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Published by The American Radio Relay League

DECEMBER
1924

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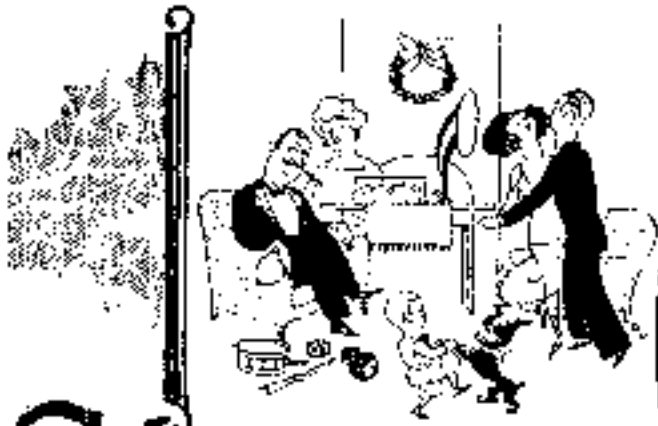

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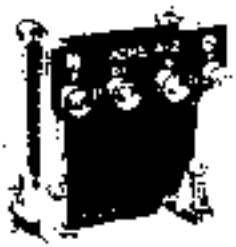

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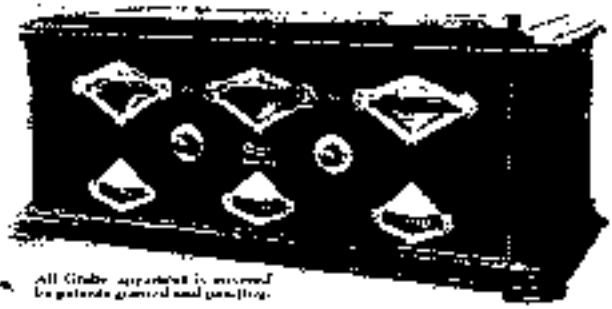

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QST

The Official Organ of the A·R·R·L

VOLUME VIII — DECEMBER, 1924 — NUMBER 6

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THE AMERICAN RADIO RELAY LEAGUE

The American Radio Relay League, Inc., is a national non-commercial association of radio amateurs, bonded for the more effective relaying of friendly messages between their stations, for legislative protection, for orderly operating, and for the practical improvement of short-wave two-way radio telegraphic communication.

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

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

Inquiries regarding membership are solicited. Ownership of a transmitting station, while very desirable, is not a prerequisite to membership; a bona-fide interest in amateur radio is the only essential. Correspondence should be addressed to the Secretary.

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EDITORIALS
de AMERICAN RADIO RELAY LEAGUE

New Problems.

THE recent Washington conference went on record as favoring the discontinuance of the amateur spark. It fact it made no provision whatever for the continuation of the spark. The Department of Commerce so far as is possible will follow the recommendations of the conference. Ergo, there should be no sparks.

The Department does not feel that it should issue an order cancelling the licenses of all amateurs possessing spark equipment, first because the 1912 law really permits their possession, and second because the situation is taking care of itself. Less than 1% of A.R.R.L. membership is now on spark; we do not believe there are a hundred active spark stations in the country. There might not be any. The day of the spark is dead. We have said so many times in these columns, and we repeat it. The spark is selfish, and in these days of congested service there is no place for it whatever!

The conference also recommended a lowering of the minimum decrement for all spark transmitters, and their maximum limit of .2 is probably unattainable by the average station on amateur waves. That, if it were even input, would also put the quietus on C.W. Spark.

Bearing all these things in mind the Department of Commerce feels, and has asked us to so say, that the amateur should evince a spirit of cooperation with the Department in return for favors shown him, and get rid of the spark. We heartily second the motion. The A.R.R.L. here and now calls for the complete and immediate abolition of the amateur spark. Its days is done; let it begone. This is a civilized age and we have no place for decrement today. The Editors of QST have owned and operated sparks that were their joy and pride, sparks as good as most of them, and nobody knows better than we the romance and fascination of the old rotary. But its name is Mud today and out it must go. 100%.

Won't the few remaining spark-pushers please take note that they are indubitably just in the way, standing in the way of progress, losing friends at every turn, and keeping themselves completely out of the possibilities of modern DX long radio? Junk the dern things today, O.M., and get a bottle pecking tonight!

Exit the Spark

THE decisions of the recent national radio conference create new problems for us amateurs. Broadcasting has been extended downwards until it comes right down to meet us at 200 meters. The waves below 150 meters have been carefully cut into little slices and doled out to the various claimants, so that now the whole territory is staked out and soon we will have neighbors on both sides of all our bands. Thus it becomes of paramount importance that we stay within our appointed fences. If we slop over now it is no longer the simple little matter of merely not being where we belong, with no trouble caused. Instead, we will be where somebody else wants to be, and we're certain to be pulled on in short order.

We have been given these short-wave bands more or less on trial. We have them for a year. We have had them so much a while that no one could say with any positiveness that we could not stay where we belong. If our record is black when the next conference rolls around, we shall not have so well. Relay broadcasting for station interconnection has been given the exclusive use of five bands of short waves. If the "bugs" in this service can be removed it is undoubtedly destined to become a most potent factor in broadcasting. The companies interested in it are not too happy at seeing us amateurs on short waves, for they fear we will interfere with them. Wire to us if we do. We can get plenty of DX without having a phone station rebroadcast us. We have plenty of territory now, and the expansion of our second band from 75 to 75.85-4 meters is particularly helpful. Let us all make sure that we never emit a signal outside of our authorized bands.

Prospectively we shall have a new set of amateur regulations very soon. We expect they will result in a new form of station license, under which we will all be authorized to work in any or all of our bands without special permit for each band. We expect that all transmitters will be required to use loose coupled circuits, and that is certainly very much to be desired. That will go further than anything else we know to minimize harmonics, key-clicks and modulation ripples; the tubes will run cooler, and the filament transformers won't be so liable

to depart this life suddenly. With other services immediately adjoining ours and with 3,000 A.C.P.A. signing for low-power DX right down to 200 meters, it is essential that we adopt this. In a few months we hope it will be considered just as bad form to show a considerately-coupled transmitter circuit as it is to talk about a fixed spark-gap in the operating circuit.

It is rather probable that under the new regulations the use of "raw A.C." on the plates will be prohibited during quiet hours, even on the short waves. If this occurs it will be because the Bureau believes our chances of interfering are too great if we have a completely-unrectified plate supply and they will want us to utilize some method whereby both sides of the cycle are employed, which means either a rectifier or a tube on each half of the cycle, preferably the latter. More about this later.

In the business of finding short waves for all the services that wanted them, our special-station band of 105 to 110 meters was lost in its mid portion will be cancelled on existing licenses shortly. In this modern day there does not seem to be any particular reason for "specials" and we fear they are to be done. If this is the case, however, we expect that existing stations will be permitted to keep their old "2" calls as mementos of days that were.

Our representatives at the Washington conference were able to show that to a huge extent we amateurs are a self-governing body. Therein lay one of our chief claims to recognition. Let us keep up the good work by doing exactly what is expected of us in the obeying of the anticipated new regulations.

QSO Our Field Man

WHEN these lines are printed our A.R.R.L. Treasurer, Mr. Arthur A. Hebert, will be on his way back to Hartford on a twelve-thousand-mile trip that for two months has occupied him in the business of establishing contact with many of those portions of our League never before visited by a representative from Headquarters. It is a fine thing, such a trip as this, and we are glad that our A.R.R.L. is able to do it. We have become a big organization now, with nearly eighteen thousand members, and it is quite a problem to maintain adequate contact between Headquarters and the state. There is a reason for everything in our affairs, and our Board of Directors, in wisely authorizing Mr. Hebert's trip, sought that every little misunderstanding that can occur in our organization or is attributable to insufficient contact and interchange of ideas.

This trip of Mr. Hebert's is bound to be a splendid thing for the League, not only in the messages he can carry to our members everywhere he goes but in the data he can bring back to our Board, whereby they will be able the more intelligently to administer League affairs. We hope this may prove to be only the first of many such extensive contact missions, and that in the near future a Headquarters representative will have succeeded in getting QSO every town of size in the country.

Last Call for Hoover Cup Entries

THE last of the Department of Commerce Trophies, now authorized by Secretary Hoover, will be awarded under the auspices of the A.R.R.L. to that U. S. amateur station in which the bulk of the apparatus is home-made. This is the last call for entries.

Because of the manifest impossibility of doing so January 1st an entry which contains a station log thru December 31st, the closing date has been extended to February 1st.

The rules governing the contest have been published so often that it seems unnecessary to do it again. See November 1923 *QST*. But if any amateur is unfamiliar with the rules and needs further light, write A.R.R.L. Headquarters and instructions will be supplied immediately.

This cup is worth competing for. Its possession is a big honor. The judges cannot make an intelligent award unless descriptions of stations are filled with them. Overcome your modesty, fellows, and get your entries in by Feb. 1.

Three More Cups Offered!

IN the January *QST* announcement will be made of Three additional cups for A.R.R.L. work this winter. There will be one each for the 5, 20 and 40 meter wave bands. Competition is limited to American Radio Relay League membership.

By all means take advantage of the December and January tests to become acquainted with the various low wave-lengths.

Old Timers Attention!

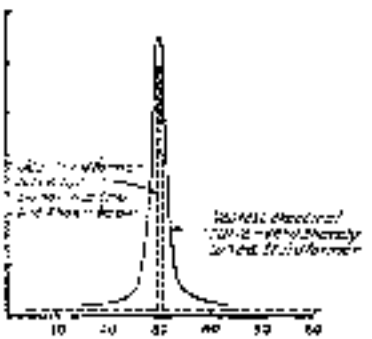
We mean old timers—long before anyone had ever thought of a vacuum tube receiver. Please take a look at the note on page — and do whatever you can for us.

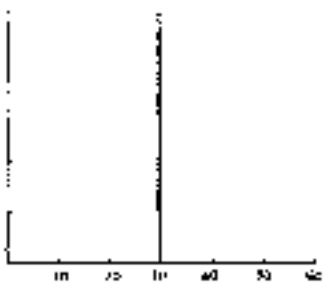
Superheterodyne Transformers

AIR-CORE transformers have been so much discussed in our series of super-heterodyne articles that they need not be taken up in detail here. The information may be found in the June, July and August issues.

We have gotten to thinking that all radio circuits should be tuned as sharply as possible. This is not so. Why it is not so can best be shown by a brief discussion.

Looking at Fig. 1 we see the "spectrums" of some radio signals *after* they have been heterodyned to 20,000 cycles, which is frequently called 20 kilocycles. Putting it





SPECTRUM OF C.W. STATION (i.e. TUBE STATION WITH BATTERY SUPPLY) WHEN KEY IS HELD DOWN

FIG. 1

FIG. 1. FREQUENCY-SPECTRUM AND TRANSFORMER CURVES FOR C.W. WORK.

differently, these signals have been run through the frequency changer (oscillator and 1st detector) of a super-heterodyne receiver, so as to shift the carrier-wave of the signal to 20 kilocycles. What the wavelength of these signals was originally does not matter now—they have been transferred to the region in which super-heterodyne amplifiers work, and that is where we are going to discuss them.

First, let us take the continuous-wave ("C.W.") signal in Fig. 1. This may be

RADIO INSTRUMENT CO. SX-2H.
Peak at 450 meters.

the carrier wave of a radiophone station (when nothing is being said into the microphone), or else it can be the carrier of a radio-telegraph station in which the key is being held down.

Evidently this is a single frequency and can be amplified perfectly well by the sharpest possible transformer. If we can equip our intermediate-frequency amplifier with a tremendously sharp amplifier this signal will be properly amplified *without* amplifying any interfering signals at the same time. This seems like a very beautiful state of affairs, and we wonder why it will not be best to equip *all* super-heterodynes with just such transformers.

As a matter of fact it is not best to use such transformers in all super-heterodynes —for several good reasons.

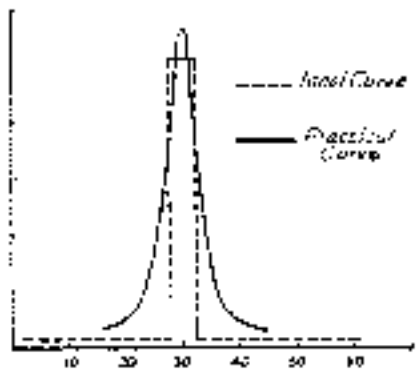
First of all—very sharply tuned transformers must be adjustable, it is simply out of the question to build them exactly matching. This is a complication.

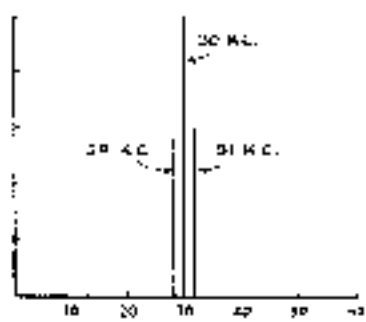
Secondly—such transformers require special circuit-tricks to keep the whole system from oscillating.

Thirdly—and this is by far the best reason—such transformers will distort most signals most unmercifully, although perfectly OK on C.W.

Why Sharpness Distorts

Suppose that a 1000-cycle note is sent into the microphone of the radiophone station. If the station does not happen to be equipped for radiophone work, we can get the same effect (nearly) by using a 1000-cycle buzzer to break up the transmitted





SPECTRUM OF A TUBE SIGNAL WITH 1000 CYCLE MODULATION

FIG. 2

FIG. 3. FREQUENCY-SPECTRUM AND TRANSFORMER CURVES FOR LOW NOTES.

wave. In either case the effect is that we get two "side frequencies" to the original "carrier wave". Since the transmitting note is 1000 cycles, we will find these "side frequencies" just 1000 cycles to either side of the carrier; in other words, they will be at 29,000 and 31,000 cycles, as shown in Fig. 2. Thus the whole spectrum consists of a trio of frequencies at 29,000, 30,000, and 31,000 cycles. To amplify this set of frequencies properly the transformer must be "flat topped" all the way across this region. It would not do at all to use the usual transformer of Fig. 1, because it would totally fail to amplify the "side bands". Therefore nothing but the 10-cycle note would come through.

Radiophone Distortion

The thing is even more complex of course in radiophone work. Here we again have a "carrier" at 30 K.C., but this time

BRANDTON R-91.
Peak at 5810 meters.

we are not adding a single tone. We are adding all the notes of an orchestra, including some very high notes from the piccolo and violin. Some of these notes are as high as 5,000 cycles, and their third harmonics run to 15,000 cycles. Thus the "spectrum" will consist of the "carrier" at 30,000 cycles and two side bands 5,000 cycles wide on either side, as shown in Fig. 3. The whole thing now reaches from 25,000 cycles to 35,000 cycles—and even then we have not taken care of the higher harmonics that exist in the original tone. However, the harmonics that run above 30,000 cycles are hardly worth worrying about—I will explain why in a few lines—and we can get very good reproduction of everything up to a 5,000-cycle tone

GENERAL RADIO CO. TYPE 574.
Peak at 3500 meters.

and the third harmonic of the same will require a transformer that has a "flat top" above 15,000 cycles wide.

The Ideal Transformer

Of course the ideal transformer, from the standpoint of interference, would be one that just took in the side bands of the different signals (Figs. 1, 2 and 3), and then would cut off perfectly square right outside of the bands. Such curves have been sketched and styled "ideal transformer curves". Please note that "ideal" is here used to apply to the matter of freedom from distortion and discrimination of interference only, otherwise we will wander off into a dismal jungle of confusing facts and predictions. Let us therefore not discuss too many things at once.

The Practical Transformer

Unfortunately such "square cornered" curves do not happen where we are thinking of. Such a couple thing as a transformer. They can be made to happen (almost) when we use a filter chain, but that's a bit expensive and hardly a manufacturing proposition. The practical curve is always more or less in the nature of a hill, sloping off to both sides. Perhaps the hill is narrow, perhaps the top is lopsided, but in any case there are sloping shoulders that take in a lot of territory to either side. To make a transformer with such a curve work distortionlessly for almost as far as it will, we must make it so wide at the top that it

W.F. ST. JAMES AIR-CORE TRANSFORMER IN 3 KILOM. Peak at 1200 meters.

completely takes in our "ideal" curve before the two slopes start. Then we will have to put up with the interfering signals and noises that sneak in because of those wide slopes.

Now the important point of this: For C.W. we can make the curve exceedingly sharp, so that it comes rather close to the ideal curve; but for phone work we need a curve that is "broad as all outdoors" so that we take in a horrifying amount of territory (10,000 cycles across the top and the slopes added to that). In some of the transformers now on the market the curves are so fearfully broad that they run down below 10,000 cycles and keep right on amplifying. In other words, they run into

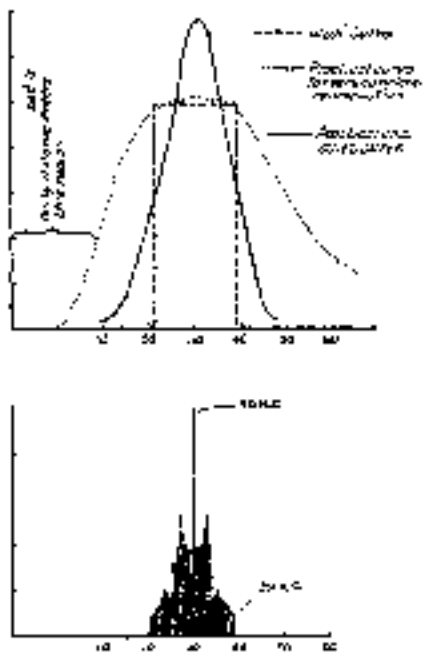


FIG. 3

FIG. 1. FREQUENCY-SPECTRUM AND TRANSFORMER CURVES FOR RADIOPHONE WORK, ASSUMING THAT ORCHESTRA MUSIC IS TO BE HANDLED. FOR SPEECH ONLY THE CURVES OF FIG. 2 ARE OK.

the audio range and become audio amplifiers. The result is a super-heterodyne that is beastly noisy. Perhaps this will be better understood from Fig. 4, reproduced from our June issue.

However, do not for a moment consider getting rid of this difficulty by providing a transformer that is too sharp at the top of the peak and besides quietness by notching off the audio end and all the sidebands at the same stroke. The "ideal practical" transformer (as nearly as we have it now) is somewhere between. It is equipped with a curve with plenty of width, but it "drops dead" before getting into the audio region. To design such a transformer is no job for a "soldering copper mechanic". The thing requires basic understanding of transformers. That is why the good super-heterodyne

transformers are being designed by men with an engineering education back of them, a laboratory before them, and an

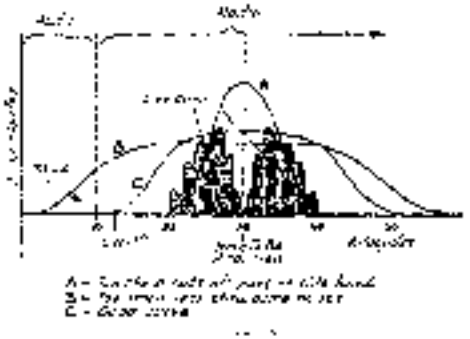


FIG. 1. EFFECT OF DIFFERENT WIDTHS OF TUNE WHEN WORKING WITH RADIOPHONE SIGNALS. REPRODUCED FROM PAGE 32, JUNE QST.

honest purpose. The super-heterodyne can be given a vote of thanks for having made the way exceedingly rough for many of the numerous brand of "radio engineers" who cropped up from nowhere these two years ago. (Parenthetically, most of the post

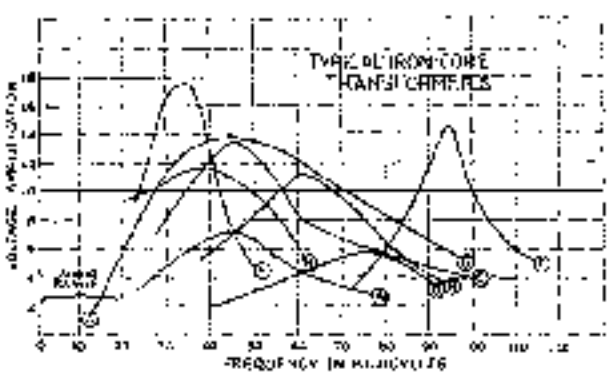


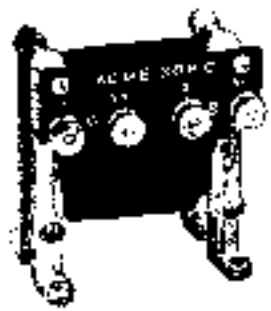
FIG. 2

FIG. 2. TYPICAL IRON-CORE TRANSFORMERS. These curves were obtained by measurement in several laboratories and some and transformers now on the market. No attempt has been made to make these curves correspond with the photographs shown in this same article. The curves are believed to be reliable as most of them were checked by at least two laboratories. Therefore the best transformers will be those having their peaks and say, over 8, on either side of their peaks as much as possible and the balance of the curve as low as possible. Results though not really good, usually may be obtained with a single-amplification hand only 4 to 6 wide.

today calling themselves "Radio Engineers" have no right to the title, there being but very few schools which confer the degree. The man who signs himself as belonging to the radio engineering department of a commercial firm or a shop is generally all right, but the self-styled "Radio Engineer" —but why continue, it is a dying tribe.)

Transformer Curves

So far we have talked as if all transformers worked at 30 kilocycles, or 10,000



THE ACME "30 KILOCYCLE" TRANSFORMER. Peak at 9150 meters.

cycles or the shorter wave than does a perfectly feasible to work at a higher frequency (lower wave) with excellent results. The peculiarities of a 30 kilocycle transformer as compared with a 60 kilocycle (10,000 cycle) transformer were very thoroughly discussed in "A Study of Superheterodyne Amplification," in our October issue. If you care to think of it that way, these are transformers that work at 30,000 and 5,000 meters. The thing can be done at still lower wave-lengths for instance, 1,500 meters.

Which of these is best? That can be argued about pretty extensively, and the argument is not profitable. Refer to the article just mentioned.

The Shape of the Curves

If the curves of different transformers are drawn on a wavelength scale they will not tell us anything very useful, because the short-wave transformers (1,500 meters or 200 kcs) will seem to be very much sharper than the long-wave ones (10,000 meters or 30 kcs), for the reason that a hundred meters will represent many more cycles at the shorter wave than does a

bunated meters in the higher wave. For instance—there are 12,500 cycles between 2,500 meters and 1,000 meters, but there are only 8,700 cycles between 30,000 meters and 11,000 meters. Therefore curves that show the wavelengths covered by transformers are not particularly easy to compare. It would be a mighty good thing if the makers of the things would stop furnishing these confusing curves and instead give us curves that talk in frequencies. Then we can see directly and at once if the particular transformer will cover the required territory without taking in a lot of valueless real estate in the way of additional signals that are not wanted. The curves in this article have been drawn in this way.

REMLER TYPE 600
Peak at 3700 meters.

It will be noticed that some of the transformers do not comply with the idea of covering an 18,000-cycle band. This does not necessarily mean that they are poor; one can get along very decently with a transformer that is good enough at 3,000 cycles from the peak as it is at the peak.

Transformer Construction

It is a useful thing to have transformers shielded by metal cases; it prevents needless trouble between stages—provided the job has been well done. Sometimes metal cases are not necessary, because the core construction provides a shield, or perhaps the maker prefers to space the transformers well apart. In the case of supersonic—the the various stages even use the same core.

GENERAL ELECTRIC CO. TYPE 216.
Peak at 3000 meters.

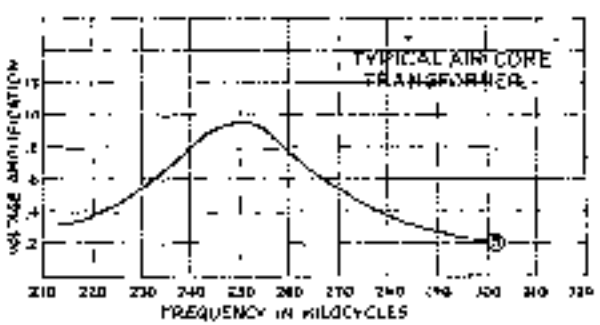


FIG. 6

FIG. 6 REPRESENTATIVE AIR-CORE TRANSFORMER shows that air-core transformers are not particularly different from the iron-core variety. This particular transformer works at fairly high frequencies but smaller curves are obtained with larger transformers. Sharper curves require careful construction to secure uniformity.

Certainly though, one can demand solid construction, good terminals, pain systems of the connections and moisture proofing of the windings. The transformers pictured in this article come up to these requirements with a good deal of uniformity.

Antipodes Linked by Amateur Radio

New Zealand and British Amateurs Work 12,000 Miles—All Records Smashed—N. Z. Showing the World

GET ready for a shock, gang. The laurels in this little old game of amateur radio no longer belong to America. We're barely in it. A whole slather of new records have been rung up during the months of September and October by the busy amateurs of New Zealand and it will probably be a long time before we can even up the score.

All amateur DX records were broken into smithereens on October 19th when 2AA, Frank D. Hall, of Palmerston South, N. Z., was in communication with Mill Hill School, London, g2SZ, for ninety minutes. And on Oct. 25th 2AG, Ralph Slade, of Dunedin, N. Z., worked British 2NM, Bermuda Marconi! We make the distance right at 12,000 miles. It is staggering! We amateurs have been recording our distances regularly but few among us dared to expect that the uttermost ends of the earth would be linked by ham radio so quickly. These two places are practically opposite each other on the globe. Unless somebody can arrange to get into communication with a ship diametrically opposite his station, on the other side of the earth, carefully arranging to achieve the world's maximum of 12,240 miles, it is very doubtful if this record will ever be exceeded. It is a record of which any commercial station on the globe of whatever power, might well be proud. We congratulate these stations with all our hearts—it is positively wonderful!

Reminiscent logs also indicate that 2AA probably was in communication on Oct. 22nd with g2KF, Partridge of London, who was the first Britisher to work America. This is as yet unconfirmed.

American amateurs have been busy the past few weeks too, of course, and some splendid communication with New Zealand has resulted, distances being achieved that would cause us to swell with pride were they not so greatly exceeded by the N. Z.-England communication. On Oct. 13th 1SF of Short Beach, Conn., was in good QSO with Ivan O'Meara, 2AG of Gisbourne, N. Z., the chap who first worked Argentine (3BS for an hour and twenty minutes. Thus 1SF is the first east-coast American to work New Zealand and his record greatly exceeds the work that won the Boomerang, reported in our last issue, being around 9,000 miles. Then on Oct. 17th 6SHV in Washington worked 2AG, Dunedin. For the same length of time, with good signals, taking a message for Hartford Hq. filed there by 6ZAG8 who recently visited N. Z. On the same date 6BFW, Orange, Cal., also worked 2AG for the same length of time, and on the 18th IKC in Northampton, Mass., worked both 2AG and 2AC, while on the 20th 5DW in Greenville, Tex., spoke 2AA for another 45 minutes. 6CGW should be credited with working 2AG as well as 2AA on that eventful night of Sept. 21st when contact was first established, and 6BCP in San Pedro, Calif., winner of the boomerang, worked 2AA again on Sept. 25th. Thus in one brief paragraph must we dismiss many glorious achievements.

New Zealand signals are now almost commonplace throughout the U. S. and Canada. They are being heard in Europe too. French 8FU, in Le Mans, writes us that he is regularly hearing N. Z., 2AG, 2AC, 2AA and 2AG, and Australian 3BM, 3BD, and 3BQ. Incidentally he has 101 different U. S. and Canadian amateurs to his credit. Wake up, fellows. Maybe we started amateur DX but we're not in at with these chaps.

Why do we so freely hand the laurels to New Zealand when our own American members have participated in most of this DX? Read on, gang, you haven't heard the half of it.

"Ev" ("Buck") Ashell, 2AA, recently cables from New Zealand for England on the S. S. "Port Caroline", going east across the South Pacific via Cape Horn, up the Montevideo, and thence across the Atlantic to England. At last reports heard a short-wave ham set with two UV, 202's, input 60 watts, signing 2AA and using "x" for his intermediate. Latest reports up to this writing show that New Zealand amateurs have kept in touch with him every night since he left home, handling messages and testing. The last reported distance was 6,908 miles, near Montevideo. 2AA reports 2AC, 2AA, 2AG and 2AK, also at 5,000 miles; he worked Jack Davis of Sydney, whose input is 3½ watts, at 4,750 miles, and 2AG, 12 watts input, at 4,600 miles; and 2AG got to him 5,908 miles on color. For a night of real N. Z. DX, try to pick this: On Sept. 21st when 6BCP and 6CGW worked 2AA, 2AC worked voice 5000 miles to 2AA, turned around and duplicated his one-time world's record by hooking up again with Argentine (3BS, and then connected (3BS and 2AA. On Sept. 24th, the night when 2AA clicked again a few minutes with 6BCP, 2AG worked 2AA at

6,200 miles, 6BS again at 7,300 miles, and 1BH, another Argentinian, at the same distances. We don't know anything about such monosyllabic 5X with such powers in this country. Why, if the New Zealanders can follow 6AA across the Atlantic to England they will have succeeded in working around the world in both directions, for the

kept 6BCP, who used Zeh Bouck's redesigned Roberts circuit from August "Radio Broadcast", having one stage of radio.

Mr. Chas. E. Bielo of 9ZAUS, operating aboard GDWQ, writes us from New Zealand, where he has visited almost every prominent amateur station. He says the fellows are the finest amateurs he has met in the world, and they have shown

6 BCP, WINNER OF THE BOOMERANG. The transmitter is a mister oscillator, using one 5-watter as oscillator and four as amplifiers, supplied at 575 volts from a generator. Coupled Hartley circuit. This set puts 4.2 amperes at 150 meters in a 4-wire inverted-L, flat-top aerial 35 feet long and 45 feet high; rope leads-in. Roberts receiver, par 2PR in August "Radio Broadcast." Note the Pyrex dishes used for lead-in insulators.

x2SZ-x4AA communication apparently occurred over a long east from Greenwich!

Put all this work down as another short-wave demonstration. 1AF was on 90 meters, 1AA on 92, 2AC about 85, and x3AA around 220 meters. 1SF used a fifty on 77 meters, 2BHV the same on 78 meters. British 2SZ is a short-wave station too, and his input for the world's record was just 250 watts! Put this work down to the credit of low-loss tuners, too. The New Zealanders have junked their r.f. as a lady, and their standard is the "6BCP low-loser" (see February 1924 QST). All the stations on which we have reports used low-loss antennæ except him the time of his life. These radio conditions are marvelous, unheard of distances being achieved in that part of the world on practically no power. Which reminds us of our recent editorial on N. Z.—us for there someday!

Anybody willing to outfit a floating short-wave ham station under the Stars and Stripes and send it to the Antipodes of good U. S. stations, please communicate with A.R.R.L. Headquarters. There's a mathematical possibility of exceeding this British-New Zealand 5X record by 600 miles and a chance in a million of doing it.

—*A.R.R.L.*

The Third National Radio Conference

Amateur Bands Definitely Confirmed, with Some Extensions and Slight Shifting All Short Waves Now Allocated

THE Conference has allocated to amateurs substantially the same frequency bands that are now in use, with some minor changes in their location. The temporary allocation of waves below 150 meters made by the Department of Commerce has now been given definite approval with some slight changes in the bands. The net result of this is to give to amateurs an increase over what they had at the end of the Conference a year ago, and to allow them a much greater area for operation."

So reads the report of the Third National Radio Conference, which convened in Washington on October 4th and by remarkably efficient organization concluded on Oct. 10th. It was a large and representative gathering of about eighty members, from every branch of radio and from every part of the country. Its sessions in the main were characterized by a marked spirit of cooperation. We feel sure it must be counted on every hand as a most successful conference, for it was able to devise ways for the betterment of all phases of radio.

The High Spots

The Conference report is a bulky document and we have space here to mention only its major recommendations. At that, however, we must point out that the status of the Conference was advisory to the Department of Commerce and that the recommendations can not be considered as effective rules enforced by the Department.

Broadcasting of course occupied the center of the stage. The 360-meter marine wave was abandoned, and with the recent postponement of 250 m., the way was open to assign the whole band 200 to 545 meters exclusively for broadcasting. A new channel plan was worked out, creating 30 additional broadcasting channels, or a total of 100. A new classification of stations was established: Class 1, 545 to 360 m., the same as old Class B, the best stations (the old Class C wavelength of 360 meters was wiped out, its stations going into whichever of the new ones they fit); Class 2, 275 to 214 m., made up of old Class A and some from Class C; Class 3, 211 to 208 m., 5 channels, for all broadcasting stations of less than 500 watts power. Allocation of a specific wavelength to each station is being done by a committee consisting of the Supervisors of Radio.

The 600-meter marine wave is to be used hereafter for calling and distress only, the working waves being 600, 720 and 675 m., as well as the already-allocated wave of 706. The band from 1670 to 2500 m. was also assigned for various marine services.

It was believed that nationwide broadcasting by interconnection of stations deserved every encouragement and circulation and to that end the Conference recommended the appointment of a continuing committee to work out necessary plans for its accomplishment. Higher power for all broadcasting was considered desirable, to increase the reliability of the service, and the Department is preparing regulations under which this will be possible. There was a big argument over so-called "super-power" broadcasting, 25 to 50 k.w.; the Conference declined to recommend authorizing unlimited power but did recommend experiments along this line, under carefully regulation which will require, among other things, that such stations be located sufficiently far from centers of population to avoid abnormal interference.

The Conference assigned all the wavelengths from 0 to 2158 meters. Those in which our readers are particularly interested are as follows:

0	to	4.1	meters. Beam transmission
4.7	"	5.1	" Amateur
9.1	"	16.3	" Beam transmission
16.	"	19.2	" Public service and mobile
19.1	"	22.8	" Amateur
22.8	"	25.8	" Public service
25.5	"	27.1	" Relay broadcasting, etc.
27.1	"	30.0	" Public service
30.0	"	33.1	" Relay broadcasting, etc.
33.1	"	33.6	" Public service and mobile
33.2	"	49.4	" Amateur and army mobile
49.4	"	61.7	" Public service
61.7	"	64.6	" Relay broadcasting, etc.
64.5	"	69.0	" Public service
69.0	"	86.7	" Relay broadcasting, etc.
86.7	"	93.0	" Public service and mobile
93.0	"	95.0	" Amateur and army mobile
95.0	"	103.8	" Public service
103.8	"	150.2	" Relay broadcasting, etc.
150.2	"	150	" Mobile
150	"	157	" Aircraft, navigation
157	"	150	" Point-to-point, non-rel.
150	"	200	" Amateur
200	"	545	" Relay broadcasting, etc.

These allocations are designed to hold for one year—the Conferences probably will be annual affairs. Government departments are authorized to work in the waves below 150 meters "with due regard to the authorized use thereof by other legitimate services." The "2" band from 105 to 110 m. was lost. About the Army's sharing of our short-wave bands, see the statement by Maj. Reuder elsewhere in this issue. "Public service" in this allocation means all telegraphy. The day has arrived when we may expect to hear trans-ocean commercial traffic on the short waves; in fact the Radio

Corporation is developing all of its high-power long-wave stations with a short-wave auxiliary station and WGH, Tuckerton, is already at work. These stations will work chiefly in the band 600-1000. There are also six Canadian commercials now under construction for operation in this range.

It will be noted that the amateur bands have been altered slightly, so that the assignments of each band fall within the successively lower wavelength bands. This same scheme was applied to the other short-wave allocations too, and was proposed by Dr. A. N. Goldsmith, who was the leading genius of Sub-Committee No. 1 on Allocations. As John V. L. Hogan put the motto of that sub-committee, "Everybody must eat his own mush". It goes without saying that it is a splendid idea.

The amateur representative on the Conference was our A.R.R.L. president, H. P. Maxim, with C. H. Stewart, our vice-president, as substitute and K. B. Warner, General secretary, as alternate to Mr. Maxim. At the opening session Secretary of Commerce Hoover charged the Conference with the duty of taking adequate care of the amateur. At the first meeting Mr. Maxim presented a brief on behalf of the amateurs, asking that they be permitted to retain their present bands, and Mr. Hoover again complimented favorably upon their work. It was in this atmosphere that the amateur allocations were made, an atmosphere in which the undoubted disapproval of certain commercial interests was necessarily ignored. Such was the course of amateur fortune at this conference. Appreciation must also be expressed to Prof. A. E. Kennelly, Dr. A. N. Goldsmith, and Prof. C. M. Jansky, Jr., for very valuable services to the amateur.

The Amateur Sub-Committee

In charge of amateur details there was a sub-committee with Mr. Maxim as its chairman and Third District Supervisor Chalmers as its secretary, the other members being Prof. Jansky; A. H. Halloran, editor of "Radio"; A. H. Lynch and "Zeh Bouck" of "Radio Broadcast"; Dr. G. B. Jaffé of Illustrato; P. G. Oganyan, representing the Seventh District Executive Council; E. H. Armstrong; and Messrs. Stewart and Warner of A.R.R.L. Most of the membership of the Washington Radio Club was in attendance at the meetings, too.

This sub-committee recommended the compulsory use of loosely-coupled transmitters on all amateur waves; the free use of all amateur waves under one station license; the refinement of plans and rules right NOW to the band 1715-40 meters; and the confirmation of the system of intermediates established unofficially by the A.R.R.L. No definite action has yet been taken on these recommendations.

The Conference made no provision whatever for the continuance of the amateur spark, and it is expected that the ham spark will speedily be done away with. (See Editorial in this issue.)

New Regulations

In order to put the Conference's recommendations into effect, new regulations are being issued by the Bureau of Navigation and we may expect a complete set of new amateur regulations soon. We had hoped we might have the news for this issue but it is not available at this writing. Watch next *QST* for the dope.

—*K. B. W.*

The Army-Amateur Joint Bands

By Major L. B. Bender, Signal Corps, U.S.A.

THE recent action of the Third National Radio Conference in recommending the allocation of the same frequency bands above 5000 kilocycles for amateur stations and portable stations of the Army is a distinct improvement in the field of radio regulation. It is also notable that this recommendation was made with entire concurrence on the part of the amateur and Army representatives present and without opposition from any source. Lest there be some misapprehension on the part of amateurs concerning the possible effect on them of this agreement, the opportunity is welcomed to outline for *QST* the present situation and the future plans of the Army for operations in these bands.

Since 1920 the Army has had several hundred portable field sets of low power operation between 3000 and 4000 kilocycles. Recently many of these have been modified to work in the band between 4000 and 4050 kilocycles. These sets employ a loop antenna for both the transmitting and receiving, and the transmitting energy is derived wholly from dry batteries. Due to the low power input and the small amount of low efficiency, the operating range of these sets does not exceed five miles. That range is quite sufficient, however, for the

purpose intended and it serves a very important military need.

The success attained with these sets has led to the development of similar sets working in other frequency bands and for other purposes. The quantity production of this design may not appear within a year but these are the sets with which the amateurs are to share their bands. Although the design must cover bands not allocated for military use in order to obtain the required number of channels for a field army, the actual peace-time use will be limited so far as possible to the bands so allocated. In national emergency we count on the public consent to use army bands necessary to meet the emergency. The amateur has practically nothing to fear in the way of interference from these army sets in his case. As already pointed out, the range of the sets is so limited that only those amateurs located near training camps or posts of the Army will ever hear them. Then again, the use of these sets will normally be in the daylight hours when amateurs are not nearly so active as after dark. The Army operators are probably subject by this arrangement to more interference from amateurs than they will cause, but the Army is willing to take a chance on that in the belief that a certain amount of interference is a real benefit to military training and that it will never be really troublesome.

It is unfortunate in a way that the low power of the Army equipment makes it impractical in all but isolated cases to interchange traffic between Army and amateur stations. Such an arrangement might be a valuable aid to training. But there will at least be some gain in the arrangement which puts the amateurs and the Army in the same bands. The experience such obtains in high frequency apparatus and its capacities is most useful when an emergency comes and the amateurs find themselves converted into Army operators over night. They will then feel much more at home than if their training had been in fields widely different from the military field.

There is no reason apparent why the proposed scheme should not work out to the entire satisfaction of both classes concerned. It is something of a satisfaction to be set down among our amateur friends who composed so large a share of our radio operators during the last war and it will be our intention to so conduct our operations with respect to the amateurs that any future emergency will find them equally eager to join their talents with us in the common cause.

The Conference, in Relation to Amateur Activities

By A. E. Kennelley

Professor of Electrical Engineering at Harvard University

THE National Radio Conference convened by the Secretary of Commerce at Washington during October was notable in various ways. Its attendance was large and representative it received more widespread and active public attention than preceding conferences of the kind; it has been the first conference to recommend the allotment of wave lengths shorter than one hundred meters.

The activities of the radio amateur received particular attention. Not only were five bands, comprising collectively a range of 12 megacycles per second, allotted to amateur operation; but in the opening speech Secretary Hoover referred to the importance of the amateur's work and the desirability of having that work preserved and encouraged within its own proper limits. Indeed the Secretary's remarks were so justly appreciative of the best activities of the amateur that one might almost suppose that during his leisure moments he was a radio amateur himself, and entered into the realm of international morse-code good fellowship, with the happy appellation of the Knights of "73", all the world over.

The bands of frequency apportioned to American amateurs by the conference do not differ markedly from those which had just previously been assigned to them; but they have in detail certain new, interesting and important properties. The new bands are shown in the Table.

It will be observed that except for a small departure in the first entry in the first column, the new frequencies assigned are in simple binary relation. That is, the band varies after the first are all 1:2:3, and with the same exception, the frequencies limiting one band are the octaves of those in the band preceding. Those of the lowest line are the double octaves. In other words, if we consider the first band as extending from 1.75 to 2.0 megacycles, plus a guard range of from 1.5 to 1.75 megacycles, then all the even harmonics of the first band belonging to the series 2, 4, 8, and 32, are found in the other bands. Similar distributions of even harmonics were allotted to the other services in wavelengths below 150 meters. As one member of the conference expressed the matter colloquially, each service should be charged with the duty of consuming its own harmonic excrescences. If an amateur working in the range between

3.75 and 2.0 megacycles unwittingly emits octave harmonics up to the 42d. he will only thereby disturb fellow amateurs and not other services, such as aircraft, public service, or broadcast relays. Reciprocally, if any of these services develop accidental harmonics they may disturb their own friends, but not the amateurs.

It is evident for the first time that the amateurs are no longer the exclusive occupants of the short-wave marginal region, as they were at preceding conferences. They now receive band allotments that are dovetailed in between those belonging to various other elements. It thus devolves upon the amateurs to develop and occupy these bands, if their claims are to be strengthened at future conferences. Already, as QST has shown, the amateurs have made abundant use of the 80-meter band, good use of the 40-meter band, and some use of the 20-meter band. It will in future be desirable to expand all of these activities, and to open up for occupation the 5-meter band, which happens to lie in the neighborhood of that first revealed by the experimental researches of Heinrich Hertz.

It is generally admitted that the present recent developments of radio engineering between the orders of say 0.3 and 7.0 megacycles, (from $10^{5.5}$ to 10^{7} cps, or from 150 to 40 meters in wave length) is largely due to the successful development of that range by the amateurs. In transoceanic work, and this in the face of the apparent dictates of experience. It has long been realized, as a result of experience with waves of different frequencies over long distances, that the absorption of energy increased approximately as the square root of the frequency—exponentially; so that, other things being equal, low-frequency waves always had the advantage, while high-frequency waves were progressively handicapped by attenuation. The well known Austin-Cohen formula is but a formulated statement of that idea and it has been satisfactorily checked in a great many cases. So far as we know, although we are still sadly deficient in precise measurements, the absorption of 100-meter waves by surfaces of land and sea is greater than that of 1000-meter waves, and yet greater than that of 10,000-meter waves. If that is so, why are 100-meter waves able to carry messages successfully at night across the seas, with but little attenuation?

If we cannot as yet find an answer to this question at the bottom of the ladder, we may attempt to find one at the top.

There is now good reason to believe that a conducting layer exists in the upper air, say at an elevation of 50 km. Its possible existence seems to have been first published,* 1902. If that conducting layer is sharply defined, so that there is a sudden transition from a lower insulating to an upper conducting region, then that layer should (should?) radio waves like an inverted ocean surface, without much absorption at the boundary. Such waves should then expand in nearly flat circles like an expanding surf wheel, instead of in three dimensions like an enlarging soap bubble. The two-dimensional surf-wheel expansion would greatly conserve the energy in the wave. If, however, the transition from insulation to conduction in the upper air is not sudden, but gradual, the losses of energy near the hazy boundary might be as great or even greater than the effect of simple expansion in an endless insulating sky. During daylight hours the ionizing action of sunlight may be supposed to muddy the upper air over a wide range of levels, and interfere with the formation of a sharp transition. At night, however, with this ionizing disturbance removed, and neutralization being at work, the opportunity for the formation of a sharp boundary of conduction would be greater, and the long radio signal ranges of the night time may be attributable to such tranquility. Perhaps the greater volume activity of the high-frequency waves may enable them to cut for themselves a sharper conducting boundary surface in the upper air than the long waves of lower frequency. If so, they might be able to carry further in spite of a greater tendency to undergo absorption over the surfaces of earth and sea.

This is only one of the many and debatable questions which today cannot be answered, but which the work of amateurs may be able to find an answer for in the future.

Frequency in Megacycles Per Second					Wave Length in Meters		
From	*To*	*Range*	*Ratio*	*Octaves*	*From*	*To*	*Range*
3.5	3.8	0.5	1.243	0.415	300.0	150.0	50.0
3.8	4.0	0.5	1.143	0.193	85.6	75.0	10.6
7.0	8.0	1.0	1.143	0.193	42.8	37.5	5.3
14.0	16.0	2.0	1.143	0.193	21.4	18.7	2.7
56.0	64.0	8.0	1.143	0.193	5.3	4.7	0.6
		12.0		1.187			69.2

* "On the Elevation of the Electrically-Conducting Strata of the Earth's Atmosphere," Electrical World and Engineer, N. Y. March 15, 1902, p. 473. See also "Radio Electrons", June, 1919, p. 350.

A Set That Works From 40 to 200 Meters

By M. W. Goldberg, 9APW

I AM enclosing an unimposing photo of the 4-coil transmitting inductance used at this station for transmission at short waves with fairly uniform efficiency.

The lowest coil is a 6-turn grid coil which is wound 3" from the lower end of the 6½" tube. ¾" above this is a 5-turn plate coil and ¼" above that is the 15-turn antenna coil. ¾" above the antenna coil is a second plate coil, also having 5 turns. All coils are wound in the same direction and connected as in the diagram.

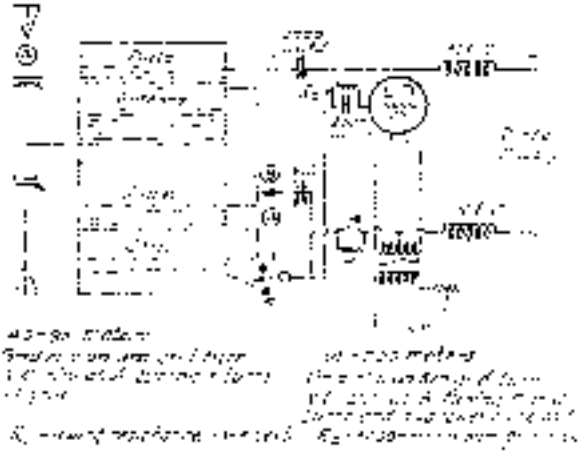
The grid-tuning condenser has a capacity of 500 mmfds. For the 40-95 meter range it is connected across the grid coil only but for the 100-200 meter range the clip is moved up, connecting the condenser across both the grid coil and the lower plate coil.

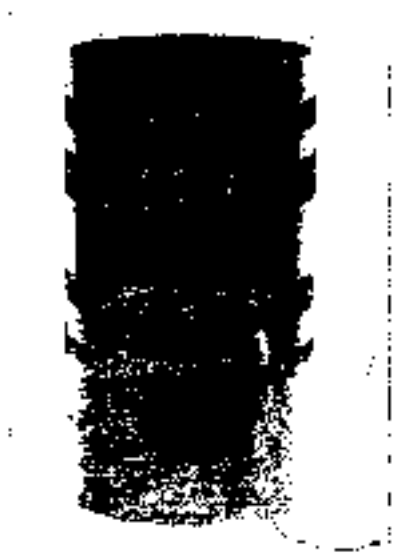
The system operates smoothly over a wide range of wavelengths as is shown by the following half-power antenna currents.

150 meters	2.0 amperes
140 meters	1.92 amperes
100 meters	1.56 amperes
75 meters	1.21 amperes

For powers up to 250 watts (input) 60-strand No. 38 wire works FB. (For heaven's sake don't make the mistake of thinking this means "litzendraht" which is useless below 200 meters.—Tech. Ed.)

Notice the high resistance, R, across the key. I believe this is really the whole solution to the key click problem. At least it





The Coils of 9APW-9ZG
Used on powers as high as 250 watts input.

is here. Key clicks are present because the transmitter either starts or stops oscillating suddenly. By inserting a very high resistance across the key contacts the set is ALWAYS oscillating weakly and therefore never stops or starts. Sparking at the key is negligible, and the antenna will be very well loaded together without the fear of making sensitive tubes quiver and chatter.

Use ten times as many ohms resistance here as volts for the main supply. That is, if 1000 volts is used, use 10,000 ohms across the key. If 500 volts is used, use 150,000 ohms across the key. In any case if the antenna rises up to more than 10% of the full value when the key is up compared to what it is when the key is down, the remedy is to add resistance across the key until the desired effect is obtained. The wave is readily compensated and for the difference at this station between the frequency with key up and down is about 10,000 cycles; in other words, just at the upper edge of audibility. The above resis-

Editor's note: I note this is not the usual Meissner set. It is quite clear that the coil Meissner uses as a single antenna coil is used and coupled to both the plate and the grid.

tance that is inserted the further are the two waves apart, but in any case they are never more than a meter or two different. The tone is easier to read because the current does not have to build up through the zero from practically zero value, and the absence of key clicks sharpens up the wave and cuts out interference locally.

I use RC grid leaks in series on this station and they certainly fill the bill. Little as I run on the air it is always QSB FB, etc. without my ever asking for a QRK report. Many have also remarked on the clean sending which is always due to the above.

Low Loss Loops ???

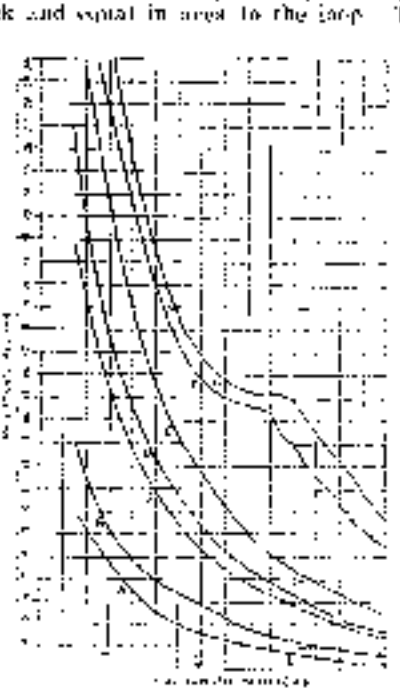
By William W. Harper*

FOR many years we have known about the absorption losses caused by poor dielectrics in the field of an inductance coil or loop antenna, as well as the losses introduced by eddy currents in metallic objects. Even so, a great many of us continue to violate the principles of good design, but not without paying the penalty. In order to emphasize the nature and magnitude of the losses caused by various materials the following data will be presented. These data are the result of an experiment conducted with a small loop antenna, in which a series of measurements of the high frequency resistance of the loop were made under various conditions. The results of each individual measurement are shown in the family of curves presented herewith.

The Curve A shows the high frequency resistance of the loop when carefully supported on the measuring table in such a way as to be as far as possible from all objects which might tend to increase its resistance. The loop used was specially constructed with the idea of keeping the resistance and distributed capacity at a minimum. The least possible amount of dielectric and metal was used in its construction. It will be seen from Curve A that the resistance increases from .3 ohms at 500 meters to approximately .60 ohms at 187 meters.

After completing the measurement represented by Curve A, a piece of heavy leather was placed along one side of the loop. The area of the leather was equal to that of the loop. Another resistance measurement was made and the results plotted in Curve B. A measurable increase in resistance is noticeable due to the dielectric absorption in the leather. These curves were carefully checked on each measurement.

In the next measurement, represented by the Curve C, a piece of dry well-seasoned wood was placed adjacent to one side of the loop. The leather used in the first experiment was destroyed to this piece of wood so that it had the same position in respect to the loop as it had when Curve B was taken. A considerable increase in resistance is observable due to the presence of the wood. The wood used was about half an inch thick and equal in area to the loop. This



HOW THE RESISTANCES CHANGE
Showing that a good loop isn't the end of the story

means that we must be somewhat particular as to the kind of wood we use in our apparatus and especially it is advisable to make sure that it is not so situated in respect to conductances that we get appreciable dielectric absorption.

In making Curve D a piece of one-eighth inch bakelite equal in area to wood and leather was also placed along side the loop. This caused another slight but measurable

* Consulting Electrician, Member Superintendents Section

increase in resistance. It should be noted that the aerial resistance of 3 ohms at 600 meters the loop reached a value of 4.5 ohms.

A box was now made of the same kind of wood as used in the previous measurements, which was also covered with the previously mentioned leather and a sheet of bakelite panel included in the box construction. The loop under test was then placed in the lid of this box. A curve was then made while the lid of the box was open, that connecting the loop a good distance away from the lower part of the box. This is the curve E and it will be seen that the R.F. resistance is very noticeably increased by the additional dielectric absorption.

There was a good reason for keeping the box open: the parts of a portable receiving set had been placed in the lower part of the box and connected together and the idea was to keep the loop several feet away from these things to make sure that they had no effect.

In curve F we see the preponderous effect of closing the cover of the box. In doing this we bring the metal parts of the receiver in close relationship to the field of the loop. The irregularities in the curve are due to eddy current losses in the various metal objects in the set.

In the last curve, designated by C_1, the receiver was completely wired and filament and plate batteries were placed in the box. The increase in resistance due to additional eddy current losses in the wiring and the battery shells is obvious.

The increase in resistance at 600 meters caused by these various complications is equal to approximately 0.5 ohms as shown by the various curves.

No observations were taken as to the increase in the distributed capacity, but it may be safely predicted that it was also considerably increased.

Conclusions

After we take great care to make an efficient loop antenna we should take equal care to eliminate all objects from its field which are likely to cause a loss of energy. This same thing applies to the coils in the set. Some experimenters, and manufacturers as well, design wonderfully efficient coils and then ruin their efficiency by putting them in some position where the energy absorption and losses are maximum. Others have designed low loss H.F. coils and then placed a metal container inside and extending with the axis of the coil so as to make a neat job, regardless of what it will cost them in ohms. Still others try to evade the well-known dielectric absorption which is found to exist in certain immunized phenol ohms. At least it is evident that we will undoubtedly have to be more careful in the design of some of our apparatus even though the subsequent elements may be of the low loss type. Ambitious experimenters should confine their work to the development of some kind of "moulded air" which certainly should have very little loss and would be great for loop and coil supports. How about Pyrex for this kind of work?

Attention
Old-Time Commercial Men

WERE you one of the many who liked the full-page set of photos of 1PZ in our May issue?

Good—we thought you were the man.

Several members have asked for pages of those old sparks and arc stations that did the real pioneering—in the days when we called it "wireless telegraphy", uses the Morse code, and that a magnetic detector was about the final thing in sensitivity. It sounds good—if we can get the pictures.

The men that have them are probably out of the brass pounding game these days, and we don't know just where to find them. Therefore any advice will be greatly appreciated by the Technical Editor.

P. S. The pioneering wasn't all done on the Atlantic Ocean. Gulf Coast and Pacific stations are especially desired.

WWV and 6XBM Schedules

DETAILS of the standard-wave transmissions are given on page 21 of the November issue, to which please refer.

Schedule of Frequencies in Kilocycles

(Approximate wave lengths in meters in parentheses)

Time*	Dec. 5	Dec. 10
10:00 to 10:08 p. m.	700 (430+)	550 (545+)
10:12 to 10:20 p. m.	615 (487)	650 (461)
10:24 to 10:32 p. m.	545 (550)	750 (400)
10:36 to 10:44 p. m.	477 (630)	833 (360)
10:48 to 10:56 p. m.	425 (705)	1000 (300)
11:00 to 11:08 p. m.	500 (600)	1200 (250)
11:12 to 11:20 p. m.	600 (500)	1500 (200)
11:24 to 11:32 p. m.	666 (450)	1500 (200)

We had hoped that this month's schedule would include much more short wave use like those of November 5th.

* Eastern Standard time for WWV, Washington, D. C. Pacific Standard time for 6XBM, Stanford University, California.

The New Sodion D-21 Detector

THE sodion tubes are intended for detection only. Both the S-13 of last year and the D-21 of this year depend on the presence of sodium for their sensitivity. Other metals, such as potassium, caesium or rubidium can be used to serve the same purpose, but sodium is comparatively cheap and easy to secure.

This solium serves the same purpose as the small amount of gas which is left in the usual "soft detector" tube. However the action is said to be quite different and the tube curves do not have the "kinks" which destroy the sensitivity of the gas tube.

In other ways the two tubes are not at all alike. The S-13 was a non-oscillating tube with a non-standard base, also it was so designed that it required slight changes in the wiring standard receiving sets.

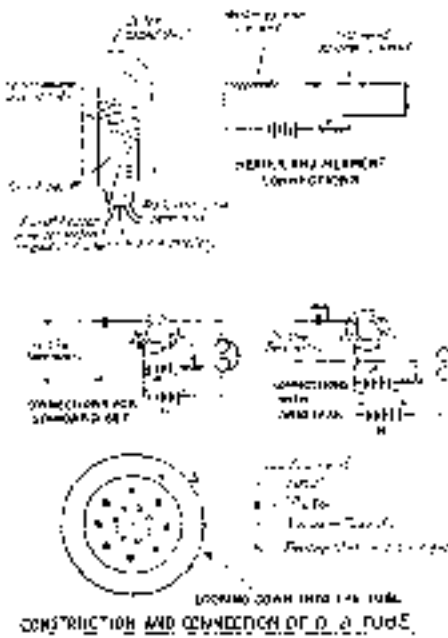
The new D-21 has a standard base, can be made to oscillate smoothly and easily and is so designed that no wiring changes are necessary—it can be substituted for a "gas tube" or "hard tube" without any alterations.

THE NEW D-21 TUBE (UNMARKED) WITH THE OLD S-13 TUBE

The base of the D-21 is of standard size. The frosted shell of the D-21 has been made larger than that of the old tube so as to provide a better grip when putting the tube into the socket. The actual vacuum tube inside is of about the same size as that of the old S-13.

Construction

The photographs show the external "machinery" of the D-21. The tube itself is quite small but is surrounded by a frosted glass shell (our airtight) which shields the tube itself from draughts, sticky fingers and dust. The inner glass shell is of the usual fashion and contains the grid, filament and plate. Also the "heater" is wrapped around it. All four of these things are different from the devices found in the more common varieties of tubes. The filament is of tantalum instead of the usual tungsten, although tungsten will work equally well. The heater is connected in series with the filament and serves to warm up the tube so as to keep up the best temperature for tube operation. This is necessary because the tube contains sodium vapor, as previously stated. When the tube is turned on the filament at once glows bright yellow, the heater warms up more gradually and after a minute or so the tube is in operating condition. The frosted glass outer shell then prevents sudden changes of temperature. The grid is made of wires spot-welded together into a fine "squirrel cage". The "plate" is not a plate at all, but a larger squirrel cage of the same sort, located so that its wires come between those of the grid. This is shown in one of the diagrams.



CONSTRUCTION AND CONNECTION OF D-21 TUBE

By changing the size and number of wires in the squirrel cages, also by changing the diameters of these cages, it is pos-

sible to get almost any desired grid and plate impedance. The present dimensions are chosen so as to agree with standard practice.

Operation

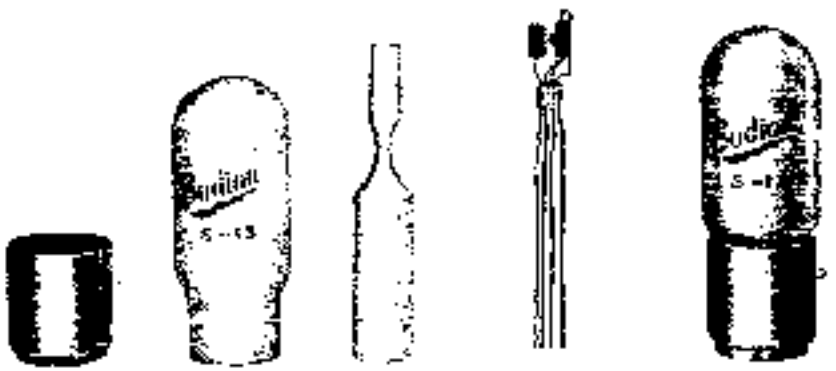
The D-21 tube can be used as a non-regenerative detector, or a regenerative detector and as an oscillating detector. Since the tube is exhausted to a "hard" vacuum there is no need for critical adjustment of the plate and filament voltages.

Three tubes were secured at the factory and given some bench tests in different receiving sets. Of course these tests were quite crude—they consisted of listening and making notes. However it is interesting to find that tests made at different places by four different men check up very well indeed.

Two of the tubes worked best without a grid leak, the third one worked best with a grid leak with a 2.5 megohm leak. The difference between the tubes was surprisingly small and one report will answer for all three.

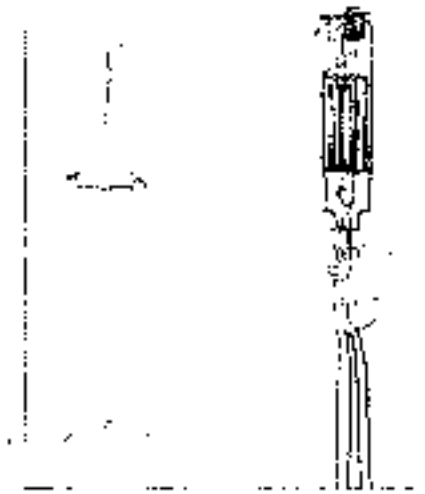
In a Superheterodyne

When used in the first detector socket of a superregenerative receiver for telephone work they showed very fine sensitivity. On very weak signals they proved very much better than any one of six UV-199 tubes and a little better than any one of three UV-201-A tubes. A "match" tube was not handy for comparison, therefore this test was not particularly complete. When strong signals were being received the UV-201-A tubes seemed to have the advantage, the UV-199 choking up entirely while the D-21 stayed clear but did not give as strong signals as the UV-201-A. On the whole the honors were with the D-21. It was most sensitive when sensitivity was most needed—on weak signals, when the adjustments were entirely uncritical.



THE D-21 TUBE OF LAST YEAR

1—The small base. 2—The frosted outer shell, not airtight but merely cemented in the base and acting as a protective covering for the tube itself. 3—The tube itself before the "getter" are put inside. 4 The metal parts of the tube. These are sealed into the tube (3) after which the tube is exhausted and sealed. The "getter" wire is then snapped across the tube and connected in series with the filament. Next the tube is fitted into the base, the 4 wires connected to the terminal pins and the frosted outer shell put into place. 5—The finished D-21 tube after assembly.

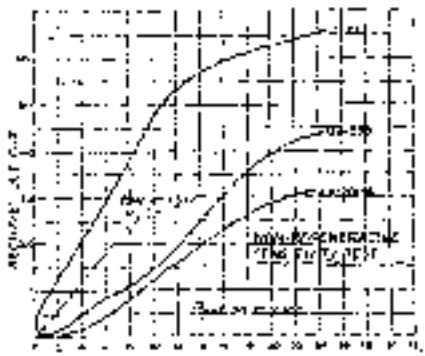


THE METAL PARTS OF THE D-21 TUBE

The straight tantalum filament runs thru the center of the assembly. Around this on the side, made in squirrel-cage shape are four wires spot-welded together electrically. These two cylinders are surrounded by a larger squirrel-cage with its bars opposite the gaps in the grid: this larger squirrel-cage takes the place of the plate in the standard types of tubes.

In a Tuned R.F. Set

The tube was next tried in a set using two stages of tuned R.F. amplification



SENSITIVITY TEST OF THE D-21 TUBE IN A NON-REGENERATIVE RADIO SET

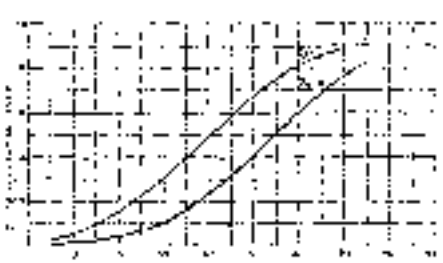
The method is described in the article. Referring to the inner (horizontal) scale of the curve, when the loop is in the position "0°" it is at right angles to the line of transmission; therefore it is collecting only a very little energy from the passing ether wave and this very little is due only to accidental antenna effect. For practical purposes we can say that in this position the loop collects no energy. Going to the right along the scale the larger figures indicate that the loop was being turned thru a greater and greater angle, approaching the line of transmission. Unfortunately the scale on the loop was an arbitrary one and did not indicate angles directly. However the interpolating was easy.

ahead of the detector. The report on this test is quoted:

"Slightly better than a UV-200 as a detector, with either 22.5 or 15 volts on plate. Seemed fairly non-critical as to both A and B voltages.

"On weak signals very little difference between the Sodion and a 200 was noted. On moderate signals, using loud speaker, the Sodion gave possibly an audible increase of 15 or 20%. On loud signals the Sodion did not help much.

"Quite a difference in the tone reproduction was noted. The Sodion gave a deeper



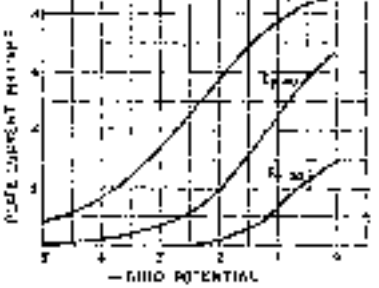
tone or timbre than the UV-200. Of the two the Sodion gave much the better tone.

"Another peculiarity was noticed. On tuning KDKA exactly to resonance, the 200 was almost as good as the Sodion; on throwing one circuit (primary or secondary) slightly out of resonance, the Sodion was greatly superior to the 200. (We now have chance to test on higher waves to see if this still holds good. (Note—All these tests made on radiophone broadcasts at usual wavelengths.—Tech. Ed.)

"In comparison with a unifilon UV-201-A, used as a detector the Sodion was superior at all points. The Sodion was tried in both audio and audio frequency circuits (i.e. it was tried in the amplifier sockets of the same set, both before and behind the detector.—Tech. Ed.) but was no good.

"Also tried it as short wave rec as an oscillating detector but couldn't make it oscillate even with utmost persuasion."

The D-21 was next tried in the detector socket of an ordinary regenerative receiver. When working non-oscillating it gave results similar to those in superheterodyne. Weak signals could be heard very nicely,



through these specially picked UV 201-A tubes (tuned them critically. When strong phone signals were received the D-21 dropped behind the UV-201-A.

As an audio amplifier the D-21 was a failure.

When an attempt was made to receive C.W. signals with the D-21 acting as an oscillating detector the results were most disappointing. C.W. signals were heard and these were weak. The UV-201-A and the UV-199 "beat all the delegates" in this field.

Summary of unofficial tests:

It will be seen from these tests that the general effect was to make the D-21 seem an excellent device for use as a *detector* in non-oscillating radiophone reception, giving the best performance on weak signals and acting very well indeed on strong signals. As an amplifier (R.F. or A.F.) it was not a success, nor was it particularly encouraging as a C.W. detector.

Laboratory Tests

Some laboratory tests at the factory gave the following interesting results. An oscillator was set up so as to transmit a wave modulated signal. This signal was received some distance away on a loop receiver equipped with a tube detector (non-regenerative circuit), two stages audio amplifier and tube rectifier. The output of the rectifier was measured as an indication of the output of the detector. This performance was repeated with the loop set at different angles to the line of transmission, thus changing the input to the detector and giving an idea of the change in sensitivity when different signal strengths are being dealt with. The results for various tubes are given.

Miscellaneous Notes

The grid return should be made to the "+" terminal of the socket if a good leak is being used. This means that the return is really being made to the negative terminal of the heater.

On many receiving sets the return is not made to the "+" of the detector socket, but to the "−F" instead. The change in the wiring is simple but it can be avoided by taking off the grid lead and operating with the grid condenser only. The return can then be made to any point of the filament circuit.

The tests given were made on three tubes which came direct from the factory. We do not know where the tubes may be bought on the present market, hence were unable to make the test otherwise. However, the tubes were not "hand picked", they were simply taken from the regular production. The curves shown in this article were also made at the factory on regular production tubes with the heater in place and the heater connected. Therefore the drop through the heater should be added to the grid biases which are indicated.

The measured value of the mutual conductance was 200 micromhos, the plate impedance 50,000 ohms, and the voltage amplification 22.50. For the sake of comparison, a typical UV-201-A will measure as follows: Mutual conductance varying from 200 to 750 micromhos with a plate voltage range of 80 to 20, plate impedance 10,000 to 35,000 ohms, with same plate voltage change. The voltage amplification will be fairly steady at 8.

A Quick Coil Test

THE main excuse for this story is to show how easily one can get an idea of the goodness of a coil and how entirely unnecessary it is to have any elaborate equipment for doing it.

We began by wondering how important it was to use the proper material for a coil form, assuming that there was going to be something in the way of a tube to wind on.

This was after supper and we didn't have time to think of making coil resistance measurements. Therefore, we connected up the apparatus shown in Figure 1: the driver being nothing but the usual transmitting set run at low power, and working on 180 meters. The reason for sticking on 180 meters, was that we were curious about coils that tuned from 125 to 270 meters when we used a condenser with a maximum capacity of 501 μμfds. 501 meters would give a fair idea of the action of the coils clear through the range.

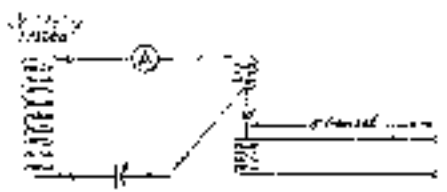


FIG. 1. A very simple set-up for finding out whether a coil is worth while using. The antenna ammeter is the most important part of the equipment.

The first candidate was a coil having 21 turns of No. 18 D.C.C. wire wound on a tube 3¼ inches in diameter. This tube was of bakelite but perhaps it was formica and was about 1/16-inch thick. The wire was spaced by its own width, which made the coil 2½ inches long. With very careful tuning, we were not able to get a secondary current of over .20 ampere.

A glass tube was next tried and carried out to be just a shade poorer, as the best current was only .25 ampere. The curve was nearly the same, resonance being secured with the condenser at 13 on a scale of 100 divisions.

Next, the winding was taken off the bakelite tube and a layer of corrugated paper from a vacuum tube package wrapped on before replacing the wire. Since this made the coil somewhat larger in diameter, the number of turns was slightly reduced to get the same tuning as before. The weight of wire was almost exactly the same. The current was .3 ampere.

Finally a self-supporting coil was tried and a current of .37 ampere obtained.

(Continued on page 22)

A New Hornless Loud Speaker

WHY do loud speakers have horns? What purpose do they serve?

A complete answer to that question is not easy, because the horn does a number of things at once. One of them can be explained as follows:

The business of a loud speaker is to make sounds that can be heard all through the room—in other words, the air-mass in the room. There is a great deal of this air, but it may needs to be vibrated through a small distance. *Right here is the important part of the problem, that we wish to vibrate a large amount of air through a very small distance.*

Down in the base of the usual loud speaker is the *small* diaphragm which moves through a *rather large* distance.

It will be seen that the sort of vibration manufactured by the diaphragm isn't just the thing we wanted, and some sort of a conversion device is needed.

Very well—that's where the horn comes in. One can push into the small end of a horn an energetic (high amplitude) vibration such as the diaphragm manufactures. This vibration will travel the length of the horn and come out of the large end in different form. It comes out as a vibration covering a much larger area (the mouth of the horn being larger than the entering end), but at the same time we have converted the vibration into one with lower amplitude, i.e., with the air particles swinging back and forth through lesser distance. This sort of vibration may now be sent into the air of the room, and will be fairly effective in vibrating all parts of it with about the same intensity, which is what we started out to do. For this particular purpose we can look at the horn as providing a sort of gentle coupling between the *small* diaphragm and the *large* mass of air.*

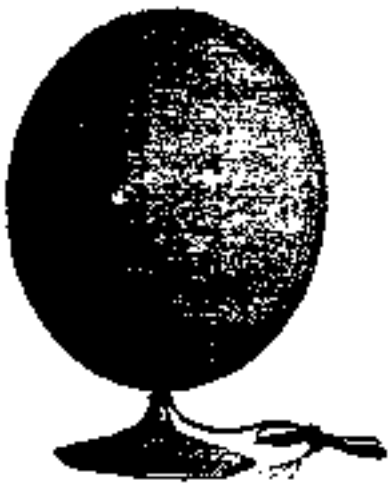
In general the horns that do this job *besides* doing just one very large and unordinarily very noticeable for household use.

Of course that isn't all there is to the design of a horn, because the horn has other things to do. For instance, it acts as a resonance chamber and tends to strengthen certain notes. This isn't altogether a misfortune, because a skilful designer can use these peaks to even out distortions that originated in the diaphragm. In some horn-type loud speakers this has been done quite skilfully so that very good reproduction is secured.

The Type 540-AW Loud Speaker

Another way of going about the whole thing is to avoid the use of a horn altogether. From what has been said before it will be seen that this can be done by the use of *a very large* diaphragm, moving through a *very small* distance. This has been done in the new Western Electric hornless loud speaker, type 540-AW, which is shown in the photographs.

The laboratory work on this speaker was done at the Western Electric laboratories, which previously have produced the well-known 10-B horn and 7-A amplifier, also the public address systems which many of our readers have heard, and finally the entire equipment of most of the well-known broadcast stations. (No, that statement

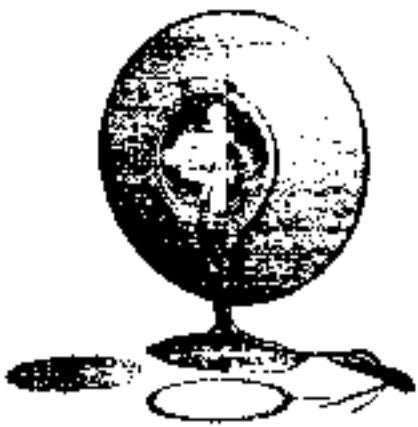


wasn't written at 463 West Street; the Radio Ed originated it right here, just because the excellent work of the "WE" doesn't seem to be noticed as much as it should be.)

The construction of the 540-AW loud

* If one is *personally* inclined the thing may be made clearer by looking at it in another fashion. Suppose we consider the air column in the horn as a transformation network connecting the high-impedance input device (diaphragm) with the low-impedance load (air of the room). It is then evident that we need a graduated network to make such a transition, each mesh having a lesser impedance than the last and the number of meshes being large so that the difference between successive meshes will be small and reflection will be avoided. The analogy is a very long horn tapering from a small inlet to a very wide mouth.

speaker can be best understood by inspection of the photograph which shows it partly disassembled. The projector consists of two flanged cones, having their bases permanently together. The point of one cone has been cut away to leave a circular opening, the edges of which are secured to the supporting frame as shown. Obviously the opening is covered by the sound-sensitive plate in the cabinet so as to permit air to enter and leave as the projector vibrates. The electro-magnetic driving device is sup-



ported just inside the opening, and its driving rod is connected to the apex of the cone at the point where the metal star is seen in the photo. This rod pulls the point of the cone in and out, thereby causing both cones to vibrate. The distance between the grating and the point of the cone is about 5 inches, the whole affair standing about 18 inches high.

The impedance of the windings of the receiver is about 30,000 ohms at average voice frequencies, thus permitting connection to the output of ordinary amplifiers.

Peculiarities of the Bottleless Type

It seems that some of the sound must come from the outer surfaces of the cones and some from the circular opening. The result is a very large source of sound which transmits about equally well in all directions. This causes a peculiar effect as follows:

In one demonstration two Western Electric loud speakers were compared. One of them was the well-known 10-D horn, the other was this new 540-AW. The amplifier was the same for both and it was a very excellent amplifier. When the 10-D horn was in use there was never the least doubt about which way it was turned, the "volume of sound" was pretty definite. The volume was distinctly more than enough. The harmonic 540 AW was at first a distinct disappointment, with the same input it was not as loud. However, a moment's reflection showed that there was no directional effect that could be noticed, the sound was equally strong on all sides. It was impossible to locate the horn by ear. As a proof of this we ran into a peculiar stunt. With the 540-AW reproducing an orchestra we closed our eyes and walked around the room trying to locate the loud speaker by ear. We didn't succeed, but our imaginations did. Our imaginations remembered that orchestras are usually in front, therefore this invisible orchestra always seemed to be in front of us, and not at *all in the direction of the loud speaker.*

Of course this non-directional effect means that the sound will not be as strong in any given direction, hence the new horn may be less satisfactory than the old one where signal strength is low. With ordinary signals the new device should have advantages, and for very loud signals it can be made to produce an overpowering volume of sound that the horn type could not quite accomplish without distortion of a very bad sort.

In another demonstration the 540-AW speaker was compared with a cheap horn-type loud speaker, the input to both horns being from a rather poor amplifier. Curiously enough, the cheap speaker sounded better than the 540-AW. The reason was that the loud amplifier was manufacturing a lot of high-pitched harmonics that had nothing to do with the original music. The 540-AW faithfully reproduced the resultant mess, but the cheap horn was dead to all things of high pitches, hence it chopped off the harmonics and actually produced something that sounded a little like music. However, the same horn was utterly lost if it had been asked to reproduce good music, nor was it any better off when asked to reproduce new tones. It was simply a case of two mistakes accidentally making partial correction for each other—although the result was still bad enough.

However, one must admit that this last stunt doesn't have anything in particular to do with the presence or absence of horns—it simply points out the fact that it is now up to the amplifiers to perform as well as some of the loud speakers have already been doing.

We learn that the home-made filter mentioned in note 4 of August *QST* and credited to an Australian magazine was originated by Dr. A. E. Banks, 6XN, and first published in "Radio" a year or so ago. This note is published to place credit where it is due.

The Weld in the Vacuum Tube*

THE simple vacuum tube is the result of the most painstaking and detailed investigation. Its size, its gas content, the size and location of the wires, the kind of metals to be used, even the method of sealing the wires where they pass through the glass—each problem has been given the most careful scrutiny.

For instance: it is necessary for wires to pass through glass, yet to air leak is unthinkable, no matter how small it may be. There must be an air-tight seal.

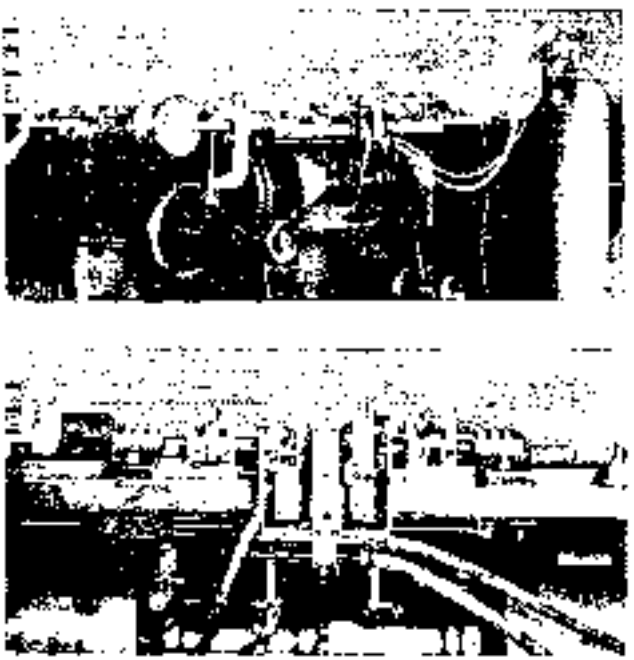
That is all. The seal must stay tight although the tube is heated and cooled many times when used in radio sets. Therefore some kind of wire must be used that will not only make a tight joint in the first place, but will stand many heatings and coolings without cracking out. Platinum wires can be sealed into glass and will stay tight, but platinum is a very expensive metal. In spite of this platinum was formerly used in the following manner. Copper wire was used outside the tube and nickel wire inside, the two being connected by a very short piece of platinum located in the glass "stem" where the seal was required.

Even the short piece of platinum became too expensive, so a new material and new methods were sought. Fig. 1 shows how the thing is done today. The wires used in the tube are made of nickel as before. Where one of the wires is to be brought through the glass it is welded to a length of copper-clad steel which can be brought through the glass where it will make an air tight joint. The same piece of copper-clad wire is used to make the external connections. Where one of the nickel wires inside the tube is to be supported but not brought outside the tube it is welded to a short piece of the copper-clad wire which is embedded in the glass but not continued through it. Contact wires to filament, grid and plate supports are then welded to the nickel wires inside the tube.

Beginning at the left of Fig. 1 we have in turn, plate contact wire, grid support, filament contact, filament support, grid contact and plate support.

So far so good, but how are the small nickel and copper-clad wires to be welded together? Here is where the welding flame gave another illustration of its almost infinite versatility.

It is important that the nickel and copper clad steel wires be neatly joined. This not only makes it easier to avoid the glass about them but decreases the tendency to



The Machine that welds the nickel and copper-clad wires together. The upper picture shows the machine as a whole, the lower one shows a close-up of the welding heart. The operation of the machine is explained in the text.

heard air bubbles and leaks. Many methods of making the joint have been tried but welding by machine has been most successful.

The machine pictured in Figs. 2 and 3 was designed by E. F. Wallner and Sons, 780 Greenwich St., New York City, Automatic Machine Designers. Its fundamentals may be briefly described as follows: A spool of the nickel wire is mounted at the

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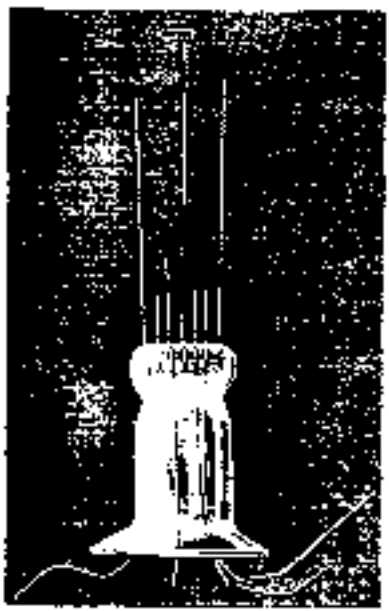
*Courtesy Union Carbide C

end of the machine while the copper-clad wire is mounted at the other. These wires travel toward the center of the machine from the respective spools passing through the same type of mechanism, so it will be sufficient to describe the course of one wire. As the wire leaves the spool it passes



The two-part wire welded together and sealed into the "mash" of a receiving vacuum tube. Note that the connecting wires continue thru the mash and come out at the bottom of the stem, where they will later be connected to the contact pins. The copper-clad do not continue thru as they are provided with but a very short length of the copper-clad wire.

around the spring tension sheave shown on the side of the machine in Fig. 2. This sheave maintains a constant tension on the wire, irrespective of the amount that has been taken from the spool. The wire then passes between two rolls which by gripping the wire snugly compensate for the pull of the tension sheave. Next, the wire passes through a set of rolls mounted horizontally to straighten it in a horizontal plane; then through a set mounted vertically to straighten it in a vertical plane. From these, it passes between clamp jaws controlled by a cam on the mainshaft.

Next the wire passes through a tube slightly longer than its own diameter on the inside of which is a small shear jaw; that is, the arrangement is very similar to a glass cutter. Further on is a second set of clamps, and, finally, the welding tip is located in the center of the machine.

As to the operation of the machine; the outer set of clamps opens, slides outward, closes on the wires, and slides inward, drawing the wires toward the center until the ends are within about ⅛ in. of each other. Then, these outer clamps let go, the inner set of clamps grips the wires, and the tip swings in so that the flame impinges on the ends of the wire. Next, the shears clip off the wire, and the inner clamps butt the two pieces together in the flame, the tip moves away and the welded wire drops into a pan—a perfectly and neatly welded product.

One may have gained the idea that this process is slow. Not so, however. The output of one machine is 5000 wires an hour.

The machine is a very cleverly worked out affair, but the quality of its work is dependent upon the welding flame. This is constant and positive. The tip from which it emerges is very simple; but more than a brass rod tapered at one end and drilled out for a portion of its length to form a straight hole, then tapered to a small hole at the flame end. The mixed gases are piped to this tip from a blowpipe secured to the machine as shown in Fig. 2. That is all there is of it, but it does the work.

Some of the welds made by this process are illustrated in the tubes in your set. Note their neatness. Better tubes are made with these wires at less cost.

Thus has gas welding benefited the radio enthusiast.

Do You Remember This Fellow?

A Short Wave Wavemeter

By F. Dawson Bliley, 8GU

JUST as no amateur station has in the past been complete without a wavemeter covering the 150 to 200 meter band so today no station is complete without a wavemeter that will cover the 20, 40 and 80 meter bands.

Every short wave station should really have a meter that will cover all amateur waves. This would call for a range of 5 meters to 200 meters, but that is not practical and I will describe a meter which will cover the region from 20 to 220. (A wavemeter for the 4 and 5 meter waves is described elsewhere in this issue.—Ed.)

It must first be understood that you have a wavemeter at hand which will cover the old 150 to 220 meter band and which was carefully calibrated from WWV or otherwise so that you can really depend upon it. The whole idea of this article is to show how the calibration which you already have on this meter can be transferred to a lower wavelength.

Construction

The construction of the special wavemeter will be described first, the way of calibrating it a bit later on.

The inductance should be 6" in diameter and wound with 13 turns of No. 14 S.C. wire on a tube that has been lightly varnished and baked. A "Mother's Oats" box will do the trick.

This coil is provided with taps at the 7th and 8th turns.

This coil is to be used with a condenser having a capacity of 500 mmfds and a dial or scale with 100 divisions. This again will be used from 10 degrees to 80 degrees only and if the coil is tapped as described it will have the following ranges:

13 turns 50-220 meters
7 turns 25-80 meters
3 turns 12-40 meters

The connections to be used are shown in Figure 1.

Harmonic Calibration

This method is not hard to understand and, of the various methods of calibrating a wavemeter (other than that of direct fundamental calibration), is the most accurate.

In this method two oscillators are necessary. The receiver can be used as one and your transmitter as the other. Various circuits can be used but the Hartley seems best because of its simplicity. Care should be taken that the antenna and counterpoise are disconnected so that no harmonics other than those wanted will be created. The circuit shown in Fig. 1 may be used for both of your oscillators. Be sure that they both have a large wavelength range or you will be unable to use this method.

The following is an example of the method:

Tune the transmitter (oscillator) to 220 meters and check with your regular wavemeter. (Do this very carefully). Now with your receiver oscillating and with

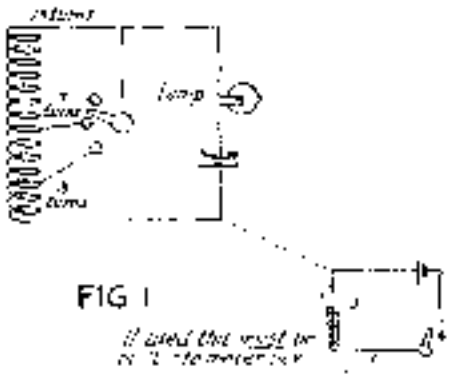


FIG 1

If used this must be a 2 wavemeter

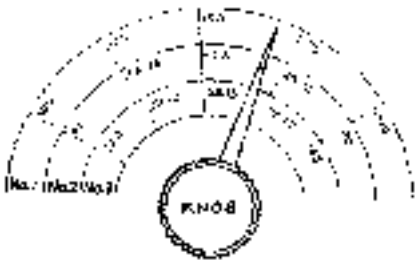
the phones on listen carefully at 110 meters for the 2nd harmonic and at 73-1/3 meters for the 3rd harmonic. (Warning—In all of this work you are likely to find a strong beat note at the 1/3 wavelength, which in this case is 146.66 meters. This point is perfectly good and reliable and may be used but do not mistake it for the 110 meter or 1/2 wave point.—Tech. Ed.)

Now that you have located these two harmonics, tune the receiver to zero beat on the 110 meter (or 1/2 wave) harmonic and then use the well known "Heising" method to locate this point on your new wavemeter, setting the switch on point 8 for the purpose. Put down the scale reading and the wavelength, then tune the receiver down to the third harmonic at 73-1/3 meters; again set for zero beat and then find this point on your wavemeter by the click method, this time setting the switch on point 7. To check up the process tune the oscillator to 110 meters and listen for the second harmonic with the receiver set on 220 meters. If over this until you have these first points right because everything depends upon them. Now leave the oscillator at 110 meters and tune the receiver down to zero beat at 55 and locate this point on the wavemeter with the switch on point 3. Again reverse the process at 55 meters and

check that. All the way through be careful to avoid the 2 harmonic wave the appearance of which is described in another article in this issue.

In like manner all of the waves can be calibrated. Start at 150 meters and listen for harmonics on 90 and 60 meters and so on.

Now this is all very easy but how are we going to get the waves between 110 and 150 meters? This also is easy. Example: to locate the 140 meter point turn the indicator to the right that wavelength or



The scale on the meter at RHOB. This will not fit your wavemeter

FIG. 2

210 meters. Use your old wavemeter to make sure that you are on 210 meters. The second harmonic will now be on 105 meters and the third harmonic on 70 meters. This is a combination in which the 2 : 1 wave may be used to advantage in locating the 140 meter point. When you are sure the oscillator is set on 210 meters, find this point with the receiver, then tune down carefully and look for the 2 : 1 wavelength. At 140 meters you should get a beat note because the 2nd harmonic of the receiver (70 meters) will beat on the 3rd harmonic (70 meters) of the oscillator. Make sure that you really have this adjustment, and that you have not accidentally gone up or to the half wave of 105 meters. It should not be hard to recognize the difference as you already have some calibrations up to 110 meters.

Arithmetical Calibrations

If the oscillator fails to work on very short waves an arithmetical method may be used to great advantage. This method is accurate enough. There is no reason why it should not be almost as accurate as the harmonics method.

You will note in Fig. 2 a set of calibrations but *this will not fit your wavemeter.* These calibrations are given as an example only. Yours may be very much different.

In Fig. 2 it will be noticed that on my wavemeter 90 meters on scale 2 is opposite 245 meters on scale 3. Since the ends of the condenser scale are not being used, curves are perfect enough so that it is safe to say that if 90 is opposite 245 then 45 will be opposite 100. This same system can be extended to other points. The idea can be illustrated by showing examples of the use of data on the meter at RHOB, remembering that the same figures will do out of your meter. Example: we have a 125 meter point on scale 2 and wish to know what wave is opposite this on scale 3. Putting it differently, we wish to know what value the meter turns go with the pointer at 125 on scale 3 but with the coil switch set on using 2.

By using the system just described we find that,

$$100 : 25 \quad :: \quad 15 : X \quad (X \text{ is the wave to be found})$$

multiplying this out we find that X = 3.75 meters.

This whole wave then marked on the wavemeter dial as shown in Fig. 3.

Another example: to find what wave on scale 3 comes opposite 25 on scale 1. We already know that 90 is opposite 245 so we write

$$100 : X \quad :: \quad 22.5 : 25$$

multiplying this out we have X = 11.44.

Still another example: to find what wave on scale 2 comes opposite 25 on scale 1. We know that 15 falls opposite 22.5. Therefore

$$15 : X \quad :: \quad 22.5 : 25$$

multiplying this out we have that X = 30.

This can be continued until all the waves wanted are obtained from a few "correct" waves.

By combining the two methods errors can be caught, making sure that one has used the correct harmonic.

Hints

The "zero" method may make some

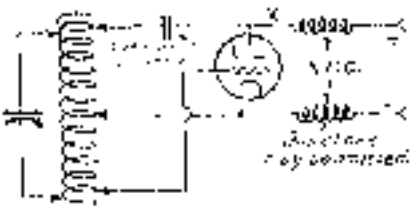


FIG. 3 OSCILLATOR

R.F.C. As described by Bellanger for waves of one to twelve meters. Below that it should consist of 8 to 10 turns No. 22 D.C.C. wound on 1/2 inch form and spaced its own diameter using close

trouble on waves below 20 meters. In this case it is best to use a buzzer which

should be made a part of the wavemeter before calibrations are started. It is a nice job to calibrate the wavemeter twice. The buzzer circuit should be composed of a buzzer, small flashlight cells, and a switch connected in series. Connect this arrangement to the wavemeter by one wire only.

Concerning the Two-Thirds Waves

The subject of using the two-thirds waves was suggested to the technical editor by a Chicago member several weeks ago. It has proven very useful although the editor must admit having made the error of informing our correspondents that there was no harmonic at the two-thirds wave. This is incorrect. There is a harmonic there and the reason for it is explained in our article on 4 to 5 meter work.

Southern Minnesota Convention

Reported by WCP.

THE Southern Minnesota Radio Association Convention was held Saturday, Sept. 13th, 1924, at Sleepy Eye, Minn. These conventions have been held regularly during the past four years, and through the great interest and energetic efforts of the members of this Association, the convention has always turned out to be one of the most interesting of the year.

The Standard Opera House at Sleepy Eye served as a meeting place for the convention, and members showed up from all over Southern Minnesota. Others came from the Twin Cities and from the Northern part of the state.

The convention opened with registration at 8:30 in the morning. Some of the members were a little late in arriving, due to the fact that an all-night watch had been kept station 9AWH, the station of L. V. Berkner that gained fame last year in the Hamilton-Hornaday relay. Needless to say, the convention party enjoyed operation of this fine station.

At 9:30 A. M. the program started with short talks from each of the principle entertainers present.

Mr. E. P. Johnson, Wayzata, Minn., gave a talk on a new type of primary control for filament and plate transformer which will raise and lower the voltage secured from these devices.

At noon the Convention Banquet was held. Some very humorous and enlightening speeches by various members made the dinner most excellent. Perhaps the event of the day was the award of the Cup for the best all around amateur station in Southern Minnesota. This Cup was presented to radio station 9EGG. 9EGG is owned by 3 boys, and has operated under difficulties during the past year. He uses Ford spark coils for his power supply, and even with this equipment, has been talking with all Districts. Recently he communicated with the Canadian Arctic Expedition which was 150 miles north east of the magnetic north pole.

The code contest was held at the Banquet and, by process of elimination, there remained three of the best copyists, 9BYW, 9EGG, and 9BBF, run off with the honors in the first contest. In the elimination contest, 9BBF easily took first place with a beautiful copy at 32 words per minute.

In the afternoon, the Division Manager acted as Chairman of the discussion which embraced the latest A.R.R.L. news, S.M.R.A. news, and operating standards. A full discussion of the methods of handling messages took place, and different ways to help along the delivery of messages. This was followed by a technical discussion under the direction of the Division Manager, which lasted throughout the remainder of the afternoon. At the end of the discussion, the convention was declared officially closed, and the delegates went to the various radio stations in Sleepy Eye and New Ulm to spend the remainder of the night in communicating over the most convenient stations to be found in that territory.

Rules Governing the A.R.R.L. Information Service

1. Before writing, search your files of QST. The answer is probably there.
2. Do not ask for comparisons between apparatus products.
3. Be reasonable in the number and kind of questions you ask.
4. Put your questions in the following form:
   - A. A *Standard* Business Size stamped, self-addressed envelope MUST be enclosed. No stamp required from foreign countries.
   - B. Write with typewriter or inkable ink on one side of sheet only.
   - C. Make diagrams on separate sheets and fasten ALL sheets together.
   - D. Number each paragraph and put only one question to a paragraph.
   - E. Keep a copy of your letter and diagrams.
   - F. Put your name and address (NOT merely call letters) on each sheet.
5. Address all questions to Information Service, American Radio Relay League, 1045 Main Street, Hartford, Conn.
6. Please remember Rome was not built in a day.

A Counterpoise Investigation

By Gaston B. Ashe, 6XBN

I AM showing herewith a set of curves giving a summary of the results obtained in some counterpoise work. I believe the curves are self-explanatory.

The same antenna was used in all cases and only the size and shape of the counterpoise changed. The measurements were between 100 and 600 meters as shown.

Considerable thought has been expended in perfecting the apparatus for making these measurements so that accurate results were obtained and could be duplicated at any time. The resistance board, Fig. 1, proved very satisfactory where the resistance to be measured was less than 30 ohms but for 100 meters, where 100 ohms was found in several instances, another method was necessary.

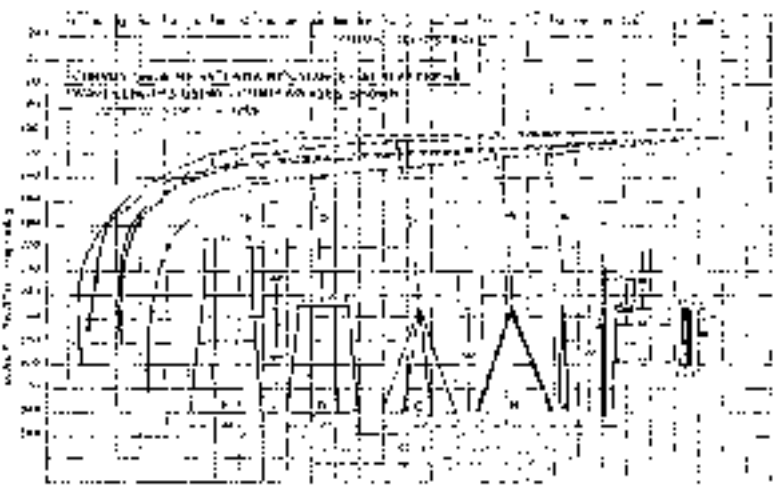
The most satisfactory method was by the use of the formulae

$$R_x = \frac{R\,I_1}{I_2 - I_1} - R_m$$

where

- R_x = Antenna resistance.
- R = Known non-inductive resistance (20 ohms).
- I_1 = Galvanometer reading (milli) with R shorted.
- I_2 = Galvanometer reading (milli) with R not shorted.
- R_m = Resistance of Galvanometer.

The resistance R was measured on a wheatstone bridge to within .01 of an ohm. A series condenser was used below the



of an ohm, indicating a degree of accuracy of better than 2% in the region of the fundamental.

A sketch of the apparatus is enclosed on a separate sheet.

These experiments are being continued and at a later date I hope to have sufficient data on hand to permit the publication of

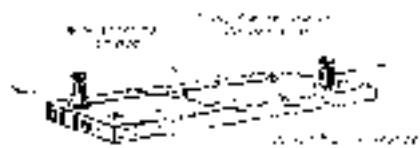


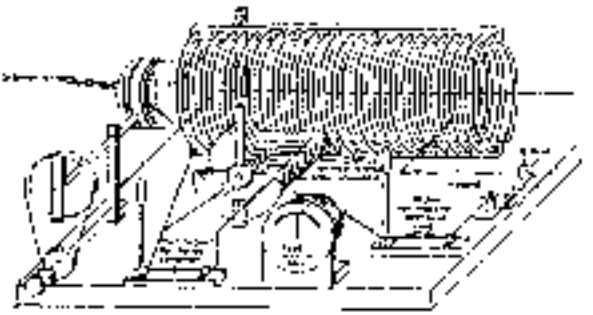
FIG. 1

radiating systems with predetermined characteristics and also to find the most efficient antenna for a given wave.

Results from actual transmission tests at this station indicate that as the wave is reduced the signal strength increases until about 125 meters is reached and decreases below that point. I believe that it is not efficient to work more than 25% below the fundamental as the curves show that the resistance rises very rapidly below that point and it is very difficult to get the power into the antenna. Of course it is realized that the lower waves carry better than the higher so which I believe is more due the success of last winter's Trans-Atlantic tests than to the fact that the antenna was worked so far below the fundamental. I am attempting to design the most efficient antenna for 100 meters. Any information on the subject will be greatly appreciated.

The resistance measurements show that something peculiar happens to the resistance right at the fundamental. It flattens off very suddenly and seems to drop a bit. I found that Mr. Pierce's radiation resistance curves flatten off. It might be possible that they decrease for a meter or two below the fundamental.

When the series condenser is cut in the curves start on a lower plane instead of an upper as you would think they should due to losses in the condenser.



The Resistance-Measuring Layout

I trust that these results will be interesting either to you or the readers of QST, either in whole or in part.

Where Has Interference Gone?

THIS is not a Polyanna story of "wonderful futures" and "unguessed marvels". Everyone of you have read enough such rubbish to last for six ordinary lifetimes. This time let us talk about the remarkable things that are right here and doing business at this moment. After all, isn't progress most interesting when you can reach out and put your finger on it?

The Old-Fashioned Boiler Shop

In every corner of the world ship operators are handling commercial traffic. They are copying through a couple of interference, partly through skill, partly by sheer mule-headed concentration with the assistance of cricket and magenta phrases studded with crash words. Of course, sometimes the interference lets up and only five signals are heard at the same time, which makes matters considerably easier.

The commercial man is not especially happy about this situation, but is inclined to accept it as a long regards Brass—an infernal nuisance but not to be avoided. The engineer for the commercial company would like to throw out the sparks and put in vacuum tube transmitters, but is held back by a Board of Direction which entertains the peculiar notion that the stations should be made to pay dividends.

FLOOR PLAN OF THE RADIO SHOW AT SPRINGFIELD, MASS.

Map showing location of different exhibits at the Springfield Radio show. Solid white lines in the hall created private booths for exhibitors but the portable radio set that was very much used by one receiver in the hall, because they were all modern broadcast receivers and could not be interfered with by a modern amateur transmitter.

The New-Fashioned Fire Bottle

Mr. Citizen Radio is not so. He has no Board of Directors unless he is married, and even then the Mrs. may be a radio nut

present. Wherefore Mr. and Mrs. Citizen Radio turn out the old equipment every two months and purchase a nice new shiny receiver or transmitter.

That's why the vacuum tube receiver has become peculiar among comparatively few amateurs. That's why the vacuum tube transmitter today is universal amongst amateurs but a long way from universal commercially.

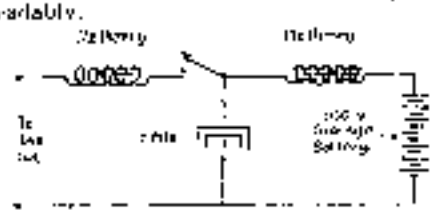
Free sounding for apparatus helps the development, for the radio game can climb only with the aid of strands of obsolete apparatus. Fortunately these stepping stones are being provided—now the idea of maintaining single-circuit "tuners"; the direct-coupled vacuum tube sending sets and the rusty-old spark sets?

Have we said that we are getting on?

A couple of years ago the citizen's radio man was fighting the same war of hate but the commercial man is up against today. Because of the things we have just talked about Mr. Citizen Radio man is just about out of the woods today. He can receive his broadcast unadulterated (unless he lives too near a commercial or broadcast station) or he can work his amateur "fine battle" transmitter in the cheerful certainty that he isn't manufacturing interference for anyone. Sounds unreasonable, doesn't it? Sounds like one of these things that happen in the novels about 1934. But it isn't, it is right here today. Honestly, this seems remarkable to us. It seems so remarkable that we now expect everything in radio to rouse our right. We even think that WHZ will sharpen up that horrible broad wave and take out the commutator ripple that NAT will fix that dizzy key they use to send Chinese with, and sometimes we even think the time will come when all amateurs will be compelled to send the continental code decently and readably.

THE A.R.R.L. HEADQUARTERS STATION 1AWW

This is not the regular 1AWW but a special station built for the reception and operated under special permit from Hadgerene Sidatee. The latter was the center of much interest on the part of both amateurs and broadcast listeners. The Springfield Radio Association co-operated with the Assistant Business Manager and with City Manager Henry Slaughter in the making of the installation and in operation the station.



1AWW KEYING SYSTEM

THE KEYING SYSTEM WHICH MADE THE STUNT POSSIBLE

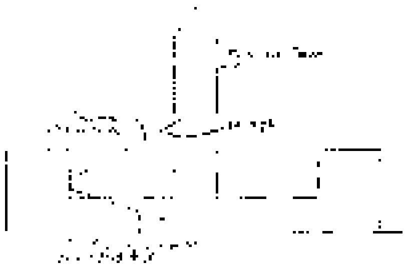
No keying chump with this arrangement. Just such an arrangement was shown in Figure 2H, page 38 of July 1923 QST. We were reminded it strongly and nobody seems to have paid the least attention to it.

Of course, all this is just effervescence, but there's a reason for it.

At the Springfield (Massachusetts) Electrical and Radio Show just such a combination was in operation. No special tricks were used, no transmitter secrets simply a good modern amateur transmitter and the receivers bought good modern broadcast tubes

Making Good

Can you imagine a transmitter set right down in the middle of a roomfull of receivers? Certainly you can, and you can probably imagine a time to go along with the scene. But can you imagine all this equipment in operation without any semblance of interference? Well, the thing is possible today, although we didn't believe it was two years ago.



1AWW ANTENNA SYSTEM

THE RADIATING SYSTEM

Although surrounded on three sides by concrete and granite buildings with steel frames and reinforcement this system proved very effective.

The transmitter was in the booth operated for the American Radio Relay League by the Springfield Radio Association. The show was primarily a broadcast show, therefore everybody's first thought was that it would be best not to transmit. In the next instant, however, it was realized that with the modern 200 meter transmitter the thing would be practical and desirable.

Working Fast

No transmitter was available and one had to be built in a hurry. In a little over eight hours Frank Crosier, 1BSJ; T. F. Cushing, 1AWW; and Ralph Gross, 1BLU, constructed the transmitter. In accordance with modern practice, inductive coupling was used. With direct coupling the whole thing would have been impossible. A one-wire antenna and a one-wire counterpoise were hurriedly installed and the station put into operation. The transmitter only used a pair of little UV-202 tubes, and the antenna current was about a quarter of an ampere. With the old 200 meter waves this would have represented a few miles of range only. With this 80 meter 1AWW, transmitter 3MO at Allentown, Pennsylvania, was worked ten minutes after the set was connected; in broad daylight.

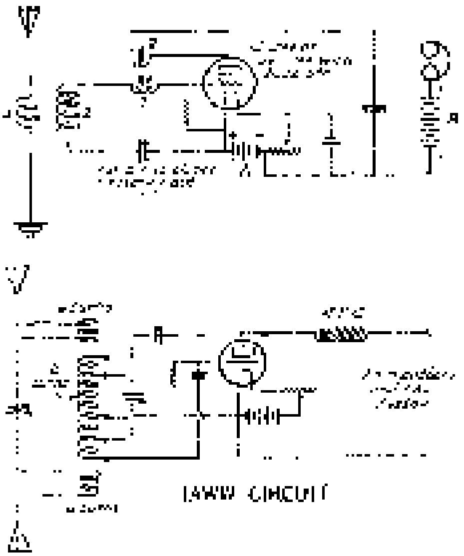
During the week the transmitter was in continual operation from 1.00 P.M. until 11:00 P. M. every day, stopping only long enough to change operators. During the week there were many radio conversations and 135 radiograms were handled, the farthest station worked being 5KH of Tuscaloosa, Alabama. The distance is about 1000 miles. Two and three hundred miles communication during daylight was the regulation thing.

We, the Advisory Committee, certify that the broadcast receiving sets [illegible] American Radio Relay League at the Springfield Electrical and Radio Show during the week of October [illegible] 1922, [illegible]

[illegible]
[illegible]
[illegible]
[illegible] 225 Worthington St. [illegible]
[illegible] Main St. [illegible]
J. M. Moss Co., 390 Main St. [illegible]
[illegible]
The Radio Shop, 274 Worthington St. [illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

All this was in the midst of a dozen broadcast receiving sets, some not more than 20 feet away. Not a one of these receiving sets was able to determine when the station was in operation.

Think of the contrast between that and the great volume of interference created by older types of transmitters. Think also of the difference in the broadcast receivers that were able to tune out a near-by station as compared with those of a couple of years ago which merely received but did not tune at all. Truly, we are progressing after all.



THE COUPLED HARTLEY CIRCUIT USED

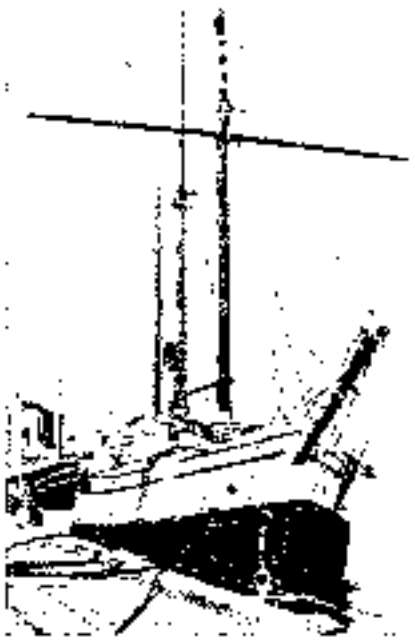
Two UV-202 tubes were used in parallel. With an input of 125 milliamperes at 350 volts this set put 250 milliamperes into the antenna at 77 meters.

The 1924 Trip of the C. G. S. "Arctic"

By Wm. Chose, c3CO, the Operator

THREE days before the "Arctic" left Quebec the transmitting equipment was given tests and communication carried on with a number of amateurs in Canada and United States, while tied up at the wharf. The equipment in use has been previously described in this publication.

Sailing from Quebec on July 5th, communication was maintained by the 600- and 2100-meters, as well as the short wave sets. Shortly after passing the straits of Belle Isle, some heavy weather was encountered and a very important long, code message was put through from the "Arctic" to c9AL, c1AR, c2CG and 8AFP. Co-operation between these amateur stations in assisting each other was fine business as all of them could be heard on board the "Arctic" confirming different portions of the message to each other. This message would not have been put through amid a considerable time later by commercial channels.



THE "ARCTIC" AT DOCK

Operator William Chosie may be seen at the top of the foremast, although his cheerful grin is a bit hard to make out.

During the time that the "Arctic" was proceeding up the Labrador Coast and over to Greenland, messages were sent back through the Danish revenue cutter, "Hans Hedtoft", which was stationed off the lower Greenland coast, he's skin being in communication with the Louisburg station in Nova Scotia on 2100 meters.

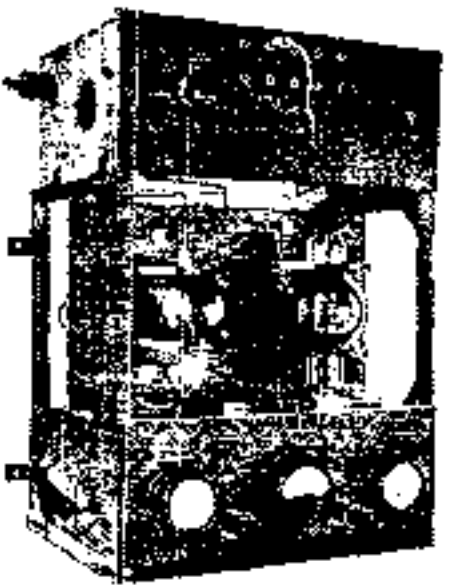
When Ponds Inlet, which is situated at the north end of Baffin Land, was reached, communication with the outside was cut off, probably due to the high mountains which surrounded the ship while anchored there. However, amateur signals were still copied at this place although there was continuous daylight. Continuing south from Ponds Inlet, the ship reached Etah on August 11th and found the "Bowdoin" had left five days previously and was proceeding down the Greenland coast. All the way up the "Arctic" had been calling the Bowdoin at approximately midnight, as were about 175 meters and was unable to get in communication with Mac.

On August 16th we headed southward and arrived at Dundas Harbour, North Devon Island, on August 17th. Here the "Arctic" anchored for nine days, while the police post was built and the Government cache made. While anchored here numerous amateurs were copied, including Canadian 3CO, my own station.

On August 26th we left Dundas Harbour and that evening communication was established with Canadian 4FV, of Regina, Saskatchewan, thus breaking the three weeks' silence. One message was sent through this station advising of the welfare and position of the "Arctic" and all those on board. This was daylight communication as far as the "Arctic" was concerned. The next evening in Eclipse Sound, a few miles south of Dundas Harbour, the following stations were worked: 4FV, 4UBH, 5VH and 6BO. Work was nearly completed this night when the power supply failed, much to the op's consternation, until the second dynamo was run up.

The expedition in which the Canadian Government Steamer "Arctic", under the Northwest Territories Branch of the Department of the Interior, has just carried a detachment of the Royal Canadian Mounted Police to their various outposts in the Canadian Arctic, left Cape of St. Lawrence, the eastern entrance to the Gulf of St. Lawrence, on the 5th of July. The "Arctic" was put through the ice floes of the North with supplies and provisions for the various outposts of the Mounted Police, and returned to Quebec on October 4th, having completed the trip in safety. The "Arctic" was under the command of Captain J. D. Bernier, who has had many years experience in navigating Canadian waters in the Arctic regions. Mr. Chose of 3CO, Toronto, by the courtesy of the Hon. Dr. Roche, Minister of the Interior, was appointed as operator of the "Arctic" for the trip. Amateur equipment was used throughout the trip, and communication was established with various amateur stations in Canada and the United States. Mr. Chose was also instructed to keep a log of the trip, and to report on the possibilities of amateur radio communication in the Arctic regions. The following article is a result of his observations.

On the following evening while anchored at Ponds Inlet again, a message was sent to 1HG and communication was carried on with 1GGH. From Ponds Inlet the "Arctic"



THE 3200 METER TRANSMITTER OF THE ARCTIC

Antenna tetrahedral hookup is shown at the upper left side of the set. On the control panel at the top of the set will be seen two knobs and a pair of cords. The left cord is labeled "Reaction" which we call tridbacks, the right one "Variometer". The variometer is probable in series with the antenna. The upper row of jacks connects in taps on the antenna inductance, the lower row of jacks represents plate taps.

The small fuse at the left is a Marconi "MT1" and the other one is an "MT3".

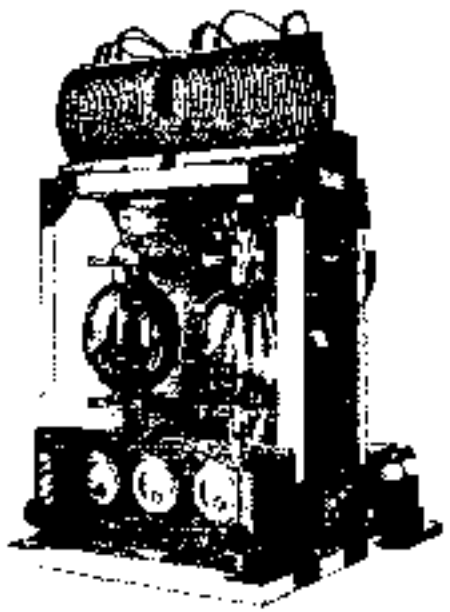
The meters left to right—are plate milliameter, antenna ammeter and filament voltmeter.

proceeded to Albert Harbour where ballast was taken on board and the engines overhauled. While here the "Bowdoin" was worked, she being then at Godhavn, Greenland.

Albert Harbour was left at midnight September 3rd, and the following day communication was carried on with 8GG, Timmins, Ontario, one message being sent under great difficulties. No more traffic was sent until we neared the southern coast of Baffin Land, when on September 9th four messages, one very important, were relayed through WNP, who was then stationed at Indian Harbour. WNP was at this time 1SO URV. Two days later the Hudson Bay Scot, "Nascopie", which was then anchored in Cumberland Gulf, was worked on the 2700-meter C. W. set. From the time the "Arctic" passed Hudson Strait on its homeward journey till Belle Isle was reached, very few amateurs were copied and those that were heard were fading very rapidly, although at this time about eight hours darkness was being experienced. There seems to be something fancy about communication while off the Labrador Coast.

From the time Belle Isle was reached till the ship docked at Quebec on September 24th, nightly communication was carried on with amateurs in several parts of Canada and United States. The record two-way communication was made when 2NM in Surrey, England, received and QRK'd a message from the "Arctic", which was then off the coast of Anticosti Island in the Gulf of St. Lawrence. The signals of 1AR were terrific when in the Gulf.

Extremely valuable work was done by Mr. Harrison at 8AFP of Ottawa, Ontario,



THE 100-250 METER SET UP THE "ARCTIC".

Two 1-k.w. tubes are supplied with 1400 volts at 10,700 volts. Antenna tuning inductance above the tubes with tuning meters on a bakelite panel across the bottom. Plate transformer, etc., are mounted behind the tube panel. This is the set that did the work.

who delivered messages from the "Arctic" direct to the Department. During the whole trip the C.W. telegraph signals from the experimental set at KDKA, operating under the call 8XS, were received and from the time that Belle Isle was passed on the way up till the "Arctic" returned, these

signals were of almost unvarying strength no matter whether the boat was landlocked or not. However, great difficulty was experienced in trying to copy the short waves (90 meters) when the ship was rolling to any extent.

The conclusions which I have come to from this trip amount mainly to the fact that the short waves are greatly preferable to the commercial wave lengths for ship-to-

"DEMONSTRATION WELL", PAGE 10

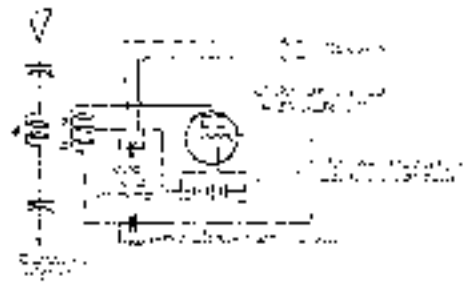
shore communication provided this is not carried to an extreme. Great difficulty was experienced in copying waves below 150 meters in any kind of a heavy sea owing to the rapid changes of capacity caused by the rolling of the vessel. The waves between 175 and 150 meters seem to work out the best for this work but no doubt some means of combating this change of capacity would enable shorter waves to be used satisfactorily. Strangely enough few stations were heard below 100 meters, although a watch was kept as low as 60 meters. Some trouble was experienced due to the salt water spraying portions of the electric light circuits of the ship when heavy seas were coming over, with correspondingly noises in the receiver.

An official report will be issued by the Radio Branch of the Department of Marine in due course.

9APW's 5-Meter Equipment

ABAT 7 days after the last contest we did get the parts at.

The transmitter is built like the one constructed by Beezley of A.R.L. and described in *QST* for October. It takes up the same scheme, moving the legs of the brass tubes to and fro. Pretty crude? Perhaps. But what else are you going to do—shift the plate and grid inside the tube? The tube itself is a UV-201 type (UV-201-A), which can be obtained from anyone who is tired of supplying an amateur whose quarter runs out on him. In St. Paul the current price of used UV-201 tubes is $1 (Americans, or ten pesos. In the set at 9APW-9ZH the plate supply is from a storage battery, hence no radio chokes are needed. If any other plate supply is used, be sure to use very effective chokes—see the October issue.



The power tubes be made of a variable grid condenser, consisting of all the other devices suggested here. The diagram explains the circuit, and the proper number of turns is marked opposite each coil. As there are only very few turns in each coil, it doesn't matter particularly just how they are wound. The ones at 9APW started out to be spider-webs, but 2 parts couldn't make much of a web. The variable condensers can be almost anything that comes handy, provided you are willing to tear out all but 2 plates and perhaps to run down the rotary plate engineer.

Has it occurred to you how tremendously easy all this is as compared to the rig we formerly had to use on 200 meters?

Experimenters Section

THIS month the space of this section will be given over to the 20 meter and 5 meter tests, because that is the most important thing to be done.

By this time all members of the Experimenters Sections have gotten their openings on the 20 meter region, having had the tests of November 22 and 30 to work on. There should now be a good supply of wavemeters, tuners and transmitters for the 20 meter band.

The December and January tests are for all A.R.R.L. members, and the members of the section are asked to help other A.R.R.L. men in every way possible.

Why the Tests?

As stated elsewhere in this issue, the 20 and 5 meter bands are being ignored by entirely too many amateurs. There is far too much of this thing of "letting George do it first." Except that some attitude delayed the 100 meter work for six months and exactly what sort of attitude was what probably lost us the record below 150 meters in the first place.

These tests are designed to cure that state of affairs and to give all of us "the courage to make mistakes" on the new waves.

What Circuit and Apparatus?

Even today we get letters that ask "What circuit shall I use on ... meters." Use your own pet circuit—just cut the thing down to the right size and use it. For details on the following articles:

Antenna Series Condensers, p. 21, March *QST*.

Loose Coupled Transmitting Circuits, p. 11, April *QST*.

Meissner Transmitters, p. 18, May *QST*.

Calibrated Oscillators, p. 64, July *QST*.

These articles were written for 200 meter work but will fit the present job. However the following articles were written for short-wave work.

Tuner That's Different, p. 42 August *QST*.

3rd Harmonic Transmission, p. 12 August *QST*.

20-40-80 Meter Work, p. 9 Sept. *QST*.

Short-Wave Wavemeters, p. 24 Sept. *QST*.

Tuner (cut down for 20 M.), p. 38 Sept. *QST*.

5 Meter sending set, p. 13 October *QST*.

5 Meter wavemeter, p. 12 October *QST*.

5 Meter antennas, p. 13 October *QST*.

5 Meter receivers, p. 13 October *QST*.

Short-wave super-regenerators, p. 22 October *QST*.

Short-wave antennas, p. 31 Nov. *QST*.

Practical Short-wave sets, p. 11 Nov. *QST*.

Short-wave Wavemeters, p. 31. This issue.

Just one more suggestion—Goldberg of 9AJW was going to write us a story about a 5 meter tuner but he hasn't gotten to it, so the idea is shown in the Figure. No explanation is needed except that the variable condensers can be "thigh loss" with very little bad effect, because they are series condensers. The size of the plates, the spacing and the coils are all up to you, that's where the fun comes in. But it's better to start with a "dopased" (?) tube, as explained in the 5 meter article mentioned above.

(Note—we almost forgot: that there's an 5 meter tuner in the "Amateur Builder" section this month.)

The Schedule

The tests are so arranged that all stations in the "Atlantic International Time Belt" send first, then the stations in the "Eastern Standard Time Belt" then the ones in Central Time Belt, etc. However, all times are given in Pacific Standard—figure out the correction for your own location and send accordingly.

Each test sent as follows:

"QST QST QST (your own call three times only) 20 meter test."

Repeat this during your test period. (It is best to send slowly and clearly (fading is often bad at 20 meters—and there is no telling what it will be at 5 meters). Above all—make many short calls; don't copy those idiots that sign for ten minutes at a stretch.

Evening of December 11—20 Meters

Pacific Std. Time.

(Figure your own time from this.)

All stations in Atlantic International Time Belt send	10:00 to 10:15 P. M.
All stations in Eastern Std. Time Belt send	10:15 to 10:30 P. M.
All stations in Central Std. Time Belt send	10:30 to 10:45 P. M.
All Stations in Mountain Std. Time Belt send	10:45 to 11:00 P. M.
All stations in Pacific Std. Time Belt send	11:00 to 11:15 P. M.

Daylight Test, December 21-20 Meters
Pacific Std. Time
(Figure your own time from this)

All stations in Atlantic
Interconti'nl Noon to
Time Belt send 12:15 P. M.

All stations in Eastern
Standard Time 12:15 to
Belt send 12:30 P. M.

All stations in Central
Standard Time 12:30 to
Belt send 12:45 P. M.

All stations in Mountain
Std. Time 12:45 to
Belt send 1:00 P. M.

All stations in Pacific
Std. Time 1:00 to
Belt send 1:15 P. M.

Evening of December 27—5 Meters
Send exactly as on night of December 13—but use 5 Meters.

Daylight Test of January 4—5 Meters
Send exactly as on December 27. Also use 5 Meters.

Reports

Please make your log as complete as possible and mail it to "Experimenter's Section, A.R.R.L., 1045 Main St., Hartford, Conn." The report will be unscrambled unless you date it so we can tell one test from the other. Also please don't mix a lot of other things into the same letter, we don't have time to sort them out. Unless your log is mailed promptly after each test, it can not be used in the QST report.

Concerning Other "X Section" Affairs

The tests take up the room this month. For information on this section please see the last issue of QST, page 38. *Please* write any letters as requested there.

Application for membership is explained at the same place.

How About This?

A. F. JOHNSON
RADIO SUPPLIES
WARREN, MINN.

July 8,1924.

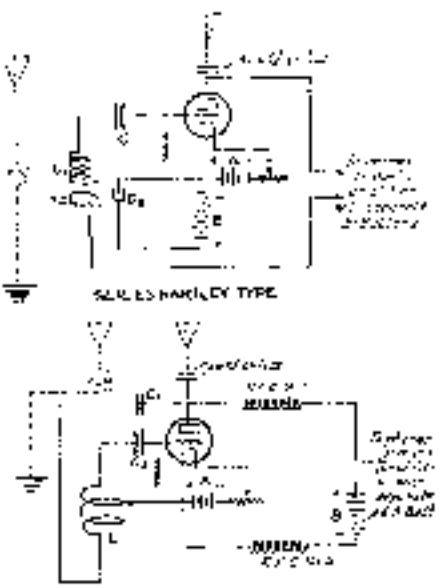
Experimenter's Section, A.R.R.L.

Gentlemen:

We are very much interested in putting on the market a transmitting inductance which will meet the needs of present conditions in amateur transmission. There is but one prominent make now available, and in our business we receive a great many requests for them. However, even this is not made in sufficient quantities to supply the demand, and it is not entirely suited to various desirable uses.

The writer will be interested in cooperating with the Experimenter's Section and receiving whatever data is now available in order that the best possible instrument may be put at the disposal of the amateurs.

Very truly yours,
E. F. Johnson, A.R.R.L.



STANDARDIZED 5-METER TUNERS

Notes—

A 4-foot antenna may be tied to the plate as shown. The very small condenser may not be strictly necessary but if used it can be made of two wires as shown at Page 9, Fig. 2, Sept. QST. If the antenna is coupled to the coil as the diagram shows from the coupling very loose—coils at least 10" apart.

A grid leak may be used if necessary—connect as shown, not across the condenser.

The tuning condensers should have long insulating controlling handles. Ordinary variables are far too large. Experiment—two very small plates an half an inch apart for the grid circuit, two insulation plates set at usual distance for C3. Metal end plates don't do this job—the capacity is away too high.

The shunt-fed circuit is probably best. For ideas on building it with very short leads see the 4-5 meter transmitter on page 14, October QST.

To find out if a set of the sort is working, make two and listen for beat notes with one of them.

C1—Tuning condenser. Maximum capacity 10 micromicrofarads.

C2—Bypass condenser. 500 Very compact condenser of 250 micromicrofarads or more.

L1—Grid coil. Two 3-inch turns or one larger turn.

L2—Plate coil (Hartley). One turn 2 or 3 inches diameter.

R. Centadohm helix of 1 or 2 small turns.

C4—Same as in series-fed circuit.

C3—Plate stopping condenser used as regeneration control. Capacity of 50 micromicrofarads about right.

R.F.C.—Five layer No. 36 D.C.C. (or other very small wire) wound on 3-inch wooden pencil or porcelain mixing tube.

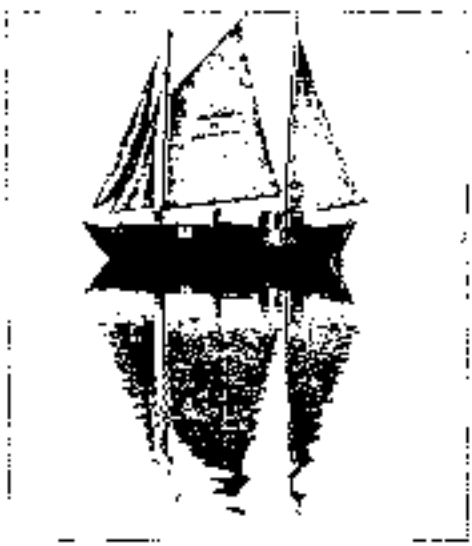
The Bigbill Installation

THIS story should have appeared before—but we have been hoping and hoping for some pictures of the transmitter, also for a lot of news about the voyage. However—they may come later, so here's the first part of the story.

The Bigbill was built at Chicago and named after ex-mayor William Hale ("Big Bill") Thompson. She left Chicago for a two-year trip into southern seas.

Of course she carried a short-wave transmitter; you can imagine an exploration outfit getting out of Chicago without knowledge of Big Wraith Grimes? Naturally also the operator was an A.R.R.L. man, E. C. Page of 9ARU-9XW. The construction and installation of the set were due to P. J. Marco, (9ZA) of the Premier-Tully staff; R. H. C. Mathews of PZN, Chicago Radio and Speech Corporations; and W. E. Schweitzer of 9AAW-9XB-9ZW.

Does this sound like another Bowdoin story? Have patience, it will soon become radically different.



THE "BIGBILL", WBU

The Trip Down

Of course the Bigbill could have gone to sea via the St. Lawrence river—but she wanted to go south and not north. Therefore Captain A. J. Duken took her out via the Chicago Ship canal and the Illinois river into the Mississippi. Now here the yarn begins—the ship canal has suffered from lack of use, the Illinois river also isn't in the best navigable condition. Even the little Bigbill had Satan's own time getting through, and once had to be dragged over a sandbar by a steel cable and a locomotive. Once she got into the Mississippi it was possible to proceed by towing behind one of the War Department's big steel towboats that run on the Mississippi-Warrior runs. Since the towboats were always shepherding a big herd of barges, the Bigbill had to take potluck, and frequently got into arguments with bars and other obstructions. A hectic trip resulted, and the outfit reached New Orleans by the heaviest sort of work.

The set was aboard and ready for installation, but the actual installation had just begun when Bigbill left Chicago. The set had previously been tested at 9XN, the Research Division of the Chicago Radio Laboratory at 1929 S. Kedzie Avenue. With the temporary antenna and bad ground used there it was not reasonable to expect brilliant results. However, the antenna current was 1.5 amperes at 40 meters, 2.0 amperes at 110 meters, and rose as the wave went up. The test was a brief one, but stations at Panama, Washington, and Hartford, Connecticut, were all worked easily enough. Everyone was therefore confident that the set was good.

On the trip down Schweitzer and Marco and Page worked furiously to get the radio set into place. When Memphis was reached the set was in action and making a great splash in the ether. Before New Orleans was reached all states had been worked and "WBU" was beginning to be a familiar call.

Good contact was established with Chicago via 9AAW, which was being operated by Richie Schweitzer.

At New Orleans the rest of the radio gang left for home, and the Bigbill headed down the river for the Panama Canal and the southern Pacific Ocean.

Where she is at this writing we do not know, but we understand that radio contact with 9AAW-9ZW has been excellent, using some wave near 80 meters.

The Radio Installation

The Transmitter consists of two panels. The upper, or radio-frequency panel, is vertical. The lower panel is brought out at a slant somewhat after the fashion of

the panel of a Zenith receiver. Jewell meters are provided throughout for all circuits. There are two antenna connections, one with a range of 0-8 amperes and the other with a range of 0-2 amperes. The reason for two antennæ is found in the very great wavelength range of the set—80-700 meters.

WIID's Zenith Transmitting with Schweitzer on the Right and the Top Two Inches of Mabee Showing in the Lower Foreground.

Two UV-203 A tubes are operated in parallel in a plate Hartley circuit. The plate supply is obtained from a 1000 volt dynamotor which operates on the ship's 32 volt storage battery. The battery is charged by a Delco generator.

Quoting from a letter by R. H. H. Matthews—"Copper ribbon wiring is used throughout, and special attention has been given the construction of the set in order to make it sturdy as well as efficient. The dielectric losses have been minimized by proper design and construction. Porcelain supports are used wherever possible, and if porcelain is not available hard rubber is used. No bakelite or moulded material of any kind is found in the set. A loading inductance is provided to bring the wave of the set up to 700 meters to allow communication with commercial ship and land stations when amateur stations are not available.

A complete set of spares has been included with the equipment, including spare rheostats, antenna wire, tubes, condensers and even a spare key.

The ground consists of a two-foot copper strip running completely around the hull below the water line.

The Tuners

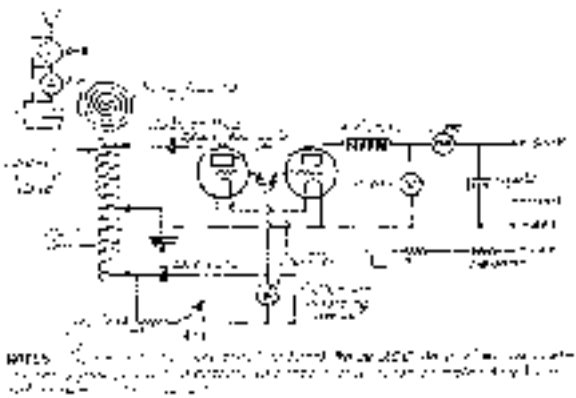
The tuner is of the low-loss type and was built in the Chicago Radio Laboratory,

Research Department, by K. E. Hassel, who wrote the first article on low-loss tuners which appeared in QST last January. This tuner embodies all the latest developments in low loss construction, and has a wave-length range of 50-600 meters.

A second tuner is provided, this being a standard Zenith 3-C, having a wavelength range of 200-800 meters.

Antenna

The antenna is a four-wire aerial 68 feet above the waterline, with wires spaced 2 feet apart. The wire is No. 10 gold plated and the halliard is composed of 7x26 strand



THE CIRCUIT OF THE TRANSMITTER

If you can't get it be sure to make your inductance coupled as you don't have the special license carried by WIID.

of this same gold-plated wire soldered at intervals of a foot, the wire not being twisted but brought straight down parallel through the insulant insulator. The gold-plated wire, of course, is used to eliminate corrosion.

Burgess Helps

A temporary battery supply has been provided by the Burgess Battery Company with special attention paid to the conditions under which the set will operate, regarding temperature, moisture, etc. Enough is the receiving set uses three "B" batteries and a "C" battery, a number of sets of batteries have been provided and sealed in corrugated metal cases here which will be packed below the waterline of the ship in as cool a spot as possible.

A.R.R.L. Affiliation

As manager of the Central Division, Mathews issued an O.R.S. certificate to the ship. Accordingly the Central Division now has a station somewhere west of Panama. Probably this set will shortly be the "farthest south" station of A.R.R.L.

"Each month a report of the traffic

Some of the gang who had to do with the Installation at WBU. Left to Right they are: E. A. Reins, 9th District Supervisor; R. H. C. Mathews, 9XN; F. J. Maran, 9ZA; W. L. Schweitzer, 9AAW. Hiding behind Maran is E. C. Page, 9BU, the A.R.R.L. operator at WBU; and at the far right is William Hale Thompson, the man for whom the "Bigbud" is named.

handled will be sent to the superintendent at District No. 9, state of Illinois. This will be included in the regular traffic report of the Central Division."

Watch for WBU on 110 meters and on 38 meters.

Fifth Canadian District Convention

By Fred Elliott, 6ZH

To the accompaniment of tin whistles, Q2's cat calls and much blowing of automobile horns, the First Canadian 5th District Convention opened Sept. 30, 1921, at Vancouver, B. C. Quite a number of the gang turned out for the morning session in spite of the weather QRM and it was a happy bunch who met in the B. C. E. A. club rooms at 11:00 A. M. to start the most eventful days in the 5th District's history. After all hands had registered everybody was loaded into cars owned by various members and the whole procession headed for the Point Grey Govt. Station VAB where Mr. Medish, the operator on duty, showed the visitors over the station.

The afternoon was spent in visiting 6AG, 6AE, 6HB, 6AH and 6CN; all local Hamstations.

At 6:00 the whole gang assembled at the B. C. E. A. club rooms and paraded up to the Grosvenor Hotel where the banquet was held. The first couple of courses where the "Quiet" hours but then things began to get warmed up and soon a smoke screen gradually enveloped the gang. The first being a Scotchman and naturally prepared for anything started a sort of vacuum cleaning outfit that sucked the smoke up through the roof and cleared the atmosphere sufficiently to see from one end of the table to the other.

The program was opened by a performance by 5JB and 5CN, piano and vocal[illegible] respectively. Mr. McGoughan of the Northern Electric Company, gave a talk on "Low Loss Condenser Construction" and passed one around for exhibit (he successfully got it back). Next followed a talk by 5HF on "Wartime Radio Communication". Next on the list was a code jamming contest: 50 words straight and 50 jammed. Senior 5GP, Jammer 5BJ. Winner 5GO, 2nd 5AN, 3rd 6AK. Mr. Edgar, Australian 5AP, representing the Wireless Institute of Australia, then gave a talk on ham activities down under.

A diagram passing contest was won by 5BJ 1st, and 5AS 2nd. The banquet finally broke up at 10:30, the whole gang singing "God Save the King" and cheering for the A.R.R.L.

The very successful staging and costumes of the B.O.W.B. Initiation was a big surprise for most of the gang had rather expected it to be a very modest affair. Thanks to 5GP and 5GO who both worked like Trojans, the whole affair went off beautifully. The costumes were splendid, everyone knew his part and there was no hesitation. The only regret of those present was that the sitting was not final

enough for the rest of the affair. The parts were taken by the following MO, 9UP; MM, 5AK; PA, 5AN; U.S.A., 5QN; OM, 9HG; O.D.O., Vic Wallace; QKM, 5BA; QRN, 5HB; K.I., 5BB; F. 5BD; U, 9BF; MG, 5GO.

While enough soberness was drifted into the R.O.W.H., institution to give everyone something to think about, and while we don't admit it possible to have a better bunch than the fighting Canadian District Hams, still if any improvement is possible the necessary inspiration was supplied by the R.O.W.H.

A New Kind of Short Wave Tests

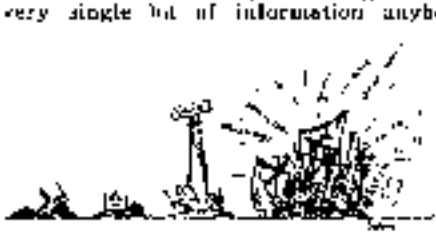
Exploring the 20 and 5 meter bands in December

EVERY amateur transmitter in America seems to have found the 40 meter band—although there may be a few exceptions.

The 40 meter band is settling up more slowly, but the pioneers are doing splendid *daylight* work on that band.

But as 20 and 5 meters—dead silence!

What's the Idea? QST has given out every single bit of information anybody



needs to get going on these waves within 48 hours—and nobody seems to give a whoop. That's some thing happened when the pioneer 40 meter work was being done by 1HX, 1AAW, 1AA, 1AM, 9ZN and 8XK. Everybody sat around and croaked "It can't be done". But those 6 captains went ahead and DID IT!

One show of that sort is more than enuf. Let's wake up and show some signs of knowing that we have these lower wave-lengths.

* * * * * * * *

Next this once let's hold a mid-west of test, one in which we don't sit here and wait for someone else to do it but all try together and at the same time.

The tests come in December, the story is told in the Experimenters Section of this issue of QST.

Now please:—

1—Read the plans for the tests in the Experimenters Section.

2—Get into the test whether you belong to the section or not.

3—Report *promptly to the first* requested Thanks.

—*of K.*

More Low Power Work

THIS is a continuance of the station efficiency contest. The first data on which was run in the May, QST. These are all summer incidents and, for that reason, should be all the more interesting. Fraternally all of the work was done at night.

Transmitting Station		Receiving Station
9BRQ, Colse, Ill.		9BGR
9BPJ, Minneapolis, Minn.		9BNF
6ADR, Los Angeles, Wash.		6SF
2ASH, Audubon, N. J.		1BQE
2BV, Wilmerton Pk., Eng.		2CVR
9BPG, Portland, Mich.		9BFD
9DDV, E. Grand Forks, Minn.		9GR
9DDE, Fairgrove, Mich.		8BTR

Date	Communication Distance Miles	Code	Voltage	Current Amperes	Input Watts	Message Words
May	700	202-A	50	1	2	5
5-7	170	202	200	.002	.2	450
5-11	100	202	20	?	?	5
June	208	?	11	.002	.48	2000
June	1100	?	?	?	.25	124
July	20	201-A	6	2	7	12,731
Sept.	1300	202	200	.008	1.5	940
July	2000	201-A	2	?	8	250

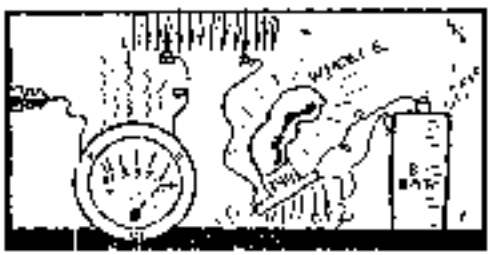
The excellent work shown above should be a reproach to those hams that need reports of 2000 watts and all kinds of exciting antenna currents. In most of the cases above, the antenna current could not be measured on the instruments in the possession of the station owners.

The record of 2BV deserves special mention on two counts: he was using a temporary antenna only 18 feet high at one end and 35 feet high at the other; and his antenna current was 1/4 ampere. 8DDE deserves some sort of an explanation in that he used a spark coil plate supply and the input to the spark-coil itself was eighty watts. Because of the inductive transfer and heating in the resistance of his vibrator, his actual input to the tube would be, most likely, much lower; however, we don't know that wattage definitely.

The record of 9BPG deserves special mention also. It shows what this low power business can degenerate into. Someone is going to get a 202 oscillating on one volt B battery and work his friends two blocks away, and then we will have a mile per watt record that would take a certified accountant five minutes to merely think of. Not that 9BPG does not deserve

credit for doing what he did— he does. He might have made an error, however, for he figured the plate current from the rated value of 1000 ohms plate impedance for the tube, which is a perfectly reasonable assumption. Even if he erred as badly as 100% his kilowatt figures would only drop to 6000 volt amps and that itself is a very respectable figure.

Not enough really low power work is being reported upon, and not enough of



that reported follows the form outline given in *QST* of last November. We are still interested in these low-power accomplishments and would like to receive reports of this sort of work in which the person accomplishing the DX was using an inductively coupled transmitter; however, this is not necessary.

—*A. W. H.*

Quien Sabe—But Play Safe!

ON 'C' we know for sure that sets below 150 meters were supposed to use inductive coupling.

The last conference has got things all upset—licenses have even been granted for capacity-coupled sets.

It seems as if it is up to the individual Supervisors of Radio to say what they will approve.

As soon as we know something definite we will tell you about it in *QST*. Meanwhile, we strongly suspect that the new rules are going to call for inductive coupling on all waves and at all times. Better play safe and put in that sort of a set now.

TRANSMITTING HINTS

Removing Tube Bases

When removing tube bases for short wave work it is a good idea to begin by heating the pegs and then "flipping" the solder out of them. After that the base may be heated to soften the cement in the fashion that we have described before.

If you start to take off the base without unsolidering the pegs first the tube may be seriously damaged.

Fitting the Antenna to the Set

Everybody seems to be nursing the idea that the antenna which will be good for a couple of UV-204 tubes will be absolutely useless when a single UV-203 is used.

As far as the Editor of this column is concerned that is simply nonsense.

If an antenna is efficient when a kilowatt is being put into it then it will also be efficient when 10 watts are being put into it. On the other hand if it is rotten when 10 watts are put into it then it will keep right on being rotten when 5000 watts are put into it.

The way to decide what antenna you are going to want is to forget all about the set and consider these three things:

1. The space in which the antenna must be erected.
2. The wavelength on which you wish to work.
3. The strains the weather will put on the system.

Your Space

Let us begin by being honest and admitting that there is little use in talking antenna theory when the actual antenna absolutely must be built to fit the space. The rules for making the best use of your space are simple yet lots of all amateur antennas ignore them thoroughly. Here they are, listed briefly; think them over to fit your own particular job.

a. Keep the antenna in the clear, 10 feet away from houses, trees and guy wire. If you have to cut 10 feet off to do that, *go ahead and cut off the 10 feet.*

b. Other things being equal, height is likely to prove more useful than length.

c. The counterpoise needs just as much attention as the antenna. Put it where the wires can lie of the same length and can be kept decently clear of things. Whether the counterpoise happens to come under the antenna or not isn't the main thing at all.

Your Wavelength

Our ideas on the proper size of antenna for a given wavelength are shifting rather

frequently these days. In general they are shifting toward the idea of using a big fundamental. It is possible to go much further than this. At 1XAQ a 100-meter antenna has been worked in 42 meters with fair results.

Weather Effects

To reduce the wind and ice load it is desirable to use few wires and space them rather widely. In the Editor's estimation the small cage is a complete fizzle from the standpoint of getting top capacity but it is a glorious success from the standpoint of providing plenty of wires for the wind and ice to work on. In most cases a two-wire cage spreading 3 feet long will be as good or better. This is said with the full realization that an argument will start at once. This is all right—arguments are harmless when the claims are not backed by careful tests.

From the standpoint of steadiness in windy weather that antenna is best which can be most firmly secured in place. This bars wide spreaders and it also bars large cages. The Editor's roof would be for a three- or four-wire flat top but two would not make him particularly unhappy. The fewer wires there are the easier it is to make them behave themselves. A single one would be ideal but of course the top capacity is lower then. In any case the downlead should have all of its wires spaced within an inch or two of each other. If there are more than two of them this still holds true in a small cage. Most downleads are far too large: they thrash around unnecessarily in the wind and they add capacity where it is not wanted.

Corrosion

Corrosion of antenna wires is not serious unless stranded wires are used or unless badly soldered joints are made. In any roughly constructed antenna there is no excuse whatever for stranded wires, especially not for bronze or braided wires. Copper or copper-clad will always give the best account of themselves.

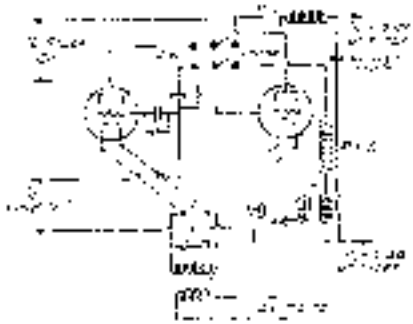
In addition to this it is possible to make first-class joints in the solid wire which simply cannot be done in the braided wires and is very difficult in the bronze ones without destroying their strength.

It seems as if it has been said enough thousands of times so that it would be remembered for even only one year, unnecessary that have considered joints or else joints that are green with the corrosion occasioned by acid soldering compounds. If you must use soldering paste to hold the thread of rosin, then at least scrub the joints thoroughly with alcohol afterward.

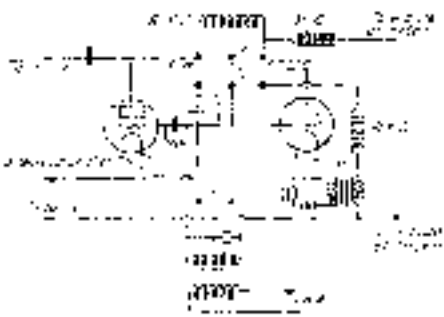
Well, that's that! Now get down your copy of Ballantine and dig out the rest of it. It is all there.

Switching To Phone

There seems to be all sorts of grief connected with the transfer switch in a phone-C.W. set. About 20 times a month this matter has to be explained.



SERIES FEED MEISSNER



SHUNT-FEED HARTLEY

Switch to phone: C to ground, L1 to key, L2 to antenna

KEY—Open circuit jack in series with one lead of the power supply. Closing key closes circuit and sets up C.W. oscillations.

We have printed it several times before, it has been in Ballantine all the time, and here it is once more.

The Rotten Location

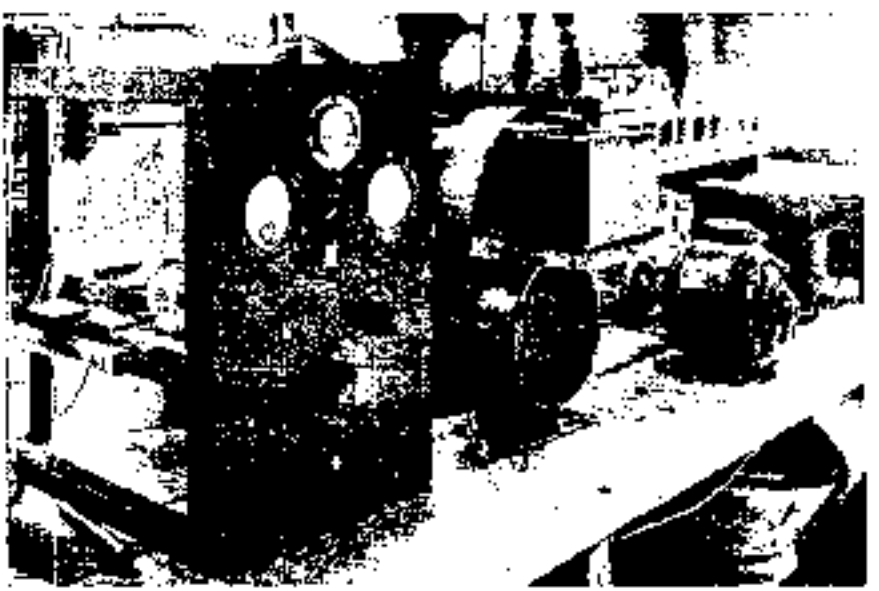
If your antenna is full of bronze wires and frays the station may still be good for something.

To understand what really can be done in intelligent work under bad conditions read again the description of 1XAM on page 38 of July QST.

In addition to that read Ballantine on antenna designs for bad locations.

Amateur Radio Stations

4IO Atlanta, Georgia



4IO is the Station of Jimmie Morris of 58 Frederica St., Atlanta, Georgia. It has been in operation since 1922 when it started out with spark and a "Spark Forever" slogan. Since then it has passed through the usual C.W. stages and is using a 250-watt tube at the present.

Not so long ago a brand new tower went up and was promptly blown down. Following closely upon that, another storm came by and lightning lopped upon the old mast knocking every insulator out of the guys. Fortunately they were not in the old manner, being porcelain eggs, and the pole did not fall for the guys merely hooked upon each other. However, the lightning wandered into transmitter and blew out the stopping condenser and knocked the grid leak off the air but did not injure the tube. It also knocked down the receiver, ruined the detector tube, skipped the tube in the first step and blew out the one in the second.

The antenna is a 4-wire fan some 85 feet high at the free end and 41 at the counterpoise. The counterpoise is one of 28 wires, 50 feet long, and 50 feet wide and is directly underneath the antenna. By winter a new 100-foot tower will have been installed. A great deal of care in insulating the antenna was taken. The lead-in insulation of the antenna and the counterpoise consist of two large glass plates. The insulation of the antenna and counterpoise proper consists of Ohio brass porcelain and glass.

The receiver is a "double decker." It has a honeycomb receiver in the upper part for reception of the long waves and a short-wave tuner in the lower part similar to the one used at 1MO. The end of the tube control cabinet and of the receiver cabinet are cut

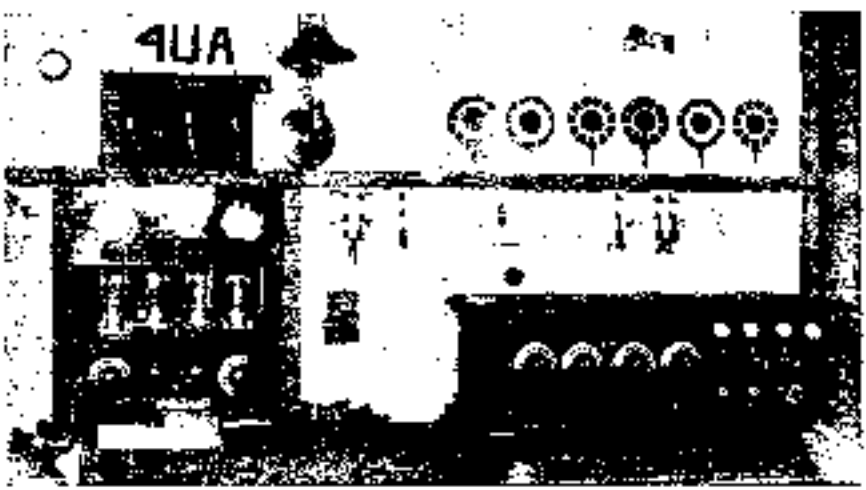
out to allow connections to be made without the use of binding posts on the panel. For

the longer wave arrangement binding posts are used on the receiver panel and in the detector two-step are anti-capacity switches for changing from one set to the other.

The transmitter photograph shows clearly the 250 watter transmitter which is kept in readiness in case of emergencies. The C.W. set uses the four coil Meissner arrangement with a 250-watter tube. A 500 cycle rectifier is used to deliver 1000 volts to the plate of the tube and an antenna current of 3.5 amperes is obtained on a wave of 75 meters. The present transmitter was preceded by a "50-watter", a "250-watter" and a transmitter using a single 5-W tube with 1000 volts on the plate. 4UA has been heard all over the U. S. A. in Europe and so on. It has been in communication with the foreign stations with comparatively little difficulty.

The insulators in the air are tied to wires that support the condenser in the spark above the Rotary gap and thus make the leads short as is necessary.

4UA Dundee, Florida



4UA is the Station of Eugene Hemmer at Dundee, Fla. It is in a special radio shack which has an additional small closet or extra room attached. Thus the transmitter, as can be seen in the photograph, is flush with the wall of the shack with the works sticking back through the wall into the closet and all batteries and auxiliary apparatus are also kept there out of sight. This certainly makes a neat arrangement.

The transmitter is made for use with four five-watt tubes but, due to power limitations, is generally operated using two. It use the inductively coupled Colpitts circuit. A thirty jar chemical rectifier with power transformer supplies the plates.

The receiver uses removable spiderweb coils and has two-steps of audio-amplification in the same cabinet. Because of the changeable coils it covers the various wave bands very effectively.

The switches on the wall control everything from the transmitter to the battery charger so that the operator doesn't have to leave his seat to accomplish most of the ordinary tasks about the station. Unfortunately 4UA doesn't have an automatic

brooms, so a few grease does its part in keeping the station so very neat.

With the possible increase in power supply, the station will have a fifty-watt tube and very soon there will be a new antenna using two lattice towers 75 feet high. We have no description of the present antenna.

1UA works rather regularly and has accomplished good DX over the country. Mr. Hummer says he is always ready for traffic and keeps it moving.

Note

With this month we inaugurate a new policy which may or may not be liked. If it is not liked tell us so that we may know whether or not the majority want the department run as heretofore. This policy consists of only one thing: we will no longer use photographs of transmitters that do not use inductively coupled transmitters because we believe we have advanced to the point where the conductively coupled set is passé. Sufficient reasons for this have been given in various technical articles.

We would like to publish descriptions of those stations you would like to see. Therefore, suppose that you send in the calls of some amateurs whose stations you would particularly like to see in this department. Particularly would we like to publish descriptions of good, inexpensively built, stations using only one or two five-watt tubes. If an obviously efficient and neatly constructed "five-watt" station description were received at headquarters we would be overjoyed.

The photographs should preferably be taken by a professional photographer because snap-shots generally fail to show up well. The photographs need not be larger than 4 by 5" or thereabouts. The prints must be on glossy paper. Please state definitely, when you send the description in, whether or not you expect the photographs back. Please don't send us a description and then send it to another magazine. If we publish it, don't you think that we deserve to have a "scoop" on it?

In sending in your station description, be certain to mention those things that are possibly unique about the construction and those things that are original. The other fellows are always interested in little ideas or "tricks" about doing different things.

This is important. The order in which stations are run in this department has no bearing on the importance of the station except in exceptional cases. They are usually arranged the way they fit in best or because of the appeal to the eye of the photographs. This very definitely is not a measure of the worth of the station itself, as you can see immediately. So don't feel bad if your station is run second or third. If various amateurs must take the order in which these descriptions are run to heart, then we will print only one station description at a time and avoid any trouble.

BOOK REVIEWS

"Storage Batteries," by George Wood Vinal, Physicist, Bureau of Standards. Published by John Wiley & Sons, Inc., New York. Price $4.00.

Once in a very long while I get a book that makes me want to use all the pleasant adjectives in the dictionary. Such a book is "Storage Batteries". The book is beautifully illustrated, clearly printed and, above all, the text is written by a man who is an undoubted authority in his field and who has the rare gift of saying things clearly and understandably.

And what a job he does manage to say in this book! It is of interest to anyone who has any connection whatever with storage batteries. The title page says "A General Treatise on the Physics and Chemistry of Secondary Batteries and Their Engineering Applications", but that is far from all that is called about. To this one should add "And a World of Clearly Put Information Useful to Anyone Owning, Using, or Repairing Storage Batteries".

The Westinghouse Electric and Manufacturing Company at East Pittsburg, Pa., has just issued a most interesting little booklet called "Westinghouse Fabrics and Papers for Insulating Purposes". Those who have not read a book of this kind will be greatly surprised at the large variety of such materials. For anyone using insulating materials it is a good idea to write for a copy of the booklet and get up-to-date on an interesting subject.

"Resistors and their Practical Applications in Radio Reception", Dayer Radio Corporation, Newark, N. J. Limited distribution.

Despite the formidable note that is a booklet of 16 pages. However these pages are interesting and quite to the point as can be seen by one glance. The author is Dr. "Z. B. Hook". Hook has the gift of the merchant pen and says things with the least possible waste in words. Therefore the number of resistance units of quantities is here presented with a directness that is refreshing—relief from all the "gas" that other publications have printed about the same thing in the past 6 months.

"A Quantitative Study of Regeneration by Inductive Feedback", by C. B. Jolliffe and J. A. Rhoman, both of the Radio Section, Bureau of Standards. Also known as "Scientific Paper of the Bureau of Standards No. 487" can be obtained from Government Printing Office, Washington for 10c.

The title explains this work better than a review could. The serious radio student will find the work interesting, for it is not theoretical. However we wish the conclusions had been qualified a bit—surely Ballantine can now convince the radio world that

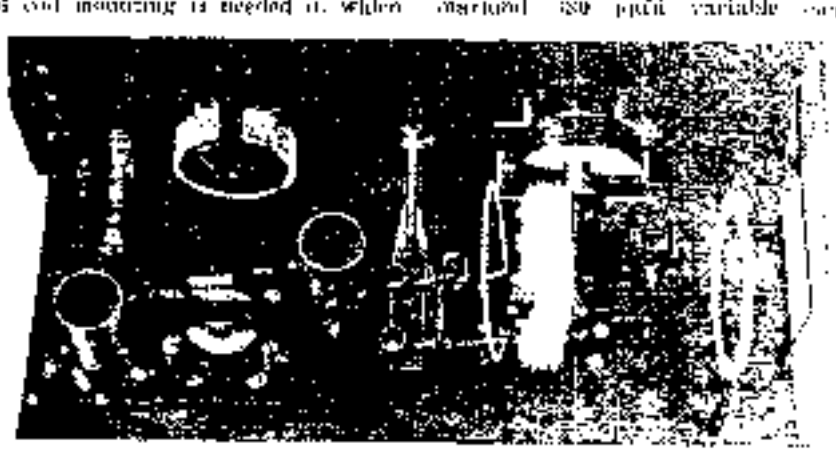
(Concluded on Page 59)

THE AMATEUR BUILDER

A Well Designed Tuner

By H. P. Gotwals, 2BRC and E. C. Horner, 9UN

IT may seem superfluous to contribute another article on a low loss tuner but we believe that there are some ideas in this particular one that will be of use to the gang, now that we have various short wave bands. We have such a multiplicity of wavelengths that it becomes necessary either to have several receivers or to arrange the coils so that they can be removed easily. If we use removable coils some form of coil mounting is needed in which



there must be a minimum of losses and the contact must be positive.

For mounting the coils so that they may be changed with facility, the scheme shown, using coil-in coil terminals and Carter "Imp" jacks, provides a good wiping contact and enables for rapid coil changing. The coil terminals are made by sliding a fuse-cord tip over a 6-32 machine screw and soldering it in place. Another simple and cheaper mounting consists of a couple of binding posts on a strip of hard rubber separated about 1¾ inches. Then the coil ends can have hook like as in Fig. 6 for the ordinary binding post or, for types like Eby, simply straight ends to slip in the binding post hole.

All of the coils for the short wave bands are wound with No. 18 Cotenamel insulated magnet wire to avoid corrosion and the need of dope for protection from dampness. The winding jig was rigidly made by boring ¼ brass rod into a brass base, but something that will serve as well is the well-known board with a circle of nails; fifteen pins being used in this case on a 3½" circle.

The following table shows the range in wavelength of the various coils we are using the set and which are obtained by a Hammarlund .00 mfd. variable condenser.

Coil Turns	Wavelength Range
24	85-270
11	64-136
7	54-71.7
4	41-57.7

A single turn tickler is used for all coils but is changeable as is the secondary, so that others can be used. With 90 volts on the detector, 201-A, no other tickler was found necessary for the range of the receiver. By the use of so small a tickler, which proves to require very little adjustment, and fixed coupling to the antenna by 3 turn coil four inches from secondary, the

Other good makes of variables are Aleo, of course, and a cruder is necessary.

receiver is virtually a one-control set. No grid-leak was found to be necessary.

Notes by the Department Editor

There are several changes that might be necessary or desirable in the receiver described above which will come to the mind of the reader and which no doubt had been thought of by the constructors but eliminated from the consideration for simplicity and for their own use.

First of all you must realize that this receiver can be used on any wavelength by making the primary removable and by providing a sufficient variety of coils. Then, of course, you're going to get the single turn tickler to working but they will be able to cover such broader plans, these three being suggested: 5 turns, 4 turns and 3 turns. But don't forget that you can try others. Also, the fact remains that a detector using a high plate voltage proves to be less sensitive to really weak signals than when a low plate voltage is used. This has been confirmed by a number of observers and seems to be a pretty well-proved fact; and with the low plate voltages, in the vicinity of 10 to 20 volts, a single turn tickler is likely not to be satisfactory.

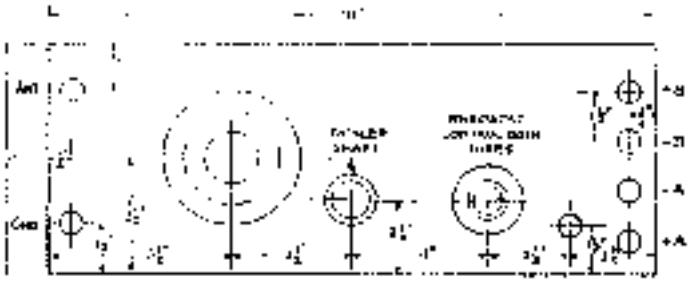


FIG 1 LOW LOSS TUNER PANEL LAYOUT

For the man wanting the sizes of coils necessary for the broadcast band, the following sizes are suggested: Primary 15 turns and Secondary 20 turns of 18 or 20 Enamaled, magnet wire, and the tickler about 12 turns.

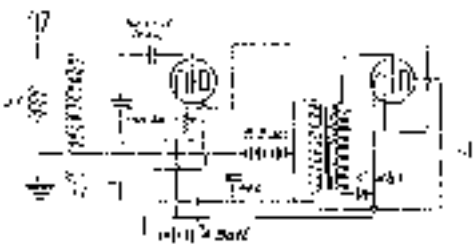


FIG 2

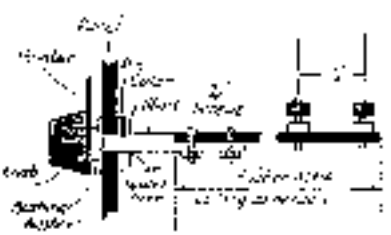


FIG. 3 DETAIL OF TICKLER SHAFT

Another thing that suggests itself is the use of two variable condensers and the Hartley oscillatory arrangement from which the Reinartz is derived. This forces us to have a three terminal coil and avoids the use of extra tickler coils. With the plug system of mounting, it is very simple

to make up a three-terminal coil mount similar to the two-terminal mount and as has been suggested and illustrated before

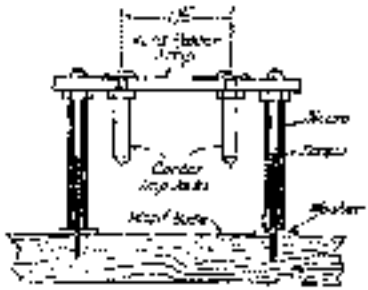


FIG 4 DETAIL OF COIL MOUNTING

in QST.[1] The circuit for such a set is shown with constants in Fig. 7. Coils for it are suggested as follows:

42 turns tapped at 21 giving 3 turn tickler.
11 turns tapped at 10 giving 1 turn tickler.
7 turns tapped at 5 giving 2 turn tickler.

The primary—six remaining at 5 turns for the 'counter range and with the same

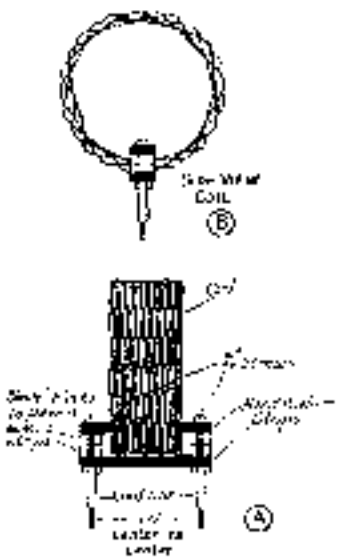


FIG 5 DETAIL OF COIL AND PLUG

spacing are fixed coupling, four prongs, found in the set described by 2BJD and 2UN.

1. See the single-control two-tube article in October QST. Obtainable from QST circulation department for regular price.

2. Obtainable from circulation department for regular price.

In either this Hartley circuit set or the set described by 2UR-2RHC the coils should be spaced to be clear of all three solid bodies by at least 1½ inches or 2 inches. That means that the coils should be that far from the baseboard, the condenser, the panel, and the cabinet. The distance for primary is from these things is not so important because it is in a relatively high resistance circuit, the antenna circuit. The distance from the antenna coil and the secondary was adjusted to avoid dead spaces in the tuning where the receiver failed to oscillate. Such dead spaces show that the antenna is in tune either directly or by harmonization, and the primary is too close to the secondary.

POSSIBLE METHOD OF MOUNTING COILS FOR BINDING POST TERMINALS

FIG. 6

Don't get the idea that it is necessary to wind your coils like those used in the set described in this article. The Lorenz winding, the correct name for the basket-weave, is used for only one reason, to give a minimum distributed capacity. It is no better than the straight cylindrical coil such as

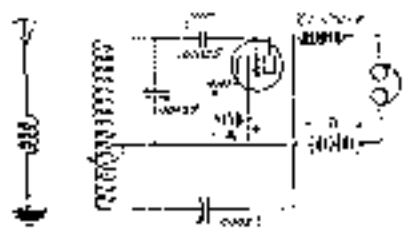


FIG. 7

pictured on page 17 of the August issue of QST.[1] The Lorenz coil has another interesting feature; it will often short-circuit a turn where the wires cross, giving you a dead turn. The noise being very difficult

(Concluded on Page 74)

Who's Who in AMATEUR WIRELESS

HARRY F. DOBBS, 4XS

Harry Dobbs' start in radio, as radio dates go, is almost shrouded in antiquity. In 1908 he built his first radio set which included coherers and, later, electrolytic detectors. His radio experiences were further continued by way radio service, after the Naval School at Cambridge, Mass. After his release from service he secured the call 4DN and later 4ZA. Now he owns the call 4XS and a good experimental layout. In addition he has been President of the Atlanta Radio Club; is the President of the Atlanta Association of Radio Engineers; and holds a commission in the Naval Reserve.

He is the present director of the Southeastern Division, a live amateur, and member of the firm of Dobbs and Wey.

BERNARD S. SHIELDS, 5AJJ

Mr. Shields obtained an unusually early start in Radio because his father was a Morse man and the whole family could read the code. The change-over to Radio was comparatively easy as wires were strung around rather generously anyhow. Before the war he carried a crystal receiver as he traveled, which his job required and which prevented him from owning a station.

He is now the West Gulf Division Publicity Manager, City Manager of Dallas, owner and operator of a good master oscillator set, and, in his spare time, a salesman. He has been heard by WNP, Cuba, Hawaii, and other distant places using a so-called '20 watt transmitter.'

PAUL M. SEGAL, 9EEA

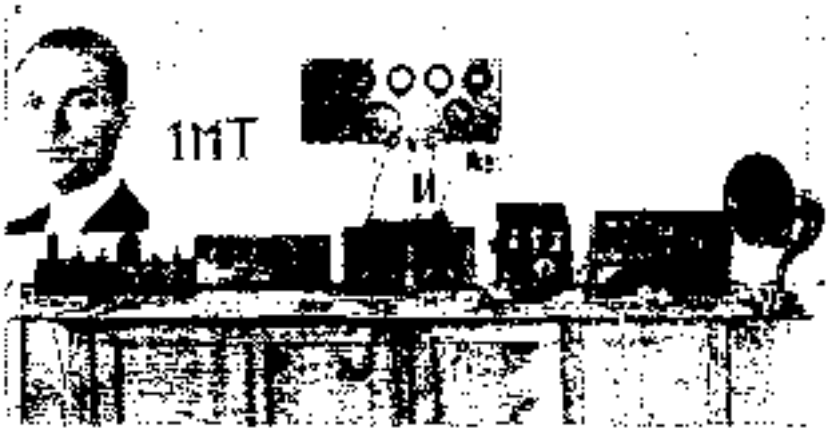
Paul Segal's first touch upon Radio was in 1911 when he built a transmitter, but no receiver, and used it. After that he let Radio get along as best it might without him for a number of years. Just before broadcasting came into its own he built a crystal receiver with results that were satisfying. From then on he advanced with characteristic rapidity through the operators license, Station license, District Superintendent, and Assistant Division Manager stages. Now he is the Director for his division, the Rocky Mountain, and owner of a Denver Station.

He is an Attorney and Counselor at Law and a married man in addition to being a diver and alive A.R.R.L. member.

INTERNATIONAL Amateur Radio

The Station of Guglio Salum of Venice

1MT at Venice, Italy, is one of the pioneer amateur stations of that country, and is owned and operated by the President of the Radio Club Veneto. It has, too, commercial telegraph and telephone licenses. The station is well known throughout Europe.



Three different aerials are in use. One, a "flat" antenna, is a single wire for receiving about 700 feet long and nearly 115 feet above the ground; a double wire inverted L about 160 feet long for spark and telephony; and a 45-foot cage for the short wave telegraphy.

Several receivers are shown in the photograph with Mr. Salum's picture in the upper left-hand corner. In the center is a three tube long wave set using honeycombs. To the right of it is a Marconi Cliff crystal receiver of the navy type. To the left of the honeycomb set is a short wave relay receiver which has two stages of R. F. amplification. The set to the extreme left is a four tube set of Italian manufacture that covers a wavelength range of 200 to 3000 meters. A Grebe CR has been purchased and installed since the photograph was taken.

The transmitting apparatus shown consists of a 300-watt spark set, antenna current, and three different powers of C. W. obtainable from two sets. One of the sets, used solely for radiophone, is not shown. The other set uses either of two kinds of oscillator tubes; one Marconi MT-1 200-watt input tube with 2500 volts D. C. on the plate or two French SIF 250-watt input tubes with 2000 volts on the plates. Spare requirements are resistors and cutting from the right end of the picture a large marble power panel with a number of switches and meters.

A new 500-watt Hartley set has been installed since this photograph was taken. It was built for communicating with the United States.

Notes on Holland and Germany

E. W. Darrington of EDOH, the S. S. Atlantic, took a six-day bicycle trip through Holland and met most of the prominent amateurs there. He writes into International Q S T a number of things which have been extracted and detailed below.

The most prominent Radio Club of Holland is the "Nederlandsche Vereeniging Voor Radiotelegraphie", which, in English means the Radio Club of the Netherlands. The majority of its members speak English as it is taught in the Dutch high schools. This Club has been the active instrument in obtaining government-licensed Radio for the amateur in the country. Licenses are allowed only to a branch of the club and only one license to a town. As branches are formed rapidly, that is being taken care of. The station must be installed in a private house which has telephone service. The maximum power in the antenna is limited to 100 watts and a working permit of four hours, from 7 to 11 P. M., is kept under special permit for tests at other hours. Wavelengths up to 200 meters may be used. The operator is required to have a code speed of 12 words per minute and the station license comes to about $20 of our money per year.

One Holland amateur has to send his message holders 75 miles by canal boat to have it changed.

These surprisingly numerous sidelights on the end of 1CII were also mentioned in Mr. Darrington's letter. A number of reporters were unfamiliar with the technical terms used but were familiar with passenger terms. So when they heard "three element valve", they transcribed "three cylinder valve" as a compromise between their knowledge and their ear. When the three element valve was mentioned to the dunce he objected stating, "You can't put me" and wanting to know whether one of these valves were meant. Finally an agreement was reached whereby the data were into the records as "four electric valve."

Germany licenses no transmitters and few receivers. The receivers have the controls on the inside and the set is sealed by the inspector after he sets the tuning to the wave length of some particular broadcasting station. German wartime ships sell for 10 Marks or 6/- which, perhaps, is just under par today.

The intermediates used at present, in addition to those we already know, are: Holland N, Belgium B, Switzerland S, Luxemburg L, Poland PN, and Denmark D.

Frederick L. Hoyt, g2SH, writes that he is beginning to really hear 5's and 6's for the first time, now that a number of them are on the 75 to 80 meter band. He says that they seldom are heard on any other wave. He has been experimenting some on the shorter waves and says that a closer watch be kept for the English starting over here for he has had little luck. Until after December 1st he will be on seldom as he is going to college.

D. Miguel Moya has been chosen to represent the Radio Club of Spain at the International Amateurs' Congress. Mr. Moya is a well-known Publicist and Engineer and possessor of the first official license granted in Spain. His call is EAR1.

Belgian amateurs are requested to send their address and call letters to Mons. L. Hennessy, President of the Radio Club Belge de l'Est and Delegate to the International Amateur's Congress. Mr. Hennessy will then supply the information thus gained to all that are interested. Address; Hennessy T. S. F., Verviers, Belgium.

The correct address of the Wireless Weekly of Australia is Publicity Press, Limited, 34 Regent St., Sydney. This was published before with the addition of the name W. L. Mackrodt, who was then the Editor. He has since left the magazine and letters that have been addressed to him have, as a result, had to be forwarded and an inevitable delay resulted. Mr. A. W. Watt is now the managing editor and called our attention to the necessity for this correction.

British 6L

One of the amateurs on the other side of the Atlantic who has been doing very good work in receiving amateurs in America is Stanley K. Lewer, English 6L. To date he has heard over 100 U.S. and Canadian amateurs, including stations in every U.S. district and four Canadian districts.

"My set is but a simple single circuit tuner, detector, and one stage of audio amplification," says Mr. Lewer. "I have tried radio frequency amplification but I am convinced that there is nothing to beat the good old detector and one step. (And this from an Englishman! Dept. Ed.) The hookup is shown in Fig. 1. There are two points of special interest. The first is that the grid lead is taken to a point higher on the coil than the antenna tap. This permits the tube to regulate very easily on short wavelengths. I can get down to 45 meters with ease. The next point is that a lower plate voltage is used on the amplifier than on the detector. The detector is a low vacuum tube of Dutch manufacture with 20 volts applied to the plate. The amplifier is a good high vacuum tube with 15 volts on the plate. At times this is reduced to four volts or even less. Cutting down the plate voltage is done to reduce all of the unwanted background noise which, when audio amplifiers are used, tends to cut all

of the really weak signals. Of course the signals will not be as loud when you reduce the plate voltage, but this is an advantage, as the final audio is limited to a certain strength while the weak signals are amplified as usual. Restoring the plate voltage after the working of the tone and you will have to do some experimenting to get the best grid bias adjustment. Bush a potentiometer across the filament with the lever connected through the transformer to the

grid, and a C battery should be tried. The whole secret of making the thing amplify is to place the grid at the right potential at the outset. The rest of the tuner is constructed on "low-loss" fashion and Brown phones are used.

"The antenna now in use is very badly screened by surrounding buildings. The receiving ground connection is made to thirty square feet of metal buried directly under the antenna. The ground lead is a stranded copper cable, twenty-five feet long and one quarter of an inch in diameter.

"I intend to listen every Sunday morning right through the summer to see if it is possible to do any transatlantic work all the year around, and will send periodical reports to QST. Since the end of January I have kept a complete log and will be pleased to send reports to any hams who care to write me. The address is 82 Gascony Ave., West Hampstead, London, N.W.6

No bids have yet been made for the trophy announced on page 49 of the April, 1924, QST, to be given to the first American or Canadian amateur who definitely establishes two-way radio communication on amateur wavelengths between New Zealand

Several more reports on the reception of New Zealand and Australian amateurs in the U.S. have been received; some verified; and some not. Conditions are becoming more favorable at this end and we expect a telegram to arrive at Quist factory at any moment, telling that the inevitable feature of the Pacific has been accomplished. Who is going to be the first to do it? That's the question.

Three new short wave stations heard recently are UFT, LPZ, and POZ. UFT is the French station at St. Assise, France; LPZ is the new station at Monte Grande, Argentina; and POZ is situated at Nauen, Germany. All three of these stations can be heard most any evening on wavelengths between 60 and 75 meters. Argentine amateurs and British amateurs report having heard all three of the above stations, which represents quite some DX. We have no idea what equipment is used at these three stations but it is supposed that they are using a directive system of transmission somewhat similar to that used by Marconi at British 2YT a few months ago when that station transmitted to Australia on short waves using 2K kilowatts. The signals from the Eiffel Tower, FL, have also been heard in Argentina.

A station signing CSG, located somewhere in Venezuela, was heard calling CYI on August 24th by 6CFE of Brookdale, Calif. This is the first indication we have had of there being any real transmitting amateur stations in the Northern part of South America. Can anyone give us any further dope on this station.

New Zealand Activity

Mr. P. D. Bell, 2YAA, writes the following news:

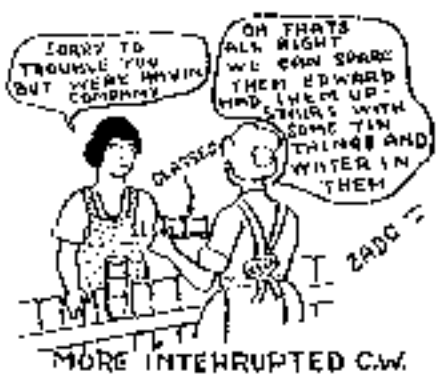
"We are pretty much allowed to do as we please so long as we don't worry the BC stations. Most of us live from 100 to 150 meters and our inputs vary up to 200 watts.

"You were asking how we cut out the 'canaries' on the 80 waves. Well, we don't. All that is done here is to try to reduce the disturbance by making everyone use [inductive] coupled circuits on the short waves. It is the Radio Inspector's job to pay surprise visits under any excuse that he may see to dig out unlicensed sets and so see if a single circuit hinger is being used. If either such case is found the fine makes it very unpleasant for the law-breaker. On the ham waves the interference from howling valves has rather lessened lately in most towns. I am told, and reason no doubt is that most hams here use the TRGF tuner, the Duckaday, or some other non-radiating type. It is to the interest of the hams to boost the use of such receivers among themselves.

"At present all N. Z. hamdom and quite a number of Australians are focusing their thoughts and their signals on Mr. H. V. Otheli, 2BAA, who has rigged up a ham set on the S. S. Port Caitlo bound for England via Cape Horn and Montevideo. He has left us to take up a position in the Joel O'Connor Telephone Co., Stanle, Coventry England, and letters addressed care of that firm will find him. We look forward to be working us from his new home, Hi!

"The transmitter is a '10-watter' with a normal input of 55 watts and operating on 148 meters the last I heard. The power supply is from a motor-generator supplying 600 volts; and the transmitter uses a Hartley circuit. It was built by Mr. Orbell in three hours! He and I, with the help of local amateurs, made the aerial, a 4-strand four-wire semi-vertical cage, on board the ship. Thanks to the kindness of the Marine operator, the whole thing was installed in a corner of the ship's wireless room. The receiver consists of the usual low-loss and two-step with an optional two steps of R. F.

"This stunt is of course a private affair fitted up at Mr. Orbell's own expense. Still it is hoped that before it is over we shall have put up some really good records in short wave work. It will be some time of course, before we receive his completed log—we expect to keep in touch with him for some time yet."



BOOK REVIEWS

(Continued from Page 11)

one cannot make the unqualified statement that reproduction comes into existence. There are limits to the thing.

* * *

"Primary Radio—Frequency Standardization by Use of the Cathode-Ray Oscillograph," by Grace Hazen and Frieda Kenyon, both of the Radio Section, Bureau of Standards. Also known as "Scientific Paper of the Bureau of Standards, No. 469". To be obtained same as No. 457 above.

By all means get a copy of this report. You will find it extremely interesting stuff if you are not familiar with what has been done and very timely stuff and the story of the Braun tube is an old novel. Those who have not must do it.

"Directive Radio Transmission on a Wave-length of 23 Meters," by Frances W. Dunmore and Francis H. Engel, both of the Radio Section, Bureau of Standards. Also known as "Scientific Paper of the Bureau of Standards, No. 462," and to be obtained as the two just reviewed.

If any fellow reader thinks simply many-meaning amateur will want a copy of this report for anything that works well at 10 meters is certainly worth knowing more of at 5 and 20 meters. Without the directive equipment there is still left a good 30 miles among us.

* * *

"Practical Radio", by James A. Moyer and John F. Wostrel. McGraw-Hill Book Co, Inc., New York, N. Y.

The name of this book was well-considered when it was completed. The complete title would have been "Practical Radio Reference Handbook". The matter is carried forward rapidly but in a perfectly logical fashion, first simple theory, recent developments and the construction of modern receivers. The information there material in a form is handy up to date and the construction of sets includes theory answers for each step so that even those with the verbal device must be able to construct the super-heterodyne successfully.

Amateur radio telegraphy and telephony receives its proper and all is done for them that can ever will permit. Besides the less technical of ship-board and transmitting sets is covered, for which reason I advise it to the title given the book.

This does not detract from the book which in our field that—here it is considerable the best we have seen and we can only wish that the authors had taken their subject with a little less deadly earnestness.

* * *

"Quality Condensers", a folder issued by the General Radio Company of Cambridge, Mass.

It isn't often that the line under mention a piece of direct advertising literature.

However there has been so much discussion and so many contrary claims on the goodness of different types of condensers that we believe everybody will appreciate receiving a folder which sets down many hard facts about resistances and does it briefly as this pamphlet does.

AMATEUR BUILDER

(Continued from Page 7)

to locate. But, in spite of all this, the fact remains that the General window is mechanically very strong when properly and carefully built, as well as being an efficient coil.

Notice

We would like to have suggestions as to what you would like to see in this department. It is a department intended to serve the beginning amateur, the man who has begun but not arrived at the point where technical articles of the usual sort are meat for him, and the man who must have more or less detailed information before he can build anything because he does not have the technical knowledge necessary to interpolate missing dimensions. That being the case, we want suggestions from fellows who are themselves beginners and don't know much about this awfully mysterious radio, but who want to know and know what it is they want to know. However, don't snow us Ed under with correspondence and expect high speed answers, but be sure and do snow him under with suggestions, even if he can't find his way to daylight again.

Strays

We are very sorry to announce that H. P. Mason has left QST to go back to his home in Seattle and that F. W. Barry, now 6ZAV, has taken his place as Department Editor. Mason was extremely fortunate in finding that he could obtain the same call that he had previously held when a member of the Seventh District. (Written by Barry—hence the modesty. BF— Ed.)

Our attention is called to the fact that the Fourth District has opened a new office in the Custom House in Savannah, Ga., in charge of Mr. Paul B. Watson. Assistant Radio Inspector and also 4ZD-4ZX.

Your automobile blue book will show the location of small towns in your state for which you have messages and do not know which way to route them. Don't let a message die on the hook because you do not know where the town of destination is. Look it up.

Thermocouples for 6 Battery Potentials

Advance gives the highest E.M.F.'s with iron, copper or nickel-chromium alloys, but the maximum E.M.F. obtainable with the Advance-Copper combination would be around 60 millivolts per couple. Figure up the available couples in your whole house and then you probably haven't enough to get a "thermocouple 6 battery". It simply isn't.

Please say "My antenna current is amperes" instead of "I radiate amperes." The latter is all wrong, because you cannot radiate amperes, you can only radiate watts.

---

50 Meter Sockets

Any of you been worrying about the half-pound of perspiration in your 5 watt sockets? Looks sorta doubtful, doesn't it?

Very well—a three hundred watt Mazda lamp socket has been pressed to the new 50-meter use. Without touching another thing, the antenna current went up and the plate current down. Naturally the plates no longer glowed as ruddy.

What make were the porcelain sockets? Now you guess that.

If your receiving set is cranky, look to the grid condenser and leak for the trouble.

Norfolk hams put across a good stunt. They sent a message to New Zealand to the friends of an unfortunate radio who needed help. The result was that he is now on his way to Scarboro and happiness. Another star in the crown of the A. R. R. L. thanks to the members at Norfolk.

By-the-way, our old friend 1ZE, Irving Vermilya, is the fellow who had that idea about putting the code preceding messages. Delivery on the new U. R. S. over here is due to those who were at the Second National Convention you remember.

We are of opinion that every one that sees his A. R. R. L. pin wants to know what Railroad club he belongs to. Maybe it's those whistle notes that get 'em.

A bare spark coil makes a good plate transformer. Screw down the vibrator and give it the regular A. C. with a voltage of 6 to 15 on the coil primary. The secondary is used like any other transformer secondary made for the purpose. 9BUF says he gets good results that way.

The information service has gained John M. Clayton, a pre-war ham and a genuine old-timer. He will answer letters and give information, and the information service will be peppier than it has been of late. Clayton's advent allows The Old Man to see the tops of the casks after months of being snowed under.

Whoee!! Just found some "static condensers" listed in the Westinghouse catalogue under the numbers 472884 and 472711. They are made to stand 5,000 volts which ought to take care of 7½-

static and the capacity is 3 microfarads—only gotta couple them once an evening.

How come the Radio Corporation has kept this quiet so long?

"Dear Sirs:

The motor you sent me only had 25 cycles. The company here says I must have 60. Please send me the other 35 cycles or parcel post us back our money."

—Terminal Cheer

The same guy that wrote us for the rubber wavelength. I'll bet.

"The A. R. R. L. . . . has recommended Esperanto as the future international language. These fellows don't need any secret language. Nobody outside their own game can understand that 'QRM-QRN-QSA-QTA' language they've been using for years."—Milwaukee Journal. Hah, nail that!

2CTY says to take along a solution of ye when you go to buy aluminum. Dip the aluminum in the ive for about five minutes and see what happens. If any aluminum is left, it should not be shrouked because real aluminum will not streak on such a test.

Corrections

In the article "Parallel Operation of Power Tubes" on page 20 of the November issue there appeared a formula for calculation of the natural period of a parasitic circuit. The first line of figures in the formula should have read:

$$\frac{1}{6.28} \text{ to } \frac{1}{6.28 \times 10^6} \text{ farads}$$

The last line should have read:

$$1 \text{ to } 39.5 \times 10^6 \text{ henries}$$

Outside of this the formula is all right.

The Capital City Radio Club of Des Moines put on a station at the State Fair that did excellent work in spite of numerous difficulties. Over 600 messages were handled with the usual A. R. R. L. dispatch and a number of subscriptions were secured. The gang that ran this display deserves a great deal of credit and our thanks, which are sincerely given herewith.

Somebody cracked this one once. Don't QST mean Quick Signals Transmitted? Or maybe what YOU mean at the same time.

The Seventh District hams are thinking of giving a medal to one of their number who never resorted to profanity when his fifty-watter blew. One of the Sixes objects though, on the ground that the Seven would have passed if he hadn't fainted.

Someone told 5JJ that "history repeats itself." That's why he now has fuses in the filament circuit of his fifty-watter, we suppose.

The new R. E. suggests that if the antenna were hauled and the counterpoise raised you wouldn't get out.

Most offices have an office cat to carry off various contributions that are positively best. We haven't a cat and were wondering where our stuff went, but now we have found out. There's a little Spitfire here who claims that some of the manuscripts are as good as his regular forget with the additional advantage of not needing shelling. We have named him "Static" but we call him "Stat" for short. If you get a card saying that Stat got your contribution, we are sure you will understand how it is now.

Don Wallace suggests that all of the QST cards have the address printed as a unit in one spot so that a fellow does not have to look in different parts of the card for the name and the address.

Viz: John Doe
2344 Main St.
Sedgwick, Oklivia.

The 13-year-old junior op at NDGS new a broken wire the other day. "Daddy, here's one of your wires in trouble." The Kid didn't know it but that wasn't the half of it.

Tube Test Sets

There seems to be a pretty general demand for more information on tubes as sold across the counter. The customer would like to see a better test than just to have the filament lit for a moment.

A convenient instrument for making check-tests has just been placed on the

market by the Jewel Electrical Instrument Co. It is known as the Type 110 Tube Checker.

The 110 "checker" works on the principle that a tube is all right if the plate current

...noticed under known operating conditions. The tube is put into a socket in the instrument, the filament rheostat is turned until the filament volmeter shows the proper voltage, and then the plate current is read. The internal connections of the

tubes are such that the grid is connected to the negative end of the filament, therefore the plate current obtained corresponds to zero grid voltage, or normal operating conditions. A 100 ohm resistance is provided to protect the milliammeter against accidental connection of too high a plate voltage.

The "Navigator" regenerative receiving set, described in this issue, which latter is type 30. This is a device with a tuning inductance and grid condenser such that variable wave lengths may be received without changing coils.

Another interesting member of the Brewer family is the type 20 oscillator tester. A few minutes with this instrument will give one many heartbreaks or prizes when the average pocketbook is concerned. There are some good buys in grid leaks, though.

Lost: A C. W. signal that started about the time my take went west. Any one finding the same please wreck it carefully and bring it to me. The Parcel Post would work anything.

The Washington Radio Club held a general discussion of the use of aluminum versus brass plates for variable condenser plates. The outcome was that the club unanimously decided that aluminum was poor because of its oxidizing habit and that soldered brass plates were ideal. Our attention, however, is called to the fact that corrosion of brass never ceases and that brass is very bad. The solution to that is to solder the brass used to make condenser plates and then make the condenser a permanent job.

9CHE advises us that a Woodpecker is pecking away on his tin roof. He is worried but not quite trouble with the S. P. C. A. We don't think he should worry; maybe Burbank has been playing around with birds lately.

The Loyal Order of the Derby, originally introduced to the Milwaukee Radio Amateurs' Club, Dec. 6th, 1923, by the old Experimental Radio Association, Omaha, in 1920, by H. F. Wareing, 9NY, has been revived, and hard hats and green ink are on sale among Milwaukee hams. The club has officially recognized these and permits derbies to be worn during meetings. Lt. S. Hellegaard, 9EO, and C. S. Polcynek, 9CMP, head the Order, and Fred H. Schnell, T. M., by virtue of his wearing a brown derby, has been selected as honorary member.

You have heard of the rubber cuntz key, haven't you? Now we have the Lingo Lower Decrer for strong signals, the Zero Tube for damped signals, and Marshall's Condenser for static.

We have heard that the Traffic Department will not issue QRS Certificates but couldn't make them stick.

A radio teacher of a radio class had all of his pupils subscribe to *QST*, which was to be used as an aid to the text books. It seems to us that a number of other radio teachers ought to be able to do the same thing and help make their classes much more interesting. Ahem!

Clifford J. Gentle, a perfectly good A. R. R. L. member, and 2JU, has joined the well-known affiliated organization of A. O. U. B. (Ancient Order of Benedicts). Yes, it's his own fault.

Radio Communications by the Amateurs

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

A Word From An Old Timer

617 Union Ave.,
Petersburg, Va.,

Editor, QST:

Acting in accordance with the thoughts impressed upon my solid cranium, I chronicle this epistle on the Ham.

There are as many types on there are splinters in a wood-peckur. Foremost are the CQ artist who wants QSL cards, the message man, and the no-message man who wants DX.

But, foremost above all in the eyes of the old timers is the all around Ham; the fellow who greets you with a GE that carries with it an indescribable personality. He is the fellow who is looking for real traffic and shoves it through as near to its destination as circumstances will permit. He also delights in getting cards, and always sends one for every one received. He is not a machine ever working DX, but takes it in its turn, not loitering traffic or the calling of a nearby station. The dots and dashes that slip from his key carry with it good hard common sense, law, and personality. Yes, we have some few of these kind of amateurs amongst our throng. Luck to these fellows who possess non-skid tires.

There are times when the fireworks subsides from a 50 word-per-minute rapid fire concrete mixer that we wonder, as we gaze at the scattered letters of the alphabet we have acrobatically been trying to copy, whether the performer is functioning for his benefit and is trying out a sure-fire muscle builder. Just think how often you could have copied this fellow solid through QRM and QRN if he only knew the meaning of QRS instead of QSQ. Speed contests are never won through static and interference. It is not reflecting on a fellows' proficiency as an operator to ask for a QTA. Of course it is nice to hear the clean cut fist sending, but when the static is so bad that the iron ring purifier fails to soothe your nerves and QRM has a special program on it is no disgrace to slow down and consider the fellow at the other end.

Another thing, how about sticking in front of that "5-watt transmitter here" on your card, the input to the innocent oscillator! This would enlighten the newcomers and avoid their expecting the instantaneous DX on 5 watts that you are not doing.

When the patent nuts out on that automatic phrase, "Nil by QRL Old," we will have more real features to talk about and more real traffic to report. Let us see this happen soon. Why waste your energy and wear out the old rock when there is plenty of real live news astir and real traffic afloat?

More power to the live wires.

Raymond J. Carr, 2BMN-8CVJ.

Re Filters

49 Avenue Georges V,
Paris, France.

Editor, QST:

There seems to be a great deal of misunderstanding among amateurs in regard to building filters on a two wire or loop basis. The majority of the filter formulae

FIG 1

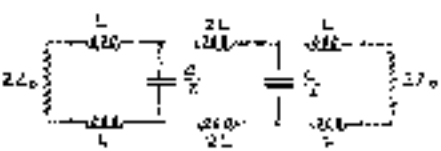


FIG 2

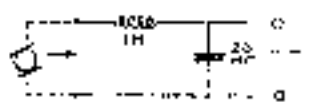


FIG. 3

that have been published, including those in *QST*, have been for filters designed on a single wire basis, such as the filter in Fig. 1.

Now if we wish to build this filter on a loop basis, Fig. 2, we will first have to de-

sign it on a single wire basis using one half the desired characteristic impedance Z.

Then having determined the $\frac{Z}{2}$

constants for the single wire filter we only have to double our characteristic impedance (22), and use one half the calculated capacities for our double wire filter. The inductance values remain the same per coil.

For a mathematical discussion of this subject see page 20 of "Artificial Electric

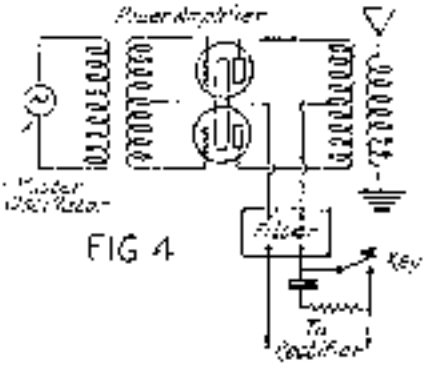


FIG 4

Lines" by A. E. Kennelly or, much better, if they can be obtained, the Western Electric notes on the subject.

Last summer, in California, I made some experiments with "push-pull" or balanced amplifiers, with a view toward reducing B battery noises. The amplifiers were used for frequencies from 6,000 to 30,000 cycles and the plate power was furnished from storage batteries through a standard Western Electric filter as in Fig. 4. The storage batteries could be charged, while operating the amplifiers with a single phase alternating current rectifier.

When using an ordinary amplifier the noise produced by this rectifier was terrific but when the push-pull amplifier was used it was difficult to tell when the rectifier was in operation or turned off. Therefore it seems to me that it should be possible to build up a transmitter on this principle, using a small tube supplied by batteries as a master-oscillator and a balanced or push-pull power amplifier supplied from a rectifier.

Also, by locating the key in the B battery lead of the power amplifier as shown in the diagram, Fig. 4, we should be able to do away with most of our "key clicks".

E. A. Puplin.

The Puritans

Sunny Dale,
c/o Northern Canada Power, Ltd.
Timmins, Northern Ontario,
Canada.

Say Eddie:

This Edison battery for plate supply on this transmitter of mine is taking hold at the finish, and there is every indication of it getting to be fashionable. The boys didn't care about looking for it there for a while. But now they are on to it in great shape, although some of them are back and say the gruff is so sharp a guy is liable to put his finger through it if he isn't careful.

Which puts me in mind of a story.

There was once a town, of quite a size, and quite a number of hams over there. They used sending sets of various kinds, with various kinds of juice to tickle the plate with. Some used motor-generators, some rectifiers, some raw A.C., while one fellow still used spark. Several of them used storage batteries, like I do, to do the trick.

Now the hams with the pure D.C. were soon respected by their fellow hams, and were called "Puritans" by the rest because their plate supply was as pure as pure D.C. could be. As fast as a fellow could afford it he got the batteries lined up, planted flowers in his rectifier, and became a "Puritan."

What I wanted to tell you about was the system they had in that town. They kept a record of all the traffic of the "Puritans" and the guy who handled the most real, note-fide messages in a year was appointed to the post of "No. 1 Puritan." The runner-up was appointed "No. 2 Puritan," etc. The reason for these appointments was because the mayor of the town and the town council had asked the radio amateurs of the town for some emergency communication protection in case of storms, fire or flood, so that the town would not be cut off from the rest of the world.

And they had a good system, too. Whenever a storm blew, or flood, or fire occurred over the telegraph poles and phone wires of course all the boys jumped in and helped to handle the communication. When the power lines went out, however, most of the transmitters were silenced and things were in a worse tangle. It was then that the "Puritans" came in, for they were the only boys who could work their transmitters without needing power from an outside source. The first man on the air would be "No. 1 Puritan." He was good for five or six hours work with his transmitter batteries and would proceed to "pick up" with the other towns and the railroads, starting relief messages, handling press dispatches, etc. Then, when his batteries were done for and the job was still not done, "No.

(Continued from page 64)

2 Puritan" would come on the air with his fresh batteries and hold the fort till the town was back to normal, or until "No. 3 Puritan" fell in line with his battery operated transmitter.

These amateurs have done such good work on several occasions that "No. 1 Puritan" has a cute little solid gold star with a diamond in its center, presented yearly, whether any call is made on the "Puritan" service or not. The Mayor pins it on him, and it has the same name on it and the words, "For Service Rendered." Besides which, every cop, fire chief, hospital, etc., is given his name, radio call and phone number so they can find him any time the "Puritan" service is needed. How OM?

—M. J. Conway, Can. 2GG.

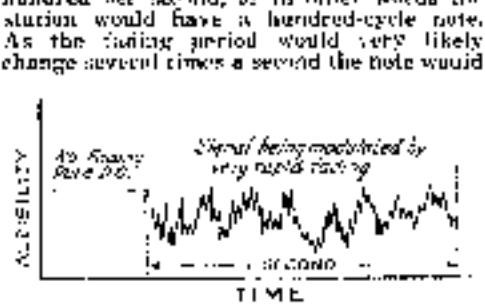
Audio Frequency Fading

90 Kensington Ave.,
Jersey City, N. J.

Editor, *QST*:

In the August issue of *QST* you published a letter from Mr. L. E. West in which he stated that he never heard any pure D.C. notes on the very short waves. Following is an explanation of this phenomena which may or may not be correct. Any one fortunate enough to own an oscillograph can use it to good advantage in determining whether this explanation is the right one.

We are all more or less familiar with fading signals, but the fading has had a relatively slow period; that is, the interval between maximum and minimum audibility was several seconds or even several minutes. Now supposing we have a pure D.C. signal which has a fading period of only one-hundredth of a second. The effect at the receiver is the same as if the signal were being modulated at a frequency of one hundred per second, or in other words the station would have a hundred-cycle note. As the fading period would very likely change several times a second the note would



not be modulated at a constant frequency but would be modulated at different frequencies at different instances thus producing a "rough" note at the receiver. The diagram enclosed will make this clear I think.

Hoping someone will either prove or disprove the above, I remain,

—*J. J. Faulkner, Jr., 2BFH.*

(This matter has been investigated for many months by Dr. Greenleaf W. Pickard and Mr. H. S. Shaw. They find that exactly such fading does exist and that it amply accounts for the fearfully bad quality that is frequently heard on short wave radio broadcasting, using the term "short-wave" to mean those wavelengths below 150 meters. Many photographic records have been made and it is found that the fading is fairly systematic, considerably more so than is suggested by Mr. Faulkner's diagram. When one is near to the station this sort of thing does not take place and that is why WGY, KDKA and others are able to send out particularly perfect telephone materials on short waves which nevertheless sounds as if it had been run through a meat chopper when it is received several hundred miles away.

The Editor wonders if this is not a thing which will permanently prevent the various short-wave re-broadcast schemes from ever amounting to anything.—Tech. Ed.)

Very Sad

14A. Ave. Norte, No. 21,
San Salvador, Rep. of Salvador
Central America.

Editor, *QST*:

It is a sad tale that I have to unwind, and I hope you will help to make it a glad one for all.

I have been listening with my Grebe for several nights, and have been rather surprised at the number of hams that come through in spite of the heavy QRN prevailing. However, I have been able to copy only one and I was lucky to get that; all because of the what-you-would-call-it chain lightning sending when they make their own calls. I am no turtle at receiving code, and have copied many messages, but those sites are merely streams of dots and dashes of which I can make tails nor heads.

There are some ones and twos and threes whose messages are copied in spite of some QSS and to whom I would only be too glad to send QSL cards but they, themselves, stop my wish rather short. That is why I am writing,—to plead that all hams send their own call more slowly and distinctly.

I believe all hams will take note of this as they all wish to kick out. They can depend on me to do my part.

J. Federico Mejia, H.E.,

A QUICK COIL TEST

(Continued from page 56)

The difference between the resistance of the coils were quite a bit greater than the

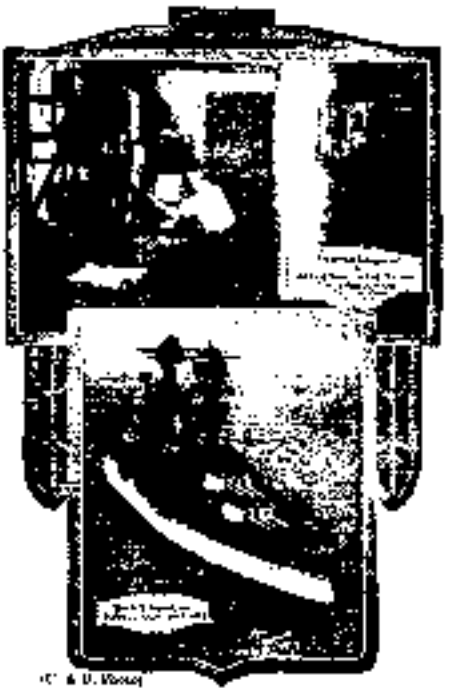
currents would indicate because these currents had to flow through the fixed series resistances of the hot-wire ammeter and the pickup coil. The condenser was good enough so that its resistance need not be worried about. Of course, a real job of measurement would have required the measuring and subtraction of these series resistances. In that case, the difference between the coils would have been quite a bit more prominent.

Some of our correspondents accuse us of over-doing this business of good coils. We plead "Not Guilty" because there is still plenty of room for improvement of the coils in most receivers. We are just conceited enough to believe that any assistance on some attention to the coils is a good thing for the industry and that eventually coils will change just as did variable condensers after we began harping on that subject, and calling attention to the few good condensers that existed at the time.

—S. K.

More Adventures of
BURGESS
RADIO BATTERIES

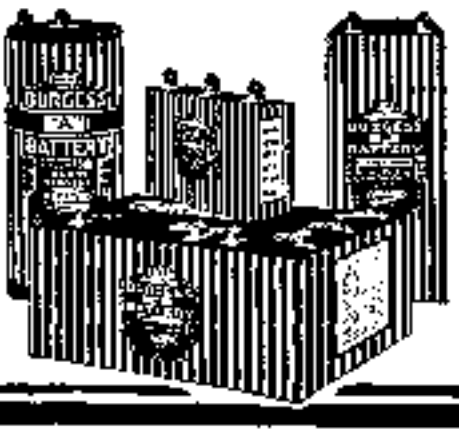
The same Burgess Radio 'A', 'B' and 'C' Batteries which are today faithfully serving the nation's armed forces on land and sea and in the air, and used by leading radio broadcasting stations, experienced radio engineers and amateurs, are sold in your own community by your own dealer for your own receiving set.



When you replace your old batteries, ask your dealer for Burgess. Insist upon this brand of laboratory products—you will receive the same measure of satisfactory service that has won the confidence of the radio public.

"Ask Any Radio Engineer"

BURGESS BATTERY COMPANY
Engineers DRY BATTERIES *Manufacturers*
Flashlight · Radio · Ignition · Telephone
General Sales Office: Harris Trust Bldg., Chicago
Laboratories and Works: Madison, Wis.
In Canada: Niagara Falls and Winnipeg



How many radio miles did you go last night?

HOW many radio miles did you travel last night?—that's the up-to-the-minute question. Did you voyage from New York to Chicago? Did you look in on Boston fifty seconds after, and on Philadelphia half-a-minute after that? If you didn't, why didn't you? There's fun and excitement, too, in a De Forest Radio—and it's ready to "get to work" five minutes after it enters your home.

Here is a radiophone so astonishingly simple for the work it does that it's your best introduction to the marvels of radio space. Here is one so perfectly developed that it invites graduation from other less efficient instruments.

Here is a receiving set sponsored by the very genius who made radio, as we know it, possible—an instrument that offers a really remarkable demonstration in radio performance at a price far less than any instrument whose achievements compare with it. Here is a practical, a modern Radiophone, depending upon no gut-strung wire to obtain results, but which, with a simple loop the size of a picture frame, opens to you a fascinating range of concert, speech and lecture—and all with a total purity, a sensitive choice, as

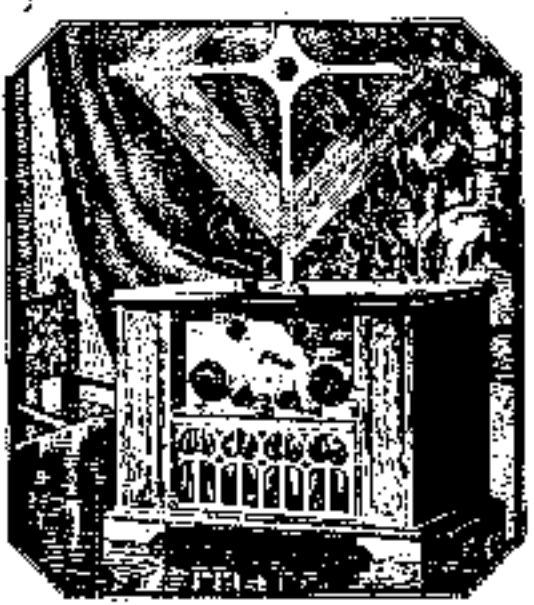
DE FOREST RADIOPHONE

For beauty and clear reproduction

Use the De Forest Loud Speaker. It reproduces naturally, brilliantly, without distortion. Its horn is shaped to retain the full brilliancy of the original sound, and also to add volume. The complete unit is free from rattles. Every De Forest Loud Speaker is thoroughly tested, and is guaranteed free from defects. Sold by authorized De Forest dealers only. Price, with 6 feet of cord, $25.00.

between station and station, that is rare to any but De Forest users.

The De Forest Radiophone is a complete four-tube receiver, built on the best reflex principle. Its four tubes and crystal detector do the work of seven tubes. We could be extremely technical in telling you how the four tubes do the work of seven and why the crystal detector gives both power and economy to this instrument. If you are technically inclined we shall be glad to do so if you will write us. Technical or not, however, know this: You can get splendid results from a De Forest D-12 Radiophone. Its upkeep is low. Its tone is clear and pure. It can be moved easily from room to room.



Why it pays to look for the De Forest agent

De Forest from first to last stands for all that is substantial and thorough and fundamentally right in radio. De Forest agents are qualified to give you sound and practical advice and help in radio. When you find a De Forest agent you find a man who knows radio—a man who has given us his word that he will see that every instrument he sells is thoroughly inspected and properly serviced after the sale. He has been carefully picked and schooled in the operation and servicing of De Forest Radiophones.

He will install your instrument and explain to you simply how to get the fullest satisfaction and enjoyment from it.

Prices on De Forest D-12 Radiophones

COMPLETE

Including loop, self-contained loud speaker, four De Forest tubes, A and B batteries, and all equipment ready to operate.

With Dry Batteries

In two-tone gray and black Fabrikoid cabinet	$161.20
In two-tone Mahogany cabinet	176.20

With Storage Batteries

In two-tone gray and black Fabrikoid cabinet	180.00
In two-tone Mahogany cabinet	195.00

De Forest D-12 Radiophone

In hand walnut cabinet with loop and loud speaker built in. Price, including five DV-2 tubes, four B batteries, and storage batteries	371.50

DE FOREST RADIO COMPANY
Jersey City N. J.

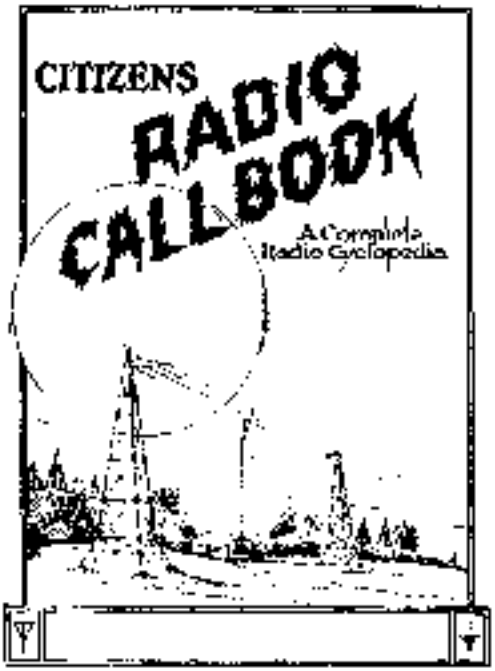
DE FOREST RADIOPHONE

Your set deserves De Forest tubes

De Forest DV-3 Tube for use with Dry Cell Batteries.

The original De Forest vacuum tube was the first of many millions of De Forest tubes that have retained foremost in quality of workmanship and performance. They are noted for uniformity, volume, and clarity. Like DV-3 with dry batteries, DV-2 with storage batteries. They are guaranteed against defects in material and workmanship. Sold only by authorized De Forest dealers. Price $4.00 each.

De Forest DV-2 Tube for use with Storage Batteries.



Important Announcement

We have compiled a 268 page book containing in addition to all the information in the present issue

U. S. AMATEURS

Complete fresh lists from the nine Radio Supervisors' offices, containing all new calls assigned and changes of addresses.

CANADIAN AMATEURS

Includes all Canada compiled by the Bureau of Marine and Fisheries, at Ottawa.

ENGLISH AMATEURS

Gives call letters, name and address of every amateur in England, carefully compiled from several different sources.

AUSTRALIAN AMATEUR STATIONS

Gives call letters, name and complete address of amateurs in all provinces of Australia.

NEW ZEALAND AMATEUR STATIONS

Shows call letter, name, address, power and wave length of all stations in New Zealand.

FRENCH AMATEUR STATIONS

Complete and up-to-date list just received from France.

LAND RADIO STATIONS OF THE WORLD

Shows all commercial and high-powered transmitting stations, giving call letters and wave length in every country of the world.

COMMERCIAL LAND AND SHIP STATIONS

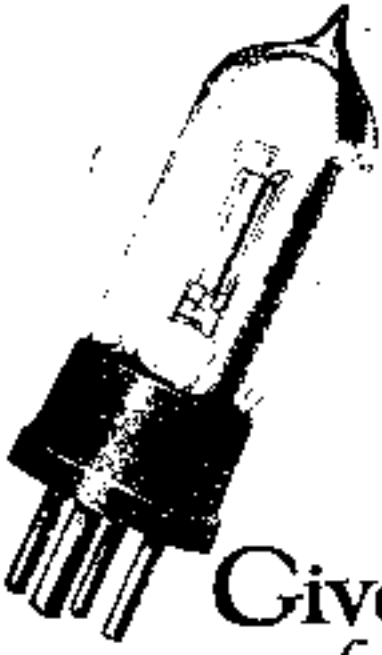
Complete list corrected right up to date of all American ships and American commercial land stations.

The price is 75 cents

If your dealer does not have them in stock send us 75 cents and we will do the rest. This volume takes the place of the present coupon system.

CITIZENS RADIO SERVICE BUREAU

508 So. Dearborn Street,
Chicago, Illinois



Give Radiotrons *for Christmas*

Radiotron WD-11
Detector
dry cell tube

Take a peek into any radio fan's set—and you know what to give him for Christmas. Note the type of Radiotron he uses. Go to any radio store—and when you buy, look for the name RADIOTRON and the RCA mark. Then you are sure to be giving him genuine Radiotrons. And mighty sure to be giving him the gift for a merry Christmas.

RCA

Radiotron WD-11
Detector
dry cell tube

Radiotron UV-199
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storage battery tube

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REG. U.S. PAT. OFF.

To Our Readers Who Are Not A. R. R. L. Members

Wouldn't you like to become a member of the American Radio Relay League? We need you in this big organization of radio amateurs, the only amateur association that does things. From your reading of *QST* you have gained a knowledge of the nature of the League and what it does, and you have read its purposes as set forth on page 6 of every issue. We would like to have you become a full-fledged member and add your strength to ours in the things we are undertaking for Amateur Radio, and incidentally you will have the membership edition of *QST* delivered at your door each month. A convenient application form is printed below—clip it out and mail it today.

.....1924

American Radio Relay League,
Hartford, Conn.

Being genuinely interested in Amateur Radio, I hereby apply for membership in the American Radio Relay League, and enclose $2 ($2.50 in foreign countries) in payment of one year's dues. This entitles me to receive *QST* for the same period. Please begin my subscription with the ..... issue. Mail my Certificate of Membership and send *QST* to the following name and address:

.....

.....

.....

Station call, if any .....

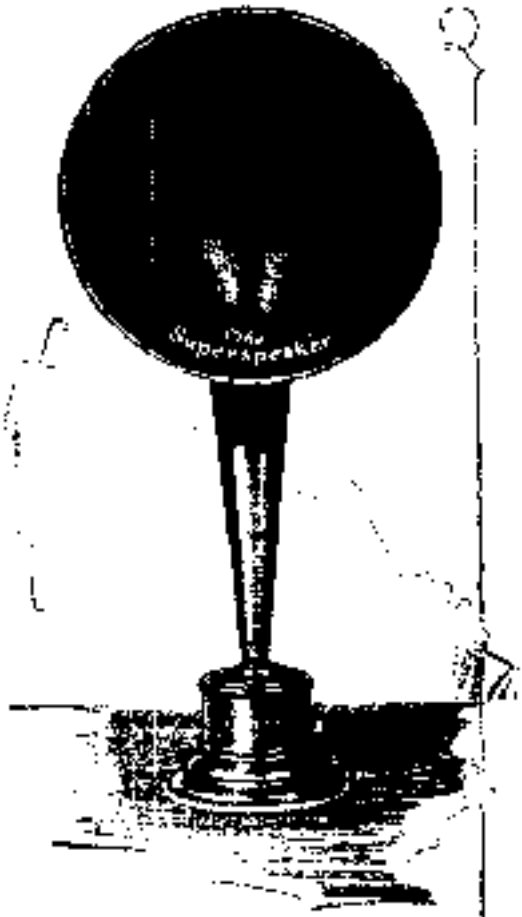
Grade Operator's License, if any .....

Radio Club of which a member .....

Do you know a friend who is also interested in Amateur Radio, whose name you might give us so we may write him about the League? .....

..... Thanks?

"Gets the Absolute Limit Out of Any Set"



"Your Superspeaker is my biggest help in closing the sale of any complete set" writes in a successful amateur builder. "It gets the absolute limit out of any set in tone, volume and distance."

Here's a frank, simple statement. It rings true. Grasp its full significance!

'The absolute limit of any set'! That's what every devotee of radio wants with all his heart. And The Superspeaker is the way for him to get it — without extra batteries and with an original method of adjustment that never deteriorates.

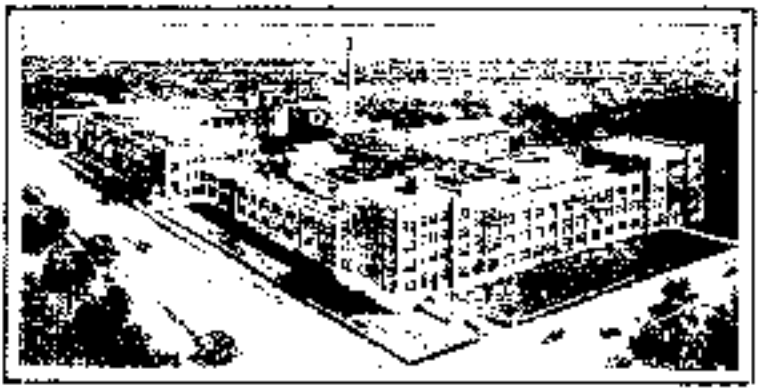
The owner of a Superspeaker-equipped set always welcomes every form of competitive test. Comparison always confirms the pride in its performance.

Here is the reproducing instrument you need for good performance.

Get a Superspeaker and reach out!

JEWETT RADIO & PHONOGRAPH CO.
5680 Twelfth St., Detroit, Mich.

The Superspeaker



The Springfield, Illinois, plant of Sangamo Electric Company, the world's largest plant devoted to the manufacture of electrical meters and instrument transformers.

Sangamo Electric Company announces A new long wave radio frequency transformer tuned at 4500 meters

THESE R. F. transformers, the heart of the Pressley circuit, are used in Army airplane receivers to build up great volume so that long range messages can be heard distinctly above the roaring engine.

Jackson H. Pressley, Chief Engineer of U. S. Signal Corps Radio Laboratories, at Camp Alfred Vail, is the inventor. Sangamo Electric Company has secured the exclusive right to manufacture for commercial use. A set of four, with a coupler coil, all matched and tuned, can be bought for $22.50.

Sangamo Electric Company is peculiarly well fitted to manufacture radio instruments which require unusual accuracy. This company has been making electric meters since 1897, bringing to this business the training and careful workmanship of the watchmaker. Sangamo meters and precision transformers, as finely made as multi-jeweled watches, are used throughout the world.

Just as Sangamo pioneers brought their experience in precision manufacturing to the building of electrical devices, so they now extend skill to the making of radio transformers. The Sangamo trade mark extends its protection in one more market.

ASSOCIATED SANGAMO ELECTRIC COMPANIES

CAPACITY 3500 METERS PER DAY

SANGAMO ELECTRIC COMPANY, *Springfield, Illinois*

BRITISH SANGAMO COMPANY LIMITED, *Pondersend, Middlesex, England*

SANGAMO ELECTRIC COMPANY OF CANADA LIMITED, *Toronto, Ontario*

ASHIDA ENGINEERING COMPANY, *Osaka, Japan*

Domestic Offices: New York, Chicago, Birmingham, San Francisco, Los Angeles. Radio Division: 50 Church Street, New York

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VERNIER ADJUSTER

The most sensitive on the market. Spring locks dial solidly from dial when not in use. With slight adjustment set can be made to hold hand any dial if desired. Patented etc.

LEAD-IN BUSHING

This device makes a workmanlike finish at a point in aerial installation that has been a source of power loss. Adjustable to meet every normal thickness. Black Body Porcelain, Black Glaze. $0.35 ea.

PORCELAIN SOCKETS

Lowest losses of any socket. Very carefully made. Black Body, Black Glaze. Side and bottom contact springs of concentral phosphor Bronze. Solder Tube. Cap Nut for screw driver or Spintite Wrench. All parts nickel Plated. etc. each.

PORCELAIN INSULATORS

Lowest power losses in the antenna. Dielectric absorption reduced to minimum because of very low phase difference of Fleron Porcelain. Very pure body. Solid Black Glaze. Seven sizes, 75c to $1.50. Each insulator in a separate carton.

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M. M. FLERON & SON, Inc.
TRENTON, N.J.

DUPLEX CONDENSERS

Stand Every Test

For all around efficiency and the micrometer adjustment permitted when unusually accurate tuning is required, DUPLEX CONDENSERS lead the field. Made of only the finest material obtainable under the guidance of foremost radio engineers, they certainly are precision instruments.

"DR" Series

A low loss receiver condenser of first value and genuine high type. Great for all builders who want excellent value at low price.

"FR" Series

The highest quality low loss receiver condenser made. Used for instrument manufacturers. Condenser won at Yale University in May, 1924, defeating competitors in remarkable efficiency.

The Duplex Engine Governor Co. Inc.
37 Flatbush Ave. Extension Brooklyn, N. Y.

Price $1.50

Hv U a Little Meter in Ur Home?

If not, you can now secure one for use on A.C. and D.C. line wire equipment which has been current at a very low price. Originally listed at $5.00 each. Our price $1.50. 2½" in diameter, projecting type of nickel case and finished in handsome nickel brass.

The Utility Radio Co.
98 North 6th St., Newark, N. J.

Always look for the Magnavox
Trade Mark when buying radio

AS the rapid progress of the radio art leads every experienced user to expect supremely high standards of efficiency in his equipment, it becomes of vital importance to know what apparatus deserves your investment in hard earned cash.

Regarding the quality of Magnavox Radio Reproducers, their distinctive characteristics are too well known throughout the radio world for special explanation or comment.

Those for whom radio has become an actual daily need, however, will welcome a brief word about the new Magnavox Radio Receivers and Vacuum Tubes.

The unique feature of the Magnavox set is the gearing together of its several resonant circuits so as to permit **positive control by a single dial.**

The Magnavox Tubes have extremely high amplification factors, and as detectors, give sharper tuning and eliminate microphonic noises.

It is well worth your time to examine these products at the nearest Magnavox store. Literature on request.

THE MAGNAVOX COMPANY
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New York: 350 W. 31st St. Chicago: 108 N. State St. San Francisco: 274 Brannan St.

Canadian Distributors: Perkins Electric Limited
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Use DURHAMS — to get Europe — Week of November 21

The biggest little thing in Radio

DURHAM *Metallic* Grid Leaks—

Fixed or Variable

There's nothing equal to metal—and these are the only *metallic* leaks. They're bound to help your set.

Variable on Condenser Base
Leaks, 75c
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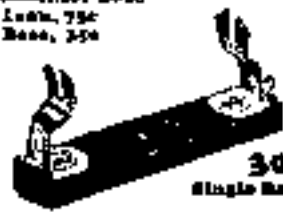

30c
Single Base

40c
Double Base

At dealers or postpaid

Prices

Fixed *Metallics*

Over ½ meg.	50c
Under ½ meg.	75c

Variables

1,000—100,000 ohms	75c
100,000 ohms—3 megs.	75c
2 megs.—10 megs.	75c

All Sizes

There's a DURHAM *Metallic* for every high resistance need. Each marked with guaranteed, tested value.

All about Resistance Amplifiers—25c

Build a resistance-coupled amplifier. Data on two-stage unit less than one transformer. Complete detailed instruction booklet, 25c. At your dealer's or postpaid.

Dealers:—

Customers would rather buy DURHAM products at your store. We have a display that helps.

Satisfaction Guaranteed

DURHAM & CO., Inc.
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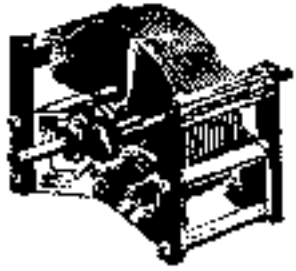
Canadian Distributors: DeFOREST RADIO CORP., Ltd., Toronto

HICO

The New Sexton Condenser



For neutrodyne or any other circuit the HICO is a real worker. Four capacities. Beautifully made.

Live Heat, Electric Soldering Iron. Light durable, guaranteed element.

PRICE
$2.50

At your dealers, or sent on receipt of price

HARTFORD INSTRUMENT CO
307 Pearl St. Hartford, Conn.

Make Your Radio Joy

A Sure Thing

YOU are going to have a "radio party," or you are going on a hunt for "DX." You get yourself set for a "flapper" evening. Then some little unpleasantness happens and you close all your radio. Money, fun and everything is lost.

The dealer says he could fix it in an instant—only a screwdriver in a few minutes. All you need is money to pay it as well as your fun—until use calls once more.

Either style of KANT-BLO means protection against blowing out tubes.

Kant-Blo

SWITCH SIGNAL POST

Lights on any Short Circuit

The KANT-BLO is not an extra accessory to your set. It is designed as a battery binding post as well as an A battery telephone switch. Both Screw and Push-Pull styles are of the best nickel plated. If your dealer is out of stock send 50c for a KANT-BLO Binding Post Style or $1 for the Switch Post and we will ship any number of KANT-BLOS direct to you, charges prepaid.

Manufactured by
CANTON-RAMER Co., Inc., N. Y.
Sole Distributors
APEX RADIO CO., Inc.
503 Fifth Ave., New York.

The shell is ORANGE! Bakelite—the best of the new Thermoplastics

The More You Know About Radio the Better You Will Like This Socket

If ever a device were designed to increase the efficiency of all receiving sets, it was this new socket by the Master Builder. Radio Engineers praise it—new set builders marvel at its ease of installation and the clear, loud reception obtained—set owners who have replaced their sets to establish new distance records and enjoy clearer reception with this better socket.

You'll like its construction, embodying a minimum of both insulation and metal—capacity losses greatly minimized *without sacrifice of mechanical strength*. And its use of sturdy Thermoplastic in beautiful color contrast with the thin shell of orange Bakelite adds greatly to the appearance of any set as the construction does to its efficiency.

You'll like its contacts (the source of losses and noise in most sockets), they are radically new in design, formed of phosphor bronze and *silver plated*—because the contact resistance of silver does not increase as it stands exposed to air. Then, too, electrical losses are minimized by providing maximum spacing between terminals, both in insulation and in the air.

You will like the way the tube is inserted and removed without turning—which prevents twisting the bulb from its base. You will like its appearance—its small size—its sturdiness. You will like its grooved posts with slotted nuts that are fastened *well* with rather severe drawn of strength. You will like the way these terminals are arranged for soldering—extra long so that they may be bent down where under-wiring is desired—and provided with ears to hold the wire in place for soldering. And best of all you will like the price, too. *This socket that meets the specifications of the most exacting radio engineer costs no more than most of those on the market today.* If your dealer has not yet been stocked, you can be supplied direct from factory at regular price plus cost of packing and postage.

THE CUTLER-HAMMER MFG. CO.

Member Radio Section, Associated Manufacturers of Electrical Supplies
Works: MILWAUKEE and NEW YORK

"Built By The Master Builder"

These Exclusive Features Assure Better Reception

A

Rubber bushed, Bell gates of tube prong cleaned when inserted — to contact at least on soldered end.

B

All metal parts silver plated—socket designed for use life of the set. Silver may tarnish but for contact resistance does not change.

C

One piece contact construction. The bushing, part of which is a part of the circuit—the whole one piece shrunk into, but not riveted, strip which carries the current direct to the soldering lug plate in rear socket.

D

Convenient terminals for soldering—full length to allow bending down for under-wiring—or may be left straight for overhead wiring. Extra long to provide room for soldering.

E

Wide spacing of current carrying parts both in air and insulation—low dielectric losses.

G

A combination of bushings and insulation for low capacity effect of rain Bakelite—the base of genuine Thermoplax.

H

The tube is held in place by proper amount of spring—to be free of 16 degrees from true.

The attractive orange shell helps identify this better socket. But the famous C-H trade mark built on the socket itself is the orange and blue box it comes in assures genuine protection.

C-H RADIO SOCKET

NO DISTORTION WITH DAVEN RESISTANCE COUPLED AMPLIFICATION

Daven Amplifier Kits

For Those Who Build Their Own

Consist of the necessary sockets and resistances.

2-Stage ... $12.50
3-Stage ... 15.00

Without sockets and resistances.

2-Stage ... $ 9.00
3-Stage ... 10.50

Resistance Coupled audio frequency amplification has assumed the prominence in the field of radio reception that its merits of efficiency and perfect quality have long justified.

The *Daven Super Amplifier* illustrated below is the newest and most compact amplifier ever offered to the public. The base is of molded bakelite and so designed that it will fit within any cabinet. All connections complete and assembly labor is eliminated.

By the use of this amplifier, distortionless amplification is assured, thus making the reception of broadcasted concerts a joy that will be forever permanent.

SOLD EVERYWHERE

Ask your dealer for the Daven "PROPRIETOR MANUAL" 15c. The book tells you the how-to-make data on Resistance Coupled Amplification.

PRICE 25 CENTS

DAVEN RADIO CORP.

"Resistor Specialists"

NEWARK, NEW JERSEY

MARLE

TRADE MARK

Radio & Audio Frequency

TRANSFORMERS

Buy One NOW
Price $3.00
Up to $8.00

MARLE ENGINEERING CO.
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from Coast to Coast
from Gulf to Hudson Bay

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vacuum arresters have protected

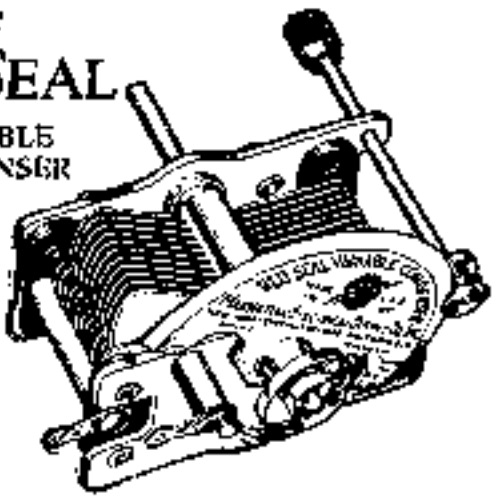
principal Railway Signal Systems, Police and Fire Circuits and RADIO for 18 years

SAFETY *demands the* **BRACH**

vacuum radio arrester

L. S. BRACH MFG. CO. NEWARK, N. J.

The
RED SEAL
VARIABLE CONDENSER



At Last—an ideal vernier to control a low-loss condenser

You have probably often wished for such a combination. Now for the first time the vernier of the Red Seal enables you to easily take full advantage of high condenser efficiency without turning right through the sharp peak of the wave.

No more slipping, lost motion, or rigid bearings. No more tuning with one knob and adjusting with another. All fine adjusting may be done with the vernier knob alone.

The above does not give you an adequate picture of the Red Seal Condenser. Go to your dealer and ask to see it. As you operate the vernier for yourself note these six important features which make it the ideal control for this efficient, low-loss instrument.

1. The action of the vernier is positive, giving delicate, smooth adjustment.
2. There is no lost motion or play at any point.
3. All tuning may be done with the vernier alone.
4. Once one dial setting stations easily logged.
5. There is no fibre, rubber, or gears. Nothing to wear or get out of order.
6. Plates turn freely. Balanced vernier eliminates need for friction or bearings.

The Red Seal has four other points of note:

1. Plates are of brass and are soldered.
2. Spring "pig-tail" connection employed.
3. End plates are grounded, eliminating the effect of hand capacity. For experimental work, insist on the Red Seal Variable Condenser.
4. To insulate turning the movable plates are given a special shape, making the Red Seal of the "straight-line" type.

Manhattan Electrical Supply Co., Incorporated
New York Chicago St. Louis
San Francisco

Manhattan
RADIO PRODUCTS

MADE BY THE MAKERS OF THE FAMOUS RED SEAL DRY BATTERIES

Manhattan Junior Loud Speaker—A real musical instrument, contained in specially designed mahogany cabinet. Not just a loud speaker unit. Not just a headset in a horn. Has 4-inch Moving Coil adjustment giving best results with any detector and amplifier—$15.00

Red Seal Headset—Designed for "DX" work. Tone quality excellent. Workmanship the best. Unobtainable at anything like this price. Light, soft rubber sanitary headband—$6.00

Red Seal Phonograph Attachment—Makes sound speaker out of your phonograph. A high grade instrument representing the work of the broadcasting artists with Radio—$5.00

Red Seal Batteries—The dependable dry battery for "DX" success. Long operating life and great concentrated power make Red Seals ideal for radio work. Sold by all classes of dealers, storekeepers, from filling stations to fresh air stands.

No. 1 of a series of 10
"FILTER FACTS"
Concerning Filter Supplies

SINGLE. In D.C. Generators operating under normal conditions here three sources of disturbance, i.e. commutator ripple, slip ripple and the cause of moving contact.

COMMUTATOR RIPPLE. A massive windings are a series of coils develop the armature, from one to large coil, with Taps brought to commutator segments. The voltages induced between commutator segments are equal, and vary as the armature revolves. The voltage is maximum at A, minimum at B, then maximum but in the opposite direction at C. The series parallel battery connection is analogous. As a brush leaves one segment, the power to the next one voltage changes slightly. This pulsating ripple is known as commutator ripple.

SLOT RIPPLE. As each set passes a pole tip there is a slight interruption of the field at that point. Each surge in the new slightly changes the value of the voltage induced in the coils. The resultant ripple is known as slot ripple.

The frequency in cycles per second for the above ripples may be expressed—

$$\text{For } \frac{\text{No. of segments} \times \text{r.p.m.}}{60} \qquad \text{For } \frac{\text{No. of slots} \times \text{r.p.m.}}{60}$$

SPARK OR MOVING CONTACT. The fluctuating working power by successive operations in the voltages of DC. The commutator and the brushes produce an audible noise in the generator.

The ratio of ripple voltage to maximum voltage for A.C. equals 50%.
The ratio of ripple voltage to maximum voltage for D.A.C. equals 100%.

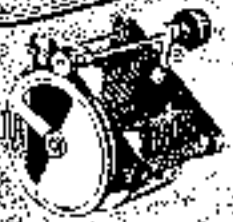
THE AVERAGE RATIO OF TOTAL DISTURBANCE, AS OUTLINED ABOVE, FOR RADIO GENERATORS is 8 OR 10%.

ELECTRIC SPECIALTY COMPANY
— "ESCO" —
68 SMITH STREET STAMFORD, CONN., U. S. A.

Makers of Motor Generators, Dynamotors and Motor-Generators that give the maximum value per watt.

Quality—Easily Recognized

Gifts that will bring joy to any Radio BUILDER



TYPE 247-H
Vernier Condenser
Price $5.00

TYPE 231-A
Amplifying Transformer
Price $5.00

TYPE 281-B
Radio Coupler
Price $3.00

TYPE 369
Variometer
Price $5.00

TYPE 247-W
Wavemeter and Filter
Price $10.00

For a Merry Radio Christmas

Acceptability

In selecting articles for Christmas giving, those who choose with the true Yuletide Spirit consider *acceptability* and *practicability*.

To the radio builder who knows the necessity of good apparatus, nothing is more acceptable and practical than General Radio parts, which are scientifically designed by radio engineers.

Practicability

A set built with General Radio parts is your unfailing assurance of quality reception. Ask the man who has built one.

GENERAL RADIO Co
Cambridge, Mass.,
U.S.A.

ZENITH
KENNEDY
RADIODYNE
Pathé
ULTIMATYRE
MURDOCK
MICHIGAN
Howard
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MUSIO
PFANSTIEHL
PHOENIX
ANDREWS
MALONE LEMON
AUDIOLA
GATES
GLOBE
HARMONY
ODELL FERRY
PEERLESS
DUCKS DELUXE
SAAL

More set makers use

New York City, Sept. 7th, 1924

Thordarson Electric Mfg. Co.,
501 W. Huron St., Chicago.

The type given which you supplied to equip the Radio on the schooner Bowdoin aroud the extreme extremities of the Arctic without the slightest mishap. They transformers are in exactly the same condition today as they were the day they were installed. May, 1923.

Sincerely yours,

Donald B. MacMillan
(signed)

Follow their lead

— Amplify with Thordarsons!

Can you imagine nationally famous builders of sets costing up to hundreds of dollars each, jeopardizing the tone quality of their instruments with anything short of the best amplification? Of course not! Then remember, in buying transformers, that Thordarsons are standard on thirty-four makes of high grade sets. That leading set manufacturers use more Thordarsons than all competitive transformers combined.

Replace your present audio frequency transformers with a pair of Thordarsons. You'll be astonished, delighted. Distorted speech will disappear. You will find they amplify with even volume over the entire musical range. Note below some of the reasons why.

Buy a Thordarson-equipped set—or follow the lead of the leading makers and build with Thordarsons. Increased production this season enables any store to supply you. If your dealer has not yet received his stock you may order from us by mentioning his name. Interesting bulletins sent free.

They Are Unconditionally Guaranteed

THORDARSON

Super AMPLIFYING TRANSFORMERS

Standard on the majority of quality sets

Thordarson "Super" Audio Frequency Transformers are now to be had in three ratios, 3-1, 5-1, 7½-1, 9-1 at $6.00. Thordarson Power Amplifying Transformers are $10 the pair. Write for other bulletins.

EXCLUSIVE!

THORDARSON SQUARE COIL CORE-DRIVE CONSTRUCTION

The Thordarson square coil core-driven construction has made possible remarkable results. In all audio frequency amplifying transformers the coils are wound in the form of a square instead of the usual round form. This makes it possible to use a much greater number of turns of wire in the same space. Greater amplification, more even response, less distortion, and increased efficiency are the results obtained by this construction. Thordarson transformers are wound with the finest grade of enamel insulated wire. Every transformer is tested and retested. Only the highest grade of materials are used throughout. Thordarson transformers are unconditionally guaranteed.

New!

We announce the Thordarson DeLuxe Audio Amplifying Transformers. Provide two stages of POWER amplification when inserted in regular Thordarson Input and Output Power Amplifying Transformers. Tone values are rendered but the quality of the reception more than retains that. Only Thordarson builds a transformer of this type. Price $5. Write for free book-up.

Six floors, 204,000 square feet, devoted to making transformers.

THORDARSON ELECTRIC MANUFACTURING CO.

Transformer Specialists since 1895

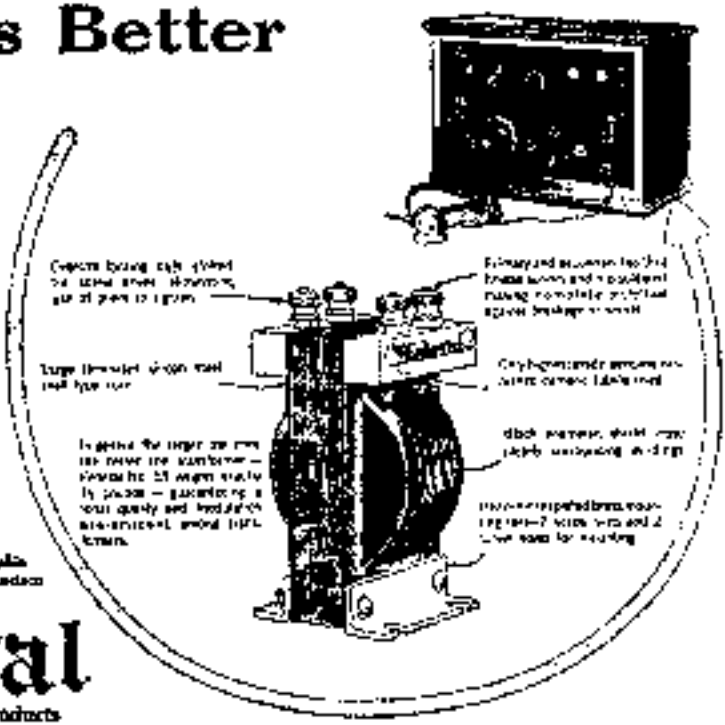
WORLDS OLDEST AND LARGEST EXCLUSIVE TRANSFORMER MAKERS

Chicago, U.S.A.

Why it is Better

"MASTER of Every Note in the Orchestral Range" is the proven claim of the Federal No. 65 Audio Frequency Transformer—Volume without distortion is the basis for the beauty of Federal Tone.

From the moment you take out the heavy brass mounting feet the Federal No. 65 Transformer unconditionally will pay for itself. Federal the mechanical leader is certainly economical when you consider quality. Ask your dealer, write for your "free" booklet. There are over 100 standard parts bearing the Federal associated guarantee signature.



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Buffalo, N. Y.

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Federal
Standard RADIO Products

NOW IS THE TIME, AMATEURS!

To Do Your Experimental Work on Your Receivers in Anticipation of Better "DX" This Winter

Parts of every description and at prices that are right to rebuild or add to your present equipment.

You Will Work EUROPE THIS WINTER
With a Good Set—

Look over a few of the items worth while.

Variometers	Reinartz coils	Formica Panels
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Pioneers in the Radio Field

Get our new Amateur Catalog

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Full of good things you need

Copper Leaders—

No. 14 solid copper enameled wire 1000 ft. $6.90. Less at 5c per 100 ft.

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E-Z-11 Power Bradleystat. $6.50

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V. F. JOHNSON

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Telegraph and Radio Instruments

FRAME CONNECTION

Quick circuit keys are recommended since it is desirable to have low wire communication power prior to the use of closed circuit keys.

Other types carried in stock.

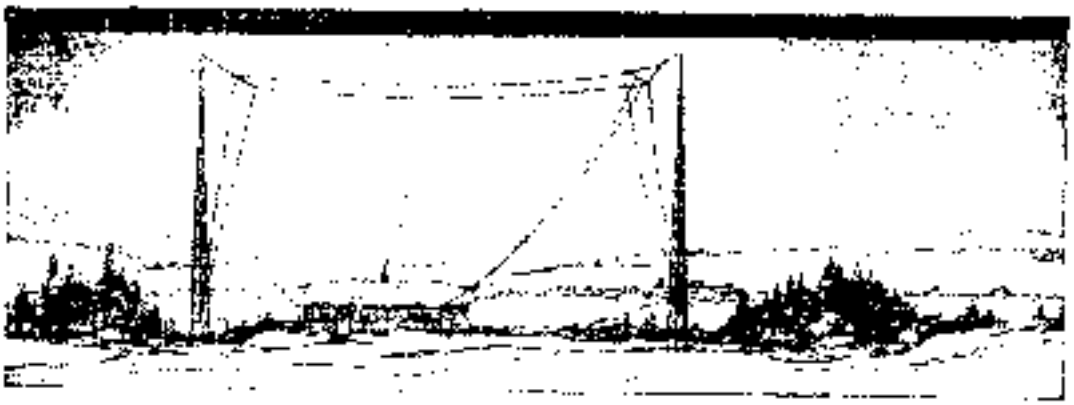
No. 1082 Polished Brass Base ... $7.00

No. 1083 Polished Brass Base ... $4.00

Send stamp for Telegraph Manual (64).

Special Price to Dealers.

J. H. BUNNELL & CO. 32 Park Place, N. Y.



Dubilier Condensers

In Far-Off Government Stations

Type 501 condenser made in capacities of .0001 mfd. to .1 mfd. 1,000 volts to 10,000 volts.

Type 577 condenser made in capacities of .001 to .01 mfd. 2,000 volts and 3,000 volts.

REGIONS such as ice-covered Alaska—where governments outposts are maintained—miles from supply depots—these are places where Radio assumes a vital importance. These are the places where life depends on the power to send and receive messages—under all circumstances—at all times. In these places—wherever there are government posts—the powerful transmitting sets are equipped with Dubilier Condensers. Government experts know the merits of Dubilier Condensers.

Dubilier specializes in condensers for amateur low power tube transmitters. Types 577 and 580 have fixed capacity and low loss. They excel in their field—and have no rivals for efficiency, performance and reliable service.

Ask your dealer to show them to you. Or write for information to 39-51 West 48th St., New York.

Dubilier

CONDENSER AND RADIO CORPORATION

A practical, authoritative book on RADIO

514 pages Price only $1
Compiled by HARRY F. DART, E.E.
Formerly with the Western Electric Co.,
and U. S. Army Instructor of Radio
Technically edited by F. H. DOANE

EVERY member of the *American Radio Relay League* should have a copy of this I. C. S. Radio Handbook. Price only $1. Written, compiled and edited by practical radio experts of national reputation. A handy reference book that will help you improve your sending and receiving apparatus. Explains the operation of dozens of circuits. Filled with interesting experiments. Note this list of contents:

Electrical terms and circuits, auditions, batteries, generators and motors, electron (vacuum) tubes, every receiving hook-up, radio and audio frequency amplification, broadcast and commercial transmitters and receivers, wave meters, super-regeneration, codes, Bonner codes, Many other features.

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I enclose One Dollar. (Dollar only accepted—the $1 edition I. C. S. Radio Handbook is in Canada.) Send it to me at once, it is understood that if I am not entirely satisfied I may return this book within five days and you will refund my money.

Name .....

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(Check here ☐ and enclose $1.50 if you wish the book sent by registered mail.)

CONTINENTAL
LO LOSS
CONDENSER

A LABORATORY INSTRUMENT AT A POPULAR PRICE

The superior features of the CONTINENTAL Lo Loss Condenser are so pronounced that the most experienced operator can appreciate them at a glance.

The general design of the instrument insures mechanical strength, rigidity, extreme accuracy and long life. This mechanical perfection was attained only by using quality materials, expert workmanship and many rigid inspections.

Write us if your dealer does not carry Continental Lo Loss

GARDINER & HEPBURN, Inc.
40 Arch Street **Philadelphia** 2100 Washington Ave.

All resistances are exact

1	Plate	5000 ohms
1	Grid	2000 ohms
1	Leak	2 meg. ohms
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Price, nickel finish, Vernier $1.00 each

WORLD'S RECORD

COILS FOR ROBERTS 2 TUBE REFLEX

1 STEP RADIO, DET., 1 STEP AUDIO

Using these coils W. S. Magner, 6BCP, San Pedro, Calif., and P. D. Bell, Waitemo, New Zealand held runaway communication for first time in history over 6900 miles, Sept. 21st 1921.

We are now prepared to furnish these coils using new LOW LOSS principle designed especially for same.

Broadcast Band 200 to 600 Meters

Amateur Band 60 to 200 Meters

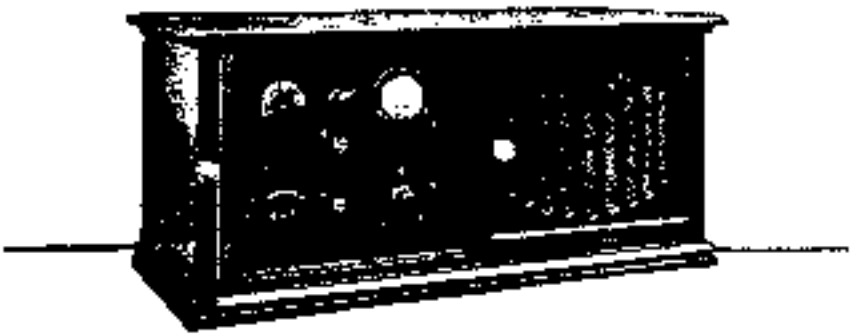
Using these coils the following stations have been copied consistently, 100 to 150 meters: 2AA, Argentine, 6BS. Complete set coils, instructions and blue prints, postpaid $3.00.

Worlds Record Coils Co.

W. S. MAGNER, 6BCP, Pres.

484 8th Street San Pedro, Calif.

BAKELITE



K. & C. DeLuxe *and* Bakelite

For clear radio reception, reliable insulation is essential. That is why the Kilbourne & Clark Mfg. Co. uses Bakelite—Radio's premier insulation—for this DeLuxe receiving set.

Manufacturers who use Bakelite insulation guarantee good results from their radio sets. Amateurs will do well to profit by the experience of these radio experts and use Bakelite when building their own sets.

Write for our Booklet "C."

Send for Our Radio Map

The Bakelite Radio Map lists the call letters, wave length and location of every broadcasting station in the world. Enclose 10 cents to cover the cost and we will send you this map.

BAKELITE CORPORATION

247 Park Avenue, New York, N. Y.
Chicago Office: 636 West 22d Street

BAKELITE
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THE MATERIAL OF A THOUSAND USES

"*The Musical Instrument of Radio*"—amplifying horn of natural wood, mellow and resonant

MODEL VI (14" Horn)
$30

MODEL VII (21" Horn)
$35

Tops the Gift List

A Music Master for Christmas! A gift the whole family will enjoy. Had you thought of that?

Music Master embodies all the tested principles of sound reproduction.

The sensitive reproducing unit responds to the faintest impulses. The tone chamber is heavy cast aluminum, unequaled for developing sound waves free from distortion. And the amplifying horn is natural wood, mellow and resonant like a violin.

Broadcast reception is at its best only with Music Master.

Your dealer will be glad to demonstrate it for you, or place one on your fireside Xmas Eve.

Dealers Everywhere

MUSIC MASTER CORPORATION
Makers and Distributors of High Grade Radio Apparatus
10th and Cherry Streets
PHILADELPHIA
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MODEL VIII

The New Music Master Cabinet model, with "Full floating" horn of natural wood, possessing all the wonderful reproducing qualities of the famous horn type Music Master. Handsome mahogany cabinet.

$35

Connect any Music Master in place of Headphones. No batteries required. No adjustments.

Music Master
RADIO REPRODUCER

MODERN RADIO RECEPTION

A New Book

By

Charles R. Leutz

264 PAGES
150 ILLUSTRATIONS
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and
Everything of importance relating to Broadcast Reception

Price $3.00 Postpaid

EXPERIMENTERS INFORMATION SERVICE, Inc.

476 Broadway New York City

The Tool Every RadioBuilder Needs

Reachit makes it easy to place nuts and screws deep down in places where fingers and pliers can't reach. Has a 9-inch reach. Press the top and the steel jaws grip hold. Then turn. Every time a trouble, prevents damage.

Reaches It—Holds It—Turns It

A practical mechanic's invention. Handles any nut or screw up to three-eighths inch diameter—square, hex or round. Made of finest tool steel, knurled grip, handsomely nickeled. Every radio builder, mechanic and electrician needs one.

JOBBERS—Write for our attractive proposition

REACHIT $1.50

Ask your dealer. Or send us $1.50 and we will send it postpaid.

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The GREATER Neutrodyne

EAGLE

Balanced Receiver Model B.5 Tubes $175

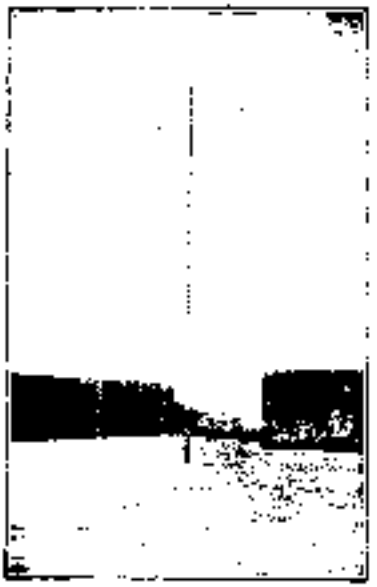
GREATER because of exclusive Eagle features—Multiple Unilateral Control, switch, ball-bearing, slotted condenser, circular coil revolving center element. Found ONLY in the Eagle Model B. Not obtainable in any other way.

Write for Literature

Licensed by Independent Radio Manufacturers, Inc., under Hazeltine Patent Nos. 1,450,080, dated March 27, 1923, and 1,489,228, dated April 1, 1924. Other patents pending.

Eagle **Radio Co.**

23 Boyden Place, Newark, N. J.



20 ft. Mast on Roof of Apartment House

40 ft. Mast in Yard

The HERCULES
AERIAL MAST

This mast is made in sizes to get 20 ft., 40 ft. or 60 ft. clearance and is the answer to an efficient aerial system. This practical mast is an improvement to any property, whether it is mast fed on the roof or in the yard. A pulley is furnished at the top for raising and lowering the antenna. All parts are made of steel and are rust and strong. The mast will carry a 100 pound pull at the top and will support a 6 wire cage antenna. We furnish complete blueprint plans for erecting the mast and it can be erected in a few minutes. It is shipped in sections for convenience in handling. The 20 ft. mast weighs 40 pounds, the 40 ft. mast weighs 100 pounds and the 60 ft. mast weighs 200 pounds. Guy wires are spaced 120 degrees, or three equal spaces. 1 ft. from the base on the 20 ft. mast; 2 ft. on the 40 ft. mast and 30 ft. on the 60 ft. mast.

20 ft. Mast	$10
40 ft. Mast	$25
60 ft. Mast	$45

Order direct from this "Ad" and we will ship Freight Prepaid.

Long Range Radio Reception

It has been said that the Hercules Mast gives results equal only to the tallest masts of the best aerial systems ever erected. This means that on the receiving end of your set, you can bring in distant stations with greater volume and clearness. Also the transmitting range of your set will be greatly increased. But don't take the above statements for granted. Install your HERCULES MAST and PROVE IT for yourself. The success of this outdoor antenna depends entirely upon the height of the mast. Use a HIGH mast.

Give Your Set a Chance! Get Results

Not only will the proper aerial increase your receiving range but the clearness of your receiving radio program, and the elimination of static troubles will be very noticeable. Don't put up a poor aerial. Don't use a low mast. Don't use poor insulators. Don't use poor lead-in wires. Don't use poor ground connections. Don't use poor lightning arrester. Don't use poor wire. Don't use poor anything. Use the best of everything and get results.

Proper Aerial Clearance

You, for yourself, realize the importance of a good aerial installation. Up from a metal shed and flimsy wooden pole will never equal the reception of an aerial of proper clearance from the ground, supported by a sturdy mast. It is the purpose of the Hercules Aerial Mast to meet such requirements. Use a HIGH HERCULES AERIAL MAST.

Have Built Radio Towers for Years

We have been building radio towers for broadcast [illegible] and [illegible] for years. We have a [illegible] U. S. [illegible] PERMANENT SIGNAL PURPOSE. Both offer [illegible] and [illegible] with [illegible] to [illegible] also to perfect [illegible] and [illegible] that [illegible] a [illegible] 200 ft. mast of the HERCULES

S. W. HULL & CO. Dept. C1

2648 East 79th St. Cleveland, Ohio

Mail Coupon for Literature

The HERCULES AERIAL MAST

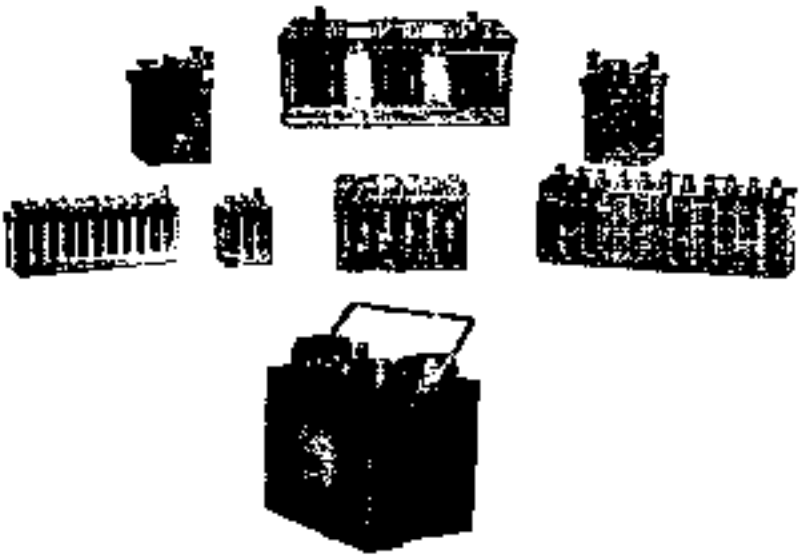
S. W. HULL & CO., Dept. C1
2648 East 79th St., Cleveland, O.

Attached you will find [illegible] for which please send me [illegible] and [illegible] Mast and [illegible] PREPAID. [illegible] [illegible]

Name .....

Address .....

City .....



A Battery for Every Radio Need

It makes no difference what set you are using; whether one or nine tubes, whether two or six volts, single or multiple circuit, regenerative or reflex, or one of the numerous "dynes", there is a Westinghouse battery to fit it.

Furthermore: If you are not already a user of Westinghouse Radio Batteries, you have no idea of the increased economy, reliability and all-around satisfaction to be had by using storage batteries, particularly Westinghouse Batteries, for all receiving sets.

THE WESTINGHOUSE UNION BATTERY CO.

Swissvale, Penna.

Distributor for Canada
The Canadian Westinghouse Co., Ltd.
Offices in all principal Canadian Cities

Distributor for South America and Cuba
The Westinghouse Electric International Co.
Mexico City, Buenos Aires and Havana

WESTINGHOUSE

RADIO

"A," "B" and "C"

BATTERIES

Tune in with MICARTA — *The Material of Endless Possibilities*

MICARTA tubes, plates and other forms are appreciated by radio amateurs. They know that *Micarta* affords that splendid insulation so vital to perfect receptivity. They know *Micarta* is not a substitute, but a better material.

Micarta is easily machined, drilled and punched. It takes a high polish. It does not expand or shrink due to contact with oil or moisture. *Micarta* can be engraved with great facility, giving clean cut, sharp characters. Ask for booklets P 4566 and P 4621. *Free on request.*

Westinghouse Electric & Manufacturing Company
East Pittsburgh
Sales Offices in All Principal Cities of the United States and Foreign Countries

Westinghouse

The GAROD PYREX GLASS Low Loss Tube-Socket

The "Perfect Socket" to complete the Perfect Set!

$1.50

Top View

REPLACE your present sockets with Garod "Pyrex" sockets—or—if you intend building a set—be sure to get Garod "Pyrex". They are solely controlled by the Garod Corporation.

If your dealer cannot supply you—send us $1.50, plus the parcel postage for each socket wanted.

Bottom View

Garod Engineers, after intensive research, announce the perfection of the ideal tube-socket. In Pyrex glass they have adopted to use in radio frequency circuits, the finest insulating material commercially obtainable, and have placed it in one of the weak spots of the radio circuit: the V. T. Socket.

Exhaustive tests, covering a period of more than twelve months, prove "Pyrex" to be the lowest loss insulating material for R. F. C. yet presented, with the exception of quartz. It is strong and heat resisting, and does not absorb moisture. Even the heat of a soldering iron does not affect it. It is entirely free from surface condensation, and is unaffected by those influences which commonly make rubber, rubber derivatives and compounds, porcelain, phenol products, and the ordinary vitreous products so inefficient. Indeed, the perfect socket to complete the perfect set, and exclusively a Garod product.

Made by the

GAROD CORPORATION

120-124 Adams Street,
Newark, N. J.

Makers of

The Powerful Garod Neutrodyne Receiver

The Powerful GAROD Neutrodyne* Receiver

Neutrodyne Radio Sets, Ltd.
Montreal, Canada

Continental Equipment Co., Ltd.
357 St. Catherine, West
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Factory Representatives

NEUTRODYNE

FRESHMAN

Noiseless Tested Mica Condensers

maintain their fixed capacity due to scientific design and construction in which constant equal pressure is exerted on the condenser plates over the entire area; making the Freshman condensers the only ones that avoid noises due to variable pressure on the plates. A metal casing protects the plates and reduces hysteresis losses to a minimum.

Capacity	Each	Capacity	Each
.0001	$0.75	.0025	$0.60
.0002	.75	.001	.60
.00025	.75	.0015	.70
.0003	.75	.002	.75
.00035	.75	.005	.75
.0004	.75	.006	.75
.00045	.75	.0075	1.00
.0005	.75	.008	1.00
.0006	.75	.009	1.00
.0007	.80	.01	1.00
.001	.80	.015	1.50
.0015	.80	.02	2.00
.002	.70	.025	2.50

Exclusive Features of Freshman Noiseless Tested Mica Condensers

1. No losses through dielectric hysteresis of the mica.
2. No insulating binder to melt at the application of heat and let the clamping pressure change the capacity.
3. Capacity fixed and unvariable.
4. Metal case protects against accidental injury.
5. Direct connection to the plates avoids the high inductance of flat terminals.
6. Application of soldering iron does not affect condenser.

At your dealers—otherwise send purchase price and one will be supplied postpaid.

Chas. Freshman Co. Inc.
Radio Condenser Products

106 Seventh Ave., New York

We challenge comparison with America's best phones. Globe Phones always stand up best when the operation is greatest. Any dealer will let you test them.

There is real experience in making the right kind of the coil before the armature and ringing qualities of Globe Phones.

As long as they are adjusted, Leather cord and head bands, long distance power [illegible] for many years.

If your dealer does not carry us,

Sales Department
THE GLOBE COMPANY,
1333 S. Michigan Ave., Chicago
Distributed in Canada by
Otto Hegel Co., Ltd., Toronto
Manufactured by

GLOBE PHONE MFG. COMPANY
Reading Massachusetts

LANE 100 Volt

Non-Acid Storage

"B" BATTERY

NO MUSS NO SPILLING—CLEAN, ATTRACTIVE

Makes a wonderful improvement in your radio set. Gives more Life and pep. Makes reception a real pleasure. Gives more power and clearer reception than you have ever received. Keeps it up at full strength until fully run down, then recharge it and it is as good as new for reception.

Life of Battery Unlimited

LITTLE OR NO REPAIRS EVER NECESSARY

No deterioration—never spoils or charge—will operate a 3 tube set continuously for over 30 hrs. Ordinary use for four months without recharging.

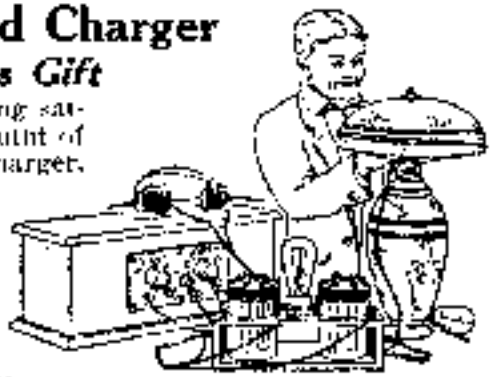
PANEL SWITCHES Give Instant and Correct Voltage

A great and necessary improvement in the operation of your radio set. Gives instant right voltage at all times, prevents burning out tubes, allows the use of the proper voltage for the different tubes. Saves its cost in a few months in tube saving alone. Indispensable for [illegible] **$25**

Attractive Proposition to Dealers and Jobbers.

LANE MFG. CO., Dept. H 2941 W. Lake St., CHICAGO

KIC-O "B" Battery and Charger
—*the ideal Christmas Gift*



Nothing gives more pleasure or lasting satisfaction to the radio fan than this outfit of KIC-O nickle-zinc "B" Battery and Charger. Battery is of the alkaline type giving constant current and long life. Heavy glass jars are completely enclosed in a highly finished cabinet. Nothing but new 2500 M. A. H. capacity elements used.

KIC-O Multi-Polar Double Potential Chargers recharge storage "B" Batteries quickly and economically. They use both halves of the A.C. cycle and operate from the ordinary electric light circuit. Fully guaranteed.

Ask your dealer or write for further information

KIMLEY ELECTRIC COMPANY Inc.

2666 Main Street Buffalo, N.Y.

KIC-O STORAGE B CHARGER

GLOBE LOW-LOSS TUNERS

Infinite Angular Dial

A Model of Efficiency
Worth Its Price
No Metal—No Eddy Current Losses
Wide Inductance—Low Distributed Capacity
Large Wire—Heat Dissipating
Low Capacity Worm-Gear Geo. R. F. Resistance
Impedance Coils.

GET ORIGINAL GLOBE COILS

PRICES:

Standard Tuner (Broadcast Range)	$3.00
Short Wave (10-250 Meters)	$3.00
For Superdyne Circuit	$5.50

Quotations Request. Dealers and Jobbers Write.

Allied Radio Co.

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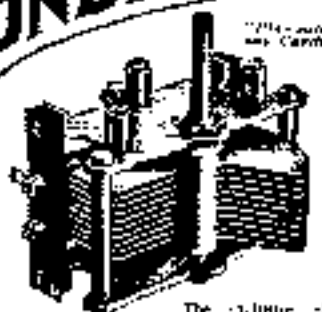
CARDWELL
LOW LOSS GROUNDED ROTOR CONDENSER



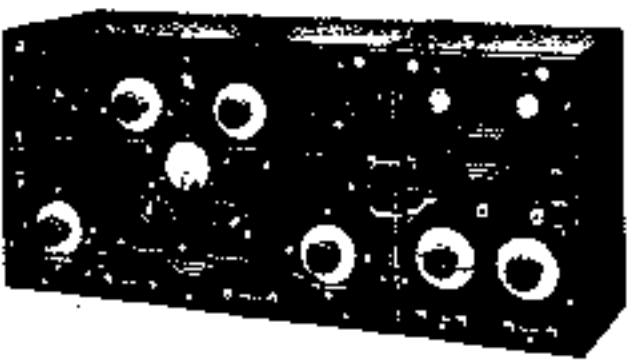
The ... of Specialized Engineering for the most Exacting Tuned Circuits ... Cardwell is the Correct Variable Condenser ... The Last Word ... Cardwell ... Specified by the Leading Set Manufacturers ... CARDWELL is Used in the U. S. Naval Research Laboratory ... Experimental ... Broadcast ... Commercial ... Amateur ... Cardwell Condensers are the Choice of Discriminating Engineers ...

Allen D. Cardwell Mfg. Corp.

81 Prospect St., Brooklyn, N. Y.

Kennedy Universal Receiver

Type 10
Formerly $285.00
NOW ONLY **$94.00**



Two-Stage A. F. Amplifier

Type 525. Formerly $85.00 NOW ONLY **$21.00**

Both Formerly $370.00—Now Reduced to $115.00

Here is that Famous Kennedy Universal Receiver. The set that will get those European long-wave stations. the instrument that universities buy to receive all wave lengths from 175 to 20,000 meters. Formerly $285.00, now $94.00

Many experimenters have wanted for years to own one of these famous Kennedy Universal Receivers because they are highly efficient on every wave length from 175 to 20,000 meters. Universities and scientific laboratories have gladly paid the high price for this receiver because there is no other set that will do so much. It has been beyond the reach of thousands of other experimenters who long to own one.

The decision of this Company to concentrate on short wave receivers for the B. C. L. gives you an opportunity to buy the finest code and voice receiver ever constructed at far less than the actual cost of building it. This is not a cheaper model made to sell at the price—it is the original incomparable Kennedy Universal.

Only a few of these splendid instruments are left—no more will be made—and it is worth while wearing shabby clothes and going without shoes to get one at this bargain price. Don't let this opportunity slip away as you may regret it for years. You could not build this set yourself for twice the price.

Hurry—only a few are left.

Send your order today with $10 remittance, balance C. O. D.

The Colin B. Kennedy Company

6400 Plymouth Avenue
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Write for a circular if you want more information

KENNEDY

The Royalty of Radio

ALL-AMERICAN

Solves Every Gift Problem

If He Has a Radio Set Already—

It can be made a better one by installing ALL-AMERICAN Audio Transformers—the most efficient and dependable audio ever designed. Two of these instruments, fitted into any set not already equipped with them, will give the receiver greater volume with remarkable purity of tone. **3 to 1 Ratio, $4.50; 5 to 1 Ratio, $4.75; 10 to 1 Ratio, $4.75**

If He Needs a High Grade Receiver—

Give him ALL-AMERICAN Super-Fine Parts, and he can build an intermediate frequency receiver embodying all the newest and most advanced features known in Radio. His set will be the envy of all "distance" fans; its tone quality will please his musical friends. Super-Fine Parts provide the ultimate in broadcast reception. **Price, $26.00**

And the Ideal Gifts for Anyone—

All-Amax Junior

A gift that will be appreciated by the beginner in Radio. It is a one tube radio receiving set, consisting of panel and baseboard, with complete instructions. It can be wired by anyone in a few hours. Easy to tune—loud speaker volume—"crystal" tone—cuts through the locals and brings in the distant stations.

Price complete (semi-finished) **$22.00**

All-Amax Senior

The ideal gift if you are looking for a compact receiver of the high-est type. It is a three-tube radio with amax cabinet and silvertop. Brings in six diverse stations on the loud speaker at unbelievable regularity. Only two controls. Completely assembled—ready to be wired. Full instructions are provided.

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The Radio Key Book

Will help anyone to read intelligently letter, schematic pictorial hints for the set builder—panel layouts—hookup diagrams of All-Amax and other circuits. Send for 10 cents, coin or stamps.

RAULAND MFG. CO.
1012 Coyne Street
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Pioneers in the Industry

ALL-AMERICAN

Largest Selling Transformers in the World

THE SENSATION OF EVERY RADIO SHOW

Ideal Xmas Gift

Height 42 inches
Width 40 inches

GERMAN

Imported D. T. W. Collapsible Loop

It does not matter if your set is the finest that money can buy. In the final analysis, the receiver is dependent upon the antenna system for signal strength and for distance. The new 1925 D. T. W. Collapsible Imported German Loop is the one piece of Radio Apparatus acknowledged universally by Radio Manufacturers to be Superior.

The inductance consists of 14 turns of REAL Litzendraht, which is made up of 200 strands of Number 38 green enamelled copper wire woven into Litz cables of 20 strands, which in turn are wound into one strand with double silk insulation. The wire is connected with pins of one to a series of binding posts located on the upright arm, giving a wave-length range of 100-400, 200-800, and 300-1200 meters. One method of tuning, by varying the inductance presents dead end losses. A table graduated into the degrees of an arc is placed at the base of the loop so that the exact degree can be accurately determined. Carefully mounted and fitting for any type Super Heterodyne for this loop has a rotary top.

The loop is a distinctive instrument of truly scientific nature and convenient beauty, which will add a thrill to the performance of your set, and bring in stations you never heard before.

From the Boston Traveler: "Masterpiece in Construction, having no equal made in this Country."

John Schantz, American Institute of Electrical Engineers: "Nothing more can be, nothing more need be said about it. The results are beyond my expectations."

Manufactured by the Deutsche Telephonwerke und Kabelindustrie of Berlin, Germany. Makers of telephone and scientific apparatus since 1847 and now employing over 5000 skilled mechanics.

If your dealer cannot supply you, order direct and we will ship Parcel Post C. O. D.

$25.00

Shipped in a permanent cylindrical container. Money back guarantee.

(Formerly $35.00)

Usual Discounts to Dealers and Jobbers

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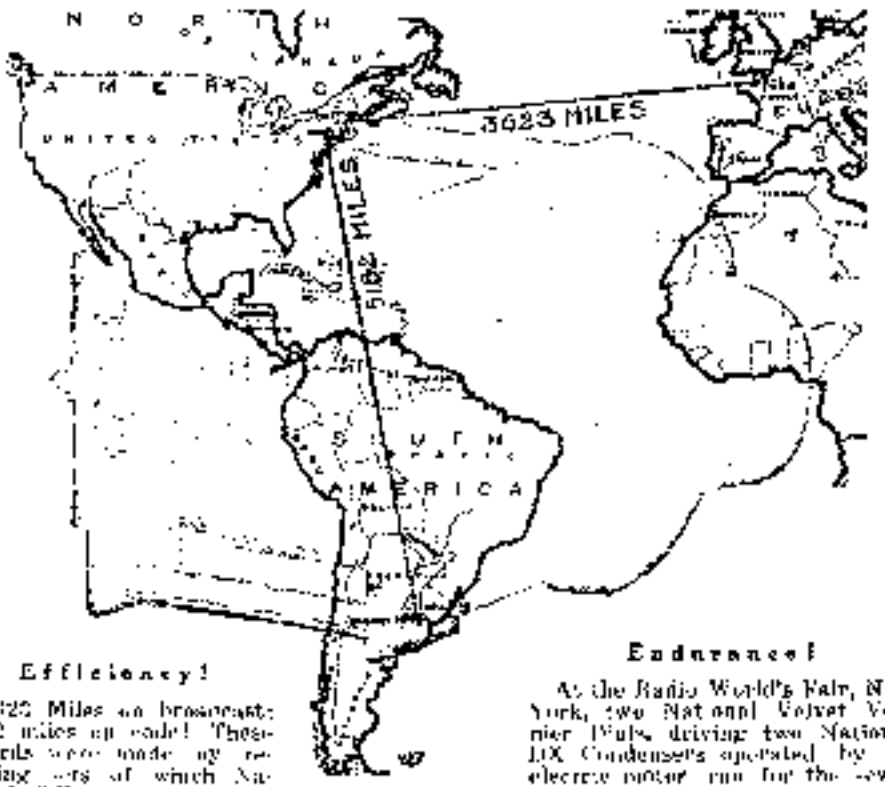
Achievement!

A Record for Efficiency and Endurance

Established by

NATIONAL CONDENSERS and VELVET VERNIER DIALS



Efficiency!

3023 Miles on broadcast; 5182 miles on code! These records were made by receiving sets of which National FIX Condensers and Velvet Vernier Dials were parts. Nationals made the achievement possible. To get distance clearly, love Nationals. They give supreme satisfaction.

Endurance!

At the Radio World's Fair, New York, two National Velvet Vernier Dials driving two National FIX Condensers operated by an electric motor run for the seven days of the Show for a total of 324,125 revolutions. At the finish they showed no evidence of lost motion or lost Lish. And they still possessed that velvety smoothness that makes Nationals so desirable.

Sizes:	.001	.0005	.00035	.00025
Prices:	7.00	6.00	5.75	5.50

Complete with Velvet Vernier Dials. Write for Bulletin No. 104 Q

Made by **NATIONAL COMPANY, INC.**

Engineers and Manufacturers *Estab. 1914*

110 BROOKLINE ST., CAMBRIDGE, MASS.

Christmas demands the best that money can buy!

Precise instruments are laboratory instruments at commercial prices

PRECISE SUPER-MULTIFORMER NO. 1700

Maximum Amplification—Stability of Performance

This amazing new instrument is the only commercial instrument that has been made in Super-Heterodyne design since the circuit was revised. Precise Super-Multiformer No. 1700 contains all necessary transformers in any type of modification of the superheterodyne circuit.

It cuts in half the time and eliminates all guesswork in building a superheterodyne. Yields the results that can only be secured by Precise instruments. Precise Super-Multiformer at only $70.00, offers the best buy of the season.

PRECISE TRANSFORMER NO. 95

Used by Mr. Cockaday, one of the well-known radio engineers, in the construction of the great Cockaday Circuit as the only transformer fulfilling every requirement.

Distortionless reproduction and fine tone quality are produced by this brilliant gem. It reproduces perfectly every tone in the audible range

PRECISE "PUSH-PULL" TRANSFORMERS

For perfect amplification and volume, you want Precise Balanced Power Amplifying Transformers for "Push-Pull" audio circuits. The correct ratios used in the construction and balance of coils assure that an other Transformer will approach Precise results. Only $12.50 per pair

Sold by the better dealers

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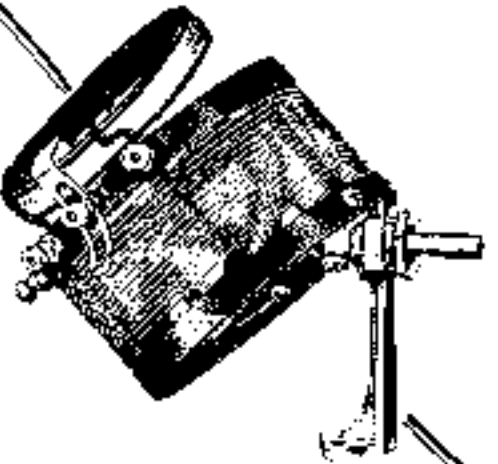
NEWS!

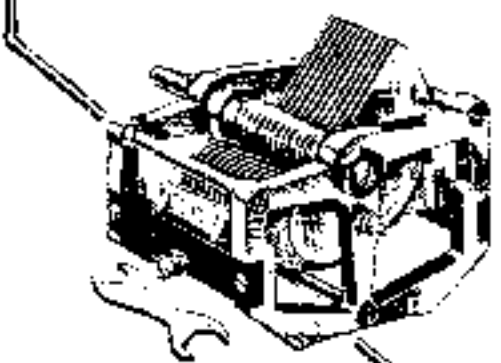
9ZA Got English-French and Mexican Stations with a



B-T SHORT WAVE LOW LOSS TUNER

Hams and B. C. L.s! Here's a **short wave tuner** that gets 'em all from 5ll to 150 meters. 9ZA did it with our first tuner from our regular factory run

The reasons for his success are obvious. The size of the wire in this new B-T product is right. The coil form has a minimum of dielectric. The windings are spaced and the rotating pickler is the right size. Adjustable "fixed tune" primary gives any desired degree of selectivity. Best of all B-T make a **real low loss** condenser to go with the tuner. Type 7-L tuning from 49 to 110 meters, or type 11-L tuning from 50 to 151 meters. Straight-line wave length plate design; adjustable lifetime bearings; soldered pigtailed connections and clear "Kenmanol" insulation with low phase difference, low dielectric constant, and low hygroscopic properties, make this the ideal working mate for the type SW, B-T Low Loss Tuner.



See these precision instruments at your dealers or write us for full information. Sixth edition of our book "Better Tuning", containing construction, tuning and general information on crystal to multiple tube R. F. Circuits, postpaid for 10c.

BREMER-TULLY MFG. CO.

"Pioneers of Better Tuning"

532 S Canal Street, CHICAGO, ILL.

Engineers developed this special panel material for radio ONLY

THERE is nothing quite like Radion—"the supreme insulation"—for real results. Authoritative laboratory tests conclusively prove highest insulating characteristics. In the set you build, it may give you just that extra energy needed to tune in a distant station. When you see Radion in a ready-built set, it is usually an evidence of general good quality in that set.

You can see the difference between Radion and common panel materials, if you will look at the finish. Radion has a high, polished finish. That keeps out dirt and moisture, which even in little particles on the surface, sometimes cause short circuits and reduce good reception. Look at Radion and other panels under a magnifying glass if you can.

Everyone knows Radion is the easiest panel material to drill, cut and saw. There are eighteen stock sizes, two colors, black and mahoganite. Sold universally by dealers who know radio. Better performance will make it worth your while to ask for it by name, and to look for the name on the envelope, and the stamp on the panel.

Radion dials to match, also sockets, binding post panels, insulators, knobs, and new Radion built-in horn.

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Mail coupon below for our catalog and booklet, "Some Insulation Stickers Explained".

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Dept. Q12 11 Mercer St., New York City
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RADION

The Supreme Insulation

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Dials Sockets, Binding Post Panels, etc.

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Please send me your catalog and booklet "Some Insulation Stickers Explained".

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The Set That Got Across!

On September 21st, 6BCP, San Pedro California, worked New Zealand 4AA, staying QSO for one hour and twenty minutes, establishing a new long distance record for two way amateur communication.

Magner gives due credit to the short-wave set designed by Zeh Bouck, 2 PI. 6BCP claims three times the audibility of the standard 3-circuit tuner.

We told you in the July "QST" that this radio frequency set was a humdinger. We have a few copies of our August number left for the ham who is after records.

RADIO BROADCAST
Magazine

A magazine written and edited for the *progressive enthusiast*—whether amateur, engineer or fan.

(Coupon)

Name .....

Address .....

HAM-ADS

Six cents per word per insertion in advance. Name and address must be counted. Each initial counts as one word. Copy must be received by the 1st of month for succeeding month's issue.

NO HUM—60 cycles. DON'T BOOK THAT TRAM TO YOUR SET. NOISY JAZZ MAY DROWN IT OUT, BUT FOR REAL DX YOU NEED AN ECHOLESS B CURRENT. A CHRISTMAS PRESENT FOR YOUR SET. A LASTING GIFT. 24 VOLTS 2½A (HI-POWER) 45 VOLTS 1½A. 135 VOLTS 50 m. 350 VOLTS 1/3A. THE CABINET IS HUMP HAK WAX FINISHED, CONTRAST, CHERRY BROWN MAT. LARGEST SIZED PROPY EDISON ELEMENTS. WIRED WITH PURE SOLID NICKEL. GENUINE EDISON ELECTROLYTE. CRATES NO LOSS. PERFORATED HARD RUBBER SEPARATORS. WHITE SEALING OIL. CAREFULLY PACKED FOR SAFE SHIPMENT. INDIVIDUAL CELLS, 1½". YEAT NEUTRODYNE AND SUPERHET NEEDS A HUSKY B. OUTDOOR CAPACITY 2000 MILLAMP HOUR 10½ VOLTS. 52.00. CHARGE IN HEAVY GLASS JARS, 5" THICK. A HANG-UP H. BUILD YOUR B FROM "HI SIDE-THE PARTS. LARGEST LIVE STEAM EDISON A ELEMENTS 5", DRILLED AND CUT IN UNITS. 5", WIRED WITH PURE SOLID NICKEL 10c per. DOUBLE 200 MILLAMP HOUR UNIT READY TO WIRE 14c. 6 ELEMENTS 3", 3 POSITIVES 3 NEGATIVE 5", BI-CAPACITY UNIT READY TO WIRE 18c. HCAP CELL PARTS 3". DRILLED READY TO WIRE 12c. CELLS WIRED 5". INCLUDING GENUINE EDISON SOLUTION. GREAT FOR SUPERS. POWER AMPLIFIERS, TRANSMITTERS. 900 MILLAMP HOUR SUPERCELL FOR THE SUPERHET AND HIPOWER TRANSMITTER. 30c CELL FOR PARTS. 40c WIRED. ANNEALED GLASS TEST TUBES INDIVIDUALLY WRAPPED TO REACH YOU SAFELY 5x8". 3". 1A 6". 4". FLAT BOTTOMED HEAVY GLASS JARS ½" THICK, MOULDED ESPECIALLY FOR TRAY B AND FOR RECTIFIERS TOO. 3x5". 4". 6"x4". 5". FOR A LASTING 300 WATT TUBE ELEMENTS WITH 500 GRAMS PURE, SOLID, GOLD INLAID ON PLATED NICKEL WIRE. The PREPAID. PURE EDISON HARD RUBBER SEPARATORS 3½ PREPAID. OVER A YEAR OF LIFE FOR SOLUTION. TO REALIZE THE FULL CAPACITY OF YOUR EDISON ELEMENTS IT IS IMPERATIVE GENUINE EDISON ELECTROLYTE BE USED. CHEMICALLY CORRECT COMBINATION OF LITHIUM AND POTASSIUM HYDRATE. 31.50 PREPAID TO MAKE 3 lbs. ELECTROLYTE. SAMPLE CELLS—A or G, 25c —supervolt 40c. YOU CAN'T TAKE OUT MORE THAN YOU PUT IN. IDEALLY CHARGE THAT B WITH A WILLARD OUTFIT. $2.00. JUMBO SIZE $5. FULL WAVE RECTIFIER CHARGES 101 VOLTS IN ONE HOUR, NO SWITCHES. $4. JUMBO SIZE $6. USE BOTH HALVES OF CYCLE. EVERYTHING FOR "THAT AMPERE H. FRANK RUCKEY, RADIO ENG., 1457 BUCKWOOD ROAD, CLEVELAND, O.

QST BACK TO UP. BOAD PAGES, 34, 35, 36 NOV. QST, THE LOW WAVES EXCLUSIVELY DEMAND NO. 12 SOLID COPPER ENAMELED AERIAL WIRE. PURE COPPER COATED WITH ELASTIC NON-FLAKING ENAMEL. HARD TO—TESTED A YEAR AT MIL. EACH ORDER SHIPPED IN ONE PIECE BURLAP-WRAPPED COIL. PREPAID TO 3rd ZONE. 1c BOOT. IF YOU ARE FIRST OF YOUR STATION YOU MUST HAVE THE BEST IN INSULATORS—THAT MEANS AERO BRASS CO. PORCELAINS, 3", 75c. 10". $1.00 PREPAID 1 and ZONE. FLUX DISTRIBUTING SHIELDS $1.00 ATTACHED. TOTALLY ELIMINATE INDUCTA LOSS. TUNE WITH NO. 22 DOUBLE COTTON SILK 100 FEET. PREPAID, NO. 16 60c. SILICON STEEL LAMINATIONS FOR THAT CHOKE AND TRANSFORMER 2½ 6. 2½x10" STRIPS, 1½", 2" SIDES U SHAPED CORE WITH HARDWARE ADJUSTABLE AIR GAP. RADIO MIL. NOW YOU CAN INSULATE PERFECTLY EVERY POINT OF YOUR RADIATING SYSTEM. A NEW LINE OF 3 INSULATORS—FLYNSH NON-FUSIBLE PORCELAIN, BROWN GLAZED. 3" 30c in 30 lots. 35c EACH. 5" 40c. IN 30 LOTS, 35c EACH. 10" 90c IN 30 LOTS, 80c EACH. 20" $1.50. GUY INSULATORS, 3 AND 5". A REAL FIND, GANG. RADIO MIL. 1457 BUCKWOOD ROAD, CLEVELAND, O.

ALL HAMS TAKE NOTICE. NEW U. V. 201-A VIP-TY WATTERS NOW AVAILABLE. LINE VOLTAGE AT THE RIGHT, NO REGVING ALLOWED. TUBE ONLY DRAWS 3.25 AMPS. FILAMENT, 1000 VOLTS ON THE PLATE, VOLTAGE AMPLIFICATION CONSTANT OF 25. 60% MUCH MORE RUGGED, LARGER PLATE, ANCHORED GRID AND FILAMENT, ETC. IN STOCK FOR IMMEDIATE DELIVERY. PRICE F. O. B. FT. WORTH $7.50. MAKE DESERVE AN XMAS PRESENT OF TIME OR MONEY. ONE'S. IF YOU'VE NEVER TRIED OUR SERVICE YOU HAVE MISSED A LOT. WE SHIP TO MEXICO, CANADA, CUBA, PORTO RICO, NEW ZEALAND, AND ELSEWHERE, NOT TO MENTION THE GOOD OLD USA. ALL ORDERS ARE SHIPPED THE SAME DAY THEY ARE RECEIVED. NO WAITS. NO DELAYS AND WE NEVER SUBSTITUTE. You GET REAL SERVICE AND A GUARANTEE REAL FROM THE ONLY HAM STORE IN THE FIFTH DISTRICT. FT. WORTH RADIO SUPPLY CO., 108 EAST TENTH ST., FORT WORTH, TEXAS

"RADIO CALL BOOK" 30PE See Page 121.

RADIO GENERATORS—300 watt 110 volt, $75.00 Battery Charging Generators $30. Have Several Motor Generator sets at also. Motor Specialties Co., Cadiz, Ohio.

MAKE YOUR NEXT REACH OUT—Some poles, some wire, fewer parts. Our $150 kit includes the new different pole, 28 feet real solid threaded wire, lithographed parts of Kinks Case in Point Circuit, and complete, simple instructions. Neutrad also in big Case selectivity with deep, resonant volume. NOT obtainable elsewhere. We pioneered this and our name source of buyers is has delighted. Satisfaction guaranteed. Details 10c. Kit complete complete $7.00. New 8 page catalog, thousands of items, mail exclusive, for stamp. We accept postage stamps same as cash. KEARAG RADIO LABORATORIES, Kent, O.

TELEGRAPHY—Morse and Wireless—Learn at home in half usual time and at trifling cost. Certificate Automatic Transmitter will send, on 8 under or Buzzer, unlimited messages, any speed. Just as expert operator would. Adopted by U. S. Govt. and used by leading Universities, Colleges, Technical and Telegraph Schools throughout U. S. Catalog free. Omnitrans Mfg. Co., 1440 Broadway, New York

ENVELOPES—500 good white envelopes with name and address printed, $1.00 postpaid. Dealers or call in set $1.25 extra. Guy Sherman, Clinton Ia.

STORAGE "B" batteries at any cell price. Purchase a replaceable "HAWKEYE" choice "B" battery. No sulphating or buckling of plates, which means always adjustable reception with unlimited life. Sold in complete knock-down units which assures you better results to put together. Does quite equal everything for the actual construction of battery such as large size sealed Edison elements, special molded hard Bakelite plate cells (not ordinary hot rubber), patched insulating base board for support of cells, pure antimonial solid nickel wire flasher supports, perforated hard rubber separators, full strength chemical electrolyte. With all orders there is included free of charge a pure chlorinated rubber flexible double jointing together number of clamps and chemicals. Prices of units as above: 24 volt $2.50 at cost $2.00; 30 volt $3.00; 100 volt $9.00; 120 volt $11.00; 140 volt $12.75; 160 volt $13.50; 200 volt $17.50. Special voltage units put up at no increase in price. Complete charge cell, the prepaid, complete combination "H" battery charger $7.75. Extra spare 100 ma. waterproof cellulose at $4.75 prepaid. Also "A" batteries at attractive prices. Order direct or write for my literature, 10 days trial offer and guarantee. Orders ship same day received. No waiting. H. O. Smith, 21 Washington Ave., Danbury, Conn.

SEND me your burned out or broken Power tubes. Any watt or over. Will pay liberally. W. Baker, 16 W. 60th St., New York City.

150 GENUINE Foreign Stamps. Mexico War Issues, Venezuela, Salvador and India Service Commemorative, Obligation, etc., only 5c. Finest approval sheets 50 to 60% discount. Agents wanted. Big Big Lists Free. We Buy Stamps. Established 25 years. Hussman Stamp Co. Dept. 35, St. Louis, Mo.

FOR SALE—Westinghouse dynamotor 10-12 volt drive, 350-450 volt output with filter system at $15. A few

32x32 volt drives with 350-450 volt output at $18.00; also General Electric double current generators and transformers 32 volt drive 600-650 volt output each equipped with Thrillier filter system, $15.00 each, all generators are new. Western Electric Navy submarine Chaser CW 250 watter complete with tubes, wired for 110V, CW, Phone. 1000 is brand new, first $200 takes it. Navy low wave set new type UN-248 range 1400-2000 meters, complete $75—1-250 watt continuous wave transmitter, panel mount, the finest transmitter you ever saw, $125.00; 1 Western Electric 1, KW type 1 tube $85, also 10 watt tubes $20.00 ea. Grebe receivers at 50% off list—all types Navy wavemeters, range 150-6000 meters, the finest meters you ever saw at $40.00 each. First money order takes them. 2AG.D.

---

300 VOLT EDISON Type "B" Battery, Unsoiled drawn. Parts for 1 tube complete $28.50 LANE MFG., 2940 W. Lake, Chicago

---

NEW RECEIVING SETS. FULLY GUARANTEED. Scott S-R Receiver and 2-M Amplifier $90.00. Jones No. 6834 11 stages scalar $125.00, Kennedy Intermediate #1-40, Type 10-5 or 10-6 $60.00, Grebe 4-R-12 $195.00, Federal No. 4 Tri-plex and 1 stage $70.00, Grebe 1000W radio Cac. amplifier $55.00 The Radio Store, 550 E. Colorado St., Pasadena, Cal.

"RADIO CALL PINS." price see Page 891

FOR SALE—1-K watt CW and tone transmitter. Crystal former, tubes, three meters "M" type, rectifier, etc., bargain for $65.00. DX New Zealand, Hawaii, Greenland, etc., one eight DeForest Horseomb coils. 100 to 1250 meters, the set for $5.00; Orfeli Carrier Avondale, Zeisler type, Ill.

GENUINE SILICON Transformer steel cut to order 25 cents lb. 10 lbs. and over, 2 cents inches, weight 1 lb. postage extra. Geo. Scheer, Calumet, Mich.

No. 32 double cotton covered wire 1½c ft. No. 16 double cotton covered wire 9c lb. No. 12 enameled solid copper wire 1c ft. No. 12 hard drawn tin copper wire 1½c ft. Low loss tubes and coils made to order—all kinds and sizes. For best results on low waves. Types transmitting and lead-in insulators. ARCO, 1046 Centre Ave., Pittsburgh, Pa.

DEALERS write for our illustrated catalogue of reliable radio merchandise. Jewell-Manning Corporation, Dept. B, 1939 Wilson Ave., Chicago, Ill.

SELL Nelson Radio Institute course of 18 textbooks. No instructions, wholesale complete. Ten dollars. Want honeycomb coils. Philip Goldsoll, Jr., Smyrna, N. Y.

FIRST CHECK FOR seventy dollars takes SCR284 used 6 hours. Guaranteed never overloaded and in perfect condition. 3AUC.

COUPLED INDUCTANCES: $14.95. PHOTO ON REQUEST. CAPITOL RADIO LANSING, MICH.

RADIO MECHANIC—four years experience, fair draftsman would like steady position with manufacturer, can furnish best of, Address J. L. Dean, P. O. Box 106, Elk City, Kansas.

$5.00 New United States Aviators leather helmet with head phones and microphones, only $25.00, postage free. Send at once, limited supply other radio bargains. Weil's Curiosity Shop, 24 South 2nd St., Philadelphia, Pa.

"PUREST VIRGIN ALUMINUM FOR SALE. PARTICULARS UPON REQUEST. 2BM"

CORK IRON—taken from tape removed at choke 37 wide three different lengths. 50 per lb. plus postage. Smith, c/o Willey, Barre, Vt.

WESTERN ELECTRIC 1M.F. oiled condensers. Tested to withstand 600 volts, guaranteed new and condition perfect. Postpaid $1.50 each, 6 for $7.00, 12 for $12.00. Pacific Radio Lab., 6240 Hollywood Ave., Hollywood, Cal.

NEW CALL—An RUA radio cardholder for your call card envelopes or letterheads. Sell 50, large 1.00 postpaid. Have your local engraver make plate. Make your card distinctive. D. A. Hoffman, 2353 E. 93rd St., Cleveland, O.

MADE TO ORDER QSL CARDS. 5A-Q-C PRINTS 'EM. 100 TWO COLOR CARDS $4.00. SAMPLES ALL DISTRICTS. 10 4 PRINTS. PORTS, 3109 EIGHTH AVENUE, FORT WORTH TEXAS.

HELLO GANG! CATCH THESE GHOSTONEST USED APPARATUS HIT ALL IN FIRST CLASS OPERATING CONDITION. MAGNAVOX RK AT $100; RADIO CORP. AR-810 TUNER AND CRYSTAL DETECTOR AT $15.00; AR-1401 DETECTOR AND 2 STAGE A.F. AT $50.00; AA-1520 THREE STAGE R.F. AMPLIFIER AT $60.00; UC-1520 PARADON PERMISTON CONDENSER, VARIABLE TO .0005 MFD. AT $4.50; WESTINGHOUSE MC 827 110 VOLTS AC, 500 VOLTS DC, 50 WATTS AT $75.00. LOTS OF NEW APPARATUS AT 10 PERCENT DISCOUNT AND IF I DON'T HAPPEN TO HAVE JUST WHAT YOU WANT, WILL GET IT FOR YOU QUICK. SHOOT YOUR ORDER IN NOW. ALL SHIPMENTS C. O. D. J. T. DAVIDSON, 9CBE.

LOW-LOSS SHORTWAVE UNIT with which you can tune down to 10 meters and will portable from 25 meters up to 120 with a few loss 12 page circulars, price to have $5.00 prepaid. KAY-DEE-AUTOCRAFT MANUFACTURING CO., 1068-17 Tribune St., Portland, Ore.

RADIOLA V detector and 2 stages audio and crystal detector like new list complete $ 42.00, set for $25.00; less tubes and batteries; one with 201a plus Frost phone. 1K30 copper with vaseline spring, balance U. S. G. subject examination. Geo. Schulz, Calumet, Mich.

GENERATORS, MOTOR-GENERATORS and Transformers, 500 to 1400 volts. 500, 750, and 900 new and unused machines, as you can see these are real bargains and will not last forever. State your requirements. WILL W. G. Mullis, Whitewater, Wisc.

COUPLED INDUCTANCES. $14.00. PHOTO ON REQUEST. CAPITOL RADIO, LANSING, MICH.

BUILD YOUR OWN rehaulable "B" batteries from old Large size Edison elements, used with rare nickle wire. ELECTRICALLY WELDED CONNECTIONS, $0.75 per pair, postpaid. Instructions with order. Sample 2.10. Arthur Chapelle, 1NX, Woodburn, Ore.

TRANSMITTER AT BARGAIN—20 watt tone CW, on table; 3 meters 500-1250 volt plate supply from a NEW "S" tubes will filtered. 4 coil Hellesen circuit. Complete $125.00; less than parts cost wholesale. Guaranteed to "work" from 30-200 meters. Also 500 volt 200 watt Robbins-Myers Motor Generator—$35.00. 9GI Greencastle, Ind.

FOR SALE—Acme KVA 0.15 Amps. $4.00, 3CA thermal 0-150, $4.00; 12V, 6c Vac SL. Starkweather, Conn.

FIVE WATTERS—you saw the ad in October QST—plenty of them in hand. Filament 7.5 volts, 2.5 amps. Plate 450 to 500 volts. Every tube actually tested on a ham transmitter. Your money back if you are not satisfied. We ship C. O. D. Parcel Post $3.50 and charges. No delay. The day the orders come in the tubes go out. Radio Vacuum Tube Co., 50 Halsey St., Newark, N. J.

SWAP OR SELL: Ballolite .30 - 8c and .45 WANTED: Grebe C.R.9 and Grebe RUSK 2 stage amplifier. Geo. Woodbury, Union City, Ind.

PURE DC FOR THE PLATES. GE 12 KW 500—1400 ampere dynamocure with filter etc. Becker-Calag 12,500 .07 ampere 350. GE 24 1500 volt .250 ampere 750 volt tap. Original Boone $40.00 adapted for 110 drive $1.00 additional. Just the thing for 52 volt plants. Limited number slightly used, close out 25%. Guaranteed. Crocker-Wheeler hot cycle self excited 500 watt generators. Navy type proof keys with "Blinker" type flash 1 KW 500 cycle amplifier transformers $15.00; cost $150. ship transmitters. Henry Kessler, 401 E. 84th St., New York City.

HERRIC RADIO DEMONSTRATOR 1-R-5 WITH TONE AMPLIFIER $65. SATTGAST-EL RADIO CO., 515 Oak Ave., Grand Rapids, Mich.

LOWEST LOSS VERNIER CONDENSERS. Acme 24.95; General Radio 24.50; Hammarlund, $25.00; plain 23.00. Fox Instrument Company, 1865 Third Ave., New York City.

SELL—TWO [illegible] TUBES AND [illegible] STAT FOR $[illegible] EACH. 9SHL

GREBE CR-12 with speaker, etc. $75.00; Western Electric 10-A speaker; both practically new; Sodion S-13 [illegible] with tube new $15.00; three circuit [illegible] $[illegible]. Laurence [illegible], Fort Myers, Fla.

Radio work of every description, rewinding, repairing, etc. Send [illegible] parts [illegible] U. S. Government Aircraft [illegible]. We sell all material, etc. Send 2c stamp for list and prices. Mail orders answered. Write [illegible] Shop, 20 S. 2nd St., Philadelphia, Pa.

[illegible]—If you should ever need [illegible] of some good parts [illegible] SAVE [illegible] because SYS doesn't live there. SAVE has been [illegible] to Dan Mackenzie, 1215 [illegible] Dubuque Av., Springfield, O.

COCKADAY FOUR CIRCUIT WITH TWO STAGE AMPLIFIER $30.00. [illegible] Young, 18 Square St., Atlanta, Ga.

100 WATT PLATE AND FILAMENT TRANSFORMERS $15 and $10 respectively. No. 12 ENAMELED WIRE [illegible] PER [illegible] FT. WILSON ELECTRICAL LABORATORIES, 2AM DEPT. 1104 MOHAWK AVE., CHICAGO, ILL.

COUPLED INDUCTANCES: $3.50. PHOTO ON REQUEST. CAPITOL RADIO, LANSING, MICH.

BAKELITE STRIPS for [illegible] panels and [illegible] tubing [illegible] to 6" wide any length & 1/4 inches thick; 8c square inches [illegible] pound. Guy Schult, Calumet, Mich.

COUPLER ONE CONTROL SUPER HETERODYNE AS PER SPECIFICATIONS NOVEMBER QST WOUND READY TO MOUNT. [illegible]. STUART A. HENDRICK, 30 W. 180th St., N. Y. C.

GET THOSE CARDS FROM 9ARN—real call and border, with blue [illegible] $2.50 for 100 [illegible] cards. [illegible] Lindsey, [illegible] Thompson Pl., St. Louis, Mo.

GREBE CR-8 in perfect condition, forty bucks f. o. b. Pittsburg, Pa. 8VD.

CHICAGO HAMS & B.C.L. [illegible] engraved on [illegible] large panels $[illegible] [illegible] German [illegible] engraving. Also [illegible] with call [illegible] for [illegible] signs. Prompt service [illegible] original "[illegible] Books" call [illegible]. A. L. Woods, [illegible] Wells St., Chicago.

[illegible] LAST CHANCE [illegible]

FOR CASH—OFFER [illegible] [illegible] INCLUDING [illegible] SIMPLEX MOVIE PROJECTOR WITH NEW LAMP ADAPTER AND ALL EQUIPMENT FINE CONDITION. ANY OFFER. WRITE A. W. [illegible], SEWARD, N. Y.

Must sell these bargains. Jewell meters: 0-5 ammeter $[illegible], 0-25 voltmeter $[illegible], 0-500 milliammeter $2.50; RCA 100 watt power transformer $[illegible]. [illegible] Acme transformer $[illegible]; [illegible] Myers [illegible] coil [illegible] with sockets [illegible] each; [illegible] inch [illegible] $[illegible] [illegible] Kiefer, 312 [illegible] Place, Chicago.

TUSKA [illegible] amplifier with tubes, $[illegible] [illegible], $[illegible]; [illegible] Grebe [illegible] Magnavox [illegible]. Clear-tone and Independent tubes $3.25, tube repairing, $2.75; adjustable horns, $10.50; complete C. W. station for sale. Radio Room shop, Box 190, Hartford, Conn.

FAHNESTOCK [illegible] COIL FORMS. Similar to those used in the [illegible] Neutrodyne [illegible]. Carefully [illegible] of [illegible] [illegible] forms [illegible] [illegible] 3 1/2" [illegible] [illegible] All forms complete with terminal screws and drilled for mounting posts ready to wind. Carefully packed and shipped postpaid. Spark Service

[illegible] made to order. [illegible] diagrams at reasonable prices. STUART A. HENDRICK, Radio Engineer, 30 W. 180th st., Bronx, N. Y. C.

EDISON BATTERY SUPPLIES. LARGEST SIZE TYPE A ELEMENTS 4c A PAIR, 3c DRILLED. PURE NICKEL WIRE 1c A FOOT. PERFORATED HARD RUBBER SEPARATORS 3c EACH OR [illegible] SHEETS [illegible]. TEST TUBES [illegible], 3c. [illegible] FOR FIVE LBS. EDISON SOLUTION [illegible]. ALL ARTICLES POSTPAID. BERNARD [illegible], [illegible] PALLISTER AVE., DETROIT, MICH.

CODE MADE EASY—interesting [illegible] [illegible]. [illegible] of eight [illegible] [illegible] $1.00. [illegible] W. SWIRSKY, [illegible] Ave., Winnipeg, Canada.

COUPLED INDUCTANCES: $3.50. PHOTO ON REQUEST. CAPITOL RADIO, LANSING, MICH.

POWER AMPLIFIER, Western Electric 10A, new, $[illegible], and EIS superheterodyne, $[illegible]. Evans, 725 N. Main st., Niles, O.

SELL—following used goods. [illegible] 1/4 henry [illegible] choke $[illegible], Baldwin [illegible] [illegible]; Murdock type [illegible] phones $[illegible]; [illegible] Jewell type [illegible] [illegible] 201 Radiotron receiving tubes [illegible] $[illegible]. F. B. Van [illegible], 57 S. Willow St., [illegible], O.

FIRST CERTIFIED CHECK OR MONEY ORDER GETS IT. Panel mounted 50 watt C. W. [illegible] Tubes, mike, key, [illegible] plate, [illegible] 2 transformers, chokes, [illegible] Jewell meters, [illegible] $[illegible]; [illegible] 20 watt [illegible] transformer, panel mounted: 1 [illegible] $15.00; [illegible], filament transformer, [illegible] [illegible] $[illegible]; [illegible] $12.00. [illegible] Pollard, 310 Wayne St., [illegible], Mo.

BARGAIN—DEFOREST TYPE [illegible] WATT TRANSMITTER [illegible] modulation transformer, [illegible] tubes [illegible]; JOHN P. MATTHEWS, Newark, [illegible]

NEW YORK HAMS [illegible] and [illegible]. W. [illegible] and [illegible] 2BRN.

LIMITED QUANTITY—[illegible] [illegible] apparatus: [illegible] ammeters $[illegible]; [illegible] voltmeters $[illegible]; [illegible] [illegible]; [illegible] transformers $[illegible]; [illegible] H. A. [illegible], 1577 34th St., Brooklyn, N. Y.

QSL Cards—send for samples and price list. [illegible] [illegible] St., Brooklyn, N. Y.

GREBE IN ORIGINAL FACTORY CARTONS—CR [illegible] $[illegible]; [illegible] $[illegible]; [illegible], $15; [illegible], $[illegible] [illegible]. [illegible] in full or 20% cash, balance C. O. D. The Radio Shop, [illegible], Dubuque, Ia.

SELL: New equipment, UV-203 [illegible] $[illegible]; [illegible] $7.50, Jewell [illegible] AC $[illegible], [illegible] $[illegible]; [illegible] 201A [illegible] $[illegible]; [illegible] $[illegible]; [illegible]. Write [illegible], [illegible], Mo.

COUPLED INDUCTANCES: $3.50. PHOTO ON REQUEST. CAPITOL RADIO, LANSING, MICH.

[illegible] complete [illegible] tubes, meters, etc. [illegible] 9CMN

[illegible] Watt [illegible] Westinghouse motor generator [illegible] $175.00; [illegible] [illegible] Warner, [illegible], N. J.

MOTOR GENERATORS—New [illegible] & [illegible] [illegible] motor generator [illegible] without [illegible]; motors and generators repaired and [illegible]. [illegible] ELECTRIC CO., [illegible] Erie st., Chicago, Ill.

WESTERN ELECTRIC [illegible] receiving tubes, amplifier, [illegible] dynamotor, power

...chboard. Sold another, brand new, complete with type indicator, 10 "G-E" tubes, 2 XT-2 tubes, choke coil, plugs all for $200.00; used 7" photographic X-Ray tube, Delmar, N. J.

ENGLISH WOOLY cocker puppies for only very few remaining at $20.00; unbreakable 3-ft. pipe rods 1 inch diameter 12 cents, 2 inch diameter 20 cents, 3 inch diameter 30 cents, 4½ inch diameter 40 cents; 4½ inch diameter 50 cents per rod. Send for circular. Schultz Chapel, Mich.

Subsidy and strike CRIS Pictures. Send money. Duty collect. L. D. D., 5040 Anita, N. D.

WANTED—GOOD VIBROPLEX, STATE MODEL AND CONDITION SOLD.

SHOT PUTS—6 inch regulation size. Also 2 in Cast Steel. Fairmount Ave., N. J.

ELECTRIC "SHOCKTRON" TUBES FOR PORTABLE MACHINES. EXPERT WORK.

ACE QUICK 20 Watt universal Tone Power Amplifier Chassis complete, $100; Mod. 1000 Class Push-Pull Transmitter, $100.

(Continued) WANTED, receiving equipment; state full particulars and complete details. Smith, 1416 Walnut Drive, Philadelphia, Pa.

FOR SALE—Three 1hp Fairbanks-Morse motors with tables, various others in stock. Motors and engines. Also wanted, 25-ton or smaller A. C. crane hoist. L. Holzworth Co., Riverside, N. Y.

GRAY "PHONE" 2 Countries Call Cards, 25 cents. Gray Phone Co., 4900 Quincy St., Chicago, Ill. 2 Thermometer Assembly Units, with cases, $3.00; 2 Thermometer Assembly Units, with cases, $5.00; everything under guaranteed brand new. New 2 inch x 3 inch plate and 3x4 inch transformer, double tapped, 110v., 15 Diagram connections printed on cards. Only $1.00 each, postpaid. Satisfaction guaranteed or your money back. Radio Transformer Co., 3 E. Kinzie St., Chicago, Ill.

FREE LIST INDUCTANCE FORMS. Clear Composition Bakelite, also Rod, Tube, Sheet, Angle, Channel Stock.

CONDENSER INSTRUMENTS—Also DIELECTRIC TESTING EQUIPMENT. CAPITOL RADIO LABORATORY, INC.

KENNEDY RECEIVER type 10 with amplifier and tube, 2 years old, works fine, in condition, $75.00 cash. Also Operadio Receiver, $40.00 cash. Both sets with loading coil in excellent condition, $75.00 cash for both. New radio cabinet, size 30x20x40 in., $5.00. Wm. Wadsworth, 34, Chicago, Ill.

TWO PRACTICALLY NEW ACME TRANSMITTERS 250-300 WATTS, CONTROL UNIT, 110 VOLT CONVERTER UNIT, COMPLETE, $125. FOR SALE, 450 Sheldon St., Lake, Mich.

WANTED—Radio apparatus of every description for our stores in Calgary, complete receiver & Kraft receiver, Kennedy tube—all must be in first class condition, cheap for cash. Send full particulars to Radio Supply Co., 1000 Second Ave., Calgary, Alta.

TWO 10-KW 2,500 Volt Transformers, 110 volt primary, 60 cycle, $50.00 each. Two 5-KW 2,500 Volt Transformers, 110 volt primary, 60 cycle, $30.00 each. Two 1-KW 2,500 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 1,000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 500 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 250 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 125 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 62 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 31 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 15 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 7.5 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 3.75 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 1.875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.9375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.46875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.234375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.1171875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.05859375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.029296875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0146484375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00732421875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.003662109375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0018310546875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00091552734375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000457763671875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0002288818359375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00011444091796875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000057220458984375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000286102294921875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00001430511474609375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000007152557373046875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000035762786865234375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000178813934326171875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000894069671630859375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000004470348358154296875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000022351741790771484375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000111758708953857421875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000558793544769287109375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000002793967723846435546875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000013969838619232177734375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000069849193096160888671875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000349245965480804443359375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000001746229827404022216796875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000008731149137020111083984375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000043655745685100555419921875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000218278728425502777099609375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000001091393642127513885498046875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000005456968210637569427490234375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000027284841053187847137451171875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000136424205265939235687255859375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000682121026329696178436279296875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000003410605131648480892181396484375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000017053025658242404460906982421875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000085265128291212022304534912109375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000426325641456060111522674560546875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000002131628207280300557613372802734375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000010658141036401502788066864013671875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000053290705182007513940334320068359375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000266453525910037569701671600341796875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000001332267629550187848508358001708984375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000006661338147750939242541790008544921875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000033306690738754696212708950042724609375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000166533453693773481063544750213623046875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000832667268468867405317723751068115234375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000004163336342344337026588618755340576171875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000020816681711721685132943093776702880859375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000104083408558608425664715468883514404296875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000520417042793042128323577344417572021484375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000002602085213965210641617886722087860107421875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000013010426069826053208089433610439300537109375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000065052130349130266040447168052196502685546875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000325260651745651330202235840260982513427734375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000001626303258728256651011179201304912567138671875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000008131516293641283255055896006524562835693359375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000040657581468206416275279480032622814178466796875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000203287907341032081376397400163114070892333984375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000001016439536705160406881987000815570354461669921875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000005082197683525802034409935004077851772308349609375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000025410988417629010172049675020389258861541748046875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000127054942088145050860248375101946294307708740234375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000000635274710440725254301241875509731471538543701171875 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000003176373552203626271506209377548657357692718505859375 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000158818677610181313575310468877432867884635925292968750 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000000794093388050906567876552344387164339423179626464843750 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000003970466940254532839382761721935821697115898132324218750 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000198523347012726641969138086096791084855794906616210937500 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000000992616735063633209845690430483955424278974533081054687500 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000004963083675318166049228452152419777121394872665405273437500 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000248154183765908302461422607620988856069743633270263671875000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000001240770918829541512307113038104944280348718166351318359375000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000006203854594147707561535565190524721401743590831756591796875000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000310192729707385378076778259526236070087179541587829589843750000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000001550963648536926890383891297631180350435897707939147949218750000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000007754818242684634451919456488155901752179488539695739746093750000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000387740912134231722595972824407795087608974426984786987304687500000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000001938704560671158612979864122038975438044872134923934936523437500000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000009693522803355793064899320610194877190224360674619674682617187500000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000484676140167789653244966030509743859511218033730983734130859375000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000002423380700838948266224830152548719297556090168654918670654296875000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000012116903504194741331124150762743596487780450843274593353271484375000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000605845175209737066556207538137179824389022542163729667663574218750000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000003029225876048685332781037690685899121945112710818648338317871093750000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000015146129380243426663905188453429495609725563554093241691589355468750000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000757306469012171333195259422671474780486278177704662084579467773437500000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000003786532345060856665976297113357373902431390888523310422897338867187500000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000018932661725304283329881485566786869512156954442616552114486694335937500000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000946633086265214166494074278339343475607847722130827605724334716796875000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000004733165431326070832470371391696717378039238610654138028621673583984375000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000023665827156630354162351856958483586890196193053270690143108367919921875000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000118329135783151770811759284792417934450980965266353450715541839599609375000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000000591645678915758854058796423962089672254904826331767253577709197998046875000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000002958228394578794270293982119810448361274524131658836267888545989990234375000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000147911419728939713514699105990522418063726206582941813394427299499511718750000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000000739557098644698567573495529952612090318631032914709066972136497497558593750000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000003697785493223492837867477649763060451593155164573545334860682487487792968750000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000184889274661174641893373882488153022579657758228677266743034124374389648437500000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000000924446373305873209466869412440765112898288791143386333715170621871948242187500000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000004622231866529366047334347062203825564491443955716931668575853109359741210937500000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000231111593326468302366717353110191278224572197785846583428792655467987060546875000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000001155557966632341511833586765550956391122860988929232917143963277339935302734375000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000005777789833161707559167933827754781955614304944646164585719816386699676513671875000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000288889491658085377958396691387739097780715247232308229285990819334983825683593750000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000001444447458290426889791983456938695488903576236161541146429954096674919128417968750000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000007222237291452134448959917284693477444517881180807705732149770483374595642089843750000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000361111864572606722447995864234673872225894059040385286607488524168729782104492187500000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000001805559322863033612239979321173369361129470295201926433037442620843648910522460937500000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000009027796614315168061199896605866846805647351476009632165187213104218244552612304687500000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000451389830715758403059994830293342340282367373800481608259360655210912227630615234375000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000002256949153578792015299974151466711701411836869002408041296803276054561138153076171875000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000011284745767893960076499870757333558507059184345012040206484016380272805690765380859375000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000564237288394698003824993537866677925352959217250602010324200819013640284538269042968750000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000002821186441973490019124967689333389626764796086253010051621004095068201422691345214843750000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000014105932209867450095624838446666948133823980431265050258105020475341007113456726074218750000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000705296610493372504781241922333347406691199021563252512905251023767050355672836303710937500000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000003526483052466862523906209611666737033455995107816262564526255118835251778364181518554687500000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000017632415262334312619531048058333685167279975539081312822631275594176258891820907592773437500000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000881620763116715630976552402916684258363998776954065641131563779708812944591045379638671875000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000004408103815583578154882762014583421291819993884770328205657818898544064722955226898193359375000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000022040519077917890774413810072917106459099969423851641028289094492720323614776134490966796875000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000110202595389589453872069050364585532295499847119258205141445472463601618073880672454833984375000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000000551012976947947269360345251822927661477499235596291025707227362318008090369403362274169921875000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000002755064884739736346801726259114638307387496177981455128536136811590040451847016811370849609375000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000137753244236986817340086312955731915369374808899072756426806840579502022592350840568542480468750000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000000688766221184934086700431564778659576846874044495363782134034202897510112961754202842712402343750000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000003443831105924670433502157823893297884234370222476818910670171014487550564808771014213562011718750000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000172191555296233521675107891194664894211718511112383840955508508507243775282440385507106781005859375000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000000860957776481167608375539455973324471058592555561919204777542542536218876412201927535533905029296875000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000004304788882405838041877697279866622355292962777809596023887712712681094382061009637677669525146484375000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000215239444120291902093884863993331117764648138890479801194385635634054719103050481883883476257324218750000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000001076197220601459510469424319966655588823240694452399005971928178170273595515252409419417381286621093750000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000005380986103007297552347121599833277944116203472261995029859640890851367977576262047097086906433105468750000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000269049305150364877617356079991663897205810173613099751492982044542568398878813102354854345321655273437500000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000001345246525751824388086780399958319486029050868065498757464910222712841994394065511774271726608276367187500000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000006726232628759121940433901999791597430145254340327493787324551113564209971970327558871358633041381835937500000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000336311631437956097021695099989579871507262717016374689366227555678210498598516377944356793165206909179687500000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000001681558157189780485108475499947899357536313585081873446831137778391052492992581889721783965826034545898437500000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000008407790785948902425542377499739496787681567925409367234155688891955262464962909448608919829130172729492187500000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000420389539297445121277118874986974839384078396270468361707784444597763123248145472430445991456508636474609375000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000002101947696487225606385594374934874196920391981352341808538922222988815616240727362152229957282543182373046875000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000010509738482436128031927971874674370984601959906761709042694611114944078081203636810761149786412715911865234375000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000525486924121806401596398593733718549230097995338085452134730555747203904060181840538057489320635795593261718750000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000002627434620609032007981992968668592746150489976690427260673652778736019520300909202690287446603178977966308593750000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000013137173103045160039909964843342963730752449883452136303368263893680097601504546013451437233015894889831542968750000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000656858655152258001995498242167148186537622494172606815168413194684004880075227300672571861650794744491577148437500000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000003284293275761290009977491210835740932688112470863034075842065973420024400376136503362859308253973722457885742187500000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000016421466378806450049887456054178704663440562354315170379210329867100122001880682516814296541269868612289428710937500000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000821073318940322502494372802708935233172028117715758518960516493355006100094034125840714827063493430614471435546875000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000004105366594701612512471864013544676165860140588578792594802582466775030500470170629203574135317467153072357177734375000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000020526832973508062562359320067723380829300702942893962974012912333875152502350853146017870676587335765361785888671875000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000102634164867540312811796600338616904146503514714469814870064561669375762511754265730089353382936826808929443359375000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000000513170824337701564058983001693084520732517573572349074350322808346878812558771328650446766914684134044647216796875000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000002565854121688507820294915008465422603662587867861745371751614041734394062793856643252233834573420670223236083984375000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000128292706084425391014745750042327113018312939393087268587580702086719703139692832162611691728671033511161804199218750000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000000641463530422126955073728750211635565091564696965436342937903510433598515698464160813058458643355167555809020996093750000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000003207317652110634775368643751058177825457823484827181714689517552167992578492320804065292293216775837779045104980468750000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000160365882605531738768432187552908891272891174241359085734475877608399628924616040203264614660838791888952255249023437500000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000000801829413027658693842160937764544456364455871206795428672379388041998144623080201016323073304193959444761276245117187500000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000004009147065138293469210804688822722281822279356033977143361896940209990723115401005081615366520969797223806381225585937500000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000200457353256914673460540234441136114091113967801698857168094847047010495361557700502540807683260484889861190319061279296875000000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000001002286766284573367302701172205680570455569839008494285840474235235052476807788502540403841630242449305951595306396484375000000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000005011433831422866836513505861028402852277849195042471429202371176175262384038942512702019208151212246529757976531982421875000000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000250571691571143341825675293051420142613892459752123571460118558808763119201947125635100960407575606123264898826599121093750000000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000001252858457855716709128376465257100713069462298760617857300592794043815596009735628175504803787878030616324494132995605468750000000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000006264292289278583545641882326285503565347311493803089286502963970219077980048678140877524018939390153081622470664978027343750000000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000313214614463929177282094116314275178267365574690154464325148198510953899002433907043876200946969507654081123533248901367187500000000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000001566073072319645886410470581571375891336827873450772321625740992554769495012169535219381004734847538270405617666244506835937500000000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000007830365361598229432052352907856879456684139367253861608128704962773847475060847676096905023674237691352028088331222534179687500000000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000391518268079911471602617645392843972833420696836269308064435248138692373753042383804845251183711884567601404416561126708984375000000000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000001957591340399557358013088226964219864167103484181346540322176240693461868765211919024226255918559422838007022082805633544921875000000000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.000000000000000000009787956701997786790065441134821099320835517420906732701610881203467309343826059595121131279592797114190035110414028167724609375000000000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.0000000000000000000489397835099889339503272056741054966041775871045336635080544060173365467191302979756056563979639855709501755520701408386230468750000000000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. Two 1-KW 0.00000000000000000002446989175499446697516360283705274830208879355226683175402720300866827335956514898780282819898199278547508777603507041931152343750000000000000000000000000000000 Volt Transformers, 110 volt primary, 60 cycle, $15.00 each. 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for a dollar (postpaid). The half pound is the galley of paper. FOG. L. J. Blomfelter, 34 Isabella Ave., Newark, W. Va.

ATWATER KENT one tube regenerative $30.00, Radio Sentralyne $25, both A. K. Cunningham (used, $2.00, cash with order. Send for list of standard apparatus at greatly reduced prices. Tulip Factory Co., Cuba, N. Y.

SACRIFICE: Dubilier phone, $2.00. WESCO 0.5 MF, 600 C.W. 200, $1.00; UV-201, $2.00, plus postage. Caldwell Varnishes, Honeycomb coils, Condensers, A. F. Transformers, sockets, meters, rheostats, cabinets, inch spark coil, wire, etc. Stamp. Greenwood, Ind.

FOR SALE—New three current generators, ball bearing type for 0.2750 Plate and 7½ filament, designed for the tube transmitting and receiving set the filaments in series, 410-00. E. Wood, 35 Way Ave., Corona N. Y.

BARGAIN—Pioneer comb roll receiver, detector and two amp. with fil. cont. Unassembled vg. mail sell. fifty dollars gets it. Carl Cardin, Chasing, Ohio

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$4.50 ACME 500 VOLT condensers $4.25 new, Limited stock, authorized dealers getters by Acme Co., A. E. Geyer, 6742 Bradford Ave., Phila., Pa.

SELL: Kennedy receiver, type 241 with 681 amplifier. A bargain at $45.00; C. Bailey, 412 10th St., Niagara Falls, N. Y.

SALE: Kennedy receiver, type 241 with 681 amplifier. A bargain at $45.00; C. Bailey, 412 10th St., Niagara Falls, N. Y.

HALF HORSE POWER MOTOR, Westinghouse 110 volt 60 cycle single phase cross $400 RPM. Will swap a tip generator for. Hi-coil and in AC condition. $15.00 takes it. Van Blarcom, Morena, Mont.

REWIND, GUILLIN and DeForest coils, new mounted only five left at following: DF-1-2-3-5-10-20-50-100-200-750 turns half list price. Postage extra. Leo Arhuis, Calumet, Mich.

"THE BEST IN REAL HAM EQUIPMENT MEANS GOOD DX THIS WINTER" THE ENSALL RADIO LAB. SPECIALIZES IN BUILDING "REAL HAM" GEAR. MANY OF THE GANG REPORT DX EQUIPMENT WE P. U. IF YOU WANT REAL HAM EQUIPMENT AT HAM PRICES LOOK OVER THE LINEUP. SUPERHETS THAT ARE GOING TO HELP FIND THE ARTICLES AND N. X. BROADCAST TYPE WHEN YOU SPECIFY. HAM SUPERHETS THAT GET DOWN TO THE LOWER WAVELENGTHS. USED FROM $60.00 UP. TYPES, FROM SIX TUBES TO 14 TUBES. USE ECIS SELECTIVITY LOSLESS COILS. THESE COILS SUPPLIED FOR ANY CIRCUIT NO "CHIRP" USED ON THEM. IN THE TRANSMITTING LINE: ANTENNA INDUCTANCES FOR DIRECT OR INDUCTIVELY COUPLED CIRCUITS. INDUCTANCES FOR THE MEISSNER CIRCUIT. 3 and 4 COIL TYPES. WAVEMETERS FOR THE LOW WAVELENGTHS. BE SURE THAT YOUR SETS ARE ON THE RIGHT WAVE. OR, DON'T GUESS! KNOW WHERE YOU ARE AT! IF YOU WANT TO USE A. C. ON THE SET GET OUR LINE OF CHEMICAL RECTIFIER POWER UNITS. COMPLETE. INCLUDE JAR IN THE 214 VOLT LINE. ALSO THEM RECTIFIER POWER UNITS COMPLETE. RECTIFIERS FOR ANY VOLTAGES. SPOKEN AMPLIFIERS TO HELP PUT THAT PONK ACROSS. WHY NOT USE TWO TRANSMITTERS. ONE YOU'LL FIND IT SAVES TIME WHEN YOU WANT TO CHANGE FROM THE SHORTER WAVES TO THE LONG WAVE LENGTHS. WE WILL BUILD YOU AN OUTFIT TO EXACTLY YOUR OWN PRICE. THAT IS WHY WE ARE REPORTED "A" WITH THE GANG. IF IT'S HAM WE ARE THE HAMS TO GET IT FROM. WE DEAL EXCLUSIVELY IN THE AMATEUR LINE. SEND IN YOUR REQUIRES. ESTIMATES CHEERFULLY GIVEN. QSO THUS ENSALL. ENSALL RADIO LAB., 1508 BRANDVIEW AVE., WARREN, O.

"FOR REAL RESULT WAVE WORK" A RECEIVER THAT GETS DOWN AND "PERKS" QSA, SMOOTHLY WITH EFFICIENCY IN LOSS COILS. HAS BUT TWO TUNING CONTROLS. WORK 'EM FROM 20 METERS DOWN. THE PRICE IS LOW. GET THE DOPE. WE BUILD ANY TYPE RECEIVER, TRANSMITTER OR WAVEMETER. FOR DOPE ON ANYTHING, GET QSO WITH ENSALL RADIO LAB. 1508 ENSALL, 1508 GRANDVIEW AVE., WARREN, O.

IVORY RADIO PANELS—Straight white "PANELITE" makes most beautiful set of all. Guaranteed satisfactory. Any size 3/16" thick sent postpaid to any mount rate. Sample free. L. P. Hasson, Dept. T, 814 Main St., Fort Worth, Texas.

FIRST $25 takes low wave three circuit receiver and two step in crystal. Has Pilotrol condenser, UV-202 $5, UV-199, 1256 East 24th St., Cleveland, O.

PUTZ your antenna system. Dyna-sonic insulators, $.50c. Pyro-Glass Insulators $1.00. Unit of four Pyrex Glass and two Pyrex Leading-in Insulators for $12.50. Terminals in U. S. A. P. H. Bellerpar, 1HFH, Newark, Ohio.

FOR SALE—The following new U. S. A. transmitting apparatus at half price. 2TMI tube transmitter; UV 1262 Magnetic Modulator; UV527 crystals; UC4161 rotary dynamo; UL1664 chokes; UP547 sockets; UC1581 condensers; one tone wheel and brush; UM1145 wood leaks; UM1414 condensers; UP1906 condensers; one UV288; one UV504; UP1904 excitation transformer. Cash with order. Theodore B. Dowse, Box 82, Berlin, N. Y.

COUPLED WAVETASTER, $15.00. PHOTO ON REQUEST. CAPITOL RADIO, LANSING, MICH.

A NEW GENUINE EDISON TWIN LEAD STORAGE "B" BATTERIES, in Rubber Lined Steel containers, 24 cells, in Edison Tray and Examiner Metal Box, $20.00, 40 cells, $25.00, 44 cells $27.00. Same are new; all guaranteed. Treat yourself to a really good charger, requiring no attachments. Split type, charges 4 "A" or 12 volt "A" batteries and up to 120 volt "B" batteries. Variable rate up to 4 amps. Special price, $15.00 without bulb, $12.00. Send for circular. Special charging of all descriptions made to order. A. R. Sweetnam, 615 N. Washington St., Baltimore, Md.

WANT MR YOUR NO. 2 Simplex; have enough to learn code. Earl Perkins, Macedonia, Ia.

HIGH VOLTAGE: Lead your battery easily to use. All capacities. Welded. Four ampere capacity 40 volts, $4.00, 60-80, $5.00. Plates 4 cts. each. Two year guarantee. Howard Frazer Rogers, N. Y.

RAMS: Let me make your loose Radio parts and equipment, brass, brass, zinc, aluminum, wood, bakelite, rubber, machined or welded. Send specifications and sketch. For estimate write complete with workmanship. Precision shops equipped. O. M. Barker, 1617 Washington Ave., Ft. Worth, Tex.

SELL: ACME 1½ transformer, $7.00; Copper and meter, $5.00; complete for wave crystodyne, $10.00. 2BXZ.

SELL: GRIDS 1½ practically new $10.00. E. Stockwick, 1M 19th St., Brooklyn, N. Y.

BRANDES Superior phones $4.75, Radiotron or Cunningham tubes any style $5.25. Send for personal. Brand Engineering Co., P. O. Box 182, Berkeley, Calif.

"RADIO CALL LINE" QRZ see Page 121.

RELIABLE QTC, heavy aluminum strip, remounted per QST, ads given; WHY WASTE TIME OR MONEY, SATISFACTION AND PROMPT DELIVERY GUARANTEED. NOVY, Rosedale Park, N. Y.

HIGHEST DWXX cash for Bridge & Stratton Motor Scooter, 1924 model, ideally suited, excellent condition cost $225.00. Edward Mussy 6725 Quincy St., Mt. Airy, Philadelphia, Pa.

THE BEST SUPERHET YET. QTR DOWN TO 40 METERS AND "PERKS". THE PRICE IS LOW ENOUGH FOR EVERY HAM TO HAVE ONE. WE ALSO BUILD THE KITS IN? MODEL 62 AT LAST PRICE OF PARTS WHEN YOU BUY THEM FROM US. ENSALL RADIO LAB. PHONE ENSALL 1508 GRANDVIEW AVE. WARREN, O.

EXPERIMENTAL RADIO, Page 63 July QST.

BUTTON 3 WATT TUBES QUESTIONS DX—FULLY GUARANTEED TRY ONE $3.00. CANDWELL LABORATORIES 1541 JEWETT, ANN ARBOR, MICH. $4.00. JEWELL 0-15 AC-VOLTMETER $5.00, STANDARD

ARC KW $2.50, No. 2045 "S" TUBES, PAIR $30, JAMES RADIO CORNS, 5A-9-11, 1149 EIGHTH AVENUE, FORT WORTH, TEXAS.

MASTER CODE IN FIFTEEN MINUTES. TEN WORD SPEED in three hours. Three new records made by our students. Code learning secret at last told by 130 students. All now licensed. Method sent free on request. Method $2.00. Ellis Hesitation. Dodge Radio Shortcut, Dept. 5C, Mamaroneck, N. Y.

ARE YOU AUTHORIZED AT ONCE PER REPORTS FROM ANOTHER HAMS WHO BY BRIEF STUDY AND LIMITED PRACTICE INCREASED AND 6 SOME CASES DOUBLED SPEED MAILED 4IN REQUEST METHOD $2.00, KILLS HESITATION. Dodge Radio Shortcut, Dept. 5C, Mamaroneck, N. Y.

DID YOU KNOW THE CODE BUT SOMEHOW FAIL TO PASS? Many Previous Failures Operating on for License have told story of QUICK SUCCESS, which e-N mail on request. Method $2.00, Kills Hesitation. Dodge Radio Shortcut, Dept. 5C, Mamaroneck, N. Y.

KNOW THE CODE OUR WAY—KILL HESITATION. Ask for list many students who won appointment as O. R. S. AM. RADIO RELAY CHANNEL and Navy on limited mode rapid progress to spark supervisor's on request. Method $2.00. Kills Hesitation. Dodge Radio Shortcut, Dept. 5C, Mamaroneck, N. Y.

INTENSIVE SPEED PRACTICE—Something new. When properly used enables HAMS to quickly develop Code Speed for Commercial Wireless Extra. Supplements to and will apply in conjunction with Dodge Radio Shortcut. FREE—COPY to FIRST FIFTY HAMS who purchase 40 U. S. state are license in each 35-45 per will give fair Code and report results. U. S. Dodge, Mamaroneck, N. Y.

FOR SALE UP 1000 Watt transformer $12.00; 2 UV 217 Tubes, Genuine at $11.00; UT 1501 Marmette Montarger $4.00; 10, 000 Endurance $4.00; Ultron 12 cents Interest $1.00; Ultron 40 plate condenser $1.50; Harry Todd, 1015 North Sixth Street, Springfield, Kansas.

RADIO CORPORATION CONDENSERS 1K EIGHTEEN TWENTY, PRICE ONE FIFTY 1K 1511 Price one hundred—$1215 Kenyon, price three dollars—all few postpaid to W. Fullerton, Station B, Toledo.

WET RAYS — after we enameled wire, or polish your antenna every day. If your time is worth to us Ohm a cent a day and on your order NOW for the only real antenna wire No. 14, solid copper enameled. Never where it costs only $1.00 per 1000 ft. or 25 cents per hundred (or less). You don't need to be told that the best stands closed provided insulators are the only type to use. Sure Fire insulators are made of the highest grade porcelain, 20 inches long, 2 inch diameter, will hold pounds strong. Only $1.15 each, or $1.00 if you get four or more. Weatherhead $5.00 lightning switch for $1.50. Get a new power transformer, Radiostat 1:2:1, for the filament transformer primary, $6.50, another 750 watt transformer, 1:2:1, Bradleystat too, for the little transformer; Transmitting inductance, coils bracket to RCA, $4.50; 4000-ft 8 tubes $1.00; insert sockets for them, 90 cents; 5-inch inch pyrex pure aluminum 75 cents per square foot, but 50 cents. RCA 0-250 or 0-500 DC milliammeters $5.00, 0-25 Thermo-ammeters $5.00, 0-1 Thermo-ammeters $2.00, 0-2.5 or 3-5 Hot Wire ammeters only $4.00; 5 watt wire leaks $1.15, 50 watt leaks $1.25; General Radio 500-W transformers 75-250 meters, or 150-600, or 375-1500, for receiving 2nd receiver or transmitter, any range $4.50. Extra coils for any range $2.25; All General Radio condensers in stock, and any, they are still the LOWEST LOSS condensers at RADIO PRODUCTS. Receive all the new theory now while give the resistance at 1000 cycles: Dubilier transmitting condensers 1K-1805 .002 mfd 6000 volt Fursalon condenser $1.50 regular price $7.00; 1K-1402 .02 mfd 750 volt filter condensers 2 at $1.50; 1K-1450 1 mfd 1750 volt $2.50 Western Electric 1 mfd 1400 volt $1.00; 1K-1838 choke coil and center $2.00; 1K-1383 power transformer $14.50, 1K-2018 power transformer $17.00, Thordarson 20 watt filament transformer $1.80; 1K-1528 140 mill. filter reactors $1.20, 1K-1685 140 mill. all heavy reactors $2.25, 1K-1684 300 mill. 30 henry $10.00; Jewel thermoammeters $10.00, 1K milliammeters and AC filament voltmeters $6.50; 1K-1685 5 watt rheostat $1.50. Get our new real Main Catalog, the HANDBOOK, full of facts; we'll delight us. A card will bring it, and lets

her 40 out an order for—we'll ship at C. O. D. Please INCLUDE POSTAGE when you send cash with order. C. D. will month. V. F. JOHNSON, 5A1D, Waseca Minn.

WESTERN ELECTRIC 10A Loud speaker outfit; new $50.00; Crystal Radio Type 1A $ transmitter 150-200 meters new $35.00; 1000W Power control panel, $20.00; 500 v. 200 watt generator, Crocker Wheeler, $20.00; 2 -525-510 volt generators in cradle, $2.00; De-Forest MR6 receiver 150-450inch meters, $60.00, coils for same $1.00 each 15 dial amplifier 3 tube $40.00; 2 Type Edison A batteries, 4 volt, 60 A. H., $30.00 ea.; any of above shipped upon receipt of money order, cash, express or 5% 3 tubes 9 tubes and power transformer. W. F. Thompson, 2420 Sedgwick Ave., New York City.

ESCO MOTOR GENERATOR set 2000 v. 300 watts 110 volt 60 cycle A. C. motor and field rheostat new, used one month, perfect condition $100. IKV, E. Ballard, 454 E. 50th St., Chicago, Ill.

HAMS TWO COLOR QSL cards with name and address $5 per hundred. Write for free samples. T. Parker, 28 East St., Fitchburg, Mass. 5AUP.

USE PYREX AND KEEP YOUR MOLASSES AND MUD "INSULATED". PYREX LEAD-IN INSULATORS $3.50; PYREX STRAIN INSULATORS $1.00; TWO STRAIN AND FIVE STRAIN INSULATORS FOR $25.00; PREPAID IN USA. P. F. BRITTAIN, 810 E. 40TH, SEATTLE, WASH.

NAVY TYPE UW 656 TRANSMITTER AND 110 DRIVER COMPLETE. Can be used for broadcasting. Includes keying and modulating equipment, power amplifier, tuned speaker, two current, switchboard, remote control box, two pairs phones, antenna switch and two phone transmitters. Made by Western Electric. Have only SIX COMPLETE SETS left at $300. Hackwood Radio Laboratories, 55 Washington Street, New York.

COUPLED INDUCTANCES, $15.00. PHOTO ON REQUEST. CAPITOL RADIO, LANSING, MICH.

2A SHUTE GENERATOR. Five, eight, double commutator and field, shunted coil, used two fifty watts, four hundred watt lamps, violetone hooded, ring oiled. One ten two twenty volt, half horse, thirty cycle, three phase, new Starlite motor. Perfectly mounted on massive base. Power panel includes mild rheostat, fuses, switches. $145 complete or $75, without motor, otherwise complete. Photo on request. Arnson Russ, Imperial Furniture Company, Grand Rapids, Michigan.

EXPERIMENTAL RADIO by Professor Turner, Indiana University. 45 experiments mimeographed, $1.00 postpaid. For review see July QST page 65. University Book Store, Bloomington, Ind.

SELL—15 Watt Transmitter with Motor-Generator $110. F. W. Brown, 2210 West Lawn Ave., Madison, Wis.

TRANSMITTING AMATEURS Attention—Don't leave those costly lights and meters lying around to be broken. Mount your transmitter on panel. Lamps better, meters better. QST page 30. Buy ready cut out three panel meter holes with no panel lost. Only smooth hole saw to fit inches in diameter, only $2.50 postpaid or C. O. D. Homer H. Salsenig, Whitewater, Wisc. 9EKH.

FOR SALE—ATWATER KENT mounted vario coupler $5.00; 2 Chamber Stan variometers, $3.00 ea. multiformer $10.00; 2 Acme transformers, 1:2:5 each, Jefferson transformer, $1.50, .001 mfd. mounted Pyrex condenser $5.00; .0005 mounted Pyrex condenser $2.00, .0005 Pyrex condenser $1.50 Triple socket $1.00, cheap sockets $.25. All A-1 condition, Merrill Hayes, Box 156, Upland, Pa.

FOR SALE—Two Peerless 6fly watt tubes never used, fifteen dollars each, express collect. For particulars write L. J. Beck, Toledo, Ills.

"RADIO TALL TALES." 25¢ now 3 for 50¢.

FOR SALE—Grebe CR 2 $20.00, with Grebe two-stage amplifier $16.00. C. L. Eight, Sioux, Oregon.

SELL—Lima Motor generator 551 volts 40 watts, one unit, cost $60.00; sell $25.00; Exp motor generator 600 volts, 200 watts 2 unit, cost $225.00 sell $70.00. 10th

operate on 110 volt 60 cycle A. C., like new and mounted in perfect condition. [illegible] [illegible] [illegible] [illegible] [illegible] [illegible], Ft. [illegible], Ia.

HAMS: [illegible] [illegible] [illegible] and [illegible] on [illegible] Call Cards made to order AS YOU WANT THEM. [illegible], [illegible] cents per 100. [illegible] & [illegible], 25 S. Wells St., Chicago, Ill.

Second hand radio goods bought, sold and exchanged. All goods tested and guaranteed; perfect condition. What have you? What do you want? [illegible] Company, 108 [illegible] Avenue, Buffalo, New York.

ENAMELED WIRE NO. [illegible] [illegible] FEET [illegible]; 1000 FEET [illegible]; 500 FEET [illegible]. PREPAID IN USA. [illegible] REINBERGER, AGENT, NORWALK, O.

NOTICE. A card from anyone hearing [illegible] or [illegible] will be appreciated [illegible] [illegible] [illegible] [illegible] [illegible]. [illegible] [illegible] [illegible] [illegible]. C. A. Johnson, [illegible] [illegible], Wynnefield, Philadelphia, Pa.

SELL—Old type Zenith [illegible] [illegible] [illegible]. [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]. [illegible] [illegible], Wheaton, Illinois.

GENERATOR—General Electric heavy duty belt driven [illegible] [illegible] [illegible] watt [illegible]. [illegible] but never used. [illegible] with [illegible]. [illegible] [illegible], [illegible] Lexington, Dayton, Ohio.

HAMS! Before buying CW parts elsewhere, write for advance information on our new line of [illegible] parts out soon. Seattle [illegible], [illegible], [illegible] [illegible] Avenue North, Seattle, Washington.

WESTERN ELECTRIC [illegible] [illegible] [illegible] [illegible] [illegible]. [illegible] [illegible], [illegible] [illegible] St., Chicago, Ill.

SILK PENNANTS MAKE EXCELLENT CHRISTMAS GIFTS. You will be well pleased with one of these beautiful and best quality felt wool pennants. The colors of which are yellow on black. Your call letters are in bold [illegible] and large, [illegible] [illegible] [illegible] [illegible]. [illegible] [illegible] $1.00 [illegible] [illegible] [illegible] letters [illegible] [illegible] [illegible]. [illegible] M. O. or check. [illegible] discount on all club [illegible] of 12 or more. [illegible] Robinson, [illegible] [illegible], Webster Groves, Mo.

SELL: [illegible] [illegible] [illegible] [illegible] transformer [illegible]. [illegible] [illegible] [illegible], [illegible].

Transmitting Tubes. All sizes, new and guaranteed here. Prices reasonable. [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] Transformers. [illegible] [illegible] [illegible]. We have been supplying most of the better [illegible] [illegible] with [illegible] for [illegible] [illegible] [illegible] [illegible]. [illegible] & Co. [illegible] [illegible], Brooklyn, N. Y. [illegible]

FOR SALE—[illegible] [illegible] [illegible] [illegible] [illegible] with [illegible] [illegible] [illegible] tube. [illegible] [illegible] [illegible], [illegible] [illegible], Morristown, N. J.

SUPERHETS [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] and one half [illegible]. [illegible] [illegible]. [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]. [illegible] [illegible] [illegible] [illegible] [illegible]. What have you? ROBERT PARSONS, [illegible] [illegible], [illegible], Mass.

[illegible] [illegible] [illegible] [illegible] [illegible]: [illegible] VOLTMETER [illegible] [illegible] SAME [illegible] [illegible] SAME [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] AMMETER [illegible] [illegible] NEW [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] FILTER CONDENSERS AT [illegible] EACH, [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] MICROPHONE WITH HANDLE [illegible] AMPERE [illegible] [illegible] CURRENT [illegible] [illegible] WESTON [illegible] GALVANOMETER, GOOD FOR WAVEMETERS, ETC. [illegible] [illegible] [illegible] MILLIAMMETER [illegible] WILL TRADE ANY [illegible] [illegible] OF ABOVE FOR GOOD [illegible] TRANSFORMER [illegible] [illegible] WATT TUBES, FILAMENT TRANSFORMER [illegible] C. L. [illegible], [illegible] N. [illegible] ST., CHICAGO, ILL.

For Sale—No. [illegible] [illegible] Transmitter [illegible] W. and [illegible] Hand Microphone, [illegible] and Record Microphone. [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] W. [illegible] [illegible]. [illegible] [illegible] four to six hundred miles on phone. First check for $150.00 [illegible] [illegible] including [illegible]. [illegible]-[illegible] JEWELRY CO., MARSHALL, MO.

[illegible] volt Dynamotor, never been used. A bargain at $[illegible]. [illegible]

[illegible]—Five [illegible] [illegible] [illegible]. [illegible], [illegible] [illegible]. Highest offer takes it. [illegible] [illegible], [illegible], Wis.

SPECIAL BARGAINS IN RADIO AND [illegible] for the month of December ONLY. [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]. [illegible]! [illegible] [illegible] [illegible]. Order DIRECT from this ad. [illegible] [illegible] [illegible] [illegible]; [illegible] and [illegible]. [illegible] [illegible] [illegible] [illegible] RUBBER STAMPS. [illegible] for samples. LOWEST PRICES. [illegible] [illegible] [illegible] PRESS, [illegible] [illegible] Avenue, LAKEWOOD, Ohio. [illegible] [illegible] [illegible] [illegible]. [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible], [illegible] [illegible].

NUMBER SIXTEEN DOUBLE COTTON COVERED COPPER WIRE 100 FEET [illegible], 50 FEET [illegible]. PREPAID IN USA. D. F. REINBERGER, AGENT, NORWALK, O.

WAVEMETERS! 200 METERS, DOWN. PRICE ON REQUEST. [illegible] RADIO LAB. [illegible] [illegible], [illegible] GRANDVIEW AVE., WARREN, OHIO.

EMERSON [illegible] W. [illegible] [illegible] motor generator [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] transformer [illegible] [illegible] [illegible] [illegible], [illegible], [illegible].

STILL GOING STRONG. [illegible] [illegible] new [illegible] [illegible] transmitting parts, guaranteed. [illegible] [illegible] watt transformer, [illegible] [illegible] [illegible] [illegible]; [illegible] [illegible] watt transformer [illegible] [illegible] [illegible] [illegible]; [illegible] [illegible] [illegible] heavy [illegible] [illegible]; [illegible] [illegible] heavy [illegible] [illegible] [illegible]; [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] watt [illegible] transformer [illegible] [illegible] [illegible] [illegible]; [illegible] 150 watt [illegible] transformer [illegible] [illegible] [illegible] [illegible]; [illegible] [illegible] [illegible] [illegible]; [illegible] [illegible] [illegible] milliammeter [illegible]; [illegible] [illegible] [illegible] [illegible] filter condensers [illegible] transformer [illegible]. W. H. [illegible], [illegible] SOUTH SIXTH STREET, NEWARK, N. J.

[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] amplifier [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible], [illegible] N. [illegible] St., Philadelphia, Pa.

GREAT REVIVAL! Audio transformer revival. Your [illegible] [illegible] [illegible] brought back to normal [illegible]. The charge is only $1.50. [illegible] guaranteed [illegible] [illegible]. Send [illegible] now. The Radio Research Laboratory, [illegible], New Bedford, Mass.

PLEASE YOUR AMATEUR FRIEND BY GIVING HIM A HUNDRED ACKNOWLEDGMENT CARDS FOR CHRISTMAS. GET OUR SAMPLES. CHRISTMAS ORDERS [illegible] [illegible] GUARANTEED BEFORE CHRISTMAS IF RECEIVED BEFORE DEC. 20th. WIRELESS ACKNOWLEDGMENT CARD CO., [illegible] SIXTH AVE., [illegible], Pa.

XMAS SPECIALS. [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]. [illegible] tubes [illegible]. [illegible] [illegible] [illegible], [illegible], [illegible] tube [illegible] [illegible] [illegible] [illegible] in [illegible] cabinet, [illegible] parts [illegible]. [illegible] [illegible] [illegible] [illegible], [illegible]; [illegible] [illegible], [illegible] 500 watt [illegible] [illegible]; [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible].

[illegible] meters [illegible] off the [illegible] for [illegible]. [illegible] transmitting and receiving. [illegible] 66 [illegible], N. Y. [illegible]

CARDS PRINTED—[illegible] in 2 inch type, border, any color. $1.50 for 100, $2.25 for 200, $1.00 for 300, $7.00 for 1000 [illegible] made to order, [illegible] per 1000. WRITE [illegible] SAMPLES. [illegible] 2191 HALBERT AVE., MEMPHIS, TENN.

Q R A SECTION

50c straight, with copy in following form only: CALL — NAME — ADDRESS. Any other form takes regular HAM-AD rates.

1[illegible] John M. Wells, [illegible] Main St., Southbridge, Mass.

[illegible] 5 watt. [illegible] L. Vanderpool, [illegible]

[illegible] Cyrus A. Weltgenhammer, [illegible] Washington Place, Bridgeport, Conn.

[illegible] Sherman Holland, Crisfield, Maryland.

[illegible] Thomas B. Wermore, Arden, N. C.

[illegible] H. K. Whittemore [illegible] Grandview Ave., [illegible] Fla.

[illegible] CAMPBELL, [illegible] St., Perry, Okla.

[illegible] John Mitchell, [illegible], Ark.

[illegible] Clair [illegible] Lake Hospital, Eureka, Calif.

[illegible] Box [illegible] 242 [illegible] St., [illegible], Calif.

[illegible]—[illegible] Polytechnic School, San Luis Obispo, Calif.

[illegible] Morris [illegible] Place, Pomona, Calif.

[illegible] Glenwood Ave., Cincinnati, O.

MISTAKE IN LAST [illegible] BOOK [illegible] Seward Bell, [illegible] Avenue, Williamsport, Pa.

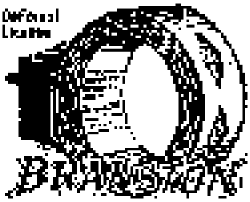
[illegible] R. Warner, [illegible] N. [illegible] St., Wilkesbarre, Pa.

[illegible] C. Ferguson, Monongah, [illegible] Co., [illegible]

[illegible] Noel [illegible] 161 [illegible] St., Buffalo, N. Y.

[illegible] William M. [illegible] Lakewood Ave., Chicago, Ill.

[illegible] Thomas J. [illegible] Grand Ave., Port Washington, Wis.



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Back and Front Panel Mountings

Plain or Geared

Genuine Bakelite

[illegible]

Send [illegible] for Super Heterodyne, Radio Frequency and Honeycomb Coil Circuits and Complete Catalog.

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Bargains!!

WAVECHANGER

One [illegible] type [illegible] Wave Changer and Loading Coil, Inductive Coupler, [illegible] Wave Lengths manufactured by the Electrical [illegible] Company.

This outfit originally cost [illegible]

Our Price $350.00

Brand new, never used, condition guaranteed.

AMMETERS

Eighteen [illegible] only Radio Frequency Ammeters, 0-20, manufacturers price [illegible] each.

Our Price $25.00 each.

INSULATORS

[illegible] ELECTROSE [illegible] Insulators. Manufacturers price [illegible]

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All of the above material was purchased by us from the U. S. Navy Department, and made in accordance with Navy specifications.

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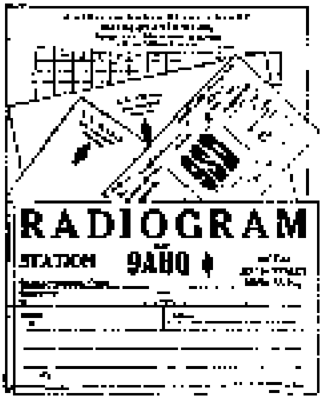
J. C. BERKWIT COMPANY

25 Beaver Street New York City

Send No Money



[illegible] Call Cards [illegible] Radiograms [illegible] League Member.

ORDER NOW.

YOUR OWN Name, Address and Station Printed FREE

[illegible] Radiograms: [illegible]

MONEY REFUNDED if not DELIGHTED

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RADIO PRINTERS, 19 Main St., Mendota, Ill.

REDUCE
Operating Costs

Thousands of people are already cutting their "B" Battery costs one-half, or more than one-third, by using the new Eveready "B" Battery No. 770 on their heavy drain sets.

This new Eveready Heavy Duty Battery marks a marvelous advance in reducing "B" Battery costs.

If your "B" Batteries have lasted only two months on a five or six tube receiver, this Eveready Heavy Duty "B" Battery will increase the service two to three times.

Use this Eveready Heavy Duty "B" Battery on any receiving set on which the "B" Batteries last less than four months. When thus used to its full capacity, it is the cheapest as well as the best source of "B" energy ever offered.

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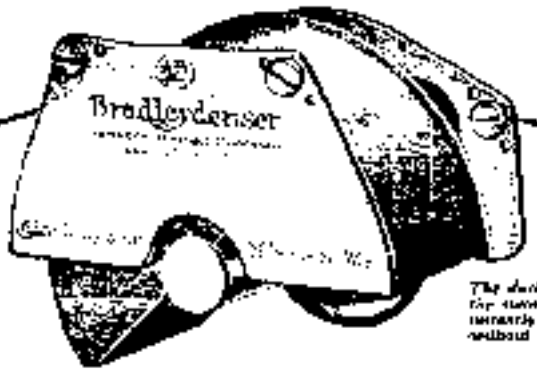
EVEREADY
Radio Batteries
—they last longer

—FOR YOUR CONVENIENCE—

QST'S INDEX OF ADVERTISERS

IN THIS ISSUE

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS



The shaft cap over the rotor plates is instantly removable without tools

A Low-Loss Condenser for Selective Receivers

All plates are solid brass, carefully selected as to purity. The Bradleydenser resistance does not increase even after long use.

THE New Bradleydenser embodies many new and important features that contribute to its high efficiency and low loss. One of the most significant innovations is the omission of the outer end-plate and the substitution of a unique bearing that maintains rigid alignment of the rotor plates without the use of unnecessary insulating or di-electric end-plates. There is almost no di-electric material in the Bradleydenser to absorb energy from the antenna oscillations.

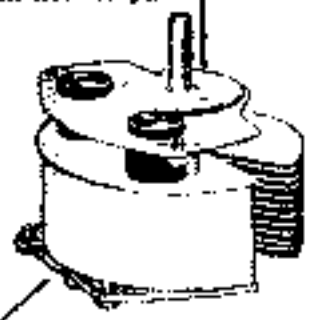
The minimum capacity also is low, affording a wide range of control. This is an important advantage in sets to be operated from loops.

We shall be glad to send you complete information about the Bradleydenser. Drop us a line, today!

Standard Ratings and Prices

0.00025	M-F.	$4.50
0.0005	M-F.	5.00
0.001	M-F.	6.00

The Bradleydenser has no center posts. The shaft is free to be any standard size.



Notice the spacing relation of stationary and rotor plates. The dielectric loss is, therefore, very low.

Allen-Bradley Co.
Electric Controlling Apparatus
277 Greenfield Avenue
Milwaukee, Wisconsin

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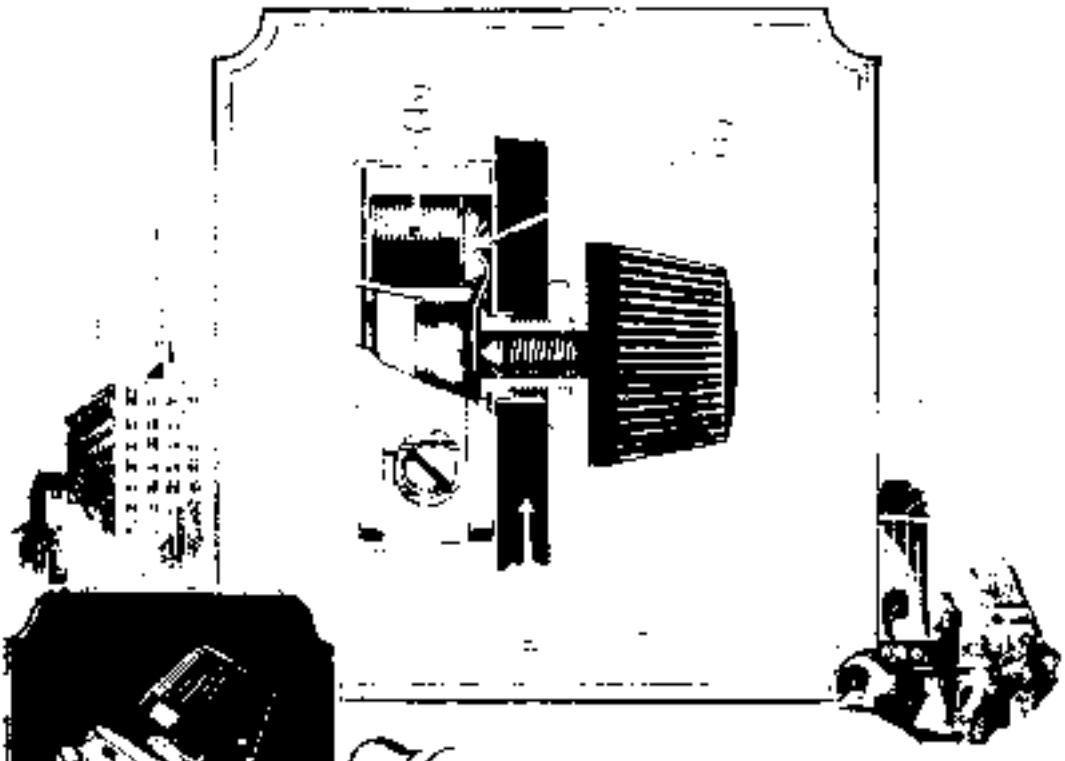
Another Allen-Bradley Radio Device of the same perfection and quality as the Universal Bradleystat



The Bradleystat

Supreme in design and performance

Apart from the novel "one-hole mounting" that characterizes the Allen-Bradley line of radio devices, the most striking new feature is the extreme compactness of the graphite disc resistance. When mounted on the panel, the new Bradleystat extends less than three-quarters of an inch behind the panel. The same is true of the Bradleyleak and the Bradleyohm. And the Bradleyometer extends only seven-eighths of an inch.

You can improve your radio set immensely by substituting a Bradleystat for your present wire rheostat or a Bradleyleak for your old grid leak. There's plenty of room. Try it!

Important Features

1. Two terminals only for ALL sizes.
2. Panel projection only [illegible] inch.
3. Holes for one-hole mounting provided.
4. Graphite [illegible] resistance less [illegible].
5. Does not switch [illegible] circuit.
6. One [illegible] resistance [illegible] to 1/4 to 10 ohms.
7. Also [illegible] Bradleystat [illegible].
8. Dial [illegible] one hole [illegible].

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Electric Controlling Apparatus
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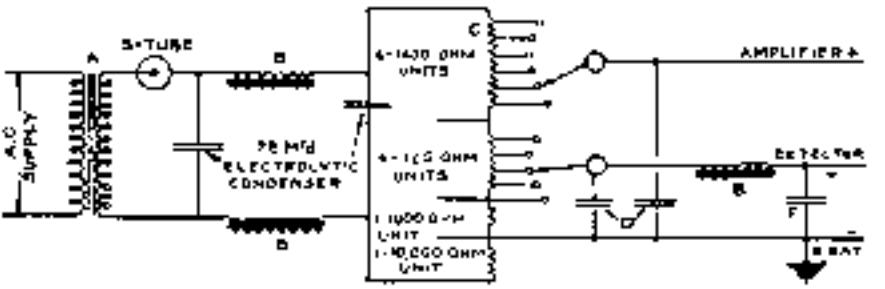


Circuit Using AMRAD "S" Tube and Modern Electrolytic Condenser

S-Tube as "B" Battery Supply

One of the most popular uses of the "S" Tube and Electrolytic Condenser is to eliminate B-Batteries. The circuit above shows the wiring and indicates the necessary parts.

A similar B-Battery eliminator, using "S" Tube and Electrolytic Condensers, was described in September "Radio Broadcast," P. 286.

To get rid of the Batteries and use the usual 110 volt A.C. of the house lighting circuit to supply the necessary heater and amplifier voltages, has been the ideal of the amateur. Results obtained have been most satisfactory, thus opening an entirely new field.

New "S" Tube
4000-1
$10.00

Write for latest "S" Tube Literature

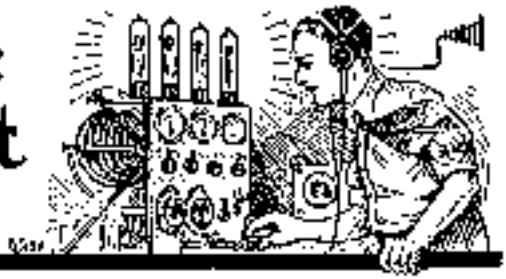
Electrolytic
Condenser
$6.00

AMERICAN RADIO AND RESEARCH CORPORATION

Dept. Q Medford Hillside, Mass.

The Traffic Department

F. H. Schnell, Traffic Manager
1045 Main St., Hartford, Conn.



Outshadowing everything that has gone before, in the way of work for our U. S. Navy, was the work of the radio amateurs in keeping watch on NERK, the U. S. S. Shenandoah, during her flight from Lakehurst, N. J., to Tacoma City, Washington, and return. The co-operation extended by the amateurs to the Navy Department is very well pictured in the following message which was broadcast from NKF on Navy Day, October 27th:

"From: Secretary of the Navy.

To: Amateur Radio Operators of the United States.

1. The co-operation of the amateur radio operators with the Naval Research Laboratory has resulted in increasing the communication efficiency of our Navy. The new long distance communication records made by the Shenandoah are a direct result of your co-operation.

2. Interest such as you have shown in the Navy in time of peace is the country's best guarantee of our Navy's readiness when called upon for our country's defense.

3. It seems appropriate, therefore, that on Navy Day, which coincides with the completion of the wonderful transcontinental flight of the Shenandoah, I congratulate and thank you for your contributions toward a better and more efficient Navy.

Curtis D. Wilbur."

At the request of Dr. A. Hoyt Taylor, Radio Division, U. S. Naval Research Laboratory, the A.R.R.L. supplied the calls of stations operating on 75 to 90 meters for communication with NERK, who was on 91 meters. NKF, on 64.6 and 82 meters was the station to be relied upon for all communication, and only in event of failure to hookup with NKF was NERK to work amateurs. However, things went so smoothly that there was plenty of time for NKF and amateurs to work NERK. At times NERK'S note seemed a bit wobbly, but all during the voyage from October 7th to October 25th there wasn't a minute of the day or night that some amateur wasn't on watch for her. Not once was the 91 meter wave used, unless some amateur heard it. It was great work, gang, and while the T.M. was at NKF October 25th, Dr. Taylor said that he was more than pleased with the splendid co-operation of the amateurs.

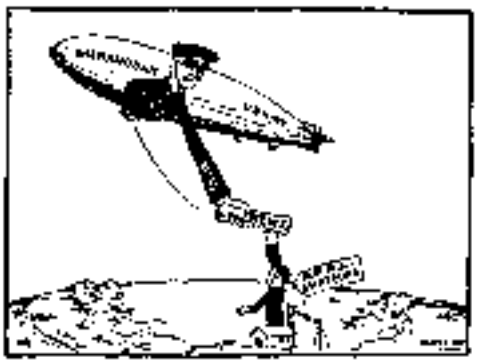
Of the logs received, we are able to give some information as to what stations were on the job for NERK. Since we are not mind readers, and because logs from other stations have not been received, although we put in a plea for them, we cannot give full credit to those stations because we have no details and next month will be too late. MIM!

TEO seems to have the best reception record, he having copied NERK each day or night from October 8th to 20th. Too bad he didn't get a chance for QSO, because he surely was on the job every minute. 6YB did some fine work in all departments. A complete station was rigged up in eight hours; a blinker was in operation and a motorcycle and rider was available for any emergency. In addition, six operators stood watches. 6YB was QSO NERK October 9th, QSR'ing a Government message, and again on the 22nd. NERK was heard on the 8, 10, 11, 12, 14, 18, 19, and 20. 6YB's log was complete and nearly the whole story is told therein. 7EO heard NERK on the 10, 15, 16, 17, and

A.R.R.L. Headquarters Station, Call 1MK, 1045 Main Street, Hartford, Conn., is on the air (75 to 90 meters) every noon from 12:00 to 1:00 P. M. and from 5:00 to 6:00 P. M., E.S.T. Let's have your traffic, OM! The operators and their personnel signs are: A. A. Hebert, "AH"; C. A. Service, Jr., "CS"; F. H. Schnell, "FS"; F. C. Heckley, "HEEK"; K. B. Warner, "KB"; L. W. Hatry, "KN"; S. Kruse, "LQ"; A. L. Budlong, "BUD"; J. M. Clayton, "ZL".

finally on the 18 got his chance and took a load of press from her, which he had to "haul" to McMinnville, Oregon, seven miles away, because his W.U. man was off watch. (7EO!) 6BUR took two Government Msgs October 10 after hearing her on the 9th. 6AFN, with his gang, didn't

let a thing get by on the 9th when they were QSO NERK also copying everything on 975 meters. IXW intercepted press on the 7th and copied her nearly every night during the trip out and QSO NERK while she was near El Paso, Texas. 4XE reports NERK every night but one up to the 14th. No further reports. 7ZU logged her October 9 and 10; 6AWT, 9; 6WI, 9 and 22; 6AJT, 8, 9, 10; 6BZ, 9; 6ZZ, 10; 6XBH, 7 and 8. The following stations seemed to



have some connection with NERK: 7AFO, 7AFN, 6AGE, 6CMH, 6JF, 6CCW, 6BBH, 5DW, 5HW, 6CFZ, 6AUV, 6UF; but since we are depending upon amateur telegraphy and not mental telepathy for our information, we are only sorry they didn't give us copies of their logs for this story.

Certainly some of us have poor fists! But it goes further than that—some have rotten, terrible, sloppy fists, and if we were to sum up the kicks from the amateurs of Australia, New Zealand, South America, England, France, Holland and Italy, we would have to go still further. Aside from our fists, some of us don't seem to have much gray matter. The past month has brought us a whole swarm of this sort of stuff, and it must be true. The foreign hams tell us to tie a can to the hog and erotic key, unless we are absolutely sure we know how to use them. That's right! Just for the sake of verifying some of these kicks, this T.M. went home with the idea of listening to this game to see if it was so. Well, the things we heard in the course of about four nights were not as bad as the foreigners had said—it was worse! Terrible! Funny, too, we had often heard these same things but just passed them by hoping they would improve.

What we ought to have is a code instruction class for some amateurs who think they know how to send, but really we've heard riveting hammers that were far better. There ought to be a class for "CQ Hounds". Haven't we tried and tried to get over to you the proper way to use CQ without making a hound of yourself? Get out May 1923 *QST* and read the story on page 20. That is the way the foreign amateurs want you to do it. Don't try to see how long you can call CQ without signing, and see how long you can keep it up at one stretch before your arm gets tired. Ye Gawds! Why do we have to keep using valuable space, that could be put to better use, by telling you these things month in and month out?

In the four nights we listened at 1XW-1MO, we logged 67 amateurs, who, in our judgment, had rotten fists. While we do not claim to be FA on good and bad fists, we do believe we know a rotten one when we hear it. There are times when two hams are working together and who understand each other and know how to chop their stuff so each will understand the other, and we are not counting that, but we refer to amateurs who have rotten fists right along. Then we ran across the "CQ Hound"—we logged 81 of his kind, some of which were in the R.F. class. Along with them was the long caller and short signer—the chap who calls about 40 times and signs once, and then so poorly his call could not be recognized. We were able to count 26 known and perhaps that many more unknown because of bum fists.

The four nights were so interesting that we've decided to make a habit of logging these chaps under three different heads, Rotten Fists, CQ Hounds, and Long Callers, and if we have any luck, providing it is bad enough, we hope to be able to present the calls in this department next month.

Now for more pleasant things. Word comes from French 8AB, our good friend Deley, that he also is QSO Argentina and New Zealand as are the British hams. By the way, FSAB and the two New Zealand hams we heard have very good fists, Z2AC and Z4AA. A great many British amateurs are using code words and transmitting them practically every night in order to determine the most consistent transmitter for the entire season. Code words are on file with the T.M. for verification. The waves in use are between 80 and 120 meters. FSAB will be on the air every Wednesday and Saturday night at 10:30 P.M., E.S.T., on about 85-90 meters. B. D. Vermani of Lahore, India, probably is on the air now with 250 watts on 100 meters. Several Egyptian amateurs have broken into the game, too. We're getting on toward that "Round the World Relay by Amateur Radio".

A complete list of every O.R.S. station has been sent to every O.R.S. This list appears in alphabetical order by calls. If you are interested in becoming an O.R.S., write to your D.S., A.D.M., or D.M. There is plenty of room for more O.R.S.'s, but we want only those which can and will be a credit to amateur radio and the A.R.R.L. How about you, OM?

Official A.R.R.L. broadcasts are sent every Saturday and Sunday night. (75-80 meters, 8:00 P.M.; 150-200 meters, 10:30 P.M.)

ATLANTIC DIVISION
C. H. Stewart, Mgr.

The DM was out of commission with an attack of LaGrippe that got him out for two weeks, the result being that many of the divisional affairs suffered a set-back. However, the time of getting QRS Certificates out to the fellows will be reduced to make up for lost time and no trouble should be experienced in the future.

The report from West Penn is mixing this month—something unusual but these happened with PEW as he always gets them thrown on time and in line order. Eastern Penn: EN traffic has taken a decided increase on short waves. Many stations are prepared to get down and use the 75-80 meter band and still further increase is expected. SDV has completely recovered from illness to succeed DAPF in getting out great QR increase. IIAO on 1c on the air with a complete new outfit, also. 2CNC, WBPN, and 3IBN keep traffic going ok. 2OS worked all Districts and Canada in three hours, using 2 Watts. DAPF continues to bat 'em out in all directions. 2CSC, 2 Watts, has reached England and New Zealand. QSS 3DM and 3BRF are opening a new station together. 3ARP will assist at 3XE. Most up-state stations are operated over the week end because of the gang being away at college during the week. In district No. 4, the ghost of 4 fever is showing out all over. 3GOO worked a bunch of west coasters and QRSF the first crack out of the box. WIFR, 1 Watt, has been heard across the Atlantic. WIFE has been appointed EM of Williamsport. QRA, C. E. Dell, 268 Union Ave.

Traffic: 3WM, 15; 3QV, 9; 3BNC, 49; 3DIC, 10; 3CTE, 2; 3AVL, 2; 3CIN, 24; 3MQ, 22; 3TP, 26; WBPN, 17; 3JHN, 0; 3CMT, 12; 3AUV, 52; 3UG, 15; 3ZO 303; 3ACU, 33; 3CCQ, 32; 3HVL, 37; 3BTU, 28; 3HD, 3; 3TE, 11. (Fine work report V. M.)

DIST. OF COLUMBIA: Practically every station in town on the short waves. 3IIX, 3UPV, and 3UIS, have been going all summer and there will be no letup this winter. 3WHV has been doing some nice work, although he is a newcomer. Miss 3CDQ, the "OYL" of the District, has put up a mono-pivot antenna and threatens to DX or bust. 3BPP and 3CBJ have put up new antennas. 3AII is getting back into operation, too. Wilson, 0AU, 3UWT will have a dual system, one on short waves and one on about 180 meters.

Traffic: 3BWT, 10; 3DPP, 16.

Dist. No. 6, of New Jersey, is the only report on hand. More traffic than ever is going through the section and with great speed, too. 3CS-3ZI is on the air and with a nice new 10 meter is going good. 3QBX is doing good work with his new meter rig also. Reeder PA every night and has been heard in England. 3KAN has been going strong and handling the share of traffic. 3KAN, 2XIS and 2XF are organizing a short wave net of the points along lines of the Public Service Electric Company, between Newark and Camden. Several test messages were started from headquarters without pre-arranged schedule. These messages were addressed to the respective heads of the dispatchers along the route and in less than an hour and a half answers were received back by telephone stating that all emergency test messages had been received ok. (By FF—T. M. and this have more of this DX dope).

Traffic: 3UBX, 14; 3KAN, 43; 3AEF, 5; 3UAY 36; 3UBI, 4; 3ZTQ, 10; 3BWT, 5; 2CFH, 7; 3AIL, 17; 3AE 77; 3PCQ, 68.

CENTRAL DIVISION
R. H. G. Mathews, Mgr.

MICHIGAN—The Fourth Annual Michigan A. R. R. L. Convention will be held in Lansing in February. We are in time to make this the best yet.

Dist. No. 1: The report this month looks rather blue, however, there are two reports early coming in from this office for the number of C.W.A. in the District.

It is time to head for the next Michigan convention at Lansing in February. If we all learn plans now this convention will be the biggest yet; some burning a helping hand to-know and all plan to be there if possible.

Dist. No. 2: On October 6 the Third District had a meeting at 8QTY, Kalamazoo, at which 12 members of district No. 3 were present. A hilarious time was had by all. 8KY won the trip's contest only because 8GS and 8NK could not take part. The gang, outside of 8KY, don't seem to be doing much on short waves, although several are still experimenting. 8IS worked thirty stations the first time he tried his new 5 watt set—8 inch spiraling. Jon 8CPB leads the district this month.

Dist. No. 3: 8QPS is back on now for the fall and winter and working out great. 8CNQ and 8UIC are running on a portion of the aviation field at Saint Ignace. 8AEB is working in the Alaska. 8XK will be out of radio for some time on account of school. 8CWK worked 8KY in daylight on 5 watts.

Dist. No. 4: 9UOH and 9GWL are both off the air at present.

Traffic: 9CED, 305; KAUW, 74; 8TOK, 58; 9DAZ, 50; 9LR, 44; 9CFY, 35; 9UVO, 36, 8AEB, 33; 9IKS, 27; 9NK, 21; 8DOO, 20; 8BTF, 21; 8DKP, 21; 9CWT, 12; 8DUT 18; 8SZ, 17; 8ZF 16; 8BQC, 15; 9DD, 14; 8CKP, 13; 9IUD, 12; 9CUW, 11; 8AUR 11; 8ZL, 9; 9IJH, 7; 8AMS, 6; 8WA, 3.

ILLINOIS—The general condition seems to be on the upgrade.

The D. C. of Dist. No. 1 has resigned. 9SQ on with spark using 1½ is getting 8.3 amps from one 5 watter. 9DAY just returned from a Pacific coast trip. He and 9WH are attending the U. of I. 9CTY is screening schedules for the winter and will be on with a good net. A lot of stations could take a lesson from 9CTY's method of handling traffic. 9DLO says on it's on the message side of the station. 9BUK is getting great DX on 80 meters and has worked all districts in U. S. and Canada, but the 5th, also Mexico. 9UBX is working on 10 meters. 9AIC is very QRW and is only on early Sunday mornings. 9DXL has been reconstructing for the past month. 9AUH has changed to the 4 coil Meissner and finds it so sharp he can't use anyone. 9LZL is also using the 4 coil Meissner with CRAC. He is using the Tuscola Gazette in August QST and is the "Barrett." The report from district No. 8 was returned to the A. R. M. because it did not follow the proper form. 9BUX opened up this month with two QSs and is knocking the wires for a goal. 9CLS erected a stick and strung up a couple wires and is working on 80 meters, which is for the better. 9CCI on Sept. 24th worked 6VE on 0-45 P. M., C. S. T. and as the car sat at 6-40 most of the distance was covered in quicksh. 9LJ was worked a few days later at 9 P. M. All this on 40 meters. 9CXL has a little hard luck when his radio shack burned down and he will be out of the game for the duration. 9AU is on 80 meters with two 9UIC. 9BCC is attending the U. of I. The report for district 9 did not come up to standard form and was returned by the A. R. M.

Bill Kingsley of Dist No. 6 is very QRW with work. 9DGW went off and came back in a lightly coupled circuit—Mrs. Widman. We are glad to hear 9CLY on the air again. 9GUW got up a new record. 9BNA got out in 43 states. Although 9CBU is crowing the CW, he still has time for the C. W. Convention. PAAW has put in a 5 Mile set also. If rags there is a method in his madness though. For talking of the Chicago Radio Traffic Association and the A.R.R.L. to the extent of buying the S.O.L.a got an earful of instructive information. 9BC is still sticking on 10W. 9UBX is out on the high waves and for some reason can only be [illegible] Jones. We would suggest 9UBX's mouth—A.D.M. The C. M. record that a number of stations report direct to the P. M., A. R. M., or U. S. Report only to your C. M. if not have one and get your report to him by the 15th of the month.

Traffic: 9CBU, 174; 9BNA, 111; 9CTY, 88; 9DGF, 45; 9BBE, 38; 9AHO, 29; 9DLR, 22; 9UUK, 20; 9BC, 17; 9UVW 29; 9BC, 25; 9CUK, 20; 9AAW 20; 9CUV, 19; 9AYF, 14; 9DWX 12; 9DNP 10; 9CVT 10; 9ADK, 15; 9UUK, 15 9BXL, 12; 9CW, 11; 9DHD 8, 9CLZ, 12; 9NC, 12; 9UAY 12; 9ENG, 10; 9CA, 9; 9DKK, 8; 9AHJ, 8; 9CXL, 4; 9ALL, 3; 9ADF, 2; 9EPQ, 2; 9TS 2; 9CWS 2; 9UBX 2; 9AIF, 2; 9DXL, 2; 9AUH, 1.

SOUTHERN INDIANA—9DUR is back on the job as D. C. of Dist. No. 5 and things there are looking up. 9CUK is handling the bulk of the traffic in the south end. 9BS is putting in part time at 9DUW working 80 watts on 80 meters. 9UVZ, on 40 meters, works the west coast quite

regularly. 9AS. has just started up at the Speedway with a 5 watter and now A. C. 9IGT is off to Purdue Univ. 9AUK is married, has sold his outfit and will be off indefinitely.

Bulletin No 8 is Club No 3 established two days apiece, 9ANF and 9ANH to locate at Orange prior. They also have appointed a committee to help keep prior with the U. C. L.s.

Traffic: 9IAR, 70; 9EJJ, 35; 9VIS, 21; 9BVB, 14; 9CMC, 12; 9BB, 10; 9AWU, 10; 9IAS, 10; 9BKS, 10; 9CUR, 8; 9IFI, 7; 9AQE, —; 9JIB, 7; 9BUW, 6; 9ADA, 6; 9AUW, 4; 9CBA, 2; 9AFJ, 1

KENTUCKY—Traffic has been moving very slowly. 9CL has been doing very good work. 9EJJ is busy with football. 9AIH is going DX with 5; 9MN has been doing great DX on 80 meters—works most coast locals every night; 9DXN is 5 watter also plays with 9TT is on again and going good. 9DAW has moved his set to Wilmore where at school and will soon be operating under a 9 call. 9IGU has been moving generator trouble but the trouble shot and has been rolled back into service.

Traffic: 9EJJ, 45; 9CTT, 15; 9MN, 26; 9AIH, 16; 9EJL, 11; 9BP, 11; 9FJN, 10

OHIO—Dist. No. 1: 8ZG is ready to go with a new mast. 8CIS is not with a 50watt 61 transformer. Distance is going out. coast. On to meters, 8XV carpet mops the meter but works both coasts o'nite. 8LU is going on 20 but is going to rebuild so as to have two sets—20 watts on 20 and 250 watts on 75 meters. 8AND blew his rig and was out most of the month. Findlay is mostly selecting. 8AHO and 8UFW in particular. 8BAL, a newcomer to the city, cannot get trans. 8BN needs to get a new batch of messages. 8CIL is the only location in Lima. 8AA is rebuilding a 50 meter antenna and transmitter with 50 watts for power.

Dist. No. 2: 8CXM is trying to interchange schedules on brand's but more luck. 8ANM is doing DX 4 and Medway circuit. 8XT-8ZB-8CX is back on the air again on 75 meter. 8CC will be off the air until 8VT is finished. 8HIC has been rebuilding. 8HCK is on 75 meters.

Dist. No. 3: 8UMX leads the district this month. 8CVT worked W6BI and is knocking off Oc and Tex. 8DKH is out here four nights over the week-end and ties up with some of the New and west. 8PT, 8SWK, 8ADA and 8DAE are also working the Pacific coast. 8BVK is back from Europe now and is on the air regularly. Arkansas is getting in shape. 8AUW has a 160 antenna.

Dist. No. 4: 8CWH expects to be going good soon. 8CWU is pretty busy. 8VX has 11 points here. 8CW is rebuilding it so as to be DX proof trans. 8CNH has been on a vacation. 8AUW will let them see in since the convention as ever. 8ANE-8ZAH is going on with a new 40W trans.

Dist. No. 5: New D.S. for the district is H. C. Slack, 615 Carpenter Ave., Columbus, Ohio. 8BO lost most of his set in a fire. 8AVN will have a second op also in 8DEM. 8VW is working both coasts 75 to 150 meters and 150-200 meters. 8UWF and 8FL are DX on 40 meters. 8BUH is also DX on 40 meters.

Dist. No. 6: The new D.S. is H. J. Rischell, 119 Perry St., Akron, Ohio.

Traffic: 8QV, 90; 8HN, 70; 8DMX, 46; 8CCI, 31; 8KAM, 29; 8FL, 23; 8CVT, 23; 8QHQ, —; 8EP, 20; 8ANS, 15; 8UAM, 13; 8UEN, 10; 8AWS, 9; 8AIA, 8; 8YX, 8; 8PLT, 7; 8ZW, 6; 8AAJ, 5; 8CUJ, 5; 8AUW, 5; 8CNF, 5; 8FJ, 5; 8UQI, 5; 8PU, 5; 8DND, 2; 8ASM, 2; 8WS, 2; 8BVB, 2; 8GW, 8; 8ENH, 1.

WISCONSIN—The most important event of the month took place over the past week-end in the vicinity of Wisconsin and a few from surrounding territories gathered at Madison on August 25-26 to hold their second annual state traffic meeting. It was a three-way affair starting Saturday night with a banquet at the Madison Y. M. C. A. and following with a radio meeting on Sunday afternoon. The meeting was presided over by Director N. Crapo, A.D.M. of Wisconsin, and the following men gave interesting addresses: E. H. C. Mathews, T. M. Miller, H. E. Corbly and short talks by all the prominent operators present.

The Technical meeting was very well attended and among those who spoke at this meeting were: S. [illegible] Proudfoot, R. M. Miller, W. R. Schnitz, Fred W. B. Corbly, John E. Kraft Mr. Hoffman, E. H. H. Mathews, F. S. Peterbrick.

At the organization meeting the Wisconsin A. R. R. L. Area was thoroughly organized and the following officers and directors chosen: President, G. N. Crapo, 9VD; vice-president, K. C. Black, 9ADA; second vice-president, M. A. Bishop, 9DBH; secretary, C. L. Amann, 9AUK; Directors: V. Wright, 9DZL; W. E. Bridges, 9BVB; E. T. Howell, 9CVT, E. F. Mayo, 9AZA; M. H. Hinton, 9DHG, H. C. Austin, 9AEL, C. E. Pedersen, 9UMP, and C. N. Crapo, 9VD

The first two directors represent each of the two A.R.R.L. traffic districts in Wisconsin and the next two representing the patching department and the A.D.M. for Wisconsin to preside at all meetings. Behind an executive director. Membership in the organization is limited to A.R.R.L. members. The association is to be incorporated as soon as possible and affiliations with the A.R.R.L. has been applied for. There are a dollar a year possible in advance. All W.A.C. port designs, of reports in the organization may be sent to correspondence with the secretary, Mr. C. C. Austin, 1215 Drake St., Madison.

Dist. No. 1: 9CIT works 1900 mi in daylight on short waves and quite a bit on all districts. 9HW works first district in daylight on new short antenna. 9DJK has new 50 C. mast. New aerial and counterpoise setup enumerated wins and working all districts on 40 meters. 9CVT has been laid up on the hospital. 9UXH reports rebuilding station and testing system.

Dist. No. 2: 9QN is going fine with 5 watts and getting out ultra although western traffic is rather sure. 9KAE states he has been in a hurry as he has to rebuild practically his in the heavy wind. 9KRB and 9UCP going strong. 9CWX, our star station, says small is picking up and get about ready to put up a mast in June. 9DXV had hard luck trying to raise an 80 footer, it came down in three pieces. He is working down to 80 meters. 9QCH is putting in a 250 watt bottle with M.C. 9OCF is operating on 80 meters now with 9KUC he puts his out. 9AAE has succeeded in raising a 74 foot mast and will be on the air soon.

Dist. No. 3: 9BVB says that on 80 meters it's hard to connect under 500 miles but rose up to 2100. 9AUO is doing the DX now connecting with the 6's and 10's daily. 9AUP says everything is quiet in his section. 9BVA has been heard on autumn evenings and is doing better work. 9AFT is working on schedule and reports traffic scarce. 9BUS sends traffic into by mail but no news. 9BVI is overhauling his set in preparation for the winter. 9CFT has been off the air but is getting ready for the winter season.

Dist. No. 4: 9AIJ has a card from Admiral Byrd, visiting Regions of Mexico and Bar plans. 9AZN has two miles of his traffic in traffic work in the two in Schenectady. 9DSU got into the game early. 9DPJ, newly appointed O.R.S. is arranging a new mast. 9ASY is back on the air with a 50 watter 1A1. 9HRC is using 50 watts also working on 150 meters. 9CFX is rebuilding again

Dist. No. 5: 9BIF is in a ribbon election on 5 meter with considerable success. 9AG reports damage by a storm but will be back with low DX soon. 9LTH is operating on 75 meters. 9DPR is on 160.

[illegible] 9WZ, 11; 9AIJ, 95; 9T, 47; 9AZN, 42; 9DSU, 11; 9AUP, 10; 9CJL, 21; 9BVB, 20; 9WIX, 32; 9LTH, 22; 9BVI, 21; 9CFT, 19; 9AIA, 18; 9AGT, 17; 9BVA, 16; 9CDP, 13; 9CPR, 12; 9HRC, 12; 9WAB, 11; 9NV, 11; 9CBV, 9; 9BSD, 9; 9BSV, 9; 9AQD, 9; 9ZEG, 8; 9PHK, 8; 9CD, 6; 9BGI, 5; 9DCV, 4; 9ARV, 1; 9BQB, 2; 9BHC, 1.

MINNESOTA—Dist. No. 1: 9HC is attending Purdue University. 9DIX is registered at C.E. of Fort Wayne. Mosier was visited by [illegible] 9UHA is some kid. He was of the Minnie Belles are laid up. 9UNE is working for a New Brighton. 9AZN the D.S. is still in 9BH W. Bush St. Marion, Ind. and will be glad to see.

9APO is here again for reports on traffic moving.

Traffic: 9BIA, 29; 9DLA, 25; 9DEI, 23; 9AZN, 20; 9QHS, 14; 9CIA, 14; 9AFJ, 12; 9CSV, 10; 9AXX, 8; 9AIT, 5; 9CVK, 4

DAKOTA DIVISION
W. C. Wallace, Mgr.

NORTH DAKOTA—Dist. No. 1: Things rather quiet but seem to be improving. Our new stations are all busy with things besides amateur radio and

it is taking on our record. 9CSL, 9AEJ, 9DNX, 9ANP, 9CBG are all doing fine work.

Dist. No. 2: 9DM has lower "miles" to send in his report on account of the summer. The district superintendent is having trouble with his antenna but he swears he will be on the air soon.

The A.R.R.L. believes that the Minneapolis convention will do more to awaken the amateurs to real work than any thing that could possibly be done. After the convention undoubtedly every station will be going full blast. The amateur needs something of great value to keep him up and get things going again. 9ABH has been appointed O.B.S.

Traffic: 9ANP, 31; 9CBG, 6; 9CSL, 5; 9DNX, 8.

MINNESOTA—U.S. certificates have been issued to the following: 9ASK, 9CW, 9CMN, 9DPU, 9DQV, 9DYX, 9EK, 9EXI, 9AWM.

Dist. No. 1: D.S. Hayes says he came in the first district to show us getting started this year and they are really "over with their reports. He intends to not alter them. The D.S. is also planning several through routes for reliable communication between what were formerly distant communication centers.

Dist. No. 9: 9BS, Stillwater is certainly on the job testing out both N. Y. and other stations in his district "tied up for traffic. 9DUF has worked Mexico City, M.U.H., using 45 and 83 meter waves. 9DCH has had bad luck with his 60 foot mast which the wind wrecked the day after it was put up. 9ANJ has worked Europe in daylight and 9CMS is remade the "station of "last week. 9EKJ is back from camp and 9CLG has a new 60 foot Lapite mast ready for the static. 9AAB will not be on this year. 9CMM is now 9DLV.

Dist. No. 7: D.S. Smoky reports very little done in the Twin Cities territory this month but this is doubtless the calm before the storm, as the Dakota division convention comes at the latter part of the month. All is "well stored, expected. There is great activity on 40 meters, however. 9EK is 9DYQ at 75 and 9EXI at Sioux Minneapolis. 9BT is working Mexicans "like a guard.

Traffic: 9AE, No. 1; 9CDV, 295; 9CD, 55; 9CCG, 11; 9DXT, 21. Dist. No. 2: 9CSP, 2; 9BFV, 27; 9DCP, 81; 9CMS, 6; 9DNT, 11; 9CCG, 2; 9DFF-9BRX, 4; 9EW, 1; 9AAJ, 53; 9CPG, 4; Dist. No. 3: 9CRA, 97; 9DPX, 5; 9DGS, 7; 9DPS, 71; 9DYK, 4; 9ASW, 1; 9BGV, 1; 9DNV, 1; 9CCK, 15; 9CP, 81; 9DDS, 1; 9DFY, 95; 9DQJ, 59; 9EK, 2.

SOUTH DAKOTA—The gang is not down nor counted out but with the hot DX on the job and a few more new O.B.S. we will be back again at about their usual place.

Dist. No. 1: 9BOF finds the static a very busy guy for month and is a good way to tune your traffic. 9CHF has been QRT but is back again for keeps this time.

Dist. No. 2: 9AEF is trying up a new crystal system and reports to get out better things we don't know what before he wants. 9CAA is getting ready for some short wave work and is getting the 5" all lined up. 9DHS is a new O.B.S. but not yet by correspondence. 9CAD, the O.B.S., is lining up a bunch of new O.R.S.'s and will have a good material organization going in his district and with the good start he has it will be one of the country's best with a good level. 9CDS was reported very QRA to Kansas but who cancelled is maybe but he's had more DX and is off the air for a while.

Several good reports were sent in but could not be used on account of the new rules. Get that O.B.S. appointment and regularize again. 9AOZ is a new O.R.S.

The personnel of South Dakota is as follows: A.U.S.M.U. Aviation Depot, S.D., Sec. No. 1: W. E. Barrett, U.S. 123 S. Main St. Madison; U. S. W.F. Kemp, 811 Douglas Ave., Yankton; C. M. H.B. Manning, 101 S. Euclid St. Sioux Falls; Sec. No. 2: U.S.A.F. Rutherford, Webster; C.M.—Merle F. Dow, 63 Lawn Terrace St. Huron; C.M.—Ted P. Anderson, 401 S. 5th St. Aberdeen.

Traffic: 9BOF, 53; 9DKT, 1; 9CJF, 6; 9AAB, 11; 9DPX, 27; 9AYD, 9.

DELTA DIVISION

W. W. Baigrie, Mgr.

MISSISSIPPI—This mail came through FB this month. 9AUY 25 watter heats his 150 watt outfit on the big hoop in the sale. 9AGS is sending traffic a-heaving for the week this winter. 9AKF says that laziness is QRXing his work. 9QZ is having a joyful time getting his O. B. S. certificate, but Uncle Sam is to be blamed for the trouble with that system.

Traffic: 9AUR, 64; 9AGS, 23; 9AGB, 16; 9AKF, 14; 9QZ, 17.

TENNESSEE—9BA used his convention gained KW matter to some in at the head of the list. H. H. Sutton, 9CY, has been appointed C. M. of Memphis in recognition of his Leaguer spirit in the settling up of the convention matters. 9XK went down to 150 meters and will go lower whenever possible. 9APG operated but half of the month due to a absence of time. 9CM is with us again. Broken crystals, repairs and remodeling of the transmitter took the week at 9CN. He is working England FB on 80 meters with 150 watts. 9AAZ, 9AQY, and 9AIY complete the Tennessee bunch.

Traffic: 9KA, 21; 9BK, 32; 9AEU, 20; 9CN, 3; 9AAZ, 4; 9AQY, 5; 9AIY 1.

ARKANSAS—Old Man 9QH is getting it hard. 9ANN comes through with another mighty welcome report. 9WK refuses to stay up as early as forty on a total of 25 for the month.

Traffic: 9QH, 65; 9ANN, 91; 9WK, 25.

LOUISIANA—D. S. Crenshaw, 9ZK, complains of the poor cooperation he gets from his stations and others. How about bettering that, gang—b. m.? 9ZK has been elected for 75 to 80 meters and 125 to 150 meters for the new low wave work. 9ZK, 9WJ, 9KO, 9AZZ, 9NJ and 9BK the "8" were active but only 9ZK reported any traffic.

Traffic: 9ZK, 10.

MISSOURI DIVISION

E. M. Glaser, Mgr.

At the writing the O.R.S. in the division total an even hundred. Every effort is cooperation and leaguer and to our great aforts. Every owner and operator of an O.R.S. will please copy the following requirements and observe them:

First—Secure a type of message that should not be issued or going out. 2. Phrase by code, etc. 3. Phone, wire, etc. 4. Greetings by radio. 5. Your sign heard by. 6. Any message that has little or no value, is not in the original form, or the minds in address or number is incomplete or illegible. It is quality that we are going to be after and for quantity. Don't send or originate any "personal messages. Have one addressed to an actual station other than. Sometimes a message travels the circle of radio before the destination and the sender sees it is finally lost. Deliver all messages for your immediate vicinity and don't pass them on. In your "outer monthly report state the "No." of messages delivered as well as those sent and received. This includes delivery by phone, by foot, or by mail. Use the method of numbering messages as described in June QST. It can be set down on the "page legibly and if "necessary short over letter line, write your name again carefully. A few "words on on the score of cancellation for violation of wavelength law.

In a previous report 9AV was accused of violation the law in several respects. This was an error as 9AV was not at the "at all; those who secure other of to the below who has been using 9AV's call report that he quoted, 9AV. 9AAA is doing good work "at 9BNX is "my address due to colors. 9BHG was operating the "at 9CH. 9CMS works "on of wire on "at 9WM will be going soon. The four who are at 9YY are doing strong including the YL. 9DP. Works "on "at 9. 9CIC is still absolute. 9BGH sends his traffic list for the division, which "at 9AV and 9AA deserves. This is the best one sent in the 9-DU. system. Many nines and tens appear 9BHS the hottest spot goes among 9AAA and 9AU have been cleared several times. 9WZ has a few "at 9DS after working the 9-DU with 40 watts input. 9CWY likes the low pump on a low key. 9ABR was getting two nines on a 5 watter for a few days. He doesn't now. Tonight 10 9WH reports all due to absence of QRA now QRA at Linden Ave., Brooklyn. 9CPQ is operating 9-DU. 9AAV has just been appointed O.R.S. 9KH has changed QRA 9DNL is the same old standby. 9AAV is doing around the low waves but doesn't seem to catch much. 9CDS has been away on vacation. 9AOL promises to get down. 9DHK is knocking 'em cold with his 5 w. wave outfit. World wide "fone in spite of numerous QRM. Aerials

[illegible] the antenna system. Only 200 watts input [illegible]. Manhattan [illegible] with [illegible] is a new O.R.S. [illegible] has been doing fine work. 2AVK is rapidly getting [illegible] shape. [illegible] the [illegible] station in [illegible]. [illegible] came [illegible] to the [illegible] again.

Traffic: 2AAL, [illegible]; [illegible]; [illegible] 2BRB, 20; [illegible]; 2CXK, 34; [illegible] 2ARK, 16; [illegible] 2CQK, 31; 2AR, 6; 2AUY, 6; 2BH, [illegible]; 2AFF, [illegible]

EASTERN NEW YORK—Dist. No. 1: There are still [illegible] the [illegible] with [illegible] in [illegible] district are [illegible] 2ABA have [illegible]

Dist. No. 2: The [illegible] he had been very much [illegible] with [illegible] and 2AZZ doing the best work. [illegible] on [illegible] but [illegible] QSM [illegible] is [illegible] would [illegible] practically no time for [illegible] has been [illegible] when he has [illegible]

[illegible] O.R.S. [illegible] C.M.'s.

Dist. No. 4: [illegible] work handling [illegible] 2AVM is doing the best work [illegible]

Dist. No. 5: [illegible] is doing [illegible] handling a good bunch [illegible] He recently [illegible] antenna system and is [illegible] 2CHA is [illegible] DX [illegible] with [illegible] 2CZR [illegible] this month. 2CZM [illegible] good DX on the [illegible]

[illegible] 2AWK [illegible] the C.M. [illegible] 2AWF [illegible] only 5 of [illegible] O.R.S. [illegible] 2CT [illegible] 2ALD [illegible] 2BNV [illegible] 2DSL [illegible] 2CLB [illegible] 2ASC [illegible] 2BKW [illegible] on the low waves. [illegible] this district.

Traffic: [illegible]

NORTHERN NEW JERSEY: The report of [illegible] than the [illegible] that the [illegible] division is [illegible] good O.R.S. 2AFB [illegible]; 2NZ(?) has [illegible] 2BZF [illegible] 2AHO [illegible] 2BNW [illegible] 2AFG [illegible]

[illegible] ent from radio. 2AFG has been reported heard in England. 2CJX never fails with a good heavy report. 2CVY handled the largest number of messages this month, with 2CXK running a close second. 2ATF is now shipping out in fine shape.

Traffic: 2CXY, 118; 2CXK, 141; 2CNZ, [illegible]; 2BAN, [illegible]; 2BYM, [illegible]; 2BLP, [illegible]; [illegible]; 2BAL, 25; 2CJX, 28; 2CRW, 16; 2AHB, 31; 2ADU, 20; 2CXG, 1[illegible]; 2AAP, 37; 2BXL, 11; 2EHD, 18; 2CHU, 1[illegible]; 2CQX, 10; 2CE, 1[illegible]; 2EY, 8; 2AOO, 7; 2ATG, 8; 2KR, 6; 2AHO, 6; 2WZ, 5; 2CGK, 4; 2CDE, 2; 2ASP, 6.

Fine work fellows, will show the rest of the country some statistics! Keep up the good work— [illegible]

MIDWEST DIVISION

P. H. Quinby, Mgr.

NEBRASKA—Dist. No. 1: The D.S. reports very little activity in his district. Very little traffic handled although weather conditions have been favorable. 9BYG heads the district. School is taking a great deal of time which accounts for part of the slump. We are all sorry to hear that 9DXY is dismantled. He was one of Omaha's most consistent stations. Traffic routes are in very poor shape and are being reorganized. Few stations working on any of the low bands. 9ENH seems to be doing very good work in the 75-80 meter band, and other stations are changing over to the new bands.

Dist. No. 2: D.S. reports considerable activity to be going on but traffic reports are very poor. The D.S. is doing some very good work organizing his district and must have the support of all A.R.R.L. stations.

Traffic: 9ARS, 43; 9EAK, 20; 9DFC, 13; 9[illegible], 10; and 9NL, 1.

IOWA—Traffic seems to have slumped off this month for some unknown reason. Des Moines is doing half the work of the state. C.M. of Des Moines reports the same. 9CLQ, 9APW, 9BPF, 9AYH, 9BKK, 9FAC, and 9BZS all out for the traffic. 9BLQ is doing long distance relaying on short waves. 9AMS reports traffic moving ok in all directions except east into Iowa. 9ATN reports being heard in New Zealand again. At present there are [illegible] O.R.S.'s in Iowa. However, a good many of them have ceased to be active, due to their leaving for college, so we need more applications for appointment.

Traffic: 9DNS, 51; 9BLQ, 87; 9APM, 3; 9BPF, 12; 9[illegible], 8[illegible]; 9CZC, 24; 9ATN, 12; 9CTD, 55; 9ES, 11; 9AKP, 31.

KANSAS—This state is picking up very much for the DX season. 9BZD and 9APL are running a schedule for the exchange of school news between Newton and Wichita. 9BHM reports lots of DX but no traffic on 80 meters. 9AIF blew four tubes and a transformer during the month. All the southern Kansas gang are using the four coil Meissner circuit now. 9AIM is doing the DX work at his [illegible]. The O.M. is getting the routes working in fine shape. 9CVX has schedules with 6GT and 6CFZ [illegible] on 80 meters, with a 50 watter and 3.5 amps in the antenna is QSO both ways. All Kansas relay routes are open for immediate QSR of QTC any direction so pass your traffic to Kansas. 9AOD and 9BXY [illegible] 9CVS is working the two [illegible] on 80 and 160 meters, [illegible] every Saturday and Sunday morning from 1 A. M. on. He will [illegible] schedules and traffic. 9DCD is putting up a new aerial system.

Traffic: 9DWM, 164; 9BGT, 47; 9CLH, 10; 9CVX, 20; 9AHC, 72; 9EIL, 6; 9DNG, 25; 9BHX, 10; 9CEL, 27; 9BCS, 34; 9DLW, 61; 9BBW, 14; 9AFF, 11; 9CKA, 1; 9ABH, 1.

MISSOURI—Traffic in Missouri has taken on much greater activity this month due to the decrease in QRN and resumption of work by many inactive stations. The changes in O.R.S.: added, 9DOK, 9AAL, 9CKM. Deleted, 9ADC—no report for 3 months. [illegible] East Missouri is kept on the map by many good stations among which we note 9DWK, 9BKL, 9BAH, 9DOW, 9DXN, 9EKF, 9EKY, 9AHF, 9BKJ, and 9DLP. Most of this is due to regular [illegible] 9AAU-9ZK works [illegible] good record. Each one of the above stations has been found handling traffic at the station of the A.D.M. 9AWK is keeping up the old relay route connection with 9CCS. [illegible] for the first district. 9BRB has abandoned keeping [illegible] but [illegible] and is on [illegible] now. 9BAN and 9DLG are handling

N.Y.C. emergency work in St. Louis. 1AAH-XK are heard on the 9-BER work. 9DXN (Jones) he didn't have enough handling N.Y.C. at home so he helps AAY with the S.S.B. box. South Missouri is a curious quantity for 5m and as station 9UKM why maintains a fairly consistent schedule with 9BIR, 9CDH and 9UKX north and east and with 9PG to the southeast. His worst trouble is QSE. Wayne (Bryant) St. Joseph came to life well enough report from all States. 9DLT worked to Kansas. 9DJE is a new 5 worker in St. Jos. 9CHE and 9BAI is QSHING on 5m. 9DJ is heard frequently handling traffic but says O'Dowd says he is feeling with fone. 9CYG is on with 1A watts. Bishop-Mc is keeping out 9UKW and 9UYM for a while. 9EAO is active and 9ro is hard QRSS to 9ABS. 9CKS is on 50 meters regularly with a 10 watt and 9UAR is as lively as last month but new calls also 8CS 9DUK was elected op of a football game and was laid up for the rest of the month. However, he had been urged often at the A.R.M.A. station and worked all districts in one sitting on 37 and 170 meters. 9UAG and 9UKO joined forces for a week or two ago on 2.50 meter. 9DAS and 9UKO are again operating an Amrad spark coil system but are experiencing some power shortly. The list of O.B.S. is voted Fb by the D.F. 9TH-DCB in SC and 9YU-BC are doing most of the short wave work in K.C. getting good results. 9XH was heard in France. Numerous calls are arriving in KC. 9AFX moved to a better location and will be on again soon he is using a Ford A.F. for portable. 9UUX completely rebuilt his antenna system and put up a new pole. 9AEZ is over 2500 miles Kansas U. at Lawrence. He is 9BZG there and keeps a regular 6 P. M. sch-dule with 9AYL. 9SC is also active at college. Missouri Univ. only has a pair of transmitters available. 9NT reports; 9XHQ, 9UNX, 9UCV is buying a 1 kw. Tube to go on and expects to echo. 9AOJ the other of the old close Amrad 9FI drive has moved in Schenectady. 9BT and 9AOD work early mornings.

Traffic: 9UH, 8; 9BS, 16; 9XH, 1; 9YD, 19; 9AOA, 1; 9AYK, 7; 9AYL, 23; 9ABR, 23; 9FKU, 1; 9CHO, 11; 9UBR, 19; 9CKS, 20; 9CHE, 44; 9UCX, 1; 9UUZ, 22; 9AOD, 30; 9BUU, 11; 9UUG, 11; 9DLW, 25; 9DLT, 5; 9UMF, 52; 9UXN, 25; 9BAI, 85; 9EBF, 20; 9EHC, 2; 9BUL, 1; 9CBH, 5; 9DAE, 10

NEW ENGLAND DIVISION

C. Vern Ivin, Mgr

RHODE ISLAND—Three in Providence are passing up while the rest of the state remains at the same. Everyone is building new sets, and putting up new aerials, for the coming DX. Only one low power set succeeding in the short waves. 1CT worked six states and two A.C.s in one week on the short waves. 1AWE's battle cry is "Low Watts But Ever". 1AWV will be off the air for a short time. [illegible] Work again with the [illegible] Get [illegible] Ops are on the [illegible] has a schedule with 1AH. [illegible] 1AUP has started a new burial and [illegible] which is used right to put most energize of age. 1BOX, 1BF perhaps 1AIW is now located in Providence. 1II is now in Boston. He was also 1BPM is but he needs brass which he gets now. He is using 500 watts and runs A.T. key. 1UV had a crack back into the newspaper and got into out of control for a while, but he is using stones again. 1AAF rebuilt his antenna system in favor of the short wave and passed everything. 1AIA No rapid set as the [illegible] now. 1UVH has worked all districts on the low waves.

Traffic: 1BUE, 12; 1AAB, 11; 1BEN, 14; 1AWV, 50; 1AWK, 84; 1AIU, 12; 1UW, 5; 1BDG, 30; 1AUP, 21, 1AID, 76; 1BF, 4; 1QV, 20; 1AAF, 8, 1UVH, 72.

MAINE—Conditions are picking up for Maine as usual in the fall and all stations show an increased amount of interest. Very few are working on the short waves at the present time.

Dist. No. 1: 1ALK is experimenting on a modified 1AIB is QSU Bright' Stay Greater also 1ALK worked 1BT off coast of Africa and Porto Rico 1BQ. 1PD is wearing foreign stations on 75 meters.

Dist. No. 2: 1AFM is having hard luck with crippled disc 10 and is going back to CW. 1CHO another 5 meter shack. 1AFF will [illegible] to regularly at their new quarters. 1PM runs [illegible] power to suit him, has YL's 15 to 75. Better over on the 14th. Boy by Jerry (AMM). 1BM expects to be back soon. 1BTT is experimenting with different kinds of antenna wire. 1BX has moved. He [illegible] and is pushing the short waves with vigor. The transmitter at 1BX is rated at 1-50 on 2 5 watt tubes. Operating set switch changes from plate voltage and takes 4 second without change of the wave.

Dist. No. 3: 1BUH expects to drop to 80 meters over [illegible] has been experimenting on 60 meters with 5 watts but still chatters at 40 watts.

Dist. No. 4: 1AUV is on 80 meters. 1CX is using 50 watts. 2BP will soon change power.

Dist. No. 6: 1IB is putting in a 1 kw tube. Dist. No. 6 boasts of the only native spark in Maine. We won't give his call as we are ashamed of him.

Traffic: 1AUP, 30; 1BTT, 20; 1ASR, 6; 1BDH, 1; 1BDF, 16; 1BEP, 32; 1BKE, 25; 1BTT, 38; 1CHO, 11; 1CBH, 3; 1CK, 4; 1EF, 8; 1FM, 40; 1HB, 10; 1IB, 3; 1KK, 1; 1AXQ, 25; 1PD, 1; 1VV, 2.

CONNECTICUT—Summing up all reports the past month has been a quiet one. Every one reports traffic as being small. Most of the O.B.S. are on the air and DX is fair, but messages are few and far between. 1ANA the latest addition to the O.B.S. ranks, is doing wine fine work. He is credited to 1 other, chats all the time and can be heard most any time. 1BSI says he hears great DX but the old transmitter won't raise 'em. 1KW is on most every night and works 'em all. He handled close to 300 messages with WNP, while at Wrightsville, Mr. LMV swept pieces a day and has worked Scotland five times. 1ALE is building a new set and will be back on the air novin soon. 1EV has worked a bunch of stations. 1AVZ cannot make his set pull on 10 meters so he is back on 150 again. 1AIO is an early riser, like the rest of us. "Always bet no." Had a thought of putting a bug in his trans unit with a view on it "Dido your messages to your friends and sweethearts in Hell, we send 'em all over the world free of charge."

Traffic: 1BGC, 4; 1CPL, 7; 1UKP, 54; 1AVJ, 6; 1AIE 36; 1DDE, 8; 1XW, 20; 1AEA, 13; 1MY, 11.

VERMONT—Not so hot this month. Seems like a case of lose between the summer and winter. Either the wives have got back with school and the kids or else have not had time to get going, since static has broken 1AYV just taking a few first steps and starting to turn over. 1TD is in the game to stay. 1AJU and 1BDX evidently trying to outwait the revolution of the seals. Don't know whether 1AFC has an one kw tube in yet or not, but we'll be seeing anyway.

Traffic: 1BDX, 17; 1AJG, 23; 1AJC, 10

NEW HAMPSHIRE 1YD has been doing some real work this month, on 80 meters. They worked 1BCH and 6ZMN using 2 watts. 1ATJ is also getting out some fine 5 watt echos. He was heard by G5II London England, also worked 1AFO.

Traffic: 1YR, 9; 1ATJ, 11; 1AVL, 25; 1AKN, 30; 1BPJ, 8; 1AER, 21

EASTERN MASS. Everyone seems to be enthusiastic and often the traffic is small, the fellows are receiving on the 5A.s. Even tho they don't handle much traffic for the month, they report just the same. The new stations being 1AEA, 1AAU, 1BPM, and Miss Hirons, 1BYL, our newly appointed O.B.S. in that state.

The 56 meter band is opening up fine. 1AAF reporting that as more stations get on down there, traffic increases, which is a big help. 1BYL, O.B.S. Dist. No. 1, is the first American station to work across the Big Pond this fall. He has worked G2WT and G5QD. Another station that is doing fine DX is 1AIL, the whole country and Europe are his usual. 1AQX has not the transmitter going so no traffic from him this month. 1BTQ has been away on a vacation for three weeks, so his traffic is light. 1EM reports traffic about normal as his station. 1CTT complains of the lack of traffic. 1BBN is on again and is doing his usual stunt of DX every month. 1BF blew 5 transmitting tubes, and 5 receiving tubes. Eh, 1BU says that Asheboro has offered him a position as transmitter DX for the short waves and that he has some pretty good stations in his city now. 1AHL is running the Telefunken and installing a 203A. 1ZW seems to be having quite a lot of trouble to get on the air, but is always cheerful. Therefore his traffic will suit this month. 1PE, a newly appointed O.B.S. has had to report his station. 1BJ, 1AWS and portions of the time he spends on roads. 1QA reports fine DX on the short waves, as 5 days it is good for traffic as well. 1NV, on a new hit, but reports traffic as nil. 1SN has a schedule with OGJ.

Traffic: [illegible] [illegible]

WESTERN MASS. [illegible] Not many [illegible] [illegible] [illegible] [illegible]

[illegible] This district has the high total [illegible] the month regardless of the fact that [illegible] short waves and [illegible] [illegible] [illegible] and pretty [illegible]

[illegible] [illegible] over the [illegible] and [illegible] 1BIX continues to be the most active regular station in the district.

[illegible] the only station heard and [illegible] traffic for his district.

[illegible] As an informal meeting held in [illegible] Saturday, Oct. 4, 1924, [illegible] [illegible] Ave., [illegible] the new [illegible] [illegible] expression of opinion for his good work [illegible] to continue. There [illegible] O. R. S. appointments during the [illegible] who is very active handling traffic [illegible] [illegible] 1AAD and 1ADS are [illegible] [illegible] [illegible] This district [illegible] and stations [illegible]

Traffic: [illegible]

NORTH WESTERN DIVISION

[illegible] Mgr.

[illegible]

The [illegible] [illegible] [illegible] [illegible] This [illegible] [illegible]

[illegible] the North Western [illegible] [illegible] [illegible] New Zealand [illegible]

[illegible] Supervisor of Radio for the [illegible] [illegible]

[illegible] NKF, the [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] the Shenandoah Q. S. O. [illegible]

[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] the Northwest. [illegible] [illegible] promptly.

WASHINGTON [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] New Zealand [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

last few summer. His 75 meter [illegible] over [illegible] every [illegible] 7GC is [illegible] traffic station. He has dismantled his set and [illegible] to northern part of Idaho. (We expect to [illegible] you OM but glad that you will stick to N. W. Div.) 7BY and 7[illegible] [illegible] empty [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] the traffic report. [illegible] has [illegible] new [illegible] on his transmitter [illegible] [illegible] [illegible] radio at [illegible] FB OM. [illegible] [illegible] showing signs of life but no traffic. [illegible] and [illegible] are heard on low waves. [illegible] are remodeling. 7AFF [illegible] are experimenting on 5 meters. 7AHQ [illegible] [illegible] [illegible] [illegible] [illegible] is [illegible] of 200 [illegible] (The [illegible] days were gone forever.)

Traffic: [illegible] Total 202.

OREGON—The past month has been exceedingly good for DX as there has been just enough rain to clear up the weather and not enough to affect the good insulation of some of the antennas. [illegible] has been working [illegible] well on [illegible] meters. [illegible] has worked [illegible] district but the first, and is increasing his QSO's by the addition of another [illegible] on [illegible] meters. 7AJS reports that he has been trying to get down to the [illegible] but hasn't had much luck as yet. New ORS appointments have been issued to [illegible] and [illegible] who are both on the air constantly between [illegible] and [illegible] meters. [illegible] and [illegible] are on [illegible] [illegible] that they are ready to go on [illegible] [illegible] 7[illegible] is on [illegible] meters and reports being heard in New Zealand, besides working [illegible] and Mexico [illegible] [illegible] 7[illegible] maintains a schedule with [illegible] of Washington on Mondays, Wednesdays, Fridays, and Saturdays. [illegible] [illegible] [illegible] and [illegible] are going to O. A. C. and are [illegible] now [illegible] [illegible] [illegible] and [illegible] are [illegible] the higher waves, and report few messages handled. One of the greatest events of the year has been the trip of the [illegible] [illegible] to the [illegible] Northwest. When [illegible] was in this district [illegible] and [illegible] held a continuous watch for her [illegible] [illegible] was worked by [illegible] and [illegible] of press was relayed in to the Western [illegible] [illegible] [illegible] the [illegible] [illegible] should be [illegible] [illegible] for his good work. [illegible] was copied under very unfavorable conditions. [illegible] [illegible] [illegible] using only one [illegible] [illegible] [illegible] difficulty in working [illegible] [illegible] [illegible] [illegible] on [illegible] meters, but [illegible] little time for working [illegible] to his [illegible] for football.

Traffic: [illegible] reports from [illegible] were [illegible]

IDAHO—Due to the change in the office of [illegible] [illegible] [illegible] the reports from the stations are missing. Several new stations are heard on the air and they are [illegible] to get in touch with either the D. S. or A.D.M. We need more official Relay Stations in Idaho so [illegible] of the old men and get lined up. Traffic seems to be very scarce.

In [illegible] Idaho the only stations heard are 7[illegible] and [illegible] who seem to be getting out well and are on regular.

Around [illegible] the active [illegible] are [illegible] and [illegible] [illegible] is heard once in a while. [illegible] [illegible] [illegible] a [illegible] commercial [illegible] He will soon be [illegible] for the winter. There will be several new stations around here after the R. I. has hold [illegible] [illegible] month.

In Northern Idaho, 7[illegible] who is attending the Idaho University is the only active station. He is going strong and has schedule with 7[illegible] to [illegible] traffic for the University.

MONTANA—Stations in Montana are [illegible] up for the winter season. Many [illegible] to the shorter waves while a few are still heard between 150 to 200. Traffic is a minus quantity in almost every case. Nobody seems to have any traffic. Let's start some now!

Montana State College [illegible] to be a [illegible] for hams. Among those registered [illegible] Helena, [illegible] of Red Lodge, [illegible] and [illegible] of Billings. They ought to keep 7[illegible] hot this winter.

7[illegible] has moved [illegible] [illegible] [illegible] where there is [illegible] [illegible] is doing [illegible] for a beginner. 7[illegible] has a new antenna and counterpoise. 7AGP and 7AFP [illegible] to be on the air soon. 7[illegible] of Butte has been appointed D. S. for district No. 2. [illegible] received an O. R. S. ticket during the month. A good number of Butte amateurs [illegible] [illegible] [illegible] Oct. [illegible] 7[illegible] is [illegible]

[illegible] Dec. 1st. Only 20 Dec. 1st [illegible] monthly. Only a limited list of traffic can be sent. 2ZB has been on regularly and handled considerable traffic. 2AD failed to report. 2ZJ did not report. 2ZU called at 0200 GMT the 5th. Address here your reports when ready to QST, 1457 A. H. Wilson of Lima and U. H. Bellamy, Superintendent of Radio, City of Syracuse, N. Y. both of whom are fully capable.

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PACIFIC DIVISION
M. D. McHenry, Mgr.

SOUTHERN CALIFORNIA—Traffic is moving to schedules and messages are cleared without much effort. Deaths have been established by notes in the [illegible] about every three on Many Calif[illegible] which have been sent on and [illegible] check. [illegible] to [illegible] the [illegible]. This is more than can be emphasized any [illegible] A meeting to [illegible] for all [illegible] [illegible] and [illegible] by [illegible] of [illegible] [illegible] [illegible]

6APE is off at present refusing to for four weeks. 8DUA has been on with 45 watts but a storm took his antenna. 6BAP is Eureka, a new station in the farthest north U.S.A.

Traffic: 6QXD, 183; 6AIB, 30; 6CQC, 29; 6CHX, 16; 6AIT, 10; 6VDA, 6VFA, 6CUD; 6CDV, 8; 5UBQ, 16; 6UCW, 0; 6CNU, 2; 6AKQ, 2; 6CAR, 11; 6AUD, 2; 6AGK, 17; 6BCF, 122; 6UB, 12; 6AAO, 68; 6UMU 27; 5PL, 122; 6JG, 182; 6ACI, 61; 6QFA, 23; 6DLW 15; 6UJS, 5; 6UMU, 53; 6CDS, 10; 6ZN, 4; 6LV, 47; 6AUB, 8; 6AJW, 41; 6UDN, 5; 6QE, 7; 6CJ, 7; 6CJV, 2; 6ZAC, 26; 6AFC, 23.

ARIZONA—This is our first report from the 6th area. He is moving and rebuilding his house so is off the air temporarily. He is busy working up stations in Arizona and says that the Yarnell Plant situation looks very favorable and as for myself I believe he will be able to keep the air safely open. Glad to have this report from him this month but hope for a bigger one next month.

NEVADA—We have a new A.R.M. in the state of Nevada, 6AIN M. V. Smith. There are 6 R.S.S. in that state now and prospects for more. The U. S. 95 is now 6AFN and 6UU. no traffic is open in that district. Things on a whole seem to be pretty well settled for the winter DX season and organization is almost completed. In the future please mail us reports short and simple as we are limited as to space in QST and nothing but pertinent facts need appear and only those of O.R.S. will be considered.

HAWAIIAN ISLANDS—6AIS was again QSO with the mainland via 6PK and 6IYW. 6ANY has left for the mainland and traffic from the coast can be sent to 6AOE. 6CBZ of UN June. is back from the states and is sounding brass again. He is QSO 6CQU. 6UA has completed installing a hundred watter. 6ASR has plate for a 250 watter. 6PCH and 6YQ have installed absolute wavelength and are sure now of a better signal than any A.C. 6TQ reports a visit by 6 ex-navy New Zealand stations: 2YC, 2AE, 2AA. 1AG, 1AA. Sigs were QRK. Irie from QSP and QRM. Also Aussie Joseph from 3QP and 3LO. 3QKJ worked 6ZAD using one 5 watter. This is the way he celebrated his first anniversary on the air. He is at 203-210 meters and is going to get him down to shorter waves. 6UP will be using soon on 75-80 meter wave, and 5FV will also work on the short wave.

Traffic: 6BA, 7; 6UP, 5; 6KA-4VN, 6; 6JR, 25; 6ZZ, 55; 6CKE, 12; 6ENS, 15; 6BFS, 11; 6UB, 5; 6QKL, 2.

ROCKY MOUNTAIN DIVISION
N. E. Hood, Mgr.

COLORADO—Denver Due to the C. M. of Denver being out of the city the report for the City of Denver is absent. No. 2CAA takes the lead for messages this month and 9DED is the only other Denver report received. The stations have been at the air consistently and better arrangements should be made for reporting when our official is out of the city. Make it double next time, please!

Dist. No. 1: 9UTE now 9AOL is the only station reporting from this district. Traffic has moved regularly through 9AOL which has been open nightly.

Dist. No. 2: All stations in this district have put through traffic on regular intervals. 9CBY, 9CDB, 9CLO, 9DCH and 9BAK have all been on nightly and traffic has moved through this district in regular fashion. O. R. S. for 9AZO has been cancelled due to the station not being in operation any longer.

UTAH—Salt Lake City—Reports from three stations only out of the entire state—6PM, 6UC.[illegible] and 6AIA reporting traffic. The A. D. M. is out of the state on an extended vacation and report was forwarded by C. S. of Salt Lake. The stations have been active but reports not forthcoming.

WYOMING—6HF is back on the air. 7NR also, and traffic has moved through this state fairly regularly. 6AIT has been handicapped by power wire outage and has gained valuable experience in location hunt. 7WO has moved a bit of traffic. A new station will come open in Casper with 30 watts. 7ZU is in Casper and may open up this winter. 7DCL is back in the state and has been on regularly.

Traffic: 6CJK, 4; 6UHT, 24; 6CLD, 15; 6UYH, 11; 6UAN, 7; 9AOL, 88-6UA, 23; 6CAA, 93; 9DED, 30; 6AJT, 3; 7ZW, 35; 7HR, 21; 6FSI, 12; 6BCH, 21; 6ZAA, 12.

SOUTHEASTERN DIVISION
H. I. Bird, Mgr.

ALABAMA—Fine spell of [illegible] weather has been experienced during the past month and as a result traffic has increased quite a bit. 6AUB leads the state. AVY comes around with 6AMH calling into Ohio. [illegible] Traffic on the low waves increases as each station sets down and experiences that stand and previous feeling. A total of 458 messages were handled in the state.

Dist. No. 1: Stations 6AMH and 5UP are combining and are planning to open in several weeks with a new low wave set. These stations are noted for their ability to handle traffic consistently. 5VV and 5ADS continue to circulate regularly and handle their part of traffic. 5HE, while low in messages this month, did a fine job of DX. He worked IHT for 45 minutes on October 3rd, while IHT was off the coast of Africa. Activities started out this month with 5AUM handling messages and concluding on the higher wave set. Golden records are also [illegible] working 5UP. 5ABL is down on the low waves and ready for work. 5ABI has been appointed as U. S. S. Mr. Johnson is also the new C. M. of Tuscaloosa.

Dist. No. 2: Only two stations handled traffic for the month, 5AR and 5AC. 5AC is now located at 524 Marine St., Mobile, Ala. Several Mobile stations have combined and are now operating as 5QK. 5QK has been appointed O. R. S.

Dist. No. 3: Sigs Brooks reports plenty of interest in his district, especially in Montgomery, where a real live club has recently been established. 5WI has apparently not received from a recent storm but is expected to be on the air at an early date.

Dist. No. 4: 4XA is on the air now and reports traffic. Many old timers may be found on the operating staff of 4XA. These are 4GN, 4BD, 4HL and 4GT.

Traffic: 5AC, 20; 5AGM, 120; 5AUB, 10; 5AJF, 445; 5AMH, 91; 5ABL, 6; 5KS, 17; 5VV, 58; 5ZAB, 18; 5XA, 216.

SOUTH CAROLINA—4SU, 4EV, 4IT and 4DX are now enjoying City college life. 4DX, however, has

his portable 4BY with him and is on with three 203's. 4BE-4YL broke his arm playing foot-ball and is now operating with the left.

Traffic: 4DX, 5; 4BE, 34.

FLORIDA—Mr. Herbert has just visited us and lent us a helping hand, resulting in considerable improvement in our stations. We are indebted to him for valuable assistance on matters of both technical and organization standpoints, and the state thoroughly enjoyed his visit.

One noteworthy fact which we are proud to report is that all Florida O. R. S's. are on Ek in the P. R. C. By others, to be called on in emergency. Florida stations have also aided in following NKRK's ships throughout her voyage, reporting her position regularly to NKF, and handling traffic for her. 75% of all Florida O. R. S's. are on short waves. 4SS keeps a schedule with Porto Rico and is copied frequently in S. A. and Europe. After blowing his last 50 he put in a 6 watter on 30 meters and worked Mexico the first night. 4EZ is back on the air and in reliable touch with Cuba. 4DK is doing some splendid relay work north and west. He has for his motto "Immediate Delivery," and the log lives up to it. 4PE is on but little. There is a great boom in amateur activities in Jacksonville, many R. C. L's. installing transmitters, two of which are soon to be O. R. S. Jacksonville O. R. S. want it known that they will accept no rings which do no comply with standard A. R. R. L. form. St. Augustine has two excellent short wave stations in 4EA and 4PL. 4SD has just been made O. R. S. 4PC puts his stations to practical use and orders merchandise direct from Jax and Atlanta by radio. 4ZE has worked every U. S. district by daylight with M. U. since October 1st, and has schedules with NKF. 4PH and 4PV are on some. D. E., 4WY, is getting South. Florida lines up in good shape. 4CH of Miami is heard often on short waves.

Traffic: 4UF, 4XX, 23; 4BS, 32; 4KC, 12; 4QY, 31; 4EJ, 9; 4KX, 5; 4PC, 8; 4UR, 5.

GEORGIA—More stations have been on the air this month than have for the past several months. Most stations are using the short waves and are doing excellent work although some difficulty is being given up their wave length but tubes and have been forced to use smaller tubes temporarily. Among the stations making excellent distant records are 4DT, 4BW, 4UA and 4IC. 4UA has worked IRT, 8BCS, G2OD and also seven other British stations and two French stations. IRT was worked on the coast of Brazil and Africa. NERK was worked by 4KU and 4UA and was heard by any number of other stations on his trip to the west coast. No trouble was experienced in multiplexing communication for distances of several hundred miles and quite a few messages were handled.

4JD and 4JT have been appointed O. R. S's. which opens the route for traffic to Montgomery, and Selma, Ala., and other points west. Mr. J. S. Morris has been appointed A. S. of District No. 1 and all O. M's and other stations not having O. M's should forward their reports to Mr. Morris.

Traffic: 4KQ, 88; 4UE, 4; 4IC, 27; 4GI, 110; 4BS, 4.

WEST GULF DIVISION

F. M. Corbett, Mgr.

Two outstanding events occurred during the month of October, the Navy's pride of the air, U. S. S. Shenandoah, known to us radio as NERK, passed over our division twice and found a number of stations ready to assist in multiplex communication and some traffic was handled with her. Then, Mr. A. A. Hebert, field man and treasurer of the A. R. R. L., visited Houston, Dallas, San Antonio and El Paso, where great amateur gatherings took place, and handsome. In Dallas, every traffic officer of Northern Texas Section was present except U. S. Martin of Unit No. 5, America.

This report is being written on the 31st of October and up to this time traffic reports have not been received from the A. R. M's of Oklahoma and New Mexico. These reports must reach division headquarters before the last day of the month or they cannot be included in the division report. Only O. R. S. activities are included in this report. Activities of other relay stations appear in the sectional bulletins issued by the A. R. M's of the respective sections. If you are not on your A. R. M's mailing list drop him a card and request that you be put on.

5OU ex-5AUO, Roswell, N. Mex., is back on the air and ready for traffic. He reports handling 12.

NORTHERN TEXAS. Cool weather has at last hit this part of the country and DX sign once more sound in. 5JF worked NERK when he was coming through Texas. 5UW was QSO NERK as well as with NZ 4AA. The latter he worked on the morning of October 18th. Several other stations stood watch for NERK and logged him. School is making its claim on the ops and several stations have been closed. Traffic is picking up slightly for the month, although fewer stations reported than did last month. Traffic is moving in fine shape all over the state from indications. Daylight and night routes are both working well.

Traffic: 5UW, 14; 5AMN, 30; 5JF, 29; 5QY, 51; 5AUK, 7; 5PII, 67; 5VG, 63; 5AJT, 30; 5III, 93; 5XAJ, 32; 5OQ, 8; 5VF, 18; 5AJJ, 45; 5UY, 44; 5QZ, 10; 5AMZ, 28; 5ED, 3; 5QW, 11; 5CV, 2; 5AJH, 58.

SOUTHERN TEXAS. The opening of ruleys has wrought havoc in this section. At least half of the O. R. S. and their certificates cancelled because they will be away from their stations. But to compensate at least in part for this loss we have with us again our old standby 5XAU, the station of the A. & M. Radio Club. Among the operators will be 5UF, 5KC, 5VO and 5NN. D. S. Sherrod of Galveston, is at Rice. We will miss 5VV-5RG. New stations that have applied for O. R. S. are 5JT at Cuero, 5EW at Brownsville, 5MS at Corpus Christi, 5APM at San Marcos, 5FY and 5ALR at Auburn, 5NK at Houston and 5XAU at College station. With this new addition the weeder will doubtless recover from the summer slump.

Two important meetings were held, one at Houston on the 21st and one at San Antonio on the 31st of this month. Mr. A. A. Hebert and the A. R. M. visited these meetings. From the lively interest shown by amateurs in these meetings we have every right to expect a very good report this year.

Traffic—5APM, 33; 5EW, 24; 5XAV—5QW, 2.

CANADIAN SECTION

There is little to report this month, the main thing being the coming division managers' meeting at Winnipeg on the 1st of December. There will be present at this meeting the five division managers, the Canadian general manager and the A.R.R.L. field man, Mr. Hebert, and at this meeting all branches of Canadian affairs will be taken up and discussed and an endeavor made to straighten up any difficulties which have arisen in the past in Canada. Any A.R.R.L. members are invited to attend the general meeting to be held in Winnipeg during the sessions above mentioned.

Good news also comes from Mr. Hebert, the field man, who advises us that he is intending to visit the Vancouver and Winnipeg divisions this fall and also the Maritime, Quebec and Ontario divisions within the next eight or nine months, so that we will have a complete tour of the Canadian divisions at an early date. The Quebec and Ontario divisions report that a radio show to be held in Montreal and Toronto will have a representative of the A.R.R.L. there to tell the story of the League with demonstrations of amateur apparatus.

The short waves are engrossing the attention of most of the progressive amateurs in Canada with the preference at the present time being shown for the 75 and 80 meter wave band. The thing is so comparatively new in Canada that little of a startling nature has as yet been done but those who are on the short waves are noting the freedom from swinging and the apparent ease with which daylight work is carried out.

MARITIME DIVISION
W. C. Barnes, Mgr.

Fredericton is especially on the following districts is making a record hole. New Brunswick in particular is coming along well. Only the activities of O.B.S.'s can be mentioned in traffic reports and all Maritime Scouts are requested to apply for O.B.S. certificates. IAW has been appointed O.B.S. of Cape Breton, N.S. and also an O.B.S. All O.B. stations please get in touch with him. 1EU sent his report by radio to the D.M. 1FH, other A.R.M. and O.B.S. might do the same. 1AF is mistaken. These are the only two O.B.S. stations in N.S., but there are also seven right of ship stations in N.S. now in different stages of construction. A few more O.B.S. would be in order. 1HZ and 1AK report no traffic. Several new stations are reported from Cape Breton. Newfoundland has three stations but no QSO test at Maritime yet. Halifax City has only 1IW doing much work. Other Halifax O.B.S. are probably inactive. 1BO, 1EU and 1US. 1DO is on Sundays the weekly QST at 8 P.M. Atlantic Standard Time on 3.5-40-80 and possibly on 14 Meters. 1DO works on 80 and 180 meters. 1AK is by far the most O.B.S. this month. 1AK works on 14b meters. He has worked Canadian 4AA direct and also a complete message of his was copied and relayed by NZ 4AG Sunday September 4th was working G5NI at 04 P.M. and was getting a message from VE1H for C. P. Edwards of Ottawa. The Halifax gang were lucky with a visit from Bill Ghent of V.D.M. and C.S.C.O. Cape during the month, and he was duly initiated into the ROYAL'S. He having worked G5NI from VE1H. Bill gave the local gang a fine lecture on "Up north" and presented John two hundred photographs.

Traffic: 1EU, 4; 1DO, 24; 1AK, 38

ONTARIO DIVISION
C. H. Bamford, Mgr.

Another month has turned around and radio weather is getting better every day. More enthusiasm is shown on the short waves this month. One setback is the fact that quite a few former men have let up on their transmitter, or have other work that keeps them busy. Several fellows are attending University or other cities and their work will be missed. In spite of this, the A. D. M's are very optimistic as to work in their districts this winter. (Pity I'll not.)

1EQ is in Toronto attending University. 3ADV has been appointed O. M. in his place. 1EQ he is a hard worker and a credit to traffic. 1WV is relaying to new wave lengths. 3EV and 3VH are QSO west coast regularly. 3EQ is doing fine work with amplifier input. 3IV and 3AWV are chief experimenters just now. 1PF has a new 20-ft. pyramid mast. 3AMB, radio editor on daily paper is a real good publicity worker. 3BBC has a new aerial system which gives better results on traffic work. 3AD is doing real DX to west coast regularly. 3AO and 3XI are on 80 watts. 3PH and 3XN are doing experimental work on short waves. 3XI and 3WS are graduates. 3WS is now at Toronto University.

Traffic: Eastern Ontario: 3EV, 15; 3EQ, 16; 3VH, 4; 3AL, 41; 3FC, 28; 3WV, 10

QUEBEC DIVISION
J. V. Argyle, Mgr.

The past month has been a memorable one for this division for we have pulled off something which we have been wished for but for which the opportunity has not yet arrived. Our booth at the Montreal Radio Show is now up, and a busy scene. We were astounded by hundreds of people that it was the liveliest feature of the show and this could be easily proved by actual count of the numbers of people at the various booths. Our fellow-citizens of the public was returned by word friend 2BL. While he showed them the difference between the old-fashioned spark transmitter (some of which, by the way, have been in operation in Quebec since 1912) and the new C. W. transmitter which was working full blast handling traffic with outside 4AG messages were flies in all and in the gangs result they were all hundreds of miles straight to their destination by Sunday night. 5HV supplied the transmitter, 2VM and 2BV the receivers, while the "Amateur and Historical Tube and Junk" exhibit was entertained to by the entire crowd of Quebec brass-pounders. Much publicity did we get and a lot of 20-a was made of the only OW, Mrs. Burgess of 2CK, who sat in and handled our traffic with us every night. 2CK's service was placed into the B. C. L. competition at the last moment, just for the fun of the thing, and it won second prize. 111. Yes love indeed the gang had fun; what with George his batteries and the catcalls, the Twin and the tube, the radio airplane, minus antenna, 2AH and 2HV, the black-eyed twins, and say who was it stayed his hand into the target fixing the antenna on that Windsor Hotel, 2MT. 2BQ showed us how a set could be worked without having to bend down to throw the antenna switch, though we did have to rig out our tree on a lie to prevent them getting a kick from their neighbors. 2BK, 2DE and 2AZ shot out most of the traffic and a hard time they had as very few of our friends across the line scored station to accept traffic from us and in despair the D. M. had to telephone a QRT to all U. S. 8's for assistance. We thank PCBK, 2KU, 2LV, 2AH, 2UVE especially for having done their best and greatly helped us out when we were Online to get remaining 50 QSL messages per night. 2AU is appointed to O. B. S. He is re-commercial and a real op.

VANCOUVER DIVISION
A. J. Oke, Mgr.

The radio season is going to a good start quite equal to mid-winter season of last year. Most all stations are QSO to district from coast to Saskatchewan.

ALBERTA—4IO spiked 3f this month and is working schedule with 6SH every night. 4AK boosts in a fine radio report and is using used DK. 4CW is with the region after rebuilding—small report, but a good one. 4CT is also on hiatus after moving to new location. 4AG has been putting down aerial and power, now down to 5 watts and single wire fed Hz. 4CAC, 4IAD, Kansas, and through to Brooks.

Traffic: 4IO, 35; 4AK, 28; 4CT, 4; 4DQ, 11; 4CW, 1.

VANCOUVER—6JF hands in a brief report of "what's what" in all the districts. Tyrol 8. 6AN is on 50 meters and reports some traffic down there. 6CO 6IS out home in a few days, set W. 2. reports his plan of 6BA on a portable-station receiver. The new U. B. S. are 6AN, 6IT, 6AY

Traffic: 6JF, 31; 6AN, 11.

VANCOUVER ISLANDS—When four five-meters A.R.M. of 7. 6CT, he dropped in a wire one and says six words and wanting for delivery the goods. 5HK has run into some more unconquered trouble.

Traffic: 6CT, 17

EDMONTON—6CL is a ship operator and has 6CL and no longer be heard on 200-meter waves. 4IP is still the only active station and sets out 5QZ with 50 watts.

Traffic: 4IP, 27

PRINCE RUPERT—All active stations please get in touch with Mr. P. Black of Prince Rupert who is the new U. S. for the district.

WINNIPEG DIVISION
J. E. Brackett, Mgr.

WINNIPEG—The majority of stations here have been inactive this month. A few of the old timers are on occasionally but QSN has been hitting pretty hard, making traffic handling rather uncertain. 4AW 4FH, 4FX and 4FU are out to 5HK are putting up for the winter season. 4AC 4AD 4CJ has gained an additional operator in 4BA, who will handle the set all winter. 4BJ is also having trouble in getting out. 4DV is working 4AA and 4CR on regular schedule and can also 4VA QRR up westbound traffic although it is difficult to work out at present.

SWANA—4BC and 4FA are going strong here. 4IV is being handled by ex-5NX who apparently never sleeps.

MOOSE JAW—4EH, 4AO and 4BP have kept traffic jumping through here and are QSO in all directions. 4EK is waiting for those new big sticks and will be on shortly. 4CE is on the air regularly. 4AA has a new 50 ft. lattice mast up and is putting Healy on the map. 4NE has the city juice attached to his house and will be on the air soon. 4CH-4BX is going when time will permit, but the OM is alone now and is pretty busy keeping the wheat handling outfit at Canoe Lake in order.

Traffic: 4DV, 25; 4FH, 25; 4FX, 3; 4CH, 6.

Calls Heard

Important Notice

It is necessary to emphasize the rules of this department with special notice this month.

1. American and Foreign amateurs should make their call heard lists like that of g6LJ published below: in numerical order according to districts and alphabetical order for each district, with separate list for each country included in the list.

2. The list must be well spaced horizontally with a comma between calls, and each line should be spaced a line from the following—typewriter double spacing. If the list is hand done it should preferably be printed and not used for writing practice with an assortment of fancy letters. I wish I could show you the hand-made copy sent in by g6LJ, u2AGQ and u3TY, as they were extremely legible and well done.

3. Calls heard lists must be in our hands by the FIRST of the month following reception so that they will not be over two months old when published. Start them from your location in time to reach our office by the first. This is the same as saying that they must be in by the first of the month preceding publication. Foreign amateurs, due to the slowness of the mails, can ignore this rule. It applies to U. S. and Canadian amateurs only.

4. Men sending lists heard on shipboard are the only ones with reason for giving a separate list for each date, as their position varies daily. Ship operators should specify whether or not their name is to be published.

5. Let's make the calls heard lists just that, and leave out stations worked. The people directly concerned already know about the station worked and no one else is interested, so why let the stuff take up space that could be used to present more heard calls? Leave your best worked dx in the hat and surround it by asterisks like this *2WQH*. That puts it only ONE station worked in a "heard" list. Now, what do you think of the idea?

The American and Canadian gang are sticking to the rules commendably with but few exceptions, who fail to get their lists printed. No foreign amateurs, with the exception of British 6WJ and British 2WJ, obey the rule of double spacing, and the majority break all of the rules. The British amateurs are the chief offenders because they send in the majority of the foreign lists. The time has come that so many are sending in lists from around the world that a carefully prepared list is going to become the only one used.

If the above rule were not enforced, it take two people four days every month to prepare the lists for printing in QST.

C'mon, fellows, co-operate with us.

Rene Berlet, (9GR, Le Fil Rue Turbi, Reims, Marne, France.

Jaan, Ibrd, Lars, Larf, Laip, Laid, 1alk, 1aow, 1edl, 1eha, 1eht, 1elw, 1ekz, 1fur, 1gh, 1gow, 1gil, 1ghw, 1gil, 1grw, 1gsf, 1gjw, 1gmp, 1gyw, 1ghf, 1hfq, 1hgn, 1hsd, 1hsr, 1ibu, 1iip, 1hls, 1ibd, 1hjz, 1hgk, 1hti, 1hvp, 1hgt, 1iou, 1hrl, 1ohf, 1hin, 1oo, 1ow, 1ozz, 1qpa, 1qrw, 1skp, 1smp, 1vak, 1wax, 1wgo, 1dr, 1ec, 1fd, 1gw, 1kr, 1my, 1qw, 1ro, 1sc, 1sf, 1sw, 1vj, 1ww, 1xz, 2bqg, 2bzv, 2gb, 2awt, 2adp, 2anm, 2bb, 2bc, 2bzv, 2cre, 2hpa, 2ml, 2nj, 2kv, 2nuk, 2qm, 2rrf, 2pd, 2ph, 2vc, 2xq, 2qr, 2rmy, 2sh, 2sdp, 3ari, 3aha, 3ajd, 3auv, 3bla, 3blu, 3bz, 3bva, 3bdi, 3bdu, 3cis, 3rng, 3cjl, 3cdz, 3bdu, 3il, 3kd, 3mb, 3row, 3qg, 3sq, 3rb, 3ja, 4ol, 4bu, 4eb, 4ob, 4fm, 4lo, 4kc, 4in, 4na, 4fd, 4uc, 4xo, 4zz, 4zd, 5bq, 5mi, 5uy, 5zaa, 5ayl, 5ain, 5dbr, 5fpk, 5tbn, 5bcz, 5bja, 5rnf, 5xji, 5ely, 6dbw, 6dmo, 6da, 6zz, 6nb, 6pl, 6ti, 6us, 6w0w, 6xzz, 6el, 6bwx, 6emc, 6om, Carolinas, 1ac, 3li, 3gf, 3hp, 4ar, Miss: Asf, afv, dac, wch, wgr, kdza, rkac.

J. L. Mcnaye, MMJ, Le Blanced, Gan. (B.E.) France.

Last Half September.

1aan, 1ag4, 1agk, 1axw, 1bf, 1bur, 1bkr, 1bcd, 1cbp, 1dcx, 1ef, 1exc, 1ekz, 1ex, 2nay, 2el, 2agp, 2brb, 2dk, 2kn, 2mu, 2rd, 2s, 2snb, 3ddp, 3mjd, 3bb, 3bg, 3bnb, 3cta, 3cru, 3bva, 3bwj, 3cnb, 3qv, 3sp, 3ew, 3wb, 4adp, 4rc, 4fc, 4fe, 4fo, 4ho, 4ra, 4re, 4ra, 4tk, 4rc, 5tk, 6ml, 6rb, 6ac, 6zo, 6anc, 6gnh, 6tr, 7bj, 8gcp, 8add, 8ml, 8lck, 8pd, 8qa, 8sh, 8ed, 8qb, 8bcl, 9big, 9bfa, 9em, naf, nfc, Canadians 1af, 1do, 2bz, 2bo, 2bq, Italian and NI cards answered. QSK my 660 watter

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E. W. Hatea, Pendarves St., New Plymouth, New Zealand.

1xat, 2cn, 2ash, 2ahe, 2anz, 2aof, 2apl, 2azp, 2ast, 2bwl, 2chh, 2cor, 2cu, 2ff, 2cpa, 2cqr, 2chi, 2cvq, 2cpl, 2af, 2fu, 2os, 2pl, 2rad, 2stn, 2ar, 2el, 2ac, 2af, 2ebr

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John F., Ijmuiden, Watershergstraat 5, Rotterdam, Holland.

Three call Lunar, 1919 style, no amplification. 2aa, 2aam, 2acl, 2bbo, 2bcr, 2bdi, 2bgn, 2bkh, 2cjl, 2co, 2fd, 2gc, 2ri, 2tr, 2vs, 2xnr, 2zrb, 2zk, 3bu, 3cel, 3pk, 3sd, 3sg, 3uc, 3ebl, 3ehg, 3in, 3nz, 3ab, 4ht, 4kf. Canadians 1ar, 3dm.

James Steffenson, Thisted[ ] 8, Hellerup, Denmark.

1aaw, 1aap, 1acc, 1arr, 1ary, 1bcp, 1bfn, 1bip, 1bnl, 1bpd, 1cak, 1cre, 1cr, 1fz, 1f, 1hc, 1mv, 1zp, 1af, 1aw, 1aub, 1cnm, 1nav, 2fz, 2qcv, 2sqv, 2bcb, 2ak, 2kl, 2ol, 2nb, 2qb, 2ub, 3dd, 3ald, 3cdz, 3hh, 3vw, 4ac, 4cv, 4hjv, 4hnr, 4zl, n.d, Canadian 1dp.

Ing. Santangeli Mario, 5, Tuphonia 18, Milano, Italy.

3aaw, 1aap, 1bkr, 1bnk, 1cpv, 1er, 1mu, 1af, 1zb, 1z3, 2bcy, 2nam, 2bnb, 2bdi, 2bun, 2bvw, 2gg, 2dz, 2gk, 2ml, 2gb, 3bg, 3bde, 3bp, 3bn, 3bvs, 3cy, 3fz, 4ck, 4fs, 4ra, 4fg, 4nz, 4na, 4zj, 4zd, 5aa, 5ard, 5cz, 5rmi, 5cyl, 5da, 5er, 5ub, 5pl, 5ckf, 5dld, Canadians 1ar, 3bp, 3bq, 3bz, 3bq, nkf.

J. V. Newton, 4216B, 139 Ormside St., London, S. E. 15, Eng.

Jaur, Jbck, Lwck, Lar, Iqim, Jnur, Jard, Jbdp, Jbja, Jbip, Jbud, Jbul, Jcfn, Jcop, Jer, Jrow Jil, Jfd, Jmlx Jos, Jow, Jxu, Jza, Jkep, Jkgu, Jkr, Ljem, Lkkr, Lkez, Jckp, Jcak, Lcre, Jdy, Jdqc, Jfd Lgw, Jgk, Jkc, Ljo, Jmc, Jnw, Jra, Jaf, Jxam, Jxuv, Lxr Lxb, Jcyn, Jzck, JaYu, Jkim, Jaqp, Jbe, Jbqx, Jbrh, Jbge, Jbrc, Jcnk, Jdr, Jfo, Jrfo, Jgk, Jgu, Jkil, Jkj Jmq, Jmr, Jpd, Jrm, Jarl, Jaun, Jbds, Jlk, Jlvs, Jlwo, Jcdr, Jch, Jcdp, Jchg, Jfr, Jhli, Jil, Jjh, Jls, Jlvc Jku, Jlw, Jmh, Jno, Jog, Jxl, Jxb, Jxvb, Jxd, Jzc, Jaic, Jbu, Jdcu, Jdtk, Jfx, Jfu, Jfs, Jln, Jka, Jmu, Jna, Jnz Jnc, Jpj, Jrr, Jsd, Jsa, Jsid, Jto, Jtcq, Juv, Jvvb, Jxt, Jyo, Jzy, Jby, Jbc, Jfs, Jbn, Jhs, Jna, Jne, Jpn, Jpl, Jtkh, Jxqu, Jzlg, Jzl, Manadiana, Jlg, Jbl, Jxw, nfx, nkf, vgh.

G5NF. Bank House, Herne Bay, Kent, England.

Ibdl, Ibrg, Ibur, Ibgy, Ibrc, Ibcx, Icqp, Ier, Igw, Ihyl, Ilo, Inw, Ivc, Ixel, Ixgb, Ixuf, Ybrb, Ybxy, Yby Zgk, Zaj, Zjd, Zor, Znl, Zoiz, Zbtk, Zbto, Zcdg, Zch, Zhh, Zwh, Zul, Zus, Kbpv, Zain, Zlgl, ihL

G2WJ. R. L. Rolfe. Aldermans Hill, Palmer's Green, London, England.

Ibay, Iajw, Iacn, Ibca, Ibgn, Icdg, Irkb, Irld, Ilk, Ijm, Ixf, Ixw, Ixj, Ixu, Ixt, Ixgw, Ixy, Xirb, Xrr, Xcls, Xam, Xak, Xbdo, Xbia, Xlav, Xdg, Xfh, Xjy, Xaa, Xnl, Xza, nkf. Canadian, Car, New Zealand, Aus, Arg Ank

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S. K. Lewer. 41J. 32 Gaisear Avenue, West Hampstead, London, N. W. 6., England, Sept. 28-Oct. 29.

Iaar, Iaaj, Iaaw, Iah, Iabt, Iacn, Iahl, Iahk, Ibqj Iajw, Iakc, Iall, Iavc, Ibrk, Iarr, Iagu, Ialj, Iaq, Iaar, Iawn, Iaxk, Ibck, Ibct, Ibhu, Ibhn, Ibip, Ibkk, Ibkr, Ibaw, Ibqi, Ibrk, Ibsl, Ibsc, Ibvl, Icr, Icku Icak, Icnb, Icmp, Icu, Irnf, Idq, Ixi, Ixi, Ikr, Imp, Iow Iqi, Irx, Irp, Isa, Isf, Isw, Ita, Ivj, Ixaa, Ixl Ixw, Ixn, Ixs, Ixz, Iyh, Ixt, Zabl, Zacb, Zaif, Zank, Zanm, Zapt, Zaly, Zaxf, Zbq, Zbqh, Zbuu, Zbrk, Zbr, Zhr Zcw, Zcei, Zcma, Zcnk, Zcqa, Zcva, Zcyw Zgk, Zir Zkl, Zkn, Zmo, Zmy, Zpd, Zpf, Zrq, Zsdk, Zskl, Zsrl, Zuyo, Zzch, Zbdo, Zbr, Zbhv, Zbtq, Zbta, Zbwl, Zcv, Zcdc, Zcin, Zdz, Zhh, Zii, Zkd, Zuq, Zqr, Zsw, Zwb, Zxd, Zzu, Zdg, Zfs, Zln, Zna Zkt, Zoa, Zrh, Zss, Zth, Zta, Zvz, Zzd, Zzh, Zko, Zmi, Zfr, Zzzc, Zzh, Zcv, Zbii, Zbkw, Zwt, Zzu, Zalm, Zauf, Zbfc, Zbha, Zbiv, Zbpl, Zcel, Zrlc, Zdhw, Znb, Zpl, Zzzh, Zzal, Zzur, Zvz, Zrky, Zzlh, Zvv, Zwl Zzz, Zzl, Cqp: Iar, Idq, Zbc, Zaa, Zn, Zpz, Ifv, nkf, vgh. Bristle tube coil. All cards answered

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Heard by BARC at Sea with a UV200.

Sept. 19, 810 miles east of Delaware, Iaww, Iand, Iatc, Iawd, Ibgl, Ibar, Ibcr, Ibl, Imv, Ial, Ita, Ixw, Itc, Zbcb, Zbc, Zca, Zda, Zbpf, Zbqp, Zccc, Zrrz, Zdnx, Zdqk, Zxb, Zzau, Zzwz, Zbcr, Zdda Zdfo Zdpz, Zdzn, Zyl.

Sept. 19, 400 miles east Jacksonville, Fla., Iaar Iael, Iagw, Iadl, Iaav, Ibpp, Zbca, Zkh, Zccq.

Sept. 20, 650 miles east Palm Beach, Fla., Ibjr, Ibgo, Ifd, Zbjb Zkn, Zfg, Zcml, Zcyi, Zaz, Zzl, Zvm

Sept. 21 640 miles s.w. Key West, Fla., Iabl, Zccb, Zac, Zmb, Zacm, Zcnw, Zcyi, Zdzl, Zdby, Zzau Zzr, Ziq.

Sept. 22, 130 miles s. e. Jamaica, Iajp, Ilqy, Izrm, Zbrb, Zlc, Zlcu, Zli, Zzbz.

Sept. 24, 300 miles n. w. Panama, Ibqq, Izr, Izf, Ii, Zcqa Zcd, Zcq, Zqz, Zqq, Zazz, Zzzz, Zgx, Zzgn. Everything heard through terrific QRN. 73

Heard by P. A. Field, ex-EI., on SS Yucatan, WGLJ.

Sept. 13th. 136 miles west of Pt. Agudo, Peru. Lat. 8:59 s. long 81 26 w. ZKD

October 5th, Lat 20:29 n., long 107:21 w., P. R. Cir. Sjf, Sph, Sfc, Sdnk, Sark, Sbcp, Sbdw, Sbra, Sngl, Sedu, Sild, Sdq Sth., lat, 14:32 n., long. 92:26 w., Imy, Iow Iza, Izw, Izaw Zapy, Zbiy, Sjjj Sdw, Sst, Sav, Szn, Sbra, Sxgw, Xaq, Sxzz, Sjw, nfv, Zone Sfx, Mex Th.

8th. lat. 12 46 n., long 98:01 w., Imy, Iow, Ixu, Ixw, Ixaw, Zimy, Zavz, Axx, Zamr, Zimw Sst, Sph, Srh, Sadk, Sngz, Sau, Sim, Sej Srdl, Srzl, Sdsy, Sdld, Szzn, Sxd, nork, nkd, only QRA

10th lat 31.02 n., long. 89 36 w., Izud, Zsk, Sadu, Sld, Sedg, Skl, Skn, Sawt, Sxvz, Szzz, Szru, Zbch, Sky, Szw, Szzs, Sdjn, Sdyn, Szz, Szld, Zmz, Szzn, zhf, wgh, F, JL 45

12th. lat 7:61 n., long 82.46 w., Ixar, Iauz, Ibgq, Ikz, Zamz, Zuk, Zdhi, Zulw, Zsa, Szzn, F, JL 4lv.

12th. lat. 7.43 n., long. 82:44 w., Iaac, Iaur, Ibgu, Ilqc, Izsz Izzv, Izzw, Zkrh, Zgk, Zjd, Zfg, Zkn, Zjm, Zsal, Sij, Szys, DV, Sfc, nfv, nkC.

13th. Day of Panama. Iml. Izw, Zblm, Zcxz, Zlc Szzz, Zch, Zzac, 41f, Zuzz, Zalu, Zuz, Zcaa, Zdgu, Zkmz, Zccc, ngz, nfv, wrj.

14th Panama Canal. Szal

15th. lat. 20:40 n., long. 14 32 w., Ibqy, Ibhn, Icab, Icmp, Izw, Zbdj, Zbzc, Zkgx, Zlc, Zcrp, Zcly, Zgz Zgl, Zpd, Zbcc, Zblu, Zbca, Zcj, Zdu, Zlz, Zlw, Zje, Zkl, Znf, Zlj, Szt, Szh, Zqk, Zuk, Zujn, Zckm, Zzm, Zpl, Zxb, Zxc, Zxz, Zzfa, Zdjn, Zcd, Dulet hms lusfast station on air.

WWH aboard KFJI, 88 Lakeserning, Marine, P. O., Detroit, Mich.

Ilv, Ibt Ibk, Ibf, Ibw, Ibj, Ixw, Iaad, Ibcd, Ibqz, Iahi, Ibhl, Iajw, Iaxz, Ibqi, Ibtc, Iauc, Iaxx, Ibcp, Ibgv, Ibga, Ibgt Ihis, Ihis, Ihsa, Ihrh, Icca, Icme, Icm, Ifi, Ifj, Ijk, Ibv, Ikn, Imm Ipd, Ixzz, Zach, Zair, Zaam, Zaxf, Zbrb, Zbam, Zkzn, Zcnk, Zcqs, Zcch, Zcrc, Zhh Zbg, Zlc, Zca, Zdj, Zlh, Zhg, Zuc, Zuq, Zuz, Zwb, Zwh, Zzdy, Zzzh, Zzbh, Zzzi, Zzuv, Zbch, Zbah, Zbcu, Zcdb, Zcbb, Zcjn, Zdl, 4cg, Zhr, Zkn, Zmar, Zrr, Zrb, 4rr, Zvb, 4ti, 4zn, 4tf, Zvr, Zcr, Zfv, Zkq, Zuql, Zrc, Zaih, Zwn, Zwk, Zapw, Zbur, Zcfb, Zcw, Zfr, Zii, Zqlv, Zfm, Zjn, Znp, Znh, Zyk, Zzr, Zzr Zyz, Zwx, Zwx, Zxr, Zxcc, Zzjf, Zajn, Zzlf, Zzpl, Zzpz, Zzpy, Zzwx, Zzwl, Zzwz, Zzwy, Zzwv, Zzwu, Zzbf, Zzcl, Zzrd, Zzkl, Zzle, Zzud, Zzph, Zzwl, Zzyl, Zdaz, Zdhn, Zdmi, Zdpn, Zdpv, Zai, Zcza, Zhn, Zlw, Zlnc, Zph, Zph, Zzr, Zzt, Zzuf Zzzu, Zzbf, Zzzt, Zuzv, Zbch, Zbcg, Zhju, Zkhc, Zkzf, Zhak, Zhvn, Zhzz, Zbty, Zcca, Zcdy, Zcdz, Zcii, Zcjc, Zclv, Zcyc, Zdcr, Zdtu, Zdzp, Zbck, Zdhy, Zdmj, Zdzn, Zdzy, Zdzg, Zcfy, Zcgg, Zcjj, Zcla, Zcli zdz, nkf, Czz, Zcb, Zbc.

1 ABC at sea with the UV200.

Sept. 20 1800 miles W Panama? Iii, Izf, Zbk, wgh.

Sept 27 1300 NW Panama? Iaac, 4zn, Zcfy.

Sept. 28 (300 NW Panama) Ibgo Iazv, Zzu, 4zz. Aaum, Zan, Zcul, Zuuv, Zzzl, Zzzk, nfv. Sept 29 450 W Nicaragua), 4zz, Zamz.

Oct. 1 (1800 SE San Diego) 4lj, nkf.

Oct. 2 (1300 SE San Diego) 4fx, Zcnh, Zalw Zcto.

U. S. S. Rochester, c/o Postmaster, New York, N. Y., Panama Bay, Panama.

Zbqn, Zby, Zcgh, Zcqz, Zxbf, Zzo, 4zl, 4bz, 4kt, 4pl 4lz, 4uk, 5kb Zamp, Zarl, Zka, Zlh, Zmj, Zns, Zpl, Zrz, Zuk, Zuu, Zzk Zza, Zcfa, Zcqa, 4l . Zzzd, Zzzl, Zzp Zhp, Zcqh, Zcwz Zdmz, Zdlz, Zdnu, Zdlb, Zdwz, Zfk, Zfbb, Zfky, Zgjm, Zdlz, Zdcz, Zdzn, Zdzx, Zfbz, Zfdz, Zfgz, Zfjz, Zfln, Zgl.

U. S. S. Wood No. 287 Vallejo, Calif.

Ibzz, Ibzl, Izz, Izqa, Izzm, Izzz, Zzap, Zbz, Zbbz, Zcb, Zzz, 4fz, 4kb, 4pb, 4pf, 4ll, 5afh, 5cf, 5ew, Zgu, Zkk, Zpf, Zql, Zqy, Zuc, Zzx, Zph, Zqk, Zus, Zza, Zyd, Zza Zaff, Zabb, Zadd, Zafb, Zafz, Zahz, Zakn, Zakz, Zalm, Zalx, Zaly, Zazy, Zbkh, Zzn, Zzr, Zzx, Zcf, Zcw, Zdl, Zfl, Zfu, Zfz, Zfz, Zfj, Zfr, Zgf, Zgk, Zgz, Zgv, Zgw, Zhu, Zij, Zir, Zkz, Zkz, Zlg, Zlz, Zlw, Zmf, Zmg, Zmr, Zmk, Zmr, Zmz, Zoh, Zok, Zpd, Zpz, Zuf, Zzy, Zzf, Zzk, Zzn, Zzu, Zzw, Zzy, Zzm, Zzu, Zzzz, Zzh, Zbzn, Zccd, Zcuu, Zcvz, Zdut, Zdzw, Zdzz, Zfbn, Zgh, Zgk, Zgz, Zgz, Zhu, Zhz, Zjd, Zjz, Zkd, Zkf, Zkl, Zkr, Zkz, Zlb, Zlf, Zlk, Zlm, Zln, Zlp, Zlq, Zlr, Zls, Zlt, Zlu, Zlv, Zlw, Zlx, Zly, Zlz, Zma, Zmb, Zmc, Zmd, Zme, Zmf, Zmg, Zmh, Zmi, Zmj, Zmk, Zml, Zmm, Zmn, Zmo, Zmp, Zmq, Zmr, Zms, Zmt, Zmu, Zmv, Zmw, Zmx, Zmy, Zmz, Zna, Znb, Znc, Znd, Zne, Znf, Zng, Znh, Zni, Znj, Znk, Znl, Znm, Znn, Zno, Znp, Znq, Znr, Zns, Znt, Znu, Znv, Znw, Znx, Zny, Znz, Zoa, Zob, Zoc, Zod, Zoe, Zof, Zog, Zoh, Zoi, Zoj, Zok, Zol, Zom, Zon, Zoo, Zop, Zoq, Zor, Zos, Zot, Zou, Zov, Zow, Zox, Zoy, Zoz, Zpa, Zpb, Zpc, Zpd, Zpe, Zpf, Zpg, Zph, Zpi, Zpj, Zpk, Zpl, Zpm, Zpn, Zpo, Zpp, Zpq, Zpr, Zps, Zpt, Zpu, Zpv, Zpw, Zpx, Zpy, Zpz, Zqa, Zqb, Zqc, Zqd, Zqe, Zqf, Zqg, Zqh, Zqi, Zqj, Zqk, Zql, Zqm, Zqn, Zqo, Zqp, Zqq, Zqr, Zqs, Zqt, Zqu, Zqv, Zqw, Zqx, Zqy, Zqz, Zra, Zrb, Zrc, Zrd, Zre, Zrf, Zrg, Zrh, Zri, Zrj, Zrk, Zrl, Zrm, Zrn, Zro, Zrp, Zrq, Zrr, Zrs, Zrt, Zru, Zrv, Zrw, Zrx, Zry, Zrz, Zsa, Zsb, Zsc, Zsd, Zse, Zsf, Zsg, Zsh, Zsi, Zsj, Zsk, Zsl, Zsm, Zsn, Zso, Zsp, Zsq, Zsr, Zss, Zst, Zsu, Zsv, Zsw, Zsx, Zsy, Zsz, Zta, Ztb, Ztc, Ztd, Zte, Ztf, Ztg, Zth, Zti, Ztj, Ztk, Ztl, Ztm, Ztn, Zto, Ztp, Ztq, Ztr, Zts, Ztt, Ztu, Ztv, Ztw, Ztx, Zty, Ztz, Zua, Zub, Zuc, Zud, Zue, Zuf, Zug, Zuh, Zui, Zuj, Zuk, Zul, Zum, Zun, Zuo, Zup, Zuq, Zur, Zus, Zut, Zuu, Zuv, Zuw, Zux, Zuy, Zuz, Zva, Zvb, Zvc, Zvd, Zve, Zvf, Zvg, Zvh, Zvi, Zvj, Zvk, Zvl, Zvm, Zvn, Zvo, Zvp, Zvq, Zvr, Zvs, Zvt, Zvu, Zvv, Zvw, Zvx, Zvy, Zvz, Zwa, Zwb, Zwc, Zwd, Zwe, Zwf, Zwg, Zwh, Zwi, Zwj, Zwk, Zwl, Zwm, Zwn, Zwo, Zwp, Zwq, Zwr, Zws, Zwt, Zwu, Zwv, Zww, Zwx, Zwy, Zwz, Zxa, Zxb, Zxc, Zxd, Zxe, Zxf, Zxg, Zxh, Zxi, Zxj, Zxk, Zxl, Zxm, Zxn, Zxo, Zxp, Zxq, Zxr, Zxs, Zxt, Zxu, Zxv, Zxw, Zxx, Zxy, Zxz, Zya, Zyb, Zyc, Zyd, Zye, Zyf, Zyg, Zyh, Zyi, Zyj, Zyk, Zyl, Zym, Zyn, Zyo, Zyp, Zyq, Zyr, Zys, Zyt, Zyu, Zyv, Zyw, Zyx, Zyy, Zyz, Zza, Zzb, Zzc, Zzd, Zze, Zzf, Zzg, Zzh, Zzi, Zzj, Zzk, Zzl, Zzm, Zzn, Zzo, Zzp, Zzq, Zzr, Zzs, Zzt, Zzu, Zzv, Zzw, Zzx, Zzy, Zzz

Obrx, Obef, Obch, Obli. Obkx, Obax, Obnk, Obnt, Obso, Ohnr, Obru, Oraa. Deak, Defk, Defr, Deil, Dcja, Dcjd, Dclq, Dcqh. Dcra, Dcte, Dcyk, Ddat. Ddhs. Dfdp, Ddaf, Ddfw, Ddhr, Ddte, Ddua. Ddvl, Deam, Dnat, Dufa. Dwky, Dwn, Dmc, Idav. ndf. afv. wgh. Completion: 4aa, 2be, 4rr, 4ac, 4pe, 4hh, 4ae, 4ba, 4bf. 8-v. 3fl. 4gn, 4ha. Foreign: 15a. Received on one cube.

Daylight log by OW. at Canadian 4DQ. Vulcan Alberta.

2enJ. 4adp, 4ml. 4qa, 4rg. 4aaa, 4ma, 7mf. 7rf, 7of. 7ac. 7aba, 8evm, 8cf, 8qu, 8cub, 8wen, 8acy, 8agl, 8adu. 8arb, 8adv, 8apq, 9bow. 9bzm. 9hpf, 9ldq, 9bob 9bsf, 9ndr, 9epm, 9cdu, 9ca, 9emx, 9cdW, 9rlp, 8dpr 9dwk. 9dca. 9hrr, 9dhc, 9ph, 9al, Can. Eal.

Can. 3MR, 18 Churchill Ave., Toronto, Ont.

4al, 4hn, 4eq, 4gk, 4gl, 4gw, 4bw, 4js, 4lg, 4ml, 4mk. 4oa. 4pl, 4rr. 4uk, 4uu, 4vn, 4ww, 4wt, 5ac, 5cu. 5gq. 4bv, 5ff, 5ka. 5kg. 5ll. 5ai. 5nv. 5ot. 5uv. 5pb, 6pr 5ru, 5sp, 5ue. 5uk, 4vv, 5va. 5ael. 5aaj. 5aan, 5act, 5adb, 5agy, 5agk, 5aqo, 5alw, 5all, 5kkh. 5kph, 5apo kaph, 6ana, 6ama, 6vr, 5aau, 5aqm. 6ayk, 6apw. 5kkn. 6bar. 5kur, 6rax, 6cdn, 6cel, 6cvl. 6cfl, 6cyu, 6cyw, 6cuu, 6cmu. 7gk. 7ay, 8bqa, 8hw, 8qc, 8wl, 9ak, 9cca, 9ez, 9gz. 9lk, 8hp, 9ow, 9hy, 9lb 9kq, 9mr, 9oy 9nb. 9rc. 9tl, 9lf, 8rr, 9w6. 9xl. 8yb, 8m, 9rl, 8mzn, 8nav, 9abf, 9abl, 9adp, 9adu. 9ahl. 9abn, 9ajk, 9ak4, 9and, 9apk, 9aqv, 9avh, 9a7w. 9axl, 9axx, 9ayx, 9azj, 9bat, 9bbj, 9bcq, 9lcx, 9lct. 9bge, 9blq, 9blu, 9bjr, 9bkl, 9bkq, 9bnn, 9bqj. 9bst. 9bid, 9bva, 9bvr, 9bwa, 8bye, 9cac, 9cbl, 9cbz, 9cck 9ccm, 9cnx, 9cnn, 9cdl, 9cnb. 9ced, 9cfy. 9cll, 9clp. 9cla, 9cls, 9ckd, 9ckl. 9clq, 9clz, 9cmd, 9cmk. 9cnr 9cyq. 8ctr, 8crf, 9cvh, 9cyg, 9cyk, 9cyn, 9dad, 9ddd. 9dfd, 9dfz, 9dfr, 9dfg, 9dgc, 9dgk, 9dgn, 9dgv, 9dhp, 9dir, 9dlp, 9dnr, 9dnv, 9dpy, 9dqa, 8dqr, 9dqz, 9dra, 9dsc, 9dtx, 9dtz, 9dvc, 9dvf, 9dvg, 9dwa, 9dwk, 9dwl, 9dwn, 9dwp, 9dwr, 9dwy, 9dxa, 9dxb, 9dxc, 9dxd, 9dxe, 9dxf, 9dxg, 9dxh, 9dxi, 9dxj, 9dxk, 9dxl, 9dxm, 9dxn, 9dxo, 9dxp, 9dxq, 9dxr, 9dxs, 9dxt, 9dxu, 9dxv, 9dxw, 9dxx, 9dxy, 9dxz, 9dya, 9dyb, 9dyc, 9dyd, 9dye, 9dyf, 9dyg, 9dyh, 9dyi, 9dyj, 9dyk, 9dyl, 9dym, 9dyn, 9dyo, 9dyp, 9dyq, 9dyr, 9dys, 9dyt, 9dyu, 9dyv, 9dyw, 9dyx, 9dyy, 9dyz, 9dza, 9dzb, 9dzc, 9dzd, 9dze, 9dzf, 9dzg, 9dzh, 9dzi, 9dzj, 9dzk, 9dzl, 9dzm, 9dzn, 9dzo, 9dzp, 9dzq, 9dzr, 9dzs, 9dzt, 9dzu, 9dzv, 9dzw, 9dzx, 9dzy, 9dzz, 9eaa, 9eab, 9eac, 9ead, 9eae, 9eaf, 9eag, 9eah, 9eai, 9eaj, 9eak, 9eal, 9eam, 9ean, 9eao, 9eap, 9eaq, 9ear, 9eas, 9eat, 9eau, 9eav, 9eaw, 9eax, 9eay, 9eaz, 9eba, 9ebb, 9ebc, 9ebd, 9ebe, 9ebf, 9ebg, 9ebh, 9ebi, 9ebj, 9ebk, 9ebl, 9ebm, 9ebn, 9ebo, 9ebp, 9ebq, 9ebr, 9ebs, 9ebt, 9ebu, 9ebv, 9ebw, 9ebx, 9eby, 9ebz, 9eca, 9ecb, 9ecc, 9ecd, 9ece, 9ecf, 9ecg, 9ech, 9eci, 9ecj, 9eck, 9ecl, 9ecm, 9ecn, 9eco, 9ecp, 9ecq, 9ecr, 9ecs, 9ect, 9ecu, 9ecv, 9ecw, 9ecx, 9ecy, 9ecz, 9eda, 9edb, 9edc, 9edd, 9ede, 9edf, 9edg, 9edh, 9edi, 9edj, 9edk, 9edl, 9edm, 9edn, 9edo, 9edp, 9edq, 9edr, 9eds, 9edt, 9edu, 9edv, 9edw, 9edx, 9edy, 9edz, 9eea, 9eeb, 9eec, 9eed, 9eee, 9eef, 9eeg, 9eeh, 9eei, 9eej, 9eek, 9eel, 9eem, 9een, 9eeo, 9eep, 9eeq, 9eer, 9ees, 9eet, 9eeu, 9eev, 9eew, 9eex, 9eey, 9eez, 9efa, 9efb, 9efc, 9efd, 9efe, 9eff, 9efg, 9efh, 9efi, 9efj, 9efk, 9efl, 9efm, 9efn, 9efo, 9efp, 9efq, 9efr, 9efs, 9eft, 9efu, 9efv, 9efw, 9efx, 9efy, 9efz, 9ega, 9egb, 9egc, 9egd, 9ege, 9egf, 9egg, 9egh, 9egi, 9egj, 9egk, 9egl, 9egm, 9egn, 9ego, 9egp, 9egq, 9egr, 9egs, 9egt, 9egu, 9egv, 9egw, 9egx, 9egy, 9egz, 9eha, 9ehb, 9ehc, 9ehd, 9ehe, 9ehf, 9ehg, 9ehh, 9ehi, 9ehj, 9ehk, 9ehl, 9ehm, 9ehn, 9eho, 9ehp, 9ehq, 9ehr, 9ehs, 9eht, 9ehu, 9ehv, 9ehw, 9ehx, 9ehy, 9ehz, 9eia, 9eib, 9eic, 9eid, 9eie, 9eif, 9eig, 9eih, 9eii, 9eij, 9eik, 9eil, 9eim, 9ein, 9eio, 9eip, 9eiq, 9eir, 9eis, 9eit, 9eiu, 9eiv, 9eiw, 9eix, 9eiy, 9eiz, 9eja, 9ejb, 9ejc, 9ejd, 9eje, 9ejf, 9ejg, 9ejh, 9eji, 9ejj, 9ejk, 9ejl, 9ejm, 9ejn, 9ejo, 9ejp, 9ejq, 9ejr, 9ejs, 9ejt, 9eju, 9ejv, 9ejw, 9ejx, 9ejy, 9ejz, 9eka, 9ekb, 9ekc, 9ekd, 9eke, 9ekf, 9ekg, 9ekh, 9eki, 9ekj, 9ekk, 9ekl, 9ekm, 9ekn, 9eko, 9ekp, 9ekq, 9ekr, 9eks, 9ekt, 9eku, 9ekv, 9ekw, 9ekx, 9eky, 9ekz, 9ela, 9elb, 9elc, 9eld, 9ele, 9elf, 9elg, 9elh, 9eli, 9elj, 9elk, 9ell, 9elm, 9eln, 9elo, 9elp, 9elq, 9elr, 9els, 9elt, 9elu, 9elv, 9elw, 9elx, 9ely, 9elz, 9ema, 9emb, 9emc, 9emd, 9eme, 9emf, 9emg, 9emh, 9emi, 9emj, 9emk, 9eml, 9emm, 9emn, 9emo, 9emp, 9emq, 9emr, 9ems, 9emt, 9emu, 9emv, 9emw, 9emx, 9emy, 9emz, 9ena, 9enb, 9enc, 9end, 9ene, 9enf, 9eng, 9enh, 9eni, 9enj, 9enk, 9enl, 9enm, 9enn, 9eno, 9enp, 9enq, 9enr, 9ens, 9ent, 9enu, 9env, 9enw, 9enx, 9eny, 9enz, 9eoa, 9eob, 9eoc, 9eod, 9eoe, 9eof, 9eog, 9eoh, 9eoi, 9eoj, 9eok, 9eol, 9eom, 9eon, 9eoo, 9eop, 9eoq, 9eor, 9eos, 9eot, 9eou, 9eov, 9eow, 9eox, 9eoy, 9eoz, 9epa, 9epb, 9epc, 9epd, 9epe, 9epf, 9epg, 9eph, 9epi, 9epj, 9epk, 9epl, 9epm, 9epn, 9epo, 9epp, 9epq, 9epr, 9eps, 9ept, 9epu, 9epv, 9epw, 9epx, 9epy, 9epz, 9eqa, 9eqb, 9eqc, 9eqd, 9eqe, 9eqf, 9eqg, 9eqh, 9eqi, 9eqj, 9eqk, 9eql, 9eqm, 9eqn, 9eqo, 9eqp, 9eqq, 9eqr, 9eqs, 9eqt, 9equ, 9eqv, 9eqw, 9eqx, 9eqy, 9eqz, 9era, 9erb, 9erc, 9erd, 9ere, 9erf, 9erg, 9erh, 9eri, 9erj, 9erk, 9erl, 9erm, 9ern, 9ero, 9erp, 9erq, 9err, 9ers, 9ert, 9eru, 9erv, 9erw, 9erx, 9ery, 9erz, 9esa, 9esb, 9esc, 9esd, 9ese, 9esf, 9esg, 9esh, 9esi, 9esj, 9esk, 9esl, 9esm, 9esn, 9eso, 9esp, 9esq, 9esr, 9ess, 9est, 9esu, 9esv, 9esw, 9esx, 9esy, 9esz, 9eta, 9etb, 9etc, 9etd, 9ete, 9etf, 9etg, 9eth, 9eti, 9etj, 9etk, 9etl, 9etm, 9etn, 9eto, 9etp, 9etq, 9etr, 9ets, 9ett, 9etu, 9etv, 9etw, 9etx, 9ety, 9etz, 9eua, 9eub, 9euc, 9eud, 9eue, 9euf, 9eug, 9euh, 9eui, 9euj, 9euk, 9eul, 9eum, 9eun, 9euo, 9eup, 9euq, 9eur, 9eus, 9eut, 9euu, 9euv, 9euw, 9eux, 9euy, 9euz, 9eva, 9evb, 9evc, 9evd, 9eve, 9evf, 9evg, 9evh, 9evi, 9evj, 9evk, 9evl, 9evm, 9evn, 9evo, 9evp, 9evq, 9evr, 9evs, 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