CONDENSER CIRCUITS

In Fig. 5 are shown six r.f. amplifier plate circuits in which no supply voltage appears across the tuning condenser (or tuning condenser section). Calculations for the required spacing of these condensers are based on the r.f. voltage alone, and thus may be taken directly from the chart of Fig. 4, as may the spacing of a split-stator condenser connected in any of the circuits of Fig. 3.

It is important in the three circuits of the top row in Fig. 5 that the condenser rotors have the dependable, safe insulation from the tuning control recommended above for the condensers of Fig. 1-B and -C.

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Field Day Results

(Continued from page 58)

3827, 7005, 7054 and 7117 kc. were used. Power was supplied from a 500-watt, 110-volt a.c. gas-driven generator, wound and built by W9LTC, and ran the whole 26 hours "old. The antenna really worked fine, being a half-wave, end fed zep with 64 foot feeders, fastened between two trees, 50 feet above ground.—The Austin Radio Club, W8LTJ-A.

Our location was a camp 6 miles southeast of Stover, Missouri, in the foothills of the Ozark Mountains where no commercial power is available.—Sedalia Amateur’s Radio Club, W6LVA-A.

The Panther Valley Gang operated near Pottsville, Pa., on the farm of W8BLT. Six complete station units were on hand but some could not operate due to lack of sufficient a.c.
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<td>$9.79</td>
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<td>NC50X and NC61X</td>
<td>99.00</td>
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<td>The NEW NC100A</td>
<td>120.00</td>
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Complete with Vari-Swiv mounting $23.50 list. We had two stations entered, W4CDC-4 and W4CBU-4. The operation of the two stations was intended to throw light on a good natured argument as to the best location for such a station. W4CBU and adhered contendently it was QTH on top of one of the mountains with which this part of the country is so liberally endowed, and was operated from the top of Missionary Ridge. W4CDC held out for a low swampy place where the ground was damp, and was operated from along side Chickamauga Creek in a place so low and damp that at one time we had three cars stuck side by side. One trial is not conclusive, but on this occasion W4CDC ran up the better score. —Chattanooga Amateur Radio Club.

Field Day is a grand opportunity of getting back into the real spirit of ham radio. Am looking forward to the next one. —VESAP.

We had a field day in Ashland this year for the first time. It went off with a bang—thunder, lightning and rain. Near Ashland in a park called Armoeco we located with trailer, tent, gas driven generator, transmitters, receivers, grub, ice box, flies, chiggers, and ants. Being the first time, there was much to learn from trial and error. Maybe a ham thinks he is ready to set up in an emergency but after several weeks of preparation we found much to be ironed out at the final moment. —W9BEW-9.

We drew straws to see whose call we would use and W3GXI won. We drove down to the Shenandoah National Park and camped 15 miles south of Hog Wallow Flats on Skyline Drive. We think that an ideal QTH for 'phone use, don't you? —W8GXI-5.

Being in the automobile business we packed our equipment in a large van. Three of us stayed overnight "on location." —W8MLM-9.

We were located on Connecticut Hill, elevation about 2100 feet, 18 miles from Ithaca. Our power source was entirely portable, being two motor generators. Two transmitters and two receivers were on the air continuously, both c.w. and 'phone. A large army tent provided sleeping quarter-Ithaca Mike and Key Club, W8QUL-8. We had an outdoor hamfest held at the location all day Sunday with about 40 visitors attending and looking over the equipment. —W1DJC-1.
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frequency with no trouble. W3EIS wanted to test his 5 meter portable rig over greater distances than were possible from the home location. Every station heard could be contacted, and the test was eminently successful on this point. — W702D-9.

It took a lot of optimism to answer FKJ1R's Q0 on 7 Mc. with 33 watts after using a kilowatt for fifteen years, but one short call got results. — W4QKL-5.

All operation was on 56-Mc. phone with about 12 watts input. Worked 67 stations. — W1NH-1.

We operated on Todt Hill, one of highest points on Atlantic coast, about 7 miles from home QTH. Power used was 5 watts running off small vibrator pack on storage battery. W7JY worked 41 stations on 3.5 and 7 Mc. — W7JYH.

Just as we completed setting up (in a covered truck) a small tornado tore through, rain, wind, lightning and the whole works. We managed to work our first station at nine o'clock where hours later. Some started. This year's Field Day activity brought a number of things to light for us, namely: that low power is not to be sneezed at and that an inexpensive vibrator supply will do the trick where we thought that a gas driven generator was the least we could use for results in case of emergency and get through QRM and QRN. We also found that it would be an excellent idea for hams, individually and in groups, to prepare a list of necessary items to be procured in addition to radio gear, should the necessity suddenly arise for one to leave on emergency communication work. At the last minute there are bound to be things overlooked that will be needed. — W8HMH-8.

All operation at W9FH-9 was on 14-Mc. 'phone. Conditions were a little tough for such low power. However, we worked 77 stations, and if you don't think 18 watts will go thru the night. Raincoats and hip boots were the order of the day. Raincoats and hip boots were the order of the day. mosquitoes that came thru the night. Raincoats and hip boots were the order of the day. mosquitoes that came thru the night. Raincoats and hip boots were the order of the day.


During the Field Day a test message was sent from Mr. C. G. Marcy, Chairman of the Schenectady County Red Cross Disaster Preparedness Committee to Red Cross headquarters in Washington. This message was sent by 56 Mc. from the Base Station to Schenectady and then forwarded by W2LU to Washington. Mr. Marcy personally visited the Base Station on Saturday afternoon and commented favorably on the set-up and the work being performed. — Schenectady Amateur Radio Association, W7DFO.

The Tampa Amateur Radio Club has participated in all ARRL Field Days with varying results, from winner to an also ran. This year, supplemented by a smooth operating low powered transmitter, built and owned by W4EUF and an old 900, a relic of many DX wars, belonging to W4AX, all operation with batteries, and last but not least a real rabbit's foot, the Club was loaded for bear. Well, we may not win the Field Day, but no better time was had by any of the other participants. — W4EUF-4.

The antennas were set up Saturday morning. By the time the two V beams had been completed W5CMQ was quite an expert in the art of tree climbing. He made a specialty of the rabbit's foot, the Club had its Field Day this year. Our 54 contacts were made with a 6V6-R133 transmitter powered by two dynamotors hooked in series and run from a bank of storage batteries. Power input 18 watts. — Pike's Peak Amateur Radio Association, W90KY-7.

The Helix Amateur Radio Club held its Field Day this year on Mount Helix. This mountain is located about 12 miles to the east of San Diego and rises to an elevation of about 1200 feet. Because of its elevation and freedom from a line disturbances it made an ideal radio location. — W6ANU-6.

A truck loaned to us was loaded with generators, rigs, tents, stove, grub, antenna poles, gasoline, water and all (Continued on page 90)

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Station Activities

DAKOTA DIVISION

NORTH DAKOTA—SCM, Ernest Hoch, W9RZA—The Grand Forks Radio Club is holding a QSO contest. The ham members were divided into two teams, the object being to work all the different stations in as many different states as possible—the final "payoff" to be in the form of a feed put on by the losing team. ITI is a new ham in Hatton. ZGR is busy rag chewing and handling traffic on 1.75-Mc. 'phone. JBD is a new ham on 144 and 28-Mc. WRL is back on the air. ZIL is ex- You ask, KXZ has the new part of TVC, D2D, LIL, LL8 has a new shack located south of Austin on the highest point in Mower County; they work mostly on 14 Mc. DCM has been reborn; the owner forgot that rule 410 applied when a license is endorsed for Class "A." The S.M.R.A. held its convention at Mankato November 6.

Traffic: W0MD 45 YNQ 13 MNZ 3 ZAD 1

CENTRAL DIVISION

ILLINOIS—SCM, Leslie M. Dickson, W9RNN—At last, the air is clear and the hamma are back in business. WSJ is working some rare ones lately. JTK, a new ham in Wataca, is trying a crystal earphone for a mike. RJF hooked up a new high-power 'phone job. ZWW put up a Vee beam for 28 Mc. KBL averages one QSO per week. KPD sold out 7 Mc. and is an O.P.S. with a nice rig. ZAD, Y7iW, MBM have 100 watts. MBM has a new rotary beam.

Traffic: W6EBX 171 RMM 140 (WLTR 307) HPQ 68 (WLT4 44) NFL 60 VEE 47 (WLTG 60) DDD 45 VES 41 (6Q 25 TUV 18 QJX 15 V8 11 PR 10 RMM 9 A.A.R.S. TBM 44) BE-TDY-79Q 7 ZCS 3 WLH 3 W6EBX 171 RMM 140 (WLTR 307) HPQ 68 (WLT4 44) NFL 60 VEE 47 (WLTG 60) DDD 45 VES 41 (6Q 25 TUV 18 QJX 15 V8 11 PR 10 RMM 9 A.A.R.S. TBM 44) BE-TDY-79Q 7 ZCS 3 WLH 3

INDIANA—SCM, Noble Burkhart, W9QG—AB is on the air and we'll get 'em for you in one evening. Although GYK is an O.P.S. with many times over, he isn't satisfied; he wants an S9 W.A.C.; four Vee beams are helping him along. KU1 is starting with an RK-20 and going to build a new one soon. DM has a new rig with 6A6 and RK39 for 3.5 Mc. The Section lost one of its members. YOB Treas has a noise silencer. Hmmmm!

Traffic: W9VOD 5 SEB R.M. OXC: O.B.S., O.O. The Section lost one of its members. YOB Treas has a noise silencer. Hmmmm!

Traffic: W9VOD 5 SEB R.M. OXC: O.B.S., O.O.

NORTHERN MINNESOTA—SCM, Edwin L. Wicklund, W9WIG—The Dakota Division QSO party will be held the week-end of January 14 and 15. Complete details will be given in next QST. WRL will spend his time with traffic. ZTL has schedules with BNT and WKB. KQA is putting up a new antenna. St. Paul Radio Club Powwow was a big success. PKO is panning out on 28-Mc. 'phone. ZGU has new Sky Champion receiver and a new T-40". ZWW put up a rotary beam for 28 Mc. IKE0 puts a new 8X1 receiver. UDK is trying a crystal earphone for a microphone. JRF hooked up a gas driven generator. MUR has two T-40's with 144 watts on 'phone and 250 watts on c.w. NGB built a small rig to operate from his home location. PWZ sends news from Ft. Wayne. QCJ is building frequency meter to meet new FCC requirements. QCQ sold his rig to QFU. SWH is a new member of A.A.R.S. TBW is holding down trunk line "L." TMP gets into Ft. Wayne occasionally. TRN has new class 'phone. W9HCR is building an O.P.S. on 28 Mc. 'phone. ZW9Y is a new bridegroom. 'OQ finally worked a Nevada station that promised to QSL; if it comes through, Gus has new Stancor 100 'phone rig and is O.B.S. and O.P.S.

Traffic: W9VOD 5 SEB R.M. OXC: O.B.S., O.O. The Section lost one of its members. YOB Treas has a noise silencer. Hmmmm!

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Traffic: W9VOD 5 SEB R.M. OXC: O.B.S., O.O.

SOUTHERN MINNESOTA—SCM, Millard L. Bender, W9QG 2 HEN S3 IGZ 3.

SOUTHERN MINNESOTA—SCM, Millard L. Bender, W9QG 2 HEN S3 IGZ 3.

Traffic: W6EVQ 2 HEN S3 IGZ 3.

Traffic: W6EVQ 2 HEN S3 IGZ 3.

Traffic: W6EVQ 2 HEN S3 IGZ 3.
rivals of boats at the canal on Louisville on the number of large of the tow to facilitate handling at the canal. TRL is DXing on 14 Mc. NAB has a new shack and works 14 Mc-

Traffic: WEBGC 158 9BH 174 (WLJL 438) LUT 137 LZE 106 KIM 90 WE 69 NUK 50 MUR 58 AQ 40 LCW 28 FG1 35 PH 32 HKR 25 KNF 15 APC 13 LJK-RRK 12

results. OVL has been building tower and motor controlled rotary beam. SFB is doing fine, 60-Mc. superhet. EMV is rebuilding. CDR is erecting tower during the season. PBX is on 14 Mc. seeking W.A.C. and W.A.S. JFC at the top of the heap in traffic again this season. L VU for rotary antenna. FH.B put in new power mains but is still not ready for big season. SDG

www.wb9slz.net

MICHRAGAN—SCM, Harold C. Bird, W8DPF—Michigan Eights: NUV is down in the 4th district going to school. Lots of luck, Vic, HDD, operating portable from the East, would like traffic from QMN boys for eastern points. RVE is O.R.S. and is looking for eastern schedules. DSQ is still under the weather. Lots of luck, Rudy, QMH moved, has sky-wire up and ways watch out now. FWU suggests O.B.S. for Michigan Net. BQA has been installing remote control and added b.d.o. and 3 meter to receiver. BMG is trying to build new rig and operate at same time. KNP will be with us soon. GUN is back on QMN. JZD is getting his planning committee together for emergency work. JQJN joined A.A.R.S. NQ is trying to work QMN and 1.75-Mc. plane. DDD is playing with W.A.C. and W.A.S. schedules to QMN. Net making a total of 145! DO1 wants boys to QSY for rag chews after QMN net. FTW is out for traffic in big way this season. QGD has single-signal working FB for traffic work. PLT reports by radio. OXM is chef for the Oakland Radio Club. RBU acquired an SW3. MPX is using his RK-20's and is increasing to high power-25 watts. RIX has new scope and new steel mast. PRW is making 28-Mc. rig. O.V.M has new double zapping fine. IYL is making his O.B.S. schedules regularly. ESJ on first report tells of handing traffic. UFT joined the new Police Operators Net which is getting started on 3715 kc. HISK is back in State Net with the new B.S. system. HSK is strong on "KYN." AIR is rebuilding—again. YQN has completed rebuilding and runs 220 watts to a pair of T40's. Traffic: WB9BC 135 ARU 109 HAX 91 EDQ 86 ELL 72 URU 28 NUB 6 YVL 3.

IOWA—SCM, Clyde C. Richelieu, W9ARE—DUA is new A.R.R.L. Q.S.T., O.R.S., and R.M. JM.X is active in A.A.R.S. again. Congrats to REH on FB traffic total—we need more of this type. LCX is editor of fifth C.A. bulletin. SCT is organizing a net for 6:15 daily in U.P. 1IT, Vee, says she is doing nice job on QMN at Flint. SH reports SHI, NWO, RCR, ROH, PVD and AYO all new ops at coast. SCR won the first prize. Congrats again. LSF reports QGD as alternate on O.R.S. bulletin. Hope you will all be on your toes in case of an emergency. If you have not joined up with Emergency Corps, do so now. You owe it to your community as well as yourself.

Traffic: W8SDQ 536 JZD 162 FTW 142 (WLTJ 42) IJX 107 DTY 108 P1C 90 CMI-HVE 87 LSF 63 BRS 41 PYT 47 JQU 38 DO1 37 FX-BMG 20 DUE 18 M3M 16 GUN 14 QZH 10 QGQ 12 ROE 8 HSO 5 QOY 3 NUV 2

Ohio—SCM, E. H. Gibbs, WAQ—Ohio Regulars spot frequency is 3370 kc. HCS and BBH are at the top of the heap in traffic again this season. LVU is net control of the Regulars and in trunk "M" besides. WE has been transferred to Findlay. HRR, LCW, RFF and RIX are O.R.S. prospects. FG1 has been working DX besides keeping A.A.R.S. schedules, 9YML/8 divides time between Ohio and Indiana. APC is editor of fifth C.A. bulletin. RIX is increasing to high power-25 watts. QGD is working DX besides keeping A.A.R.S. and R.M. schedules on new frequency of 2820 kc. HSK is putting his shoulder to the wheel once more in the State Net. AKT moved to new QTH and has been elected president of Four Lakes Radio Amateur Club. SDG is getting ready for big season. QGD has single-signal working FB for traffic work. SVX added b.f.o. and S meter to receiver. BMG is trying to build rig of his own. PSC is building new speech amplifier. O.R.S. bulletin. Hope you fellows will all be on your toes in case of an emergency. If you have not joined up with Emergency Corps, do so now. You owe it to your community as well as yourself.

Traffic: W9WBN 18 WLTJ 5 HSK 6 (WLTJ 6) SBL 32 AKT 2 HGF 4 ESJ 13 UIT 3 ZTP 16 YH 29.

MIDWEST DIVISION

Traffic: WIQO 18 WLTJ 5 HSK 6 (WLTJ 6) SBL 32 AKT 2 HGF 4 ESJ 13 UIT 3 ZTP 16 YH 29.
the other things we could think of and away we went. Six
24-foot poles were set up, four antennas strung and two
tents set up; equipment was set up in the tents and truck
when a wind of about fifty miles per hour came up and
promptly blew down two poles and one tent. — Open Amate-
ur Radio Operators Club, WEGTB-8.

The Central Colorado Radio Assn., located at Daniels Park,
Colo., about 20 miles south of Denver. This excellent loca-
tion is about 1000 feet above the surrounding area. A view
of the west, north and south. Care had to be used so as not
to disturb rattle snakes which infest the region. — WZ2OD-9.

Our rig used was entirely dry battery operated using 2
volt tube, a type 30 crystal oscillator into a 49 amplifier,
input of 3.75 watts, 55 Mc., band was used almost exclu-
sively, only one contact being on 14 Mc. The antenna was
a matched impedance type single wire fed coupled to the rig
with a pi-section filter. The receiver consisted of a pair of
290's detector and audio.—W1AWY-1.

Field Day Participation

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(Continued from page 89)

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Traffic: W9EDU 18 JMIX 10 RBH 212 LCX 235 TGK 11 ZQW 57 LEZ 44 (WLUD 24) AW8 20 ARE 52 QVA 4. JXG is with the state Highway Patrol Radio Station.

Missouri—SCM, Leslie Allendorf, W9OUD—The Missouri SCM is doing fairly well with several regular netters, among them ZVA, ZVS, VZQ, and XOQ, who is also alternating for PYF on T.L. "K." ZJK is rebuilding, using a 6L6, 800 and P.P., 500's, QOB and his new receiver worked VQG for a few contacts. The post on the line. QOJ joined the A.A.R.S. RJP worked with T.L. "AP" for a while until junior college interfered. JAP resigned T.L. "H" post but is continuing in A.A.R.S. HVT has a new rotary beam which really works; he and UYD relayed traffic on 14-Mc. 'phone during the hurricane emergency for eastern stations. EFC has a new QTH in Richmond Heights, which is still St. Louis, and has a thousand volts on a ten. KIR is back from California ready to handle some traffic, RKN is back from vacation. KLEQ has a new 175-Mc. 'phone, now operating on 28-Mc. "B" going fine. KPA is alternate for PYF on T.L. Sept. and Oct. At each picnic portable rigs were in operation...
new skywire for 7 Mc. FWE keeps the club rig, DIG on the air. GQV works at K1UDF by day and operates on 28 Mc. by night. CDD is still trying to work 50 Mc. BV2 is operated sometimes by BSI, a regular member of the club and a fine operator. BSI built his station in 1937 and has kept the antenna up. BTK rebuilt his shack and keeps the storm net going nicely. BEH worked all districts with a 6L6 crystal oscillator. HDY works on 14 Mc. BKK works 3.9-Mc., phone and is President of the Charleston Amateur Radio Club. BBR is back on 3.9-Mc., phone at his Houston QTH. CVQ carries a 7-Mc. portable in his car and can be heard or worked every night he is away from home. CFX and DRA visited the S.C.M. CFX operates on 3.9-Mc. phone. GBV has new QTH, Fort Sam Houston. Traffic: W5OW 1418 MS 311 CVQ 91 DLZ 54 FZD 55 DWN 24.

NEW MEXICO—SCM, Joseph M. Ellsworth, W5CGJ. Traffic: W5CM 1 (WILQ 37) ENI 46.

DELTA DIVISION

ARKANSAS—SCM, H. E. Velette, W5AIB—Thanks to SCM for the news in this report: GYV is working DX on 28 Mc. GJ worked Sweetwater, Texas (about 800 miles) to W5CJ by phone and c.w. He has started on R.M.'s 5BN, 5DWW. P.A.M.'s 5ADJ, 5GDU. E.C. 5DAQ. SCM is trying to get the bugs out of HGT. DRR thanks you P.B. gang for a full kw on 'phone and c.w. SCM has started on R.M.'s 5BN, 5DWW. P.A.M.'s 5ADJ, 5GDU. E.C. 5DAQ. SCM operated at New Orleans Radio Club, a new and active outfit in our Section: CXX has a 200 watt job parking FB on 50-Mc. phone in the Crescent City. KQ is our section's leading DXman. DW2 is doing his part as R.M. for N. Louisiana. HCCX is a sea-going ham these days. A0G is cutting his right down to his own size. FPO lost his complete station in a recent fire. Our regrets, OM. Newly elected officers of New Orleans Radio Club: DXX President; S.F. Vice Pres.; DXX Secretary; DRR Treasurer. EA includes EVS Activities Mgr. The club celebrated installation of officers with a banquet that was attended by all members and the Ladies Auxiliary of N.O.R.C. FXZX deserves a big hand for the swell job he has done this year. SCM will do a big job in keeping the old Section out in front. YU is station call of Tulane Radio Club. 9ZNT operates 7 and 14 Mc. from Barksdale Field. ECH is active on 14 Mc. with P.P. T5S's. GTI, BRK, EVZ and FUM are doing their stuff in Baton Rouge. HHI, HCP, DZK and RW are active stations in Lake Charles. 3ERE was visitor in New Orleans. HCCX is working on his rig. DIQ and FW report from Algiers. ADJ is out and at 'em on 1.75-Mc. phone. DAF has things well in hand as Emergency Coordinator. DZR likes new signal shifters. HCCX is increasing power. CQX does his bit of DXing. BYX has T55 final. CEW is after DX. GMF is burning up 28-Mc. phone. GUK is building receiver. CJO and GND like the FBT receiver. JW and GUK were in a motorcycle accident and were done up some. FHH likes turning the dials of his HRO. BLQ has FB rig on 1.75-Mc. phone. HITT works a 14-Mc. phone, low power. CIA is building a 28-Mc. rig. HCY has pair of T54's in final. CQX is busy with every FFB. SCI is putting up his O.B.S. W1Q, none other than OM Reinartz, was in New Orleans and gave the N.O.R.C. members and the New Orleans hams a real treat by setting up a swell rig and talking on same and answering questions. DQR is receiving a flock of good looking DX cards. EN5 is on 14-Mc. as he is staying with him. GED has 40 watts on 1.75 Mc. phone and is heard mostly carrying on with the "Hoodlum" organization. All you fellows who have wondered what has happened to ARK in 1.75-Mc. phone rig. EIP plans to go to school in Chicago in December; he will keep in touch with home via 14-Mc. phone through GNV. HDMI has 40 watts on 14 Mc. phone and is still "on the air". L.J. has 7 Mc. HGB took Class B at L.R. FGS is op, at KASP in L.R. GHJ won a 101HF at the Mooray Hamfest in Poplar Bluff, Mo. RW, after being off the air for five years, is getting back on with an all-band c.w. rig in addition to his 'phone layout for work in final. HPP is a swell time. SCM thanks to all for reporting, and to those who didn't get the
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Listings on this page do not necessarily imply endorsement by QST of the dealers or of other equipment sold by them.
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THE NEW RME-70 RECEIVER

A two stage, three circuit, radio frequency amplifier unit covering the frequency range from 550 to 32,000 Kc. in six bands. Designed to be used ahead of any good superheterodyne receiver to give added selectivity and considerable signal increase on all frequencies. The unit comes standard with antenna changeover switch incorporated, supplied with three tubes, and built-in power supply. It may be ordered equipped for any voltage or frequency, including battery or B-pack operation, either in black or gray crinkle finish.

The DB-20-70 matches in outward appearance the RME-70 series receiver, being provided with rectangular dial opening and chrome trim. The price remains identical to the standard DB-20 and is listed in the regular price sheet.

The Combination RME-70 and DB-20-70

In many instances the combination cabinet to house the receiver and preselector as one unit is desired. This arrangement has been made possible in the RME-70 series. Either gray or black crinkle finish with the fine appearance now available in this new series permits many stations to dress up modern and utilize the combination as introduced by the RME-70 and the DB-20-70.

Special literature is available for any of the separate units in addition to the combination. In the combination, the DB-20 is equipped with an antenna changeover switch. Literature will be gladly sent upon request.

THE RME-70 S. S. S. RECEIVER

In introducing the RME-70 series receiver no radically new instrument has been designed and built. Several features heretofore optional in the RME-69 series have been incorporated as standard in the RME-70. Relay control and break-in features are standard. An automatic noise suppressor is standard. Iron-core mica-trimmed transformers are standard.

A reduction in price is made possible through the elimination of all optional features, which are only available in the RME-69 series instrument. Only through standardization and concentration on this one model type has it been possible to lower the price of the new 70 and still keep the performance high.

The instrument comes standard with illuminated DB-R Meter, new automatic noise suppressor, resonator control, standard or special bandwidth for requirements as desired, standard crystal control filter of the variable phasing type, headphone jack. and, of course, built on cast aluminum frame to insure high stability and fine operation at all times.

The RME-70 is available in cabinet model only, either gray or black crinkle finish. From input to output its performance will be a revelation to even the old timers. Pay your dealer a visit and check its operation.

RADIO MFG. ENGINEERS, INC.
ONE ELEVEN HARRISON STREET, PEORIA, ILLINOIS, U.S.A.
BELIEVE IT OR NOT

WITH APOLOGIES

The unexcelled laboratory and engineering facilities at UTC bring some of the largest commercial organizations to us with their special transformer problems. Some of the more interesting units recently made by UTC for such organizations are almost in the "Believe it or not" class.

Television service represents an unprecedented problem in the wide range of frequencies which must be covered. UTC supplied transformers for one organization with a range of 30 cycles to 2 megacycles.

Innumerable hum problems are brought to UTC from remote amplifiers operating next to theatre dimmers to pre-amplifiers adjacent to power supplies. Every situation encountered was cured through the use of the LS-10X tri-alloy shielded input transformer.

Light weight is one of the specialties of the UTC design staff. A recent aircraft control filter incorporating three high Q coils and four condensers weighed approximately 5½ ounces and occupied dimensions 1½"x1½"x2".

Manufacturers of low power lamp and electric razor equipment needed a step-down transformer to permit the operation of 110 V. units on 220 V. lines. Ordinary units were bulky. UTC developed an item with the transformer built into the line cord plug.

Speaking of high Q coils, obtaining a 1 mill henry coil with a high Q at 10 KC is rather simple. Making a 1 henry coil to operate at this frequency is another story. Through special design, a recent UTC coil for this service had an inductance of 1 henry and a Q of 90 at 10 KC. Corresponding design effects a Q of 200 at 1 KC.

For brain wave machines and similar applications, exceptionally low frequency response is required. For an application of this type, UTC recently developed a transformer down only 2 DB at .5 cycles with a phase shift of 6 degrees from 3 to 5000 cycles.

The above examples are given primarily to indicate the trend and possibilities of advanced transformer design. If you have a special problem, write to the UTC engineering staff. Our standard products are described in the new compact PS-403 bulletin, now available at your distributor.

UNITED TRANSFORMER CORP.
72 SPRING STREET • NEW YORK, N. Y.
EXPORT DIVISION 100 VARICK STREET NEW YORK, N. Y. CABLES: "ARLAB"
AMATEUR RADIO STATIONS

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WHAT THE LEAGUE IS DOING
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National makes a complete line of parts for amateur use, ranging from acorn tube sockets to complete transmitters. Right down the line, every item is designed to meet amateurs' needs dependably, conveniently and at low cost. And equally important, it has the versatility that makes each purchase a long term investment. Look them over at your dealer's.
You Save These 4 Ways!

1. Initial Cost
2. Cost of Tank Circuit Capacitors
3. Cost of Power Supply Equipment
4. Cost of Driver Stage

If high power is what you're after—then here's a new RCA tube that gives it to you at very low cost! Two RCA 810's will take one kilowatt of power at a plate voltage of only 2,000 volts and a driving power of 24 watts.

The RCA 810 is of the high-mu triode type and has unusually high perveance. Features include a heavy-duty thoriated-tungsten filament, filament shield at each end to prevent stray electrons from escaping and causing bulb heating, and large rugged terminals at the top and side of the bulb. It may be operated at frequencies as high as 30 megacycles at maximum ratings. Price...

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MAXIMUM RATINGS
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D-C Plate Current 250 Milliamperes
Plate Input 500 Watts
Plate Dissipation 125 Watts

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