At the Reproducer

At the reproducer—where quality counts most—there Cunningham Power Tubes prove their indispensability to finished, well-rounded tone.

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Sixteen Types all in the Orange and Blue Carton.

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You're not getting the most out of that storage battery set of yours. The set has a bigger distance reach... all it needs is a different tube in the detector socket. Put in the RCA super-detector—Radiotron UX-200-A. You'll get more stations—get the far-away ones more regularly and more easily! It's a small change, but it brings big results.

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MADE BY THE MAKERS OF THE RADIOLA

SAY YOU SAW IT IN QST—IT IDENTIFIES YOU AND HELPS QST
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"B" Power at full strength

any time and all the time

Majestic "B" is fully guaranteed. No acids or liquids. No hum. Uses Raytheon tube. No filament to burn out. Voltage can be accurately adjusted to varying conditions in any city—and on every set.

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To know how good, really good radio reception can be, try a "Majestic" on your radio set. Your dealer will arrange a trial without obligation to buy. Phone him today.

Majestic Standard-B

Capacity, nine 201-A tubes or equivalent. 45 milamp. at 135 volts.

$26.50

West of Rocky Mts., $29. Raytheon Tube $6.00 extra

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Capacity one to twelve tubes, including the use of power tubes. 45 mils. $29.00 at 150 volts...

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Positive control of all output voltage taps. For sets having high current draw or heavy biasing batteries. 60 mils. at 150 volts.

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<td>H. R. Walte                                            597 No. James St.</td>
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<tr>
<td>A. R. Goodale                                          1824 Indianola Terrace</td>
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<td>H. W. Dunham                                            140 Washington St.</td>
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<td>C. S. Taylor                                             508 Madison St.</td>
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<td>G. L. Crossley                                           State College</td>
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<td>C. B. DeShaw                                            5010 Cedar St.</td>
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<td>G. W. Lewis                                             2530 N. St.</td>
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<td>C. F. Mason                                             2222 W. 1st St.</td>
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<td>D. H. Lane                                             292 Galicia St.</td>
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<td>Manuel L. Peñaloa                                        27th Benita St.</td>
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<td>G. A. Sears                                             27th Benita St.</td>
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<td>W. F. Geoghan                                         206 Box 87</td>
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<td>W. H. Forrest, Jr.                                      562 Royal St.</td>
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<td>E. A. Sahn                                             186 N. Academy St.</td>
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<td><em>Temporary officials appointed to act until the membership of the Section concerned chooses permanent</em></td>
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Its Flexible One Dial Control

is but one of seven reasons
why you'll want a Grebe

With its Flexible Unit Control the Grebe Synchrophase Radio becomes a one-dial control set—a great convenience for tuning local stations—with the added advantage of individual dial setting whenever desired.

Booklet Q tells about all seven advantages of the Synchrophase. Send for it.

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The oldest exclusive radio manufacturer

The GREBE Synchrophase RADIO

Color tone
Gives you control of the pitch and timbre of the loud speaker's voice, eliminating the harsh, unnatural sounds which spoil reception.
The American Radio Relay League

The American Radio Relay League, Inc., is a non-commercial association of radio amateurs, bonded for the promotion of interest in amateur radio communication and experimentation, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

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

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

Inquiries regarding membership are solicited. A bona fide interest in amateur radio is the only essential qualification; ownership of a transmitting station and knowledge of the code are not prerequisite. Correspondence should be addressed to the Secretary.

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Address General Correspondence to Executive Headquarters, Hartford, Conn.
EDITORIALS

BIG news seems to have a habit of breaking on Fridays or Saturdays, just in time for the Sunday morning newspapers but with utter disregard for the limitations of monthly magazines. Here we had the complete text of the new radio law set in type for the last issue, with a nice announcement saying that here was our new radio law, and we even had a nice editorial all written on the subject last month, all waiting for an unheedful Senate to take the final step and pass the bill. We waited as long as we could but finally had to rewrite our editorial to say that we were again about to have a new law, instead of saying “Here it is”. And then of course as soon as we got to press the thing got passed, and on the 23rd of February the President signed it. It’s a cruel world.

To form the Radio Commission the President appointed the following men: from the first zone, O. H. Caldwell, editor of Radio Retailing, New York, five years term; second zone, Rear Admiral Wm. H. Bullard, U. S. N., retired, of Media, Pa., appointed for six years, and to be first chairman of the Commission; third zone, Judge Eugene O. Sykes, of Jackson, Miss., former justice of the Mississippi Supreme Court, four years term; fourth zone, Henry A. Bellows of Minneapolis, director of Station WCCO, three years; T. F. Dillon, Supervisor of Radio at San Francisco, two years.

Now the merry war begins. We are afraid that the radio situation is by no means cleared up by the passage of this new law. Altho probably as good a law as could be expected for a compromise measure, there are other factors than the law itself to complicate the situation. What of vested rights, what of acquired rights to use one’s property, what of the right conveyed in an unexpired license? This last is a very real right that is not to be denied merely by a new law which requires a new license from a new source. These are knotty problems and the possibilities of legal tangles in the readjustment of broadcasting seem sufficient to make recent radio court cases look like a game of tiddledewinks. These commissioners have a fearful job ahead of them. If they get anywhere at all in six months it will be marvelous. If they decline to relicense about eighty percent of the broadcasting stations, which everybody except the owners of said stations believes should be done, they encounter a flock of court proceedings; if they fence off a small area and dump all the fourth-raters in there to fight it out amongst themselves, ditto; if they leave things alone, ditto. We wouldn’t have one of those commission jobs for the combined salaries of the five gents! Life for them may not be happy but it’s surely going to be vivid these next few months.

The new law requires that within sixty days (that is, by April 23rd) every station must take out a license from the new commission. How in the world it’s going to be done we don’t know. At this writing the Commission has not met, and no regulations on how to proceed have been issued. We hope it occurs to the Commission that their task would be greatly simplified if they could find some way of recognizing the existing licenses of the some sixteen thousand amateur stations, rather than try to reissue them at the time when broadcasting demands so much of their attention. It has been prophesied that it will be a great many months before the Commission can give attention to anything other than broadcasting. Considering that all other services are reasonably content and that in particular in the short waves below 200 meters there has been an allocation in effect for some years which is satisfactory and on the basis of which the numerous services have built and installed their equipment, we venture to hope that it will similarly occur to the distinguished gentlemen of the Commission that they could immensely lighten their labors if they would reaffirm the allocations of the Fourth National Radio Conference respecting the waves below 200 meters, an action which so far as we are aware would be satisfactory to everybody concerned.

This country is now about to test in practice a theory which has been largely expounded in recent years: that, a radio law should contain no technical stipulations, no guaranties to anyone, but should give discretionary power in regulations to an administrative authority. We shall very soon see.

The complete text of the new law appears in this issue. It deserves the careful study of every amateur.

IN the December 31st. issue of the “Radio Service Bulletin” the Department of Commerce devotes nine pages to a summary of important events in radio—peaks in the waves of wireless progress. The
record starts in 1827 and includes such monumental items as Faraday's discovery of electromagnetic induction, Henry's first production of electric oscillations, Maxwell's and Hertz' developments of their classic theories, Marconi's conclusion that Hertzian waves could be used for telegraphy, the first successful signalling, and so on thru the gradual progress of the art. We don't find anything about amateurs before the war, but in 1919 "The war-time ban on private and experimental wireless stations was removed". Next year "Amateur radio work in this and other countries progressed steadily during the year with the gradual removal of war-time restrictions". Not a word about those record-breaking Transcons, the most thrilling achievement of all American amateur history, but we get ours in 1921: "The progress made in amateur and experimental wireless is exemplified by the attempts made in February and December of this year to effect communication on short wavelengths between the wireless amateurs of the United States and Great Britain. The first attempt was unsuccessful, but during the second test signals from many American amateur stations were heard both by British radio amateurs and by the representative of the American Radio Relay League [Paul F. Godley—Ed.] who was sent out for the tests. The signals were also heard in Holland".

But if that's good, how about the next item?: "The American Radio Relay League held its first annual convention in Chicago, August 30—September 3, at which many thousands of amateurs of the United States were present".

In 1923 "Short wave lengths were used to greater advantage than heretofore" but the record doesn't say by whom. But in 1925 "Amateur operators by their interest have made considerable achievements in the development of short waves".

Thereafter we don't appear in the record, fellows. Nothing about our linking all the countries of the globe by short waves, not a word about any of our 1926 achievements. Let's be so darned good in 1927 that they will have to print a supplement to the blinking Bulletin next year to record our achievements!

K. B. W.

Re: The International Tests

T hese tests which were announced in last QST have a number of important objectives. They promote international fellowship and goodwill in addition to making possible some rare sport with a pile of new records for every station that takes part. Stations must help each other over with test messages to boost the score equally at both ends of a QSO.

U. S. and Canadian Hams: Please note that reply test messages may be accepted from several foreign stations in one foreign locality—though only one message may be taken from each station worked. The particular amateurs working MOST stations in any one foreign country and receiving reply test messages will be appointed Official Foreign Contact Stations for that country. Read over the Rules of the Contest in March QST (pages 28 and 29) for further details. In addition to the O. F. C. S. certificates that will be awarded the tests will show the amateur station working two-way with the greatest number of foreign localities during the two weeks of the tests—and also the highest scoring amateur station under the rules of the contest. Get your entry card in early to make sure of getting your message assignment sheet in time.

All other amateurs in the world: The highest scoring stations in each foreign locality will be presented with a fine achievement certificate making them O. F. C. S. for their locality and attesting to the accomplishments of these stations during the contest. The Canadian General Manager especially requests all amateurs in British Dominions to listen for Canadians on the 52.5-meter special band as well as on other waves which are the same as those used by U. S. amateurs. It will be interesting to see which foreign localities can QSO most (a) United States and (b) Canadian amateurs in the two weeks of the contact contest. Amateurs in foreign localities are requested to pay no attention to calls from U. S. stations found on wavelengths below or above the assigned U. S. wavehands.

-F. E. H.

New England Division Convention

P REPARE yourselves for the big annual convention of the New England Division to be held in Hartford, Conn., on April 15th and 16th at the Hotel Garde.

It's going to be the biggest and best in years. The Radio Transmitters Association under whose auspices the convention will be held has arranged a wonderful program. Talks by eminent radio specialists, a trip to QST factory (incidentally A.R.R.L. headquarters) and many other events of interest will keep you peppe up all the while you are in Hartford.

Cost, including banquet Saturday night, $4.50. Hotel Garde will furnish you rooms at $2.00 (single), $3.50 (double). We suggest that you write them for reservation.

Make plans now, fellows, and COME TO HARTFORD!
Radio Translated for the Experimenter

By C. William Rados*

It is generally admitted that the experimenter is advancing science. Unfortunately, the majority of radio experimenters in America is investigating (or tinkering) for their own education. They do not advance science much because they think of radio as something peculiar and having no connection with ordinary things. To look at radio in this way prevents the experimenter from using the general information he already has (or can easily get) and thereby to increase the usefulness of his experiments to himself and to the science. It also prevents him from taking advantage of the well tested methods used in other kinds of experimenting.

This article will try to point out the similarities between radio laws and the laws of our old acquaintances; heat, light, mechanics and wave motion—things we have been acquainted with all our lives.

WAVE MOTION

To begin with, radio vibrations are the same in character as heat, light, X-rays and gamma rays. All of these except the gamma rays are familiar to us and even the gamma rays have at least been heard of by most experimenters. All of these (from the heat to the gamma ray) are electromagnetic waves. Fig. 1 gives an idea of the range of the electromagnetic vibrations. Although it is not drawn to scale, this figure will give some idea of the tremendous range covered. The shortest vibration has a wavelength of .000,000,000,01-meter. The longest radio wavelength is more than 20,000 meters. This is a range difficult to comprehend. 20,000 meters represents the long-wave transatlantic radio stations. Coming down to the other end we see the shortest radio waves usually spoken of which are .002 meters long which is to say 2 millimeters. More recent work with spark-type radio transmitters has extended this downward right across the lower boundary of the radio territory shown in Fig. 1 and well into the next territory to the left.

HEAT RAYS FROM THE VACUUM TUBE

Next to the radio waves are the heat waves or vibrations. These start at 2 mm., just about where the radio waves are ending. This means that if you can get your tube oscillating at lower and lower wavelengths until you reach 2 mm. you will not be sending out a radio wave but instead will be sending out a heat wave.

LIGHT

Next to the heat waves are the longer light waves. Very often, to be sure, the whole range of vibration shown in Fig. 1 is called light, although the portion we can see is only one octave out of the entire 64 octaves. The word “octave” here means a range of vibrations one end of which is double the frequency of the other end. Thus in radio the range from 600 meters to 300 meters is one octave since the frequency of 600 meters is 500,000 cycles and the frequency at 300 meters is 1,000,000 cycles or twice as much. One sees that an octave can also be thought of as a range in which the wavelength is twice as great at one end of the octave as it is at the other end of the same octave. Although we have used a radio illustration the rule is perfectly general and applies just as well to light, heat, X-rays, or for that matter to music where we are not dealing with electromagnetic vibrations at all.

THE SHORTEST WAVELENGTH

Below the light waves we have ultra-violet light, beyond that the X-rays and even beyond that perhaps Doctor Milliken's ultra high frequency vibrations.

LAWS COMMON TO ALL

1. Shadows—We all know that when a screen is placed between a source of light

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*1 BFA, 16 Perth Road, Arlington, Mass.

1. An ordinary piano covers about 8 octaves of sound. Imagine what sort of music it would need to make to cover 64 octaves. Of course we could not hear all of these 64 octaves of sound any more than we can see the 64 octaves of "electromagnetic vibrations the author speaks of—Tech. Ed.

2. Wherever we meet the abbreviation "milli" it means "thousandth". A millampere is a thousandth of an ampere, a millimeter is a thousandth of a meter, a milligram is a thousandth of a gram.—Tech. Ed.
and a wall we have as a result, a shadow on this wall. Now X-rays, ultra-violet light, heat and radio can likewise be stopped by proper screens. The screen will not be the same in every case, of course. A sheet of black paper will stop light but not some of the other waves mentioned. A sheet of lead will stop the X-rays but heat will manage to get through it. Ordinary glass will stop most of the ultra-violet light though both heat and radio go through. Radio can likewise be stopped by screens of the proper materials—in general those things which will conduct electricity.

2. Reflection—When we project a beam of light on a mirror it is reflected. Exactly the same thing can be done with radio waves.

3. Polarization—Another phenomenon of wave motion is polarization. This is well-known in light and means that a wave is oscillating in one plane only. Fig. 2 attempts to explain what a polarized wave looks like. The two curves together represent the radiations leaving the antenna, or rather they represent the part which is leaving in one direction. Either curve alone gives an idea of the way a polarized wave would look if we could see it. On the other hand if both the curves are present the wave is not polarized. This thing also happens to the radio waves.

4. Others—One need not go through all the various wave effects in detail. It is enough to say that the same thing happens for all of the different wave-lengths including radio. Other characteristics are: Dispersion or scattering of the radiant energy, interference, refraction, diffraction and absorption. All these things occur in visible radiation (light) and must be true for the invisible radiations; X-ray, ultra-violet, heat and radio. Since we are interested in radio the following description will be confined to it.

**EXPERIMENTING WITH THE RADIO WAVE**

When Heinrich Hertz, in 1887, conceived the idea that the waves from an electric spark were electro magnetic he proceeded to test them. If his theory were correct his radio waves would act like long light waves. When they did act just that way it was conclusive proof that Hertz' belief was correct. His pioneer work of 40 years ago is being duplicated with better apparatus (especially the vacuum tube) in the short-wave work of today. If you are an up-to-the-minute experimenter you are doubtless trying out (with modern apparatus) the waves around 1 to 5 meters just as Hertz did with the simple equipment of Fig. 4. By putting a metal screen between the transmitter and receiver Hertz produced a shadow and cut off the signal. He reflected his waves with metal reflectors and he bent them with insulating prisms just as the light is being bent in Fig. 3.

**OHM’S LAW**

Ohm’s law states that, “Electric current is equal to the electromotive force divided by the resistance.” Mathematically this is

\[ I = \frac{E}{R} \]

This is familiar enough but did you ever stop to think how universal this law is? The electrical rule is only a special case of a general law which governs all things. This general law reads—“The result is equal to the effort divided by the opposition.” This is set down in Fig. 5 and applies to all “circuits”, whether they are working with electricity, heat, liquids, magnetism or gases.
TRANSLATING ELECTRICAL RULES

In fact all of our electrical rules are simply special statements of rules we are thoroughly acquainted with in ordinary life. A few illustrations may be helpful. In mechanics, work is force times distance. This means that if you lift 10 pounds, 5 feet, you will have done 50 foot pounds of work.

Now in electricity, work equals electromagnetic force times the electric charge.

\[ W = F \cdot d \]

Result = Effort \cdot Distance

Ohm's law for physical phenomena

**Fig. 5**

We can go on in this way but it is simpler to set down a few examples, as in Fig. 6.

The similarity of the formula is self evident.

TRANSMITTERS AND RECEIVERS

The transmitters and receivers for the exceedingly different wavelengths of Fig. 1 are of course quite different. We can only name a few of them. (See also Fig. 7.)

For radio we have the spark, the arc, the vacuum tube and the high frequency alternator for transmission. For reception we have the tube detector and the crystal detector.

The world is full of heat transmitters. Anything that is "hot" compared to the things around it is radiating heat. The sun, any hot body, fires, chemical effects, electrical effects, mechanical devices, and living plants or animals all radiate heat. Some of these are radiating light at the same time. We can build a good detector of very small amounts of heat energy by constructing an instrument which will change its electrical resistance when exposed to heat.

Light waves are transmitted by most of the heat transmitters. The eye, the camera and the photo electric cell are our light detectors.

Ultraviolet rays are transmitted by the sun and the mercury arc lamp. They can be received and detected by the chemical action of photographic plates or films and also by certain substances which convert them into longer wavelengths which we can see. These substances then glow and we call this fluorescence.

X-rays are produced by the Coolidge vacuum tube and are detected by photographic means or by fluorescence.

ALL THE SAME

We now see that these rays are very much alike. The differences are entirely due to differences in wavelength.

Now it is true that much of what has been said will seem to have no relation with radio experimenting. On second thought however, one can see that if you know the action of electric magnetic waves in general you will be much better qualified to experiment on those particular wavelengths used in radio. If a perplexing problem comes up in radio it is likely that your experience with heat or light may give a hint to the solution of the radio problem.

THE GREAT IMPORTANCE OF ATTENTION

The great difference between the ordinary experimenter and the discoverer is the ability to observe. Occurrences which escape the ordinary man are seized upon by the questioning mind of the real experimenter. As soon as something is noticed a big "Why?" springs up in the mind of the real investigator. Then he considers the connection between this incident and others that he has noticed or heard of and attempts to think out a law. Perhaps he does more experimental work before he can do this.

**MECHANICS**

- Work = force \times distance
- Power = force \times velocity
- Distance = time \times velocity

**ELECTRICITY**

- Work = EMF \times charge
- Power = EMF \times current
- Q = amount electric charge + JCT

**Fig. 6**

It was in just this way that Heinrich Hertz proved that radio waves are the same as light and heat. In just this way you will also gain ever so much more clear knowledge than by reading alone.

**NOTES. SYSTEM AND REFERENCES**

The proper way to go about an experiment is to decide first of all what you are trying to do. It is simply amazing how few take this first step. Now read up about it to avoid wasting time in finding out things that others have already done for you. Attempt to decide in your mind how your circuit should work, then connect it up and begin the experiment. Have an 8 x 11" pad or note-book at your side when working. Begin by putting down the date, place, circuit diagram, dimensions and object of the experiment. Then (and not until then) begin your work. Put down everything, trying to reason out what is happening. Afterwards check up on it by reading, asking someone else or making further experiments yourself.

A very important point is to use all the information that you have. Many times a person will not understand a thing be-

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4. Our nerves, at least those of the skin, are heat detectors. Incidentally they are indirect detectors of ultraviolet light. When the skin is "burned" the nerves report to us that the skin has been damaged chemically by exposure to too much ultraviolet light.—Tech. Ed.
cause he has forgotten some trifling detail which everybody knows perfectly well. He has made the mistake of throwing aside his every day knowledge of sound and heat and light and electricity just because he is thinking of this thing as being only a radio experiment. If all the facts are only said over to one's self they will usually give a clue to the understanding of the problem.

A good supply of books for reference is almost a necessity to the experimenter. Among others he should have Circular 74 of the Bureau of Standards, Ballantine's "Radio Telegraphy For Amateurs", Lauer and Brown on "Radio Engineering Principles" and Morecroft's "Principles of Radio Communication". Morecroft's book is about the best of its kind. Another valuable book is Bucher's "Wireless Experimenter's Manual" which has many tables and considerable information about radio measuring instruments.

In closing I hope that I have pointed out some of the connections between radio and the knowledge and means of the other branches of science. If there are any questions I shall be very glad to hear from any of the readers of QST.

5. To this may well be added Ramsey's "Experimental Manual. Naturally also, the purely radio books must be supplemented by some general science books or the experimenter will fall into the very difficulty the author warns against.—Tech. Ed.

Dakota Division Convention

The second Dakota Division Convention will take place on April 22nd and 23rd at the University of Minnesota at Minneapolis, Minn. Make your preparations to attend, fellows.

If you remember the previous one you know what there is in store for you. Director Jansky has general supervision and his committee has prepared an unusually good program. A.R.R.L. Headquarters is sending Hebert and Handy. Johnny Reinartz, 1XAM, will be present and will have something of interest to tell us. W. H. Hoffman of Burgess will also be there. The Army and Navy will have representatives and those interested in the Army-Amateur and Naval Reserve work will have an opportunity to discuss their problems. The Electrical Show is taking place during the week and a special time has been set for a visit. It is needless to say that everybody is invited. Don't miss this opportunity if you want to hear and see the latest in amateur radio, and besides, have a good time. Cost covering entire convention, $5.00. Remember, April 22-23, at Minneapolis!
The 1927 Meeting of the A.R.R.L. Board

By Hiram Percy Maxim, President, A.R.R.L.

A
NOTHER A.R.R.L. Directors' meeting has come and gone. The duly elected representatives of the members of all Divisions, save one, have come together in Hartford and for two days have deliberated upon the affairs of the transmitting amateur in America and Canada. The officers have reported to them for the past year and the Directors have made their decisions and issued their directions for the forthcoming year. The good old ship settles down for another twelve months' cruise.

It is always impressive, this council meeting of Directors who come from all parts of the country and Canada. They have come thousands of miles, some of them, to attend. They see Amateur Radio from every angle and they sit down and compare their views and in an orderly manner arrive at the conclusion that best reconciles the desires of the whole. Anyone who might sit through one of these two-day sessions would have to admit that the affairs of our A.R.R.L. are handled in a manner typical of the highest form of representative government.

The writer has sat thru many of these meetings down thru the years of A.R.R.L. history. He has seen many delicate and difficult problems thrashed out. At times he has seen the whole structure of our fine organization threatened. He has seen a World War come and bring every trace of amateur radio activity to a dead standstill. And he has seen A.R.R.L. come to life again after the war and grow into a stronger organization than ever. And at this last annual Directors' meeting which is just closed as these lines are written, he has seen the A.R.R.L. reach the height of its glory, for today we have the largest membership we ever had, we have more money laid by for a rainy day than we ever had, our good old QST is more highly regarded than it ever has been, and A.R.R.L. stands for more before the eyes of the world than it ever has in its history.

It is a superb record. We members from the oldest old timers down to the youngest member to wear the diamond button, may feel proud of our organization. Let's all realize what a fine old ship this A.R.R.L. of ours is.

Some Notes by the Secretary

The Board met in regular annual session at Hartford on February 25th and 26th, with every director and officer present except Director Gravely of the Roanoke Division, who unfortunately was confined to his home by illness. Thru two days of meetings the Board heard reports, examined conditions, and outlined policies for the coming year.

The annual reports of the officers were received, showing the past year the best financially in the League's history, its current position the strongest, its affairs and activities in excellent shape. Detailed reports on conditions in each division were made to the Board by the respective Directors, and discussed at length, particularly traffic matters. The general state of amateur radio was examined and everything conceivably relating to it came in for its share of attention. The Headquarters property of the League was inspected. A brief summary of other actions: the board ratified the acts of the Executive Committee since the last Board meeting and continued its authority; discussed legislation and regulations and planned for protection of amateur interests; amended by-laws so Communications Manager can declare a single candidate for S.C.M. elected; repealed By-Law 30 as having no further application; amended By-Law 15 to provide for witnesses of bailiff counts by Committee of Tellers but without vote on committee; agreed to one year's study of changing certain Division boundaries; rejected a proposal to have two Vice-Presidents; instructed that affiliation applications be first referred to the Director concerned; abandoned the idea of national conventions but pledged assistance to divisional conventions; added the Philippine Islands to the Pacific Division; voted thanks to the A.R.R.L. Official Wavelength Stations Committee and its appointees; ordered improvement and increased power for the Headquarters station; arranged for the establishment of a Directors' Net for radio intercommunication; instructed the officers in the investment of the League's surplus funds.

The action of the Board respecting conventions will be found interesting. The following statement of policy, adopted at the meeting, explains the subject:

"By reason of the adoption of the Constitution of December 18, 1923, it appears that the American Relay League, thru the election of new directors, now has a representative form of government under which all members of the League have votes in the choice of those who conduct League affairs."
"It therefore is plain that conventions which contemplate a participation in League management are not only impossible but unnecessary.

"The convention plan to which the League is therefore committed is one in which the members get together for technical and traffic instruction, social enjoyment and the formation of Amateur Radio friendships. Under such a plan, members attending these conventions are compelled to attend at their own expense.

"For this reason it appears to the representatives of the members, those who constitute the Board of Directors, that it is unfair to place upon the widely-scattered membership of the League the necessity of making long and expensive journeys to distant places in order to enjoy the manifest advantages of attending a national convention or in lieu of such sacrifice to relinquish such advantages.

"The American Radio Relay League is committed to the convention idea, believes in it and will encourage conventions in every possible way.

"But the only way in which these benefits can be secured for the members and distributed to them fairly and impartially is by means of the divisional convention system.

"We pledge ourselves to do all in our power to insure thorough and successful divisional conventions but feel compelled to discontinue the so-called national convention."

By order of the Board the following statement of the income and disbursements of the League for the fourth quarter of 1926 is published for the information of the membership.

K. B. W.

FINANCIAL STATEMENT
STATEMENT OF REVENUE AND EXPENSES FOR THE THREE MONTHS ENDED DEC. 31, 1926.

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Total Expenses                                 $42,076.80

Net Gain from Operations                      $7,378.75

An Overload Relay

It seems that the amateur is perfectly willing to spend all sorts of money and time on equipment that will give him just a tenth of an ampere more in the antenna circuit but absolutely refuses to take any precautions to protect this very same equipment. When one considers the many dollars spent each year for tubes that are practically thrown away because there were no precautions taken to protect them from overloads, which are more the rule rather than the exception, it certainly appears to be a mighty poor business policy.

The illustration shows a relay that is designed to open a circuit when more than a certain amount of current is flowing through it. The winding is of low resistance and will handle a maximum steady load of nine amperes. The contacts are of copper against brass and the arrangement such that a very snappy and complete break is had when the armature is tripped. The brass contact is used as a jumper between the copper ones and is swivelled so that it breaks from both contacts at about the same instant. This insures a fast break that will prevent serious arcing.

A spring allows for the adjusting of the tension on the armature and therefore the amount of pull necessary to trip it. By loosening the pull of the spring, the current required to trip the relay is reduced. A metal cover protects the instrument from dirt and mechanical injury and also prevents any sparking at the contacts from damaging adjacent equipment. These relays may be obtained from the Precise Mfg. Corp. of Rochester, N. Y.

-H. P. W.

The Relay Contest is coming. You haven't forgotten the dates May 9-22 inclusive, have you? Better mark them in red on your calendar pad.
A 15-Meter Commercial Station—2XS

A MOST unusual radio station has been in operation for some time at the "Radio Central" of the R.C.A. at Long Island. Dr. E. F. W. Alexanderson of the General Electric Co. suggests that very useful 15-meter transmission information can be supplied by A.R.R.L. men if they will observe the signals of this station, log the intensity and send the observations to the Experimenters' Section, A.R.R.L. This can be done by almost anyone as 2XS is in operation at all hours and therefore fits nicely into anyone's program.

2XS began operation something like a year ago and has operated with various wavelengths and antenna systems, one of the main objects being to find a combination that would put traffic into Buenos Aires consistently. This may not sound like a very impressive job to the man who has worked into that city with a "five watter"—but how many of you would like to do the job 365 days a year regardless of weather?

Dr. Alexanderson therefore tried transmission from a horizontal doublet, in other words the sort of thing we usually call a "Hertzian antenna". This changed the pattern of places at which the signal was received and in the new pattern Buenos Aires was at a point of good signal intensity—where it has continued to stay, showing that it is not a freakish effect. Just where the signals do come down is now a matter of great interest and that is where A.R.R.L. men all over the world can help. It will be especially interesting for observers in the supposed-to-be skip-distance because we have enough information at present to be sure that 2XS has good signal strength at points where one would not expect to hear it if the skip-distance theory were followed closely. Perhaps this is due to the power of the station—observe the signal strength at various places will clear that up.

Now as to the station itself. Quoting from a letter of our good friend F. H. Kroger, of the Engineering Department of the R.C.A.

"The transmitter operates on a wavelength of 15 meters. As you know this is not..."
in exact accord with everyone's standard but is believed to be fairly close to the actual value. There are approximately 7 Kw. in the antenna which consists of a horizontal doublet with a reflector. The antenna is elevated about 20 feet above the ground and points at Buenos Aires. The transmitter proper is crystal controlled with the requisite number of stages of amplification, providing excitation to two water-cooled tubes in push-pull relationship. The output from this power amplifier is to the transmission line feeding the horizontal doublet.

"The transmitter is on the air practically all of the time from six in the morning to early evening, depending upon the time at which Buenos Aires either clears traffic or advises that the signal has faded out for the night."

2XS is located in such crowded temporary quarters that photographs were unfortunately not possible but Mr. Kroger has supplied us with pictures of the new sets being built as a result of the experimental work at 2XS and these are shown herewith.

---R. S. K.

**Strays**

The other month we ran a short stray on the Government publication "Radio Aids to Navigation." We confess that we had not seen the book at the time the stray was run. We relied solely upon the information given by our friend Washburn of New York City. In the meantime our copy has come in and we want to say that no seagoing brass-pounder should be without a copy of this excellent book. If you are interested in time signals, radio compass stations, radio fog signals, radio "wx" bulletins, storm warnings, navigation warnings and meteorological data you will find a complete list of every commercial and governmental station in the world transmitting these signals listed in this excellent manual. It contains 381 pages of real dope you cannot afford to miss, and it costs only 90 cents, from the Sup't of Documents, Government Printing Office, Washington, D. C.

Schweinsberg of 8BMN has a nifty "low loss" switch which can be used in a variety of ways in an amateur station. The idea can be gleaned from a look at the illustration herewith. An ordinary single-pole double-throw battery switch can be removed from its base and mounted on the towel bar by means of brass strips bent as shown.

Continuing from page 37 of last month's issue, we note the arrival of another Junior op. Harold P. Westman Jr. arrived shortly after noon on February 26th. Next?
With circuits such as those shown in Fig. 1 it is often difficult for the layman to tell which tube is supposed to be the detector—and especially why that tube acts as a detector and some others do not.

For instance in the circuit of Fig. 1A, the second tube VT is an r.f. amplifier while in 1B it is a detector, in spite of the fact that the connections of the r.f. transformer RFT are the same in both cases as are the grid leak resistances and the condenser connections.

The grid bias determines whether a tube will amplify or detect most effectively. The grid condenser can be of the same size (250 pfd.s.) in both cases. The grid-leak resistance can also be the same, as has been stated. Nevertheless, the grid bias in the two cases will not be the same, for the "grid return" path is not the same. There are two sorts of grid-return paths. One is the path thru which the r.f. gets back to the filament, the other is the path thru which the d.c. (the so-called grid current) gets back to the filament. The r.f. may be brought back thru a condenser to the filament, because the r.f. passes thru a condenser quite conveniently, but at the same time the condenser insulates the d.c. and some sort of a separate path must be provided for it. Thus in 1A and 1B if we omit the grid leak Gl the tubes will block unless poor apparatus or a leaky tube provides an accidental return.

It is thus possible to secure arrangements in which the r.f. is returned to the filament thru some convenient short path while at the same time the d.c. is compelled to take another path to some point which will provide the proper grid bias for the particular tube action that is required.

TROUBLES

When working moderately the tube VT of Fig. 1A will be an r.f. amplifier because the grid leak is connected in such a fashion as to return the d.c. to the negative side of the filament, which gives the grid a negative bias.

In spite of this apparent determination of the tube function by the bias it is perfectly possible for the tube to go wrong and to detect signals by the usual machinery of the grid leak and condenser, which operates as follows.

When an incoming carrier wave arrives at the antenna, r.f. energy is fed thru the receiving set and the grid of VT is made more or less negative at a radio-frequency rate. Whenever it is less positive it has a greater tendency to accumulate electrons from the plate current and thereby to charge the condenser C, up to such a voltage that no more electrons are accumulated. This happens very soon and things are steady again. Now if the incoming carrier wave is modulated (with key or microphone) there is a tendency for the charge on C, to rise and fall with the intensity of the incoming carrier and if this happens to any considerable extent it means that the grid is following the modulation and the tube has become a detector.

To prevent this action we can do three things. We can make the condenser C, of very large capacity so that the grid current is unable to charge it very fast and hence the grid is unable to follow the variations of the incoming carrier. We can make the
grid resistance low so that there is less of an a.f. drop across it and finally we can make the fixed bias greater (grid more negative) to decrease the tendency to collect electrons on even the strongest of signals.

EXAMPLES

If in 1A we have an r.f. amplifier using a 201-A tube it will rectify (detect) excessively if the $G$ resistance is 2 megohms, the capacity of $C_6$ 50 picofarads and the B-battery voltage 45 and the grid-leak return made not as shown but to the positive filament. This is quite natural for we have a bias favorable to detection, a $C_6$ small enough to charge easily and a leak resistance across which an audio drop is easily produced. If we put a pair of phones (properly by-passed) in the plate circuit the detection will be proven.

Now if we increase $C_6$ to 5000 pfds more amplification will immediately take place in spite of the poor bias conditions. Then if we connect the leak to the negative A-battery as in Fig. 2 rectification (as shown by the headset) will be negligible. The return used in Fig. 2 is even more negative than that used in Fig. 1B since the 1-volt drop thru the filament rheostat is used to give additional negative bias.

To check the correctness of the statements as to the effect of changing the size of $C_6$, one can cut down the $C_6$ capacity in Fig. 2. When it is reduced to 50 pfds there will be fair detection even though the bias condition is entirely unfavorable for such action. Of course the detection will not be as good as that in 1B. Detection will, however, improve as $C_6$ is made smaller up to the point where $C_6$ has so high a reactance as to waste r.f. voltage.

In Fig. 1B, detection will occur with any size of $C_6$ but the audio response (detector effect) will be unimportant if $C_6$ has a capacity of 1000 pfds or more. Slight r.f. amplification will exist, or else regeneration could not exist as it depends on returning r.f. to the grid. As $C_6$ is reduced to 250 pfds or less, the tube will (according to the headset in the plate circuit) show an increase in audio output as to both quality and quantity. The process can be carried to 50 pfds with advantage under some conditions.

Another way to get more r.f. amplification than detection is to use a small $C_6$ condenser with a leak of low resistance which, on the face of it (and practically, too) is not as good as the use of a large grid condenser and a proper bias. Finally, with the large $C_6$ low resistance leak and proper bias r.f. amplification occurs as it should with negligible detection. Fig. 2 then shows the proper conditions for an r.f. amplifier in which the tube is a 201-A, and the plate voltage 45. The curves for the 201-A tube confirm this as the Eglp curve for the tube is struck at its straight center portion when a bias of 1 to $1\frac{1}{2}$ volts negative is used at 45 volts on the plate. From the curve one can also see that for 90 volts on the plate the grid should have a $4\frac{1}{2}$-volt negative bias and this is rapidly checked by the phone-in-the-plate test. The circuit then changes to that of Fig. 3 for the extra bias voltage cannot be obtained readily from the filament circuit and hence must be supplied by a separate C-battery. The rheostat is not used as part of the bias system because a more practical fixed bias is now available. It is generally better to know what bias the tube is getting, rather than to depend on a rheostat which is shifted.

EXPERIMENTAL CHECKS

Under receiving conditions some more tests were made with the arrangement of Fig. 3, using plenty of amplification (audio)

after the tube VT so that differences would be magnified and made more obvious to the ear. GI seemed to gain nothing by being of less resistance than $1\frac{1}{4}$-megohm and $C_6$ nothing by being larger than 500 pfds. As low as 100 pfds, at $C_6$ and as high a resistance as 2 megohms at GI seem quite practical—the larger capacity and lower resistance are more certain to be safe, however.

DETECTION AGAIN

Some detection does occur in most r.f. amplifiers (as shown by the headset test) even when the bias is correct for amplification. This effect is increased in circuits us-
ing a grid resistance as in 1A, 2 and 3. Strictly, this seems to hurt nothing in set performance; theoretically it should have an effect that is harmful.

To get away from this detection in such circuits almost entirely two methods have been tried successfully. The detection is due to the d.c. resistance of the grid leak. Reduce the d.c. resistance (opposition to the flow of direct current) and the detection is decreased. Since a high r.f. reactance (opposition to the flow of r.f.) is necessary at this point the d.c. return can be made thru a choke as shown in Fig. 4. It is important to have a good choke and some good ones are on the market. The choke generally is wound with such small wire as will give a resistance between 100 and 1000 ohms which is not sufficient to cause an a.f. drop of any consequence. C<sub>6</sub> may have any capacity greater than 100 pfds--10 microfarads if you wish.

The second way to get around the difficulty is to use "series feed" of the grid bias as shown in Fig. 5 and to do away with both leaks and grid chokes. Since the r.f. transformer used as an illustration has the plate battery connected to it the change in the bias system necessitates the addition of a plate blocking condenser and a plate r.f.c. The blocking condenser should have a capacity of 6000 pfds or more for a little r.f. reactance here can do much harm. The r.f. choke does not need to be so good and can be replaced by a resistance, though that calls for increased plate voltage which is not a practical solution of the problem. In some r.f. coupling devices the plate-blocking condenser and plate choke would not have been necessary when biasing as in Fig. 4 because the coupler has an insulated plate winding to begin with. It is important to note that when biasing as shown in Fig. 4 it is not possible to ground both the filaments and the condenser rotors on the shield of a set. It is best to ground the rotors directly across the pins. It also reduces the capacity between the plate and grid posts. The tube prongs fit into substantial split holders which are fastened to the base by means of machine screws threaded into the lower portion of them. Connections may be made either by soldering to the lugs which extend a generous distance from the edge of the base or to the posts which are the ends of machine screws used to hold the lugs from shifting. A marker shows the proper position in which the tube should be inserted. Care should be taken as the tube may be reversed with possible disastrous results. As will be seen, however, the marking showing the direction of the pin is very noticeable and there should be no trouble from this point. All the markings are deeply engraved. The socket is manufactured by the Radio Engineering Labs of New York City.

Power Tube Socket

The accompanying illustration shows a new socket designed for the UV-203 and 3-A tubes. The base consists of a heavy piece of hard rubber, circular in shape, with a center hole to improve the insulation di-

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Strays

In contrast to the usual run of messages handled via amateur radio we were quite pleased to see some really important messages that were handled by 6BVY. These covered various subjects from the recent China trouble to the arranging of a couple of weddings as well as looking out for the bride. 6BVY tells us that in a short time he will have had a schedule with op1AU for a whole year and that the longer you keep a sked, the better the class of traffic becomes.

You should be getting your outfits all shined up and ready for the big tests. It is the chance of a lifetime to make a name for yourself and your station. See the Rules in March QST and send a card to HQ now.
The Institute of Radio Engineers

By John M. Clayton

The Institute of Radio Engineers is the technical society representing the radio engineering profession in this country. The remarkable progress in the art of radio communication since 1900 has made eminently desirable the formation and development of an organization of this character. The radio engineering profession owes much to the men who founded the Institute of Radio Engineers, and to those who have carried on its activities. These men have foreseen the possibilities of such an organization; an organization which has fostered and encouraged the development of this highly useful art, and has afforded ample opportunities for its members to meet and discuss radio problems. It is clear that the Institute will be no small factor in the future progress of the radio art, in the technical advancement of its individual members, and in the elevation of the radio profession as a whole.

History of the Institute

Prior to the formation of the Institute of Radio Engineers, two of the most prominent organizations in the radio field were the Society of Wireless Telegraph Engineers of Boston, and the Wireless Institute of New York. To avoid inevitable duplication of effort and to increase their usefulness by cooperation, these societies considered consolidation. The consolidation was affected on May 13, 1912, at which time the Institute of Radio Engineers, with a charter membership of something less than fifty, came into being. Prominent in the early work of the Society of Wireless Telegraph Engineers, the Wireless Institute and the Institute of Radio Engineers were John Stone Stone, Lee de Forest, Fritz Lowenstein, John S. Murphy, R. A. Somerville, Joseph D. Fountain, R. B. Respress, R. A. Cleve, John Gregg, E. Barnwell, Phillip Farnsworth, Sidney L. Williams, R. H. Marriott, G. W. Pickard, John V. L. Hogan, Alfred N. Goldsmith, Harry Shoemaker and Eugene Thurston.

Many of these pioneers are still actively associated with the Institute, either in its management or through contributions in the form of technical papers.

Since 1912 the growth of the Institute has been quite rapid and healthy. On January 1, 1927, over 3,500 radio people were associated with it in the several grades of membership. The membership of the Institute consists of scientists, research and development engineers, inventors, authors, consulting and practicing engineers, professors of physics and engineering from many colleges and technical schools, professional and amateur investigators, professional and amateur operators, executives in commercial organizations, officers and representatives of many branches of the Government, as well as many others who desire to keep abreast with the latest developments in radio communication not only along research lines but along engineering lines as well. These members are distributed throughout the world, one tenth of the total membership residing in countries outside the United States and Canada.

Advantages of Membership

All the members of the Institute are furnished with copies of all issues of the Proceedings of the Institute of Radio Engineers, the monthly journal of the Institute in which from three to six technical papers are published. Among the authors of these papers will be found the names of many leaders in the radio art. To the student of radio communication, to the man just entering or just out of college, and to the amateur, the Proceedings presents the most recent developments and discoveries in the radio communication field, beginning where the textbooks leave off, presenting radio engineering and practical radio articles which will appear in the radio books in years to come.

There is also issued a report of the Committee on Standardization, which contains...
definitions of technical terms used in the radio field, together with carefully drawn diagrams of standard graphical symbols. This is the officially adopted list of standard names, terms and symbols covering the entire radio field. Future issues of the report are expected to include standard methods of testing and rating radio apparatus.

Members of the Institute are entitled to attend the meetings of the Institute and its various Sections, to present suitable papers before such meetings, to discuss papers at meetings, and to take part in the election of officers of the Institute.

The management of the Institute, insofar as the election of its officers is concerned and in the consideration of constitutional amendments, is entirely in the hands of the membership.

GRADES OF MEMBERSHIP

There are five grades of membership in the Institute.

The Junior is a member not under sixteen years of age, and not over twenty-one, interested in the study or application of radio science or the radio arts. On attaining the age of twenty-one Juniors may be transferred to the grade of Associate.

The largest part of the membership is composed of Associates who have the following qualifications to fulfill:

a. Must be at least twenty-one years of age.

b. Either a radio engineer by profession, or a teacher of radio subjects or a person who is interested in and connected with the study or application of the radio arts or radio science. The Associate is entitled to all rights and privileges of the Institute except the right to hold the office of President or Vice-President. (See note.—Tech. Ed.)

A Member is a radio engineer by profession who has designed and taken responsible charge of important radio engineering work for at least four years; or a teacher of physical science or electrical engineering in a school of recognized standing who has been active for a period of four years; or a person regularly employed in radio or closely allied work for at least four years, who by invention or proficiency in radio science, the radio arts, or radio literature, or as an executive responsible for important radio work has attained a standing equivalent to that required of engineers, or a commissioned officer of the Army or the Navy of the U. S. or any foreign Government who has attained the rank of Captain in the Army or Lieutenant in the Navy and has been actively engaged in radio work for at least three years and has had responsible charge of important government radio work.

A Fellow is a member who is a radio engineer by profession and who has done important radio work for a period of at least seven years; or a professor of physical science or electrical engineering who has attained special distinction as an expounder of the principles of radio science and of radio engineering; or a person who has done notable original work in radio science of a character to give him recognized standing at least equivalent to that required for Fellows in the above paragraph.

The Honorary Member is the most distinguished grade. An Honorary Member is a person chosen from among those who have rendered acknowledged eminent service to radio science, or the radio arts.

Note—in the staff at A.R.R.L. headquarters there are 2 Junior members, 5 Associates and 3 full members, of whom one is a Charter Member of the Institute. Many members of A.R.R.L., who are personally acquainted at headquarters have given the names of various ones of the 10 mentioned as references.—R. S. K.
JOINING THE INSTITUTE

Applications for membership of any grade are made on blanks obtained from the office of the Institute at 37 West 89th Street, New York City. Applications should give as references 5 names of I.R.E. members of the grade applied for, or higher. This does not apply strictly to Associate or Junior applicants. For these grades it is usually sufficient to furnish the names of 5 business associates who will act as references.

SECTIONS

Throughout the United States there are a number of Sections of the Institute and in Canada there is one Section. These Sections hold meetings at regular intervals. At these meetings prominent radio engineers and scientists deliver technical papers which are discussed by those present. All members of the Institute residing within the territorial limits of a Section automatically become members of the Section as soon as it is formed. In addition to the speakers who appear before the Sections, advance copies of papers which are to appear at some future date in the Proceedings are supplied to the Section officers so that these papers may be read and discussed at the Section meetings.

At present there are ten active Sections in the following localities: Washington, D. C.; Boston, Mass.; Seattle, Washington; San Francisco, Calif.; Chicago, Ill.; the Canadian Section with headquarters at Toronto; Philadelphia, Penn.; Rochester, N. Y.; Los Angeles, Calif., and the Connecticut Valley Section with headquarters at Middletown, Conn.

The total membership in the various sections is well over five hundred. Several new sections are now in the process of formation.

MEETINGS

In addition to the meetings of the Sections, the Institute meetings are held monthly in New York, except during July and August of each year. At these meetings, scientific, engineering and other papers relative to the art of radio communication are presented by members of the Institute specially qualified to treat their subjects. The presentation of papers is followed by an open discussion. The material presented at these meetings, together with other material submitted for publication only, constitutes the technical papers which appear in the Proceedings.

A list of the past presidents of the Institute contains the names of the leaders in the radio art—men who have contributed to radio engineering and to the advancement of radio science, and who today are among the most prominent people in this newest field of electrical science. They are:

1912 . . . R. H. Marriott
1913 . . . G. W. Pierce
1914 . . . L. W. Austin
1915 . . . John Stone
1916 . . . A. E. Kennelly
1917 . . . M. J. Pupin
1918 . . . G. W. Pierce
1919 . . . G. W. Pierce
1920 . . . J. V. L. Hogan
1921 . . . E. F. W. Alexanderson
1922 . . . Fulton Cutting
1923 . . . Irving Langmuir
1924 . . . J. H. Morecroft
1925 . . . J. H. Dellingar
1926 . . . Donald McNicol

and

1927 . . . Ralph Bown

Due to the rapid growth of the radio art and the interest in radio science and engineering, the Institute has taken an established place among the other engineering societies not only of this country but of the world. In this time of rapid strides in the development of new apparatus and circuits and in the understanding of radio phenomena, the amateur just as well as the engineer and the scientist finds that he benefits materially through his association with the Institute, and that through the Institute he too can be and is one of the active participants in the progress being made in all branches of radio communication.
IN this day when amateur radio activities are partitioned off into various small bands, it seems strange that most of our tuners are so constructed that these bands are covered with a dial displacement of 25 degrees or less. It seems that when building a receiver, the object is generally to cover everything from the ground up and not to worry over how few coils are required or how much territory is covered by each coil as long as the various bands are not broken up and thereby call for two coils to cover a single band. This type of receiver has, no doubt, a perfectly good reason for existing as there are some operators who desire to be continually going from one band into the next adjacent one and back again either in quest of CQs or in answer to their own. However, I believe that the working of a transmitter in one band and a receiver in two or more other bands at the same time is gradually becoming obsolete and that if a man is interested in handling traffic, either in the 40- or 80-meter band. This man does not get out of his particular band and is usually the man who makes and keeps schedules. In order to keep such schedules, it is necessary not only to note the exact setting of the dial but also it must be possible to come back to that exact setting. If the entire band is covered with a 25-degree rotation of the dial, it becomes rather difficult to read the dial spacings close enough to make possible rapid and accurate readjustments to a given wavelength unless a wavemeter is used. This is not always convenient. If, for instance, the band is spread out over the full dial, stations will appear to be four times as broad and resetting of the dial will be four times as easy.

In such a set, it is necessary to use a tuning capacity that is very much smaller than those now employed. We have been considering a tuning capacity of 100 µµf, to be a good size for these tuners but it is quite possible to cover the lower U. S. bands below the 150-to 200-meter one with a secondary condenser having a maximum capacity of about 15 or 20 µµf. The set shown in the photograph uses a Cardwell 2-plate double-spaced straight line frequency condenser that has had one of its plates removed and the other adjusted so that the desired capacity range is obtained. The condenser originally had a maximum capacity of 22 µµf, and this may be used "as is", if a large amount of territory at one or both sides of the band is wanted. This condition will give a tuning range of approximately 8 meters in the neighborhood of the 40-meter band. The band will be spread over about 50 degrees of the dial. This, in itself, is well worthwhile and will allow the tuning to extend three meters outside of the band. This may be adjusted to come at either the upper or lower ends of the band or some overlap may be left at both the ends.

If it is desired to spread out the band until it covers practically all the dial, it is necessary to cut down the condenser a bit. This is not a very difficult thing to do and with a little care can be done in short order. The two screws holding the hard
rubber pieces to the back endplate are first removed. It is a good policy to use a small box or the cover of one to hold all the screws and bolts taken off instruments when making such adjustments as they always fall on the floor and hide in some dark corner if they are not properly corralled at the start. An old cigar box is excellent.

Next, the three hex-headed studs are removed and then the end plate taken off. See that you don't drop the hall used in the bearing. It will usually stick in the endplate but this is not guaranteed. The rotor plates are then swung clear of the stator-plate and the rotor assembly removed. It will probably be necessary to hold the shaft in a vise when loosening the nut that holds the rotor plates on the shaft. This is taken off and the nearest rotor plate removed. The spacing washers are then replaced and the nut put on and screwed up good and tight. The condenser is then reassembled by reversing the process used to disassemble it. We then have a condenser having a maximum capacity of approximately half that of the original one. This is a bit small and it is only necessary to bring the plates somewhat closer together to get the proper capacity. This is done quite easily by loosening up on the set nuts which lock the front and back bearings in place. Loosen up a turn or so on the back bearing and follow with the front one. Keep tightening up on the front one until no end play is felt. There is no convenient gauge which will tell you when the spacing is correct but this adjustment can be made with the condenser in the set and the wavelength range checked immediately. If too wide a band is being covered, it indicates that the capacity is too large and if the band is too narrow, the capacity is small. Moving the plates together increases the capacity.

The circuit is shown in Figure 1 and uses a resistance for the control of regeneration. A 50,000-ohm variable unit is used. It allows the voltage applied to the plate to be varied enough so that complete control of regeneration may be had. The capacity across it tends to smooth out any small fluctuations in current which may occur when adjusting the value of the resistor to control regeneration. This condenser is placed underneath the tuning condenser in the set and is fastened to the baseboard. The relative positions of the other parts may be seen from the photo.

The coils used are made of the Hammarlund coil material and the No. 16 wire wound ten turns to the inch on a three-inch diameter. This is the size used for the secondaries. The ticklers may be made of this same size although somewhat less reaction between the plate and secondary circuits is had when the smaller size coil is used. The smaller coil has 43 turns per inch of No. 26 wire on a two-inch form.

The base into which the separate coils plug is made of a piece of bakelite 45/" by 3/" by 1/4". It is mounted directly upon the condenser by two 6" by 32" by 13/4" flat head machine screws which take the places of the top studs to hold the frame together. Nuts are used to tighten up the frame and to hold the piece of bakelite at the end of the screws. Three jacks are spaced one inch apart and are located between the mounting screws and the other one is spaced one inch and a half away and is the other side of the mounting screw. The coils are held between two pieces of bakelite which are 47/8" by 3/4" by 3/16". General Radio plugs and jacks are used.

When the range of the coil is to be adjusted to cover a band with a minimum of overlap, it becomes difficult to cut coils so that they will have this overlap just where it is wanted. To simplify the making up of the coils and to allow a certain amount of flexibility in operation, a small adjusting condenser is shunted across the secondary coil. This will allow the range of the coil to be shifted within reasonable limits. One of the Hammarlund “neutralizing” condensers are used. The piece of mica is removed to cut down the maximum capacity and to make the dielectric all air. Its long lug will just fit over the end of the plug in the coil base.

The antenna coil consists of 10 turns of
the two-inch stock and is clamped between two pieces of bakelite. These pieces are held together by means of a small machine screw that passes through them. It may be threaded into the under one or else a nut may be used. They are also notched so that they can be clamped over a piece of our wire without letting the coil slip. The bus is then bent in the form of a stand and screwed down to the baseboard. When the proper tension of the screw is had, the coil may be shifted and thus allows a variation of the antenna coupling.

No effort was made to make the single stage audio amplifier any more selective to a 1000-cycle note other than the use of an old type UV-712 transformer as a very large percentage of the notes heard on the air are of the 60-cycle variety and if the amplifier is made too selective, these lower frequencies will suffer. Unfortunately, there seems to be no way of telling the peaked transformer and the newer music transformer apart. For a time, the new ones were marked with a star but this has been discontinued and now both have the same appearance. No jack is used to connect the phones to the set as they are connected in series with the "B" lead to the amplifier tube. If desired, another set of terminals may be put on the terminal strip and used for them. It is not advisable to run them from the front of the panel as they usually are always getting in the way.

When the receiver is operating, it may be found that the set goes into and out of oscillation with a high pitched audio howl. This may be overcome by bringing the grid return of the detector tube to the other side of the filament. Although it is usually considered best to return the detector grid to the "A" positive, in this case the negative proved better.

As different operators have different desires as to wavelength ranges for the various coils, there appears in Figure 2 a graph showing the approximate wavelength to which a given number of turns of inductance will tune when the tuning condenser is set at zero and the adjusting condenser is at minimum. These figures can not be accurate for all sets as the lumped capacity across the coil due to the wiring, tube, socket, etcetera, will vary somewhat. However, if the proper number of turns is found on the curve and the number reduced by one, the coil should be satisfactory as its wavelength range may be raised by the use of the adjusting condensers. The width of the band which will be covered depends upon the spacing of the condenser plates and may be adjusted to suit the individual operator.

The use of the small tuning condenser makes it possible to use a vernier dial with a lower ratio than is usually employed. A velvet vernier dial is used in the receiver shown and is certainly a pleasure to operate. Its ratio is about right for the job and plenty of regulation of the note may be had by adjusting the secondary condenser. Unlike many tuners that cover a large band, it is possible to vary the note with the secondary condenser without losing the signal entirely. It is not necessary to do the note tuning with the regeneration control.

The grid condenser has a capacity of 100 µfd's. The leak is 5 meg. This, however, will vary with the tube used. Both 201-A and 199 tubes were used and the latter gave somewhat less detuning with a change of regeneration. The by-pass condenser is very necessary or the circuit will not oscillate readily. It should not be made too large as it is possible for it to hold its charge and make the regeneration control sluggish. A .001 µfd. one will allow plenty of oscillation.

Strays

Don't forget to send your card to the International Contest Editor if you want to enter the International Relay Tests.
Radiotron CX-340—UX-240

By Robert S. Kruse, Technical Editor

The tube known as the UX-240 and CX-340 (these double names are a confounded nuisance), differs from the more usual receiving tubes in being able to do several jobs better. It is a first rate tube for high-distortion audio amplification such as is required for amateur c.w. work and at the same time is excellent for resistance coupled audio amplifiers such as are used in broadcast receivers for minimum distortion. In addition to this it has some interesting advantages as a detector, especially for amateur c.w. work.

The UX240CX340 (I shall call it the 240 hereafter and save time) differs from the 201-A type in having a higher plate impedance, while the filament remains the same; that is to say, a ½-ampere, 5-volt thoriated tungsten wire of the so-called “X-L” type.

As an Amplifier with Transformer Coupling

When another amplifier tube is suggested we naturally think—“What excuse is there for still another kind? Aren’t 7 kinds enough?” It happens that there is a reason for another sort and as was suggested above it can serve the double purpose of a maximum-distortion amplifier and a minimum-distortion amplifier.

When as in Fig. 1 a tube works into an audio transformer the results that are gotten depend roughly on:

The amplification constant of the tube, \( r_\mu \)

The plate impedance of the tube, \( r_p \)

The impedance of the transformer, \( Z \)

No one of these makes the thing good or bad. We used to think that as long as \( r_\mu \) was large everything was lovely. By that test the 240 would be a wonder, for it’s \( r_\mu \) is (as shown by Fig. 2) very large as compared with that of the 201-A. Now suppose that in Figure 1 we start out with a good audio transformer such as the Amertran or similar transformer and with a 201-A tube. We feed an amateur c.w. signal (1000-cycle beat note) into the combination and get a certain amplification. Then we try feeding some of WGY’s excellent music thru the device and find that the same amplification stays with us on other notes; in other words

![Figure 1: The Usual Transformer-Coupled Audio Stage](image1)

![Figure 2: Showing Effect of Changing Plate Voltage on the 201-A and 20 Type Tubes](image2)
that we have a "high grade" amplifier for broadcast reception but one that is entirely too good for c.w. work because all notes come thru. Suppose now we take out the 201-A and put in a 240. We will find that the 1000-cycle amateur c.w. signal will be materially louder but that the broadcast music will be rather terrible. Low notes will be weak and there will be a strong tendency to blare when we strike 1000 cycles or thereabouts.

It looks as if by a simple shift of tubes we have turned a good broadcast amplifier into a good c.w. amplifier, which is naturally terrible for musical purposes. This is the fact and the explanation can be seen from the curves in this paper.

Suppose that we first consider what goes on in the circuit of Fig. 1. Whatever audio voltage comes into the tube V.T. is amplified by the tube by the number of times represented by the "Mu" of the tube, that is 6 or 8 for the 201-A and 30 for the 240. This is voltage in the plate circuit and the next problem is to get it into the audio transformer. For the 201-A that isn't hard tho it has taken manufacturers a long-long time to get up the courage to make transformers large enough. The reason for the size is NOT that much power is to be handled. Quite the contrary, the power is nowhere near enough to warm up the smallest of audio transformers. The reason lies entirely in the good electrical rule which is sketched in Fig. 3. At A we have a direct-current electrical generator. If the armature has a certain resistance which we will call R int. (internal resistance) we will find that the generator is giving the most output when the load resistance (R load) has the same value. If the load resistance is higher the current drops off; if the load resistance is lower the current rises but the voltage drops off and the generator does less and less work outside tho it may heat inside.

Now if we carry the same rule over to vacuum tube amplifiers as in B we find that the tube gives the most output when the load resistance R is equal to the plate impedance r p. In the same way we find that in the transformer-coupled amplifier at C the out-

![Fig. 3](image1.png)

**FIG. 3—THE OUTPUT RULE, SHOWING HOW THE RIGHT COUPLING DEVICE IS CHOSEN FOR AMPLIFIERS TO GET MOST AMPLIFICATION AND MOST, OR LEAST DISTORTION AS ONE MAY CHOOSE**

![Fig. 4](image2.png)

**FIG. 4—THE AUDIO TRANSFORMER, SHOWING HOW IT MAY BE MADE TO DISTORT OR GIVE HIGH QUALITY DEPENDING ON THE TUBE USED**

A—Normal picture of transformer.
B—Distributed capacity taken into account.
C—Effect of distributed capacity in creating a peak when using a high impedance tube ahead of the transformer.
put is greatest when the impedance \( Z \) of the transformer is equal to the plate impedance \( r_p \) of the tube.

One may think—"That all sounds well but what has it to do with amplifier distortion?"

Simple enough. Let us look at Figure 4 and we can explain it. We usually think of an audio transformer as being like Fig. 4A. Now that is not all of the story. The transformer not only has windings but these windings have distributed capacity and the complete diagram is that of Fig. 4B. Now unless the resistance is extremely high a circuit with both inductance and capacity is tuned. This one is. In fact if we take the transformer off by itself and measure it "looking into" the primary terminals we will find that it acts like the parallel-tuned circuit of Fig. 4C. If one feeds it a low frequency the affair will show a very low impedance which rises rapidly at resonance, reverses at resonance (still high tho) and then drops again as we leave resonance. This simply means that at resonance the transformer could be used as a very high impedance load but that off resonance it would fall rapidly and have a much lower impedance.

For the sake of brevity we will not start to take the transformer apart but let it go at that and get ahead.

Suppose that we used the transformer first with the 201-A tube. This would almost swamp the resonance peak we have just talked about.

**WHAT CAUSES THE PEAK TO COME AND GO**

Suppose now that we take the Amertran just discussed and connect it to a 201-A. Our diagram now changes abruptly and becomes that of Fig. 4D. The Amertran has a nice high impedance and therefore the moderately low \( r_p \) of the 201-A acts like a resistance load across the primary. The effect of the capacities of 4B is swamped out, the peak goes down and the hollows come up and we arrive at a nice flat curve, just as we found in the test a bit ago.

Now we pull out the 201-A and substitute a 240. The \( r_p \) of the 240 was 22,000 ohms at 40 volts. That of the 240 is 180,000 ohms at the same voltage. Practically speaking, we have taken the load off the primary.

The effect of Fig. 4C gets full opportunity to go to work. This means that off the natural resonance of the transformer we get little amplification while on the peak the transformer acts like a high impedance (200,000 ohms perhaps), loads up the tube and takes power from it. We get good energy transfer at the peak voltage, poor transfer at other voltages and our "good" music amplifier has become a "good" c.w. amplifier. It is a beautifully simple way to shift from purpose to purpose.

**AS A RESISTANCE-COUPLED AMPLIFIER**

In a resistance-coupled amplifier the amplification per stage is usually very, very poor. Generally speaking 3 stages are not equal to two stages of transformer, the the quality may be a bit better if we are concerned with music. The cause of this is simple also. With transformers the per-stage amplification is the \( \mu \) of the tube times the transformer ratio—for instance \( \frac{7}{2} \) or 17, less a very little that accounts for the losses. In the resistance amplifier we have the opposite condition, the per-stage amplification is less than the \( \mu \) of the tube, in fact we can hardly hope to get over 19 from a tube with \( \mu \) of 30 while the 201-A tube cannot be expected to give much over 5. Since it isn't much of a trick to obtain first-rate transformer amplification with high quality from the 201-A at the rate of 15 per stage and no trick at all to get 12, this puts the 201-A out of the running as a resistance-coupled tube.

The curve of Fig. 5 shows that the 240 under the same conditions will give good per-stage amplification so that one now has the choice of a high-quality transformer amplifier with 201-A tubes, a distortion amplifier with 201-A tubes and peaked transformers, a distortion amplifier with 240 tubes and high-quality transformers, a high-quality amplifier with 240 tubes and resistance coupling, and finally a super-distortion arrangement with peaked transformers (old style) and the 240 tubes. The last provides entirely too much distortion to
suit me, even for the reading of crystal-stabilized signals.

AS A DETECTOR

All of the things mentioned apply with additional strength to detection. Here the plate impedance is even higher than before because the gridleak and condenser add to the ordinary bias. (This is why some good transformer makers make a special type to follow the detector.) Therefore the resonance-peak effect of Fig. 4 gets an especially good chance.

My pet amateur receiver at this moment is a 240 detector followed by a "good" transformer and then by a 201-A as will be explained in a moment.

THE LAST AUDIO STAGE

Since the 240 cannot feed into an ordinary audio transformer without manufacturing peaks it certainly should not be expected to feed into a headset or loudspeaker, as these have even smaller impedance and horrible distortion is bound to follow. I find that even the 1-audio arrangement just referred to will give more of a peak than seems useful if both the detector and the amplifier are 240s. When more stages are used the peak becomes too strong.

In broadcast reception one naturally wants to keep the peaks down and the hollows up, therefore the correct combination is one or several 240s feeding into 250,000-ohm resistances and coupled to the next tube thru condensers with capacity between .05 and .005 microfarad. The last tube (which is to feed the loudspeaker) should be a normal 201-A, 112, 171 or a 210 with an output transformer. Anyone who prefers to do his broadcast reception with transformer coupling is welcome to keep right on with the usual 201-A tubes down to the output tube. There will be at least two of us.

MISCELLANEOUS

Because of the high plate impedance of the 240 the coupling resistance should have a value of 250,000 ohms and the B battery should supply from 135 to 180 volts of which about 110 will reach the tube. The amplification will be about 20 which compares well with high-grade 201-A stages, transformer coupled.

The coupling condenser of the resistance-coupler should have a value between .05 and .005 microfarads and be of the very highest grade. Paper condensers are probably not nearly good enough and any but the best mica condensers are likely to fall into the same class. The insulation resistance must lie above 100 megohms, otherwise the B voltage gets to the grid, likewise there is power loss in the condenser. When using a "B sub" one sometimes runs into the nuisance of a steady howl or rattle and gets rid of it by dropping the coupling capacity or using a low-resistance leak on the next tube. This is hardly good practice. With battery plate supply or a high-grade B sub it is not necessary. This is one of the main defects of resistance-resistance and impedance-resistance coupling. It is largely avoided by going to resistance-impedance coupling which is NOT the same as impedance-resistance but the exact opposite.

For detection with leak and condenser the 240 is used normally, for "plate detection" these are dropped and a C b'as of minus 3 to 4½ volts is used.

SPECIAL NOTE

When using the 240 for distortion amplification or detection it has a transformer primary in the plate circuit. These do NOT have a resistance of 250,000 ohms (¼ meg) but a rather low resistance and therefore the tube should be supplied from a 90-volt battery which is also correct for the 201-A tubes used in the following stage of audio.

One other matter. If a resistance-coupled amplifier "motor boats" with battery supply
the trouble probably lies in a high-resistance cell in one of the battery blocks or in the use of a long lead to the batteries. The cure is to make sure of the batteries (even new ones are not all good) by making a momentary short-circuit test thru a 10-ampere meter and also to provide a 1-microfarad B bypass in the set.

Note:—
A CX-340 tube was used to replace a 201-A in the c.w. receiver at 1MK, the A.R.R.L. Headquarters' station and has greatly relieved interference from power leak and street car noises. A UX-241 has done similar work at 10A, the writer's station.—Tech. Ed.

Handy Resistor Units

There are many uses for small resistor units about the average amateur station and in many cases the man finds it necessary to buy a variable unit as he is unable to obtain a fixed one. This not only calls for a greater outlay of money but the variable unit usually finds its way to the panel where it needlessly crowds other instruments and also invites a certain amount of adjustment which is not necessary.

For the amateur who is just starting up with simple apparatus and is using a step-down toy or bell-ringing transformer that is not center tapped, there is a 200-ohm unit that is tapped at the center. This will replace the two Christmas tree lamps which are used so commonly for the obtaining of the electrical center tap. It has the advantage of being considerably smaller and may be placed directly across the tube socket terminals. Thus, it will not only save space but will also save time in its installation. They may be employed for the same use in conjunction with power amplifiers that supply the filament of the last tube (usually a UX-210) with a.c.

In crystal control circuits, it is quite common the practise to use a couple of 210s and a 203-A or two. Instead of using separate filament lighting transformers, it is quite possible to use only one and insert resistors between the filament of the fifties and the 210s. If two of the smaller tubes are used, it will be necessary to use a resistance of one ohm to give the required voltage drop of 2.5 with a current of 2.5 amperes. In order to keep the center tap properly balanced, two half-ohm units should be used, one in each leg of the smaller tubes' filament. If only one 210 is used, the resistor should have twice this value.

The three units shown in the illustration are the center tapped, 200-ohm one and the half and one-ohm sizes. The high resistance one is wound with enameled wire and may be obtained either with the tap or without it. The other two are wound with strip and there is no reason why you couldn't make contact to it at any place to obtain lower values of resistance.

The units may be had in various sizes ranging from 1000 to 4 ohms. The manufacturer is the Carter Radio Company of Chicago, Ill.—H. P. W.

601 Wins Modesto Wouff-Hong

Because of a breakdown in the official reporting arrangements for the Pacific Division Convention recently held at San Jose, we had to cook up our own story here in the office from memory and we regret to say we omitted one very important event: the award of the Modesto Radio Club's beautiful Wouff-Hong Trophy to 601 of Stanford University, California, as the best all-around amateur station in the Pacific Division.

Those not familiar with this trophy are invited to see page 27 of QST for January, 1925. It is made from the melted-down plates and grids of some five hundred burnt-out transmitting tubes contributed by amateurs all over the country, a most fitting emblem for the transmitting ham. Each year it is awarded at the Pacific Division Convention to the best "6", to hold until the next convention. The rules give a maximum weight of 35% to DX in miles per watt, 25% to traffic handled, 20% to operating ability, and 20% to the proportion of the apparatus which is home-made. A year ago at Santa Ana the first award was made to Smith of 6BUR and now it goes to 601, with 6BJX as runner-up.

601 is owned and operated jointly by Brandon Wentworth and Phil Scofield. The award will be a popular one, for everyone admits the excellence of this station and its work. 601 has communicated with almost every civilized country on earth and many uncivilized ones, and was able to present to the judges a complete log that was a model of perfection and a huge stack of cards attesting the work done. Congrats, 601!

K. B. W.
A Sensitive Thermo-Couple

By Benjamin J. Chromy*

An extremely useful device rarely seen in the instrument collection of the average amateur is a thermo-couple capable of measuring a very small fraction of an ampere of radio frequency current. A sensitive couple which may be used in conjunction with a small milliammeter is rather easily constructed. No elaborate outlay of tools and equipment is necessary. A piece of quarter-inch hard rubber panel 1½ by 2½ inches is finished off and two small holes for binding posts are drilled on the center line which is parallel to the longer sides of the panel. These holes are ½-inch from the center. Two pieces of No. 14 bare copper wire 2 inches long are cut. A loop to fit the binding post is made on the end of each as shown in Fig. 1. A piece of number 30 A.W.G. platinum wire one-half-inch long is tightly attached and lightly soldered to one of the number 14 copper wire holders. A small lump of tellurium is next welded to a piece of number 20 platinum wire in the following manner: The platinum wire is heated to white heat in the blue portion of the Bunsen burner flame and then plunged into the tellurium very rapidly but not violently. The unit consisting of the tellurium and the No. 20 platinum is next mounted upon the second of the two No. 14 copper wire holders as illustrated in Fig. 1.

The joint made by the large platinum wire with the tellurium must be solid and tight since the efficiency of the couple depends upon the low resistance of this joint. The joint between the platinum wire and the copper holder must be tight before the joint is soldered.

The small platinum wire is next welded to the tellurium lump by the use of a small spark coil. The secondary high voltage terminals of the spark coil are connected to the binding posts of the thermo-couple. The small platinum wire is brought close to the tellurium and allowed to heat to redness; then it is plunged into tellurium quickly but not violently. The spark produced by the spark coil must not be very intense and should be less than one-eighth of an inch long.

When platinum wire of a size smaller than No. 30 A. W. G. is used it may be welded to the tellurium by the electropercussion method. A one microfarad condenser which is connected to the thermo-couple is charged at 100 to 300 volts d.c. by closing the d.c. circuit to it for an instant. The condenser is discharged by touching the small platinum wire to the tellurium. This method of welding is very satisfactory for use on couples made of fine wire.

The sensitivity of the thermo-couple depends upon the resistance of the small platinum wire and tellurium joint. A very sensitive couple may be made by oxidizing the surface of the tellurium and simply causing the small platinum wire to bear down upon it without welding the joint. If the joint is not welded the couple will be very sensitive; it will not, however, hold calibration for any length of time.

The calibration of the couple is not difficult if a one-ampere full scale deflection a.c. ammeter is available. This a.c. meter is connected according to the diagram

* Hopkins, Minnesota, operator 9CJO.

1. To be obtained from Eimer & Amend, 211 3rd Ave., New York.
illustrated by Fig. 2. The radio frequency chokes and the one-henry inductance are connected in series with a 0-5 or 0-10 milliammeter as also illustrated by Fig. 2. Readings of the low frequency calibrating current as read from the a.c. ammeter and the corresponding deflections of the milliammeter are recorded and a curve similar to that illustrated in Fig. 3 is drawn.

The size of the small platinum wire used determines the range of the couple. If No. 30 wire is used the couple should not be used in circuits carrying more than 0-3 amperes. If the couple is to be used in neutralizing the crystal amplifier then smaller wire than No. 30 should be used. The electro-percussion method of welding must then be employed in making the couple.

The thermo described finds ready application in many experiments. Many times the experimental outfit is made to work properly when it is adjusted according to the information obtained through some meter.

A list of "Calls Heard" appeared in the January issue under the call of pr4KD, U. S. Naval Radio, San Juan, Porto Rico. Some folks got the impression that this indicated that 4KD was a naval radio station. This is not true as the station is owned and operated by E. W. Mayer, who was on duty at that station and therefore his mailing address was as given above. There is no connection between the naval station and 4KD outside of the fact that the owner of 4KD receives his mail through the U. S. Naval Radio Station at San Juan.

G. A. Woodhouse of 7EL says that a good a.c. relay may be obtained from most jobbers who repair electric ranges. It is made by the General Electric Company and goes under the name of "Magnetic Switch", No. CR702-A2. Its contacts are about ¾ and are well insulated from other parts. It may be used for a keying relay in the plate circuit and has many other uses in remote control work.

An error was made in the map appearing on page 49 of the February QST. The state of Michigan is not divided in the middle as shown as it is only the upper peninsula above Wisconsin and between Lakes Michigan and Superior that are located in the ninth district.

Those who are interested in eliminators and chargers of various sorts will find a booklet "How to Use Resistance in Radio" by the Ward Leonard Electric Co., of Mount Vernon, New York to be useful. It may be obtained from them for 15 cents.

7IT reports that pba3A says that he is leaving the Philippines and expects to eventually settle in Boston where he will put in a crystal controlled outfit.

9BW1 needed some cheap plate meters, so he bought a couple of the $1. voltmeters at the quarter to a dollar store. These meters are of the vane type with a winding on a flat piece of iron, supported over the pointer vane. There are two other coils in series with this winding to increase the total resistance of the meter. Three windings may be placed in parallel and the meter calibrated as a milliammeter. For a still lower reading meter, these other two windings may be left open and just the main windings used. Calibration may be made by putting the meter in series with a regular one (borrowed) in the plate circuit of a 210 with 200 volts or so on the plate. The filament voltage may then be varied to give the required plate current for each calibration point.
The Purposes of the Army-Amateur Affiliation

By Capt. A. C. Stanford, U. S. A., Liaison Agent

The ONE great mission of the Signal Corps in time of war or peace is to furnish communication for the Army. To this end the Signal Corps has a vital interest in any agency of civilian life, whose functions and problems are similar to its own.

The large telephone and telegraph companies have problems which are closely allied to those of the Signal Corps, when wire communication is considered, and these organizations embrace hundreds of qualified men who could be easily shifted from their civilian status to the maintenance and operation of military wire lines.

In radio communication the supply of trained personnel offers a more difficult problem. There is no counterpart in the commercial companies of the field radio systems used by the army. These radio systems are usually portable, work under the most adverse conditions, and have very low power. The distances involved are small but the operating personnel must be highly trained. In any great emergency thousands of qualified operators would be needed.

While commercial radio companies cannot supply the operators that might be needed we are fortunate in having an almost unlimited supply from another source.

For many years there have been banded together in the United States, thousands of young men who are making radio work their hobby. These men are interested in the research, development, and design of transmitting and receiving equipment. They are known as radio amateurs, and are organized into a volunteer organization which promotes their general interests. This organization is the American Radio Relay League.

Members of the A.R.R.L. are interested in handling messages, and the more important those messages, the deeper their interest and the more intense their activity. The leaders of the A.R.R.L. are ever on the lookout for means that will increase the skill and operation of the stations of the various members. The country is now criss-crossed with radio channels which handles hundreds of messages each evening.

In 1925 the Signal Corps requested that it be allowed to cooperate with the American Radio Relay League. The League welcomed this request and arranged with the Signal Corps an elaborate scheme whereby a portion of the members of the A.R.R.L. would become closely associated with the Signal Corps as volunteers, and a new group called Army Amateur Operators, came into being. These young men were especially selected from leading amateurs throughout the country, because of the excellence of their work, and were asked to undertake certain communication problems under the direct supervision of the Signal Corps.

Signal Corps activities are performed in the United States by dividing the country into nine great districts called Corps Areas. In each Corps Area there is a Signal Officer, who works directly with the amateur operators within that Corps Area. He forms radio nets composed of amateurs from the American Radio Relay League. These nets comprise groups of stations which represent certain military units, and in addition embrace some of the political divisions of the states in which the nets are formed. Each net handles messages between its own stations, and with other nets in the Corps Area. Thus the Governor's office of the State of New York is linked directly with the amateur station of the Signal Officer of the Second Corps Area at New York City.

The affiliation between the Signal Corps and the American Radio Relay League offers the amateur many great advantages. Work in Army Nets, in radio operating, in enciphering and deciphering messages, provides a new and interesting activity. It tends to make the American amateur a more skillful operator, since he is proud of the fact that his hobby renders real service in handling official and semi-official government business.

The Army Amateur Operator, who is also a member of the A.R.R.L., takes pride in being a part of an organized communication plan, in identifying himself with the Army, and especially the Signal Corps. He has, when selected by a Corps Area Signal Officer, the official stamp of government approval.

The American Radio Relay League is interested in handling traffic and in the promotion of radio development and research. Here again the affiliation with the Signal Corps, which does this work for the

(Continued on Page 57)
Developments in Dry Electrolytic Rectifiers

By Robert S. Kruse, Technical Editor

I
n our May, 1926, issue there was described a trickle charger which makes use of a dry electrolytic rectifier. At that time it was pointed out that it would be very fine if the device could be expanded to handle larger currents and higher voltages so as to make the dry and silent rectifier available for other uses. Some of these developments have now become facts, and the purpose of the present paper is to describe the Elkon 2-ampere charger and the Elkon A substitute which is

had not yet been thought of and broadcasting was in the remote future. For some time past the device has been in final form and one has been at this office but the final story was obtained from

Messrs. G. N. Sieger and Harry Shoemaker by our good friend Boyd Phelps who after a hasty telephone call rejoined QST's staff for the moment, spent the day at the Elkon Works in Weehawken, N. J. and then drove to Hartford with the complete information.

THE RECTIFIER PROPER

The rectifier, as was the case in the trickle charger, is based on dry rectification between two discs or washers laid face to face. A single unit is constructed as shown in Fig. 1. Between two sheet copper squares is laid a pair of discs of which one is magnesium while the other is of a black composition whose exact nature takes a good deal of explaining tho one can say briefly that it contains zinc selenide and copper selenide. The lead washers next to the copper plates are used as “padding” since it is hard to get good contacts otherwise. Some of the rectifier discs are shown in one of the photographs.

As was said in the article on the trickle charger, the exact nature of the rectifying process is not too well understood. For convenience the process is described as “electronic reaction” between the two discs. The mechanics of the thing are probably not the same as in the lead-aluminum rectifier which we are familiar with, and possibly
not the same as in the copper-oxide rectifier which has recently appeared on the market in trickle-charger form.

One should not be too unhappy at the lack of a more exact explanation; we have not yet found out just where chemistry leaves off and physics begins, but that does not prevent them from being useful.

At the time of the trickle-charger article it was not possible to operate the Ruben-Elkon discs in series and as each pair would only stand about 15 volts it was necessary to resort to the curious connection shown in Fig. 2 which is a set of three bridge-connected rectifiers with their d.c. outputs in series. It may seem curious to speak of endangering a 15-volt device when working into a 6-volt battery but one must remember that on the reverse half of the cycle the rectifier stands the transformer voltage plus the battery voltage. The gassing voltage of the battery is 7½ and the transformer voltage must be at least 8 to get anything accomplished. The transformer peak voltage is therefore 11 and this added to the 7½ gassing voltage becomes 18½. As a matter of fact the transformer voltage was a bit higher and therefore three units (as in Fig. 2) rather than 2 units were used.

**AMPERE CHARGERS**

The trickle charger having given a good account of itself one naturally thinks of chargers operating at a higher rate. At first sight one may think that it is a trifle to go from a 1/3-ampere charger to one working at three amperes—it is only 9 times as much current and the voltage stays the same.

As a matter of fact the transfer was very slow and very painful. A look at the photograph of the discs will show how they wear, for naturally these devices wear out in time. The earlier ones did not wear in this fashion but displayed a disgusting desire to burn across violently at one point, generally short-circuiting the pair and stopping further proceedings. To prevent this the current had to be kept small (which meant a trickle charger) and a protective "ballast" resistance had to be used as is shown in Fig. 2. The problem of producing a 2-or 3-ampere charger was the same as the problem of making the current distribute itself evenly over the disc—and keep on distributing evenly. Those who have tried to make a 3-ampere aluminum rectifier begin to understand that this was somewhat difficult. The thing was finally done however and the 3-ampere charger is a sort of "big brother" to the trickle charger with no very great variation in the arrangement.

**ELECTRICAL DETAILS**

The ballast resistance material is present for the purpose of preventing any sudden rises of current which would either cause or aid a local "burn" and tend to damage a rectifier pair. This means that the resistance must rise promptly if anything in the nature of an overload takes place. The ballast is accordingly made of a nickel alloy whose resistance rises rapidly as the
temperature is raised. Putting it differently, if the voltage across a piece of the wire is increased the current will increase slowly and then very rapidly. This means that once we have reached the bend of the curve in Fig. 3 the current will have a hard time to increase further. The kink comes when

the wire is heated to about 200 degrees, therefore, its size is so chosen that the normal charging current of about 1/3 amp. will heat it to that point.

**THE A BATTERY “SUB”**

Having built a workable 3-ampere charger one naturally wonders if the device will be useful for filament supply, that is as an “A-battery substitute”. This divides into two problems; that of devising a rectifier stack to fit this exact job and that of devising a filter to remove the ripple from the rectified output. First, one has to have the rectifier. The filament-supply device ordinarily is not called upon to supply more than about 1/4 amperes, as against the 3 amperes for the charger. This permits the use of smaller rectifier discs and therefore reduces the trouble caused by local current-concentration. The voltage required at the output posts is only 6 as against 7.5 for the charger and this may at first sight seem to be an easier condition. In a way that is true for one can avoid the complex arrangement of Figure 2. On the other hand the rectifier action is such that the tendency is toward a better life when working into a battery than when working into a resistance. This will be explained later. For the present it is enough to say that the disc for the filament supply required a considerable amount of additional work and that those now produced pass thru a complex process during which many are rejected. This of course applies mainly to the “cupric” composition discs.

**RECTIFIER DETAILS**

Having a pair of suitable discs it is interesting to show how they act. Figure 4 shows the simplest test that one can make easily. A low-voltage battery is connected to an ammeter and a pair of pointed prods. When the prods are put on opposite edges of the cupric disc the current (with the voltage used in the test) was 1.5 amperes. The same result was gotten with the magnesium disc. With the pair put together as at the center of the figure the current in one direction was 1.3 amperes and in the reverse direction 0.1 amper. At a higher voltage the difference would have been much greater up to the breakdown voltage.

When the voltage used is that of the regular “A sub” the resistance in the two directions (average) is different in a ratio of about 1000/1 or more exactly, the resistance from magnesium to “cupric” is 2/10 ohms and the reverse resistance is 200 ohms.

The rectifier will work cold but operates more smoothly when warm—70 degrees Centigrade. The size of the copper fins is accordingly adjusted to keep the unit not cooler than about 70° C which is the same as 160 degrees Fahrenheit. If it warms up

the resistance of the cupric disc or the contact with it drops and the unit does not overheat. The 3-ampere charger works at 90 degrees C.

Operating at the proper temperature the rectifier has a static characteristic like that of Fig. 5A and 5B. As drawn at A the reverse current can hardly be seen at all, therefore the curve has been re-drawn in 5B with two different scales of both current and pressure. Like most d.c. curves on a.c. apparatus these curves must not be taken too seriously. Information that is more to the point can be gotten by using the oscillograph which shows the output current of
the rectifier to be like the curve of Fig. 6. It will be seen that the rectification is not as perfect as one would have guessed from a look at the "static" curves of Fig. 5, the actual rectifier efficiency being 35%. A

For the 3-ampere charger with normal load of 3 amps at 7.5 volts the input is 70 watts, giving an efficiency of 22%.

These figures compare rather favorably with the usual chargers.

The A-battery substitute, whose output is naturally at 6 volts operates as follows: the output output in this case is less than the rectifier output as there is a drop in the filter. The input at no load is 14 watts which goes to reverse current loss and possibly some loss in the filter condensers, loaded with 6 tubes, i.e. 1.5 amperes the input is 46 watts, giving an overall efficiency of 19%. With an 8 tube load drawing 2.25 amperes this becomes 56 watts at an efficiency of 21%.

THE FILTER SYSTEM

The filter system of an "A sub" is a very difficult thing to design as has been said before in these pages. If the rectifier wave form is not good, one may almost stop before starting. It is almost imperative that the filter have large capacities though we have in these pages described an A substitute which did surprisingly well with a resistance filter. In the Elkon device there has been used a 3-stage filter devised by Dr. H. S. Shoemaker who also worked out the electrical and mechanical design of the whole device.

The connections of the rectifier stack itself are shown in Fig. 7 while the complete circuit is shown in Fig. 8. The 3-stage filter was chosen because the inductance cannot be made extremely high without introducing excessive resistance and on the other hand the capacity in the filter is not so effective when concentrated across a single choke. Design considerations that had to be regarded were that the voltage at the output would need to remain between 5½ and 6 with widely varying line voltages and loads and in spite of the unavoidable IR drop in the filter and the rectifier. Taken together these things work out roughly to the effect.

![Diagram](image-url)
that between the transformer and the output there are the following ratios:

\[
\begin{align*}
\text{D C Volts} & : 52 \\
\text{D C Amps} & : 1 \\
\text{A C Volts} & : 1 \\
\text{A C Amps} & : 1.5 \\
\text{Overall} & : 30\%
\end{align*}
\]

As shown in Fig. 8 and also the general photo the transformer is equipped with 8 output AC. Input

FIG. 7—ARRANGEMENT OF RECTIFIER COUPLES TO FORM FULL-WAVE BRIDGE-CONNECTED RECTIFIER

A is the actual arrangement with the units strung on a machine screw with spring washers while B is the equivalent bridge.

secondary terminals and a traveling plug to permit obtaining various a.c. input voltages so that the d.c. voltage will remain at the proper value. Since the usual receiver has a rheostat this number is very generous and renders it possible to set the voltage at the proper value at the device after which misuse of the rheostat does not endanger the tubes.

The filter chokes have an inductance of 1/10 henry under load and a resistance of .3 ohm, giving a maximum drop of about 1.8 volts. The condensers are electrolytic and have a very large capacity per unit, the total for the 6 cans being 1500 microfarad.

OPERATION

When put into operation initially the rectifier is cold and does not form rapidly. A particular one tried here took about 3 minutes to form sufficiently to give smooth output, after which it slowly warmed up and the voltage rose as it did so. To speed up this operation the set is equipped with a starting switch (SW2 in Fig. 8) which can be closed to throw a temporary overload on the set. This will cause the rectifier to form in 30 seconds.

When used with a 5-tube broadcast receiver having controllable regeneration on the r.f. stages the device introduced no audible hum—although the same receiver has been a star performer in showing up the defects of various A and B substitutes.

Dr. Shoemaker advises that receivers with regeneration be operated with the tubes bright as such sets are inclined to seek out residual ripples and running the tubes too low will cause the remaining ripple to become relatively more important. This precaution was not found necessary here, either with the set just mentioned or with a Browning-Drake receiver, which is another type that demands good plate and filament supply.

A "B" supply is now being worked on. Perhaps some day we may hope for a dry transmitter plate rectifier.

FIG. 8—COMPLETE CIRCUIT DIAGRAM OF THE A SUBSTITUTE

Tr. is the transformer. SW1 is the secondary plug system to adjust for load and line voltage. SW2 is the quick-start switch. C1, C2, and C3 are the electrolytic condensers, each consisting of two cans in parallel L1, L2 and L3 are the filter chokes.

Strays

We have been advised by the Sup't of Documents, Gov't Printing Office, Washington, D. C., that the June 30, 1926, issue of "Amateur Radio Stations of the United States" is no longer available. All copies of it have been distributed.
We print below the complete text of the new radio law which has now superseded the 1912 radio act. Up to the time of closing our forms no regulations or announcements under the new law have been made by the Radio Commission. In subsequent issues, however, we will present the new rules and regulations announced by the Commission and the Department of Commerce.

The New Radio Law

Each member of the commission shall be a citizen of the United States and an actual resident citizen of a State within the zone from which appointed at the time of said appointment. No more than one commissioner shall be appointed from any zone. No member of the commission shall be financially interested in the manufacture or sale of radio apparatus or in the transmission or operation of radio telegraphy, radiotelephony, or radio broadcasting. No more than three commissioners shall be members of the same political party.

The first commissioners shall be appointed for the terms of two, three, four, five, and six years, respectively, from the date of the taking effect of this Act, the term of each to be designated by the President, but their successors shall be appointed for terms of six years, except that any person chosen to fill a vacancy shall be appointed only for the unexpired term of the commissioner whom he shall succeed.

The first meeting of the commission shall be held in the city of Washington at such time and place as the chairman of the commission may fix. The commission shall convene thereafter at such times and places as a majority of the commission may determine, or upon call of the chairman thereof.

The commission may appoint a secretary, and such special counsel, examiners, engineers, and employees as it may from time to time find necessary for the proper performance of its duties and as from time to time may be appropriated for by Congress.

The commission shall have an official seal and shall annually make a full report of its operations to the Congress.

The members of the commission shall receive a compensation of $10,000 for the first year of their service. The thirteenth day of March, 1927, shall be declared a legal holiday. The term of each to be designated by the President, and his successors shall be chosen by the President, and shall be appointed for terms of six years except that any person chosen to fill a vacancy shall be appointed only for the unexpired term of the commissioner whom he shall succeed.

The term of each to be designated by the President, and his successors shall be chosen by the President, and shall be appointed for terms of six years except that any person chosen to fill a vacancy shall be appointed only for the unexpired term of the commissioner whom he shall succeed.

The New Radio Law

Each member of the commission shall be a citizen of the United States and an actual resident citizen of a State within the zone from which appointed at the time of said appointment. No more than one commissioner shall be appointed from any zone. No member of the commission shall be financially interested in the manufacture or sale of radio apparatus or in the transmission or operation of radio telegraphy, radiotelephony, or radio broadcasting. No more than three commissioners shall be members of the same political party.

The first commissioners shall be appointed for the terms of two, three, four, five, and six years, respectively, from the date of the taking effect of this Act, the term of each to be designated by the President, but their successors shall be appointed for terms of six years, except that any person chosen to fill a vacancy shall be appointed only for the unexpired term of the commissioner whom he shall succeed.

The first meeting of the commission shall be held in the city of Washington at such time and place as the chairman of the commission may fix. The commission shall convene thereafter at such times and places as a majority of the commission may determine, or upon call of the chairman thereof.

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programs, transmissions of energy, communications, or signals as it may deem desirable;

(c) Have authority to exclude from the require- ments and conditions contained in this Act any radio station upon railroad rolling stock, or to modify such requirements in its discretion;

(d) Have authority to hold hearings, summon witnesses, administer oaths, compel the production of books, papers, and documents, and to make such investigations as may be necessary in the performance of its duties. The commission may make such expenditures for such study and service as are provided for rent and purchase of services at the seat of government and elsewhere, for books, periodicals, and books of reference, and for printing and binding. It may be employed to the execution of the functions vested in the commission and as from time to time may be appropriated for by Congress. All expenditures of the commission shall be allowed and paid upon the presentation of itemized vouchers therefor approved by the chairman.

SEC. 5. From and after one year after the first meeting of the commission created by this Act, all the powers and authority vested in the commission under the terms of this Act, except as to the revocation of licenses, shall be vested in and exercised by the Secre tary of Commerce; and thereafter the commission shall have power and jurisdiction to act upon and determine any and all matters brought before it under the terms of this section.

It shall also be the duty of the Secretary of Commerce—

(A) For and during a period of one year from the first meeting of the commission created by this Act, to immediately refer to the commission all applications for station licenses or for the renewal or modification of existing station licenses.

(b) From and after one year from the first meeting of the commission created by this Act, to reference the commission for its action any application for a station license or for the renewal or modification of any existing station license as to the granting of which dispute, controversy, or conflict arises or against the granting of which protest is filed within ten days after the date of filing such application by any party in interest and any application as to which such reference is requested by the applicant at the time of filing said application.

(c) To prescribe the qualifications of station operators, to classify them according to the duties to be performed, to fix the forms of such licenses, and to issue licenses to such persons as it shall deem qualified.

(d) To suspend the license of any operator for a period not exceeding two years upon proof sufficient to satisfy him that the licensee (a) has violated any provision of this Act or treaty binding on the United States which the Secretary of Commerce or the commission is authorized by this Act to administer or by any regulation made by the commission or the Secretary of Commerce under any such Act or treaty; or (b) has failed to carry out the lawful orders of the master of the vessel on which he is employed; or (c) has willfully damaged or permitted radio apparatus to be damaged; or (c) has disseminated superfluous radio communications or signals or radio communications containing profane or obscene words or language; or (e) has willfully or maliciously interfered with any other radio communications or signals.

(e) To inspect all transmitting apparatus to ascertain whether in construction or operation it conforms to the requirements of this Act, the rules and regulations of the licensing authority, and the license under which it is operated or to be operated.

(f) To report to the commission from time to time any violations of this Act, the rules, regulations, or orders of the commissions, or of the terms or conditions of this Act.

(g) To designate call letters of all stations.

(h) To cease to be published such call letters and such other announcements and data as in its judgment may be required for the efficient operation of the service jurisdiction of the United States and for the proper enforcement of this Act.

The Secretary may refer to the commission at any time any matter the determination of which is vested in the commission by the terms of this Act.

Any person, firm, company, or corporation, any State or political division thereof or any whose interests are adversely affected by any decision, determination, or regulation of the Secretary of Commerce may appeal therefrom to the commission by filing with the Secretary of Commerce notice of such appeal within thirty days after the date of such determination or promulgation of such regulation. All papers, documents, and other records pertaining to such appeal on file with the Secretary of Commerce shall be transferred by him to the commission. The commission shall hear such appeal de novo under such rules and regulations as it may determine.

Decisions by the commission as to matters so appealed and as to all other matters over which it has jurisdiction shall be final, subject to the right of appeal herein given.

No station license shall be granted by the commission or the Secretary of Commerce until the applicant therefor shall have paid and accounted for to the United States for the use of the space, whether by license or otherwise.

SEC. 6. Radio stations belonging to and operated by the United States shall not be subject to the provisions of sections of this Act, or any regulations issued under the authority of this Act, the station stations shall use such frequencies or wave lengths as shall be assigned to each of or to each class by the President. All radio stations on board vessels while at sea or beyond the limits of the continental United States, when transmitting any communication or signal other than a communication or signal relating to Government business shall conform to such rules and regulations as may be prescribed by the President by which the President shall regulate the use or control of any other radio stations and the rights of others as the licensing authority may prescribe. Upon proclamation by the President that there exists war or a threat of war, the President may by the President by an order, or regulation, issue or modify orders or regulations applicable to any or all stations within the jurisdiction of the United States as prescribed by the licensing authority, and may cause the closing of any station for radio communication and the removal therefrom of its apparatus and equipment, or he may authorize the use or control of any such station and/or its apparatus and equipment by any department of the Government, under such regulations as he may prescribe, upon just compensation to the owner. Radio stations on board vessels of the United States Shipping Board or the United States Shipping Board Emergency Fleet Corporation or the Inland and Coastwise Wartime Service shall be subject to the provisions of this Act.

SEC. 7. The President shall ascertain the just compensation for such use or control and certify the amount so certified to Congress for appropriation and payment to the person entitled thereto. If the amount so certified is unsatisfactory to the person entitled thereto, such person shall be paid only 75 per centum of the amount and shall be entitled to recover from the United States to recover such further sum as added to such payment of 75 per centum which will make such amount as will be just compensation for the use and control. Such suit shall be brought in the manner provided by paragraph 20 of section 21, or by section 145 of the Judicial Code, as amended.

SEC. 8. All stations owned and operated by the United States, except those of the Army of the United States, and all other stations on land and sea, shall have special call letters designated by the Secretary of Commerce.

Section 1 of this Act shall not apply to any person, firm, company, or corporation sending radio communications or signals on any radio frequency, nor shall any such communications or signals be transmitted in the United States or beyond its jurisdiction, except such communications or signals as may be transmitted only in accordance with such regulations designed to prevent interference as may be promulgated under the authority of this Act.

SEC. 9. The licensing authority, if in public convenience, interest, or necessity shall be served thereby,
subject to the limitations of this Act, shall grant to any applicant therefore a station license provided for by this Act.

In considering applications for licenses and renewals of licenses, and in so far as there is a demand for the same, the licensing authority shall make such a distribution of licenses, bands of frequency or wave lengths, and of the time for operation, and of power among the different States and communities as to give fair, efficient, and equitable radio service to each of the people.

No license granted for the operation of a broadcasting station shall be for a longer term than three years, and no license so granted for any other class of station shall be for a longer term than five years, and any license granted may be revoked as hereinafter provided. Upon the expiration of any license, upon application therefor, a renewal of such license may be granted from time to time for a term not to exceed three years in the case of broadcasting licenses and not to exceed five years in the case of other licenses.

No renewal of an existing station license shall be granted more than thirty days prior to the expiration of the original license.

SEC. 10. The licensing authority may grant station licenses only upon application therefore, and such application therefore shall be in writing, and shall contain in detail the following:

(a) The frequencies or wave lengths for which the application is made.

(b) The purpose for which the application is made.

(c) The nature of the business to be transacted, the use to which the station is to be put, and the location of the station.

(d) The facilities that will be used, the hours of the day or other period of time during which the station is to be operated.

(e) Any evidence that the applicant is a citizen of the United States, or if not, of any foreign country, is of good moral character, and is of sufficient financial ability to carry on the business proposed.

(f) Any other evidence that may be required from time to time which would warrant the granting of such license.

(g) Any other evidence that may be required from time to time which would warrant the renewal of such license.

(h) Any other evidence that may be required from time to time which would warrant the modification of such license.

SEC. 11. If upon examination of any application for a station license or for the renewal or modification of a station license the licensing authority shall determine that public interest, convenience, or necessity would be served by the granting thereof, it shall authorize the issuance, renewal, or modification thereof in accordance with said finding. In the event the licensing authority upon examination of any such application does not reach such decision with respect thereto, it shall notify the applicant thereof, shall fix and give notice of a time and place for hearing the matter, and shall thereupon, by section 2 of this Act entitled "An Act relating to the licensing and operation of submarine radars in the United States," approved May 24, 1921.

SEC. 12. The station license required hereby shall not be granted to, or after the granting thereof such license shall not be transferred in any manner, either voluntarily or involuntarily, to (a) any alien or the representative of any alien; (b) to any foreign government, or any corporation, or association organized under the laws of any foreign government; (c) any corporation, or association organized under the laws of any foreign government, or any subsidiary thereof, which has been found guilty by any Federal court of unlawfully monopolizing or attempting unlawfully to monopolize, after this Act takes effect, radio communication, directly or indirectly, through the control of the manufacture or sale of radio apparatus, through exclusive trade arrangements, or by any other means or to have used unfair methods of competition in commerce or in any territory in violation of the provisions of this Act.

The granting of a license shall not estop the United States or any person aggrieved from proceeding against such person, firm, company, or corporation, as to any subsidiary thereof, which has been found guilty by any Federal court of unlawfully monopolizing or attempting unlawfully to monopolize, after this Act takes effect, radio communication, directly or indirectly, through the control of the manufacture or sale of radio apparatus, through exclusive trade arrangements, or by any other means or to have used unfair methods of competition in commerce or in any territory in violation of the provisions of this Act.

SEC. 13. The licensing authority is hereby directed to refuse a station license or renewal of a station license hereinafter required for the construction of a station to any person, firm, company, or corporation, or any subsidiary thereof, which has been found guilty by any Federal court of unlawfully monopolizing or attempting unlawfully to monopolize, after this Act takes effect, radio communication, directly or indirectly, through the control of the manufacture or sale of radio apparatus, through exclusive trade arrangements, or by any other means or to have used unfair methods of competition in commerce or in any territory in violation of the provisions of this Act.

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SEC. 14. Any station license shall be revocable by the commission for false statements either in the application or in the statement of fact which may be required by section 10 hereof, or because of conditions revealed by such statements of fact as may be required from time to time which would warrant the revocation of such license.

The grant of a station license hereinafter required for the construction of a station to any person, firm, company, or corporation, as to any subsidiary thereof, which has been found guilty by any Federal court of unlawfully monopolizing or attempting unlawfully to monopolize, after this Act takes effect, radio communication, directly or indirectly, through the control of the manufacture or sale of radio apparatus, through exclusive trade arrangements, or by any other means or to have used unfair methods of competition in commerce or in any territory in violation of the provisions of this Act.

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SEC. 15. Every license issued under this Act shall be subject to terms to the right of use or control conferred by section 6 hereof.

In cases of emergency arising during the period of operation from any cause other than the license expiration date, the commission may temporarily during such emergency issue a license by special order. In cases of emergency arising during the period of operation from the license expiration date, the commission may issue a license by special order.

The grant of a station license hereinafter required for the construction of a station to any person, firm, company, or corporation, or any subsidiary thereof, which has been found guilty by any Federal court of unlawfully monopolizing or attempting unlawfully to monopolize, after this Act takes effect, radio communication, directly or indirectly, through the control of the manufacture or sale of radio apparatus, through exclusive trade arrangements, or by any other means or to have used unfair methods of competition in commerce or in any territory in violation of the provisions of this Act.

The granting of a license shall not estop the United States or any person aggrieved from proceeding against such person, firm, company, or corporation, as to any subsidiary thereof, which has been found guilty by any Federal court of unlawfully monopolizing or attempting unlawfully to monopolize, after this Act takes effect, radio communication, directly or indirectly, through the control of the manufacture or sale of radio apparatus, through exclusive trade arrangements, or by any other means or to have used unfair methods of competition in commerce or in any territory in violation of the provisions of this Act.
proposed revocation has been given to the parties
known to the commission by notice to be interested in
such license. Any person in interest aggrieved by said
notice may make written application to the commis-
sion at any time within said thirty days for a hear-
ing upon such order, and upon the filing of such
application said order of revocation shall stand sus-
pended until the conclusion of the hearing herein
directed. Notice in writing of said hearing and upon
the conclusion by the commission to all the partie
known to it to be interested in such license
twenty days prior to the time of said hearing. Said
hearing shall be conducted under such rules and in
such manner as the commission shall prescribe. Upon
the conclusion hereof the commission may affirm,
modify, or revoke said orders of revocation.

SEC. 15. All laws of the United States relating to
unlawful restraints and monopolies and to com-
munication operations in restraint of trade are hereby declared to be applicable to the
manufacture and sale and to trade in radio apar-
atus and devices, or in affecting inter-
territory or interstate commerce, and to interstate or
foreign radio communications. Whenever in any suit,
action, or proceeding, civil or criminal, brought un-
der any of such laws, the courts shall enforce or to review findings
and orders of the Federal Trade Commission or other
agency, where the matter is by law authorized to act, any licensee shall be
found guilty of the violation of the provisions of such
laws or any of them, the court, in addition to the
penalties imposed by said laws, may adjudge, order and
decree that the license of such licensee shall be
revoked if the date to which the decision becomes final
is prior to the date of such order or such decree shall
be fixed, and that all rights under such license shall thereupon cease:
Provided
That the same right of
appeal as is provided by law in respect of
other decrees and judgments of said court.

SEC. 16. Any applicant for a construction permit,
for a station license, or for the renewal or modifi-
cation of an existing station license whose applica-
tion is refused by the licensing authority shall have the right to appeal from said decision to the Court of
Appeals of the District of Columbia: and any li-
cense whose license is revoked by the commission
shall have the right to appeal from such decision of revocation to said Court of Appeals of the District of Columbia or to the district court of the United States in which the apparatus licensed is operated,
by filing, within twenty days after the decision complained of is effective, notice in writing
of said appeal and of the reasons therefor.

The licensing authority from whose decision an ap-
peal is taken shall be notified of said appeal by
service upon it, prior to the filing thereof, of a certi-
fixed copy of said appeal and of the reasons therefor.
Within twenty days after the filing of said appeal
the licensing authority shall file with the court the
originals or certified copies of all papers and evi-
dence presented to it upon the original application
for a permit or license or in the hearing upon said
order of revocation, and also a full statement in writing of
the facts and the grounds for its decision as found
and given by it. Within twenty days after the fil-
ing of said appeal the commission or the licensing authority, at its discretion, may give notice to the court of its
desire to adduce additional evidence. Said notice shall be
in the form of a verified petition stating the na-
ture and character of said additional evidence, and
the court may thereupon order such evidence to be
taken in such manner and upon such terms and con-
ditions as the court shall deem proper.
At the earliest convenient time the court shall hear,
review, and determine the appeal upon said record
and evidence, and may alter or revise the decision
appealed from and enter such judgment as to it may
seem just. The revision by the court shall be
limited to the points set forth in the reasons of ap-
peal.

SEC. 17. After the passage of this Act no person
firm, company, or corporation now or hereafter di-
rectly or indirectly through any subsidiary, associated,
or affiliated person, firm, company, corporation, or
agent, or otherwise, in the business of transmitt-
ing or retransmitting or controlling the transmission
or signals by radio in accordance with the terms of the
license issued under this Act, shall by purchase,
lease, transfer, conveyance, or otherwise, directly
or indirectly, acquire, own, control, or operate any cable or wire, telegraph or telephone line or system between any
places in the United States or in the District of Columbia or any
telephone or system, if in either case the purpose
is and/or the effect thereof may be to sub-
stantially lessen competition or to restrain
competition or in any manner to lessen the free-$ale of any product, or to unlawfully to create monopoly in any line of
commerce; nor shall any person, firm, company, or cor-
poration now or hereafter engaged directly or
indirectly through any subsidiary, associated,
or affiliated person, company, corporation, or agent, or
otherwise, in the business of transmitt-
ing or retransmitting or controlling the transmission
or signals by radio in accordance with the terms of
the license issued under this Act, shall by purchase,
lease, transfer, conveyance, or otherwise, directly
or indirectly, acquire, own, control, or operate any
radio station or part of the same, or frame, erect, or
construct any apparatus, or system, or parts of
the same, or the manufacture or sale of any of the
said apparatus, or system, or parts of the same.

SEC. 18. If any licensee shall permit any person
who is a legally qualified candidate for any public
office to use a broadcasting station, he shall afford
equitable opportunities to all other candidates for
such office in the use of such broadcasting station,
and the licensing authority shall make rules and
regulations to carry this provision into effect:
Provided
That such licensee shall have no power of
libel, or other such action, or the like or other
publicity in the physical property and/or other
assets of any such radio station, apparatus, or system, if in either case the purpose
is and/or the effect thereof may be to sub-
stantially lessen competition or to restrain
competition or in any manner to lessen the free-$ale of any product, or to unlawfully to create monopoly in any line of
commerce.

SEC. 19. All matter broadcast by any radio station
for which service money, or any other valuable
consideration is directly or indirectly paid, or promised to or charged or accepted by the station to
broadcast, from any person, firm, company, or corporation, shall, at the time the same is broadcast,
be broadcast as paid for or furnished, as the case may be, by such person, firm, company, or corporation.

SEC. 20. The actual operation of all transmitting
apparatus in any radio station for which a station license is required by this Act shall be carried on only by
person holding an operator's license issued here-
der.
No person shall be permitted to operate in such station except under and in accordance with
an operator's license issued to him by the
Secretary of Commerce.

SEC. 21. No license shall be issued under the au-
thority of this Act for the operation of any
station the construction of which is begun or is con-
tinued after this Act takes effect, unless a permit for its construction has been granted by the licensing
authority upon written application therefor. The licensing authority may grant such permit if public convenience, interest, or necessity will be served by the construction with any such station as is proposed for which the applicant shall set forth such facts as the licensing authority by regulation may prescribe as to the citizenship, character, and the financial, technical, and other abilities of the applicant and to the contemplated nature of the station, the ownership and location of the proposed station and of the station or stations with which it is proposed to combine, the frequency and wave length or wave lengths desired to be used, the hours of the day or other periods of time during which the station is proposed to operate the station, the purpose for which the station is to be used, the type of transmitting apparatus to be used, the power to be used, the date upon which the station is expected to be completed and in operation, and such other information as the licensing authority may require. Such application shall be signed by the applicant under oath or affirmation.

Such permit for construction shall show specifically the earliest and latest dates between which the actual operation of such station is expected to begin, and shall provide that said permit will be automatically forfeited if the station is not ready for operation within the time specified or within such further time as the licensing authority may allow, unless prevented by causes not under the control of the grantee. The rights under any such permit shall not be assigned or otherwise transferred without the consent of, or approval by, the licensing authority, without the approval of the licensing authority. A permit for construction shall not be required for Government stations, amateur stations, or stations upon mobile vessels, railroad rolling stock, or aircraft. Upon the completion of any station for the construction or operation for which such a permit has been granted, and upon it being made to appear to the licensing authority that all the terms, conditions, and restrictions of such application and permit have been fully met, and that no cause or circumstance arising or first coming to the knowledge of the licensing authority since the granting of the permit would, in the judgment of the licensing authority, make the operation of such station against the public interest, the licensing authority shall issue a license to the lawful holder of said permit for the operation of said station. Said license shall conform generally to the terms of said permit.

SEC. 22. The licensing authority is authorized to designate from time to time radio stations the communications or signals of which, in its opinion, are likely to interfere with the transmission of distress signals of ships. Such stations are required to keep a licensed radio operator listening in on standard time, or corresponding, or compatible, the whole time that distress and radio communications relating thereto during the entire period the transmitter of such station is in operation.

SEC. 23. Every radio station on board government-owned vessels when within the territorial waters of the United States, shall give absolute priority to radio communications or signals of distress or safety of life. Whenever a vessel, when engaged in navigating on the high seas, shall receive a signal that a vessel in distress is in immediate need of assistance, such vessel shall use all practicable means to put in immediate communication with the vessel in distress and shall assist the vessel in distress, so far as possible, by complying with its instructions.

SEC. 24. Every shore station open to general public service between the coast and vessels at sea shall be bound to exchange radio communications or signals with Government stations, amateur stations, and stations operating in radio systems or instruments adopted by such stations, respectively, and each station on board a vessel shall be bound to exchange radio communications or signals with Government station or such other station on board without distinction as to radio systems or instruments adopted by each station.

SEC. 25. At all places where Government and private or commercial stations are operating, and in such close proximity that interference with the work of Government stations can not be avoided when they are operating simultaneously such private or commercial stations as do interfere with the transmission or reception of radio communications or signals by Government stations concerned shall not use their transmitters during the last fifteen minutes of each hour, local standard time.

The Government stations for which the above-mentioned division of time is established shall transmit radio communications or signals only during the first fifteen minutes of each hour, local standard time, except in case of signals or radio communications intended to vessels in distress or for the purpose of assisting in the location of vessels in distress, and for information as to course, location, or compass direction.

SEC. 26. In all circumstances, except in case of radio communications intended to vessels in distress, radio communications or signals only shall be transmitted by any radio station within the territorial waters of the United States, including those owned and operated by the United States, during the last fifteen minutes of each hour, local standard time, except as herein provided.

SEC. 27. No person receiving or assisting in receiving any radio communication shall divulge or publish the contents, substance, purport, effect, or meaning thereof of except in case of signals or radio communications intended to vessels in distress or for the purpose of assisting in the location of vessels in distress, and for information as to course, location, or compass direction.

SEC. 28. No person, firm, company, or corporation within the jurisdiction of the United States shall knowingly utter or transmit, or cause to be uttered or transmitted, any false or fraudulent signal of distress or communication relating thereto; and any broadcasting station rebroadcast the program or any part thereof of another broadcasting station without the express authority of the originating station.

SEC. 29. No person, firm, company, or corporation construed to give the licensing authority the power of censorship over messages transmitted by any radio station, and no regulation or condition shall be promulgated or fixed by the licensing authority which shall interfere with the
right of free speech by means of radio communications within the jurisdiction of the United States shall utter any obscene, indecent, or profane language by means of radio communication.

Sec. 30. The Secretary of the Navy is hereby authorized unless restrained by international agreement, unenforceable conditions or rates prescribed by him, which rates shall be just and reasonable, and which, upon complaint, shall be subject to review under and in pursuance of the Interstate Commerce Act, to use all radio stations and apparatus, wherever located, owned by the United States and under the control of the Navy Department (a) for the reception and transmission of messages offered by any newspaper published in the United States, its Territories or possessions, or published by citizens of the United States in foreign countries, or for the association of the United States, and (b) for the reception and transmission of private commercial messages between ships, between ship and shore, between localities in Alaska and between Alaska and the continental United States: Provided That the rates for the reception and transmission of all such messages, other than press messages between the Pacific coast of the United States, Hawaii, Alaska, the Philippine Islands, and the Orient, and between the United States and the Virgin Islands, shall not be higher than the rates charged by privately owned and operated stations for like messages and service: Provided further, that the right to use such stations for the purposes named in this section shall terminate and cease as between any countries or localities or between any country or locality and Alaska or the Orient, upon notice in writing whenever privately owned and operated stations are capable of meeting the normal communication requirements between such countries and localities or between any locality and privately operated ships, and the licensing authority shall have notified the Secretary of the Navy thereof.

Sec. 31. The expression "radio communication" or "transmission" as used in this Act means any intelligence, message, signal, power, pictures, or communication of any nature transmitted by electrical force, by means of any wire, cable, or other means by which electrical energy is sent or received and any system by means of which such transfer of energy is effected.

Sec. 32. Any person, firm, company, or corporation failing or refusing to observe or violating any rule, regulation, restriction, or condition made or imposed by the licensing authority under the authority of this Act or of any international radio convention or treaty entitled or adhered to by the United States, in addition to any other penalties provided by law, upon conviction by a court of competent jurisdiction, shall be punished by a fine of not more than $5,000, and for each and every offense.

Sec. 33. Any person, firm, company, or corporation who shall violate any provision of this Act, or shall knowingly make any false oath or affirmation in any affidavit required or authorized by this Act, or shall knowingly make any false oath or affirmation in any hearing authorized by this Act, upon conviction thereof in any court of competent jurisdiction shall be punished by a fine of not more than $5,000 or by imprisonment for a term of not more than five years or both for each and every such offense.

Sec. 34. The trial of any offense under this Act shall be in the district in which it is committed; or if the offense is committed upon the high seas, or out of the jurisdiction of any particular State or district, the trial shall be in the district where the offender may be found or into which he shall be first brought.

Sec. 35. This Act shall not apply to the Philippine Islands and the Canal Zone. It international radio communications between the Philippines and the Canal Zone shall be represented by the Secretary of State.

Sec. 36. The licensing authority is authorized to designate any official or employee of any other department or branch of the Government on duty in any Territory or possession of the United States other than the Philippine Islands and the Canal Zone, to render therein such services in connection with the administration of the radio laws of the United States as such authority may prescribe: Provided, That such designation shall be approved by the head of the Department in which such person is employed.

Sec. 37. The unexpended balance of the moneys appropriated in the item for "wireless communication laws," under the caption "Bureau of Navigation in Title III of the Act entitled "An Act making appropriations for the Departments of State and Justice and for the Judiciary, and for the Departments of Commerce and Labor, for the fiscal year ending June 30, 1927, and for other purposes," approved April 29, 1926, and the appropriation for the same purposes for the fiscal year ending June 30, 1927, shall be available both for expenditures incurred in the administration of this Act and for expenditures for the purposes specified in such item. There is hereby authorized to be appropriated for such fiscal year such sums as may be necessary for the administration of this Act and for the purpose specified in such item.

Sec. 38. If any provision of this Act or the application thereof to any person, firm, company, or corporation, or to any circumstances, is held invalid, the remainder of the Act and the application of such provision to other persons, firms, companies, or corporations, or to other circumstances, shall not be affected thereby.

Sec. 39. The Act entitled "An Act to regulate radio communication," approved August 13, 1912, the joint resolution to amend the same, approved June 23, 1912, and the joint resolution entitled "Joint resolution limiting the time for which licenses may be granted, and for other purposes," approved December 8, 1926, are hereby repealed.

Such repeal, however, shall not affect any act done or any right accrued or any suit or proceeding had or commenced in any civil cause prior to said repeal, but all liabilities under said Act or the joint resolution entitled "Joint resolution limiting the time for which licenses may be granted, and for other purposes," as amended, or the joint resolution entitled "Joint resolution limiting the time for which licenses may be granted, and for other purposes," approved December 8, 1926, are hereby repealed.

Nothing in this section shall be construed as authorizing any person now using or operating any apparatus for the transmission of radio energy or radio communications or signals to continue such use except under and in accordance with this Act and with a license granted in accordance with the authority hereinafter conferred.

Sec. 40. This Act shall take effect and be in force upon its passage and approval, except that for and during a period of sixty days after such approval no holder of a license or certificate of authority under the Secretary of Commerce under said Act of August 13, 1912, shall be subject to the penalties provided therein for operating a station without the license herein provided.

Sec. 41. This Act may be referred to and cited as the Radio Act of 1927.

The Radio Engineering Labs of New York City have just put out their new catalog covering the short-wave equipment which they handle. It is more than a catalog as it contains quite a bit of interesting and instructive dope.
How Far Is It?

By C. C. Knight

ANY readers of QST must be interested in knowing how far away the stations are that they hear, or perhaps the distance at which their own signals are heard. Few, perhaps, realize that it is impossible to get this information direct from maps.

The earth is a globe and it is impossible to represent any portion of the surface of the earth correctly on a flat map. If the portion is small enough (as for example a single state) the map may be so nearly correct that distances may be scaled on it without appreciable errors. In a larger territory, as for example North America, the effects of curvature are considerable and map makers are compelled to direct from maps. That signals are heard. Fewperhaps, realize the earth correctly on a flat map. If the to represent any portion of the surface of

to correct that distances may be scaled on this map may be so nearly

larger territory, the greater, often appearing to America, the

near enough for those who are not
distances, you cannot even

exacting, but when it comes to greater
distances, such as a quarter way around the

portion is small enough (as for example a

in order to get the map onto a flat surface.

transmitters compare notes. A says, "I worked

York City have done some good long-distance

that B has doubled his distance. B really

A operator off Cape Chelyuskin, Siberia." B re­

plies, "That's nothing, I talked to

with a station at Cairo last night." B re­

Now if we cannot measure the distances
correctly on the map, how are we to find

There are two ways; measure them on a globe, or calculate them. The first is not good if you want accuracy. Even an 8-inch globe (which will not give very good measurements) costs several dollars. Such a globe is on a scale of 1000 miles to the inch. Larger globes are very expensive.

To calculate the distance between two places is quite easy. No knowledge of mathematics is required beyond simple arithmetic—for one does not need to understand a formula to use it. You can solve a problem in spherical trigonometry (as this is) without needing to know a cosine from a parallelogram, provided someone gives you the formula. You will need a book of mathematical tables; four-figure tables are good enough. I believe you can buy such

a book for a matter of cents and the more expensive 7-figure tables are no better for our purpose. An atlas is also needed, but you need not buy that. It is generally to be borrowed at a library. A large map of the world on Mercator's projection is also good if you cannot get the atlas. Now for the procedure.

GETTING READY

First get from the map your own latitude and longitude, estimating and measuring as accurately as possible from the nearest parallel and meridian shown on the map (or indicated on the edge). If you are not sure on this matter have a teacher give you your location from his large-scale wall-map. He will also be able to show you how to go about finding such things on a map. It is important to have your own position right, since an error here will affect all your calculations.

Having found your own position subtract the latitude from 90 degrees and note the figures down thus—

Latitude 410 North colatitude or polar distance 49° (a)

Longitude 730 West

Now refer to your book of tables for the sine and the cosine of your polar distance and note them thus. (Never mind what a sine or cosine is.)

Sine a = .7547 Cosine a = .6560

Keep these handy; they will come into all your calculations.

CALCULATING A DISTANCE

Now consult some good map for the latitude and longitude of the place whose distance you want to know. Take Cairo for instance.

Latitude 30 North Colatitude or polar distance 60 degrees

Longitude 33 East

I am only taking whole degrees; for accuracy, closer measurements are needed. If you do make closer measurements you will be dealing in degrees and in minutes. When making your subtractions it is then

1. The "tables" here referred to are those called "Tables of Trigonometric Functions," but it does not matter if one does not remember the name of the study—just ask for the "trig functions."—Tech. Ed.

2. A surveyor can do this sort of thing beautifully. It is his business. He will also be able to give your location down to seconds.—Tech. Ed.
important to remember that a degree is divided into 60 minutes. Getting back to the Cairo problem. The formula we are to use is written so as to give us an “angular distance” which can be converted into miles as will be shown later. For the present this “angular distance” will appear as “cosine c” or simply “cos c”.

The formula for the finding of the angular distance is

\[ \cos c = \cos C \sin a \sin b + \cos a \cos b \]

In this formula one must understand that when two or three quantities are written after each other this indicates that they are to be multiplied together, that is “cos a cos b” means “cos a multiplied by cos b”. Of course we must know what the various things in the formula stand for. Their meaning is as follows:

Cos c is the angular distance we are trying to find so that we can convert it into miles.

\( \cos C \) (note this is the one with the capital C) is the cosine of the difference in longitude between your location and the other place you are interested in.

Sin a and cos a are the sine and cosine of your own polar distance or colatitude—the thing you found by subtracting your latitude from 90. Sin b and cos b are the sine and cosine of the polar distance (colatitude) of the other place.

These things may seem very confusing to those who have not studied trigonometry but they are really very simple as an example will make them clear.

Let us get back to this New York-Cairo problem and finish it. We now know that New York's polar distance (or colatitude) is being called a and that Cairo's polar distance is being called b, also that C is the difference in longitude between the two places. From this we find (part of these figures have already been set down before)

\[
\begin{align*}
a & = 49^\circ \quad \sin a = .7547 \quad \cos a = .6560 \\
b & = 60^\circ \quad \sin b = .8660 \quad \cos b = .5000
\end{align*}
\]

The “sin b” and “cos b” were looked up in the book just in the same manner as the sin and cos for a.

Now we still need to find C, and from that we will find cos C.

Now the difference in longitude between 73W (which is at New York) and 33E (Cairo) is 106 degrees. This may look like a sum instead of a difference, but remember that it is distance that we are interested in, so that if both longitudes were west (or both east) we would subtract them, but with one east and one west we must add them. A good look at the map of the world will make this clear if you will remember that all longitudes are measured from Greenwich, England. If both points are in the same direction from there we will naturally have to subtract to get the difference, but if one is on each side we will need to add as we did for the New York to Cairo example. Very well—we have found that C is 106 degrees and the tables show that \( \cos 106 \) degrees is \( -\cos 114 \) degrees. When you try to find this in the tables you will see that I have introduced a complication that occurs only in long distances. The tables go only to 90 degrees and you have just had to look up the cos of 106 degrees—and will often have to look up values for angles as high as 180 degrees. Fortunately the sine of an angle between 90 and 180 degrees is the same as the cosine of the same angle minus 90 degrees. In the same way the cosine of an angle between 90 and 180 is the same as the sine of the angle minus 90 degrees, except that there is a minus in front of it. Thus to find the cos of 106 degrees we first subtract 90 degrees, which gives us 16 degrees. Then we look up the sin of 16 degrees and put a minus sign in front of it, which gives us

\[ \cos 106 \text{ degrees } = -\sin 16 \text{ degrees } = -\sin 16 \times \sin 16 = -27.56 \]

When all of these figures have been put into the formula it reads:

\[ \cos c = -\sin 16 \times .7547 \times .8660 - .6560 \times .5000 \]

multiplying this we have

\[ \cos c = -1.1801 + .3280 \text{ or } 1.1801 - .3280 = .1479 \]

Now we look up the angle whose cosine is .1479 and we find that it is 81° 30’ or 81½ degrees. Now it happens that 1 degree of a “great circle” (don't worry too much as to the meaning of that) is 69.04 miles. Therefore the distance we are interested in is

\[ 81\frac{1}{2} \times 69.04 \text{ miles or } 5626.7 \text{ miles} ——\] 

New York to Cairo.

Now from the same point near New York to Cape Chelyuskin in Siberia is only 59 degrees (straight over the North Pole), which is only 4073.4 miles, so A has beaten B by 1550.4 miles although B's distance looked double on the map.

This proves my contention. If you want to know your distances you MUST calculate them. A trial or two will convince you that this calculation is quite simple and easy, even though at first it frightened you.
The Most Useful Meter

By R. F. Shea

Perhaps you wonder why the title of this paper does not name the type of meter that is to be talked about. There is a good reason; the name of the thing is so much worse than the device itself and it would be too bad to scare anyone off. The meter itself is certainly one of the most useful things in radio, tho simple enough to make and use.

The vacuum tube voltmeter can be built up from the most ordinary equipment, can be operated easily and makes light work of numerous jobs that are otherwise expensive, difficult, or even impossible. Just why this is so will be understood more easily if we first see what sort of things are possible with ordinary meters and where there is a gap that the vacuum tube meter can fill.

The usual voltmeter

Referring to Fig. 2 we have at A the usual direct-current meter which is one of the most useful forms ever devised and which is known as the "moving coil" or "Arsonval" meter. Here we have a "U" shaped magnet between the poles of which is hung a coil of fine wire. By removing the cover of an ordinary d.c. milliammeter one may examine the constructional details. The little coil will be found secured to a shaft which turns in jeweled bearings. The current is led to and from the coil by hairsprings which also tend to hold the coil in the "zero" position. When a current is passed through the coil it turns to a new position. Splendid meters of this type are built to act as milliammeters. If a resistance ("Res." in Fig. 2A) is connected in series with the coil we have avolt-

meter, while if this is omitted and a shunt "Sh." in Fig. 2A is added we have an ammeter. The important point is that no matter whether we put on or leave off "Res." or "Sh." the amount of power needed to make the coil turn is the same and the shunt or series resistance uses up additional power. The sensitivity of the whole thing therefore depends on the sensitivity of the milliammeter we started with and it takes power to deflect the milliammeter—not much power but some. It takes a little more power to operate the voltmeter.

That statement is for the d.c. meter which is the most sensitive of the lot. When we come to the a.c. voltmeter and the static voltmeter, considerably less sensitivity is possible and therefore more power is taken by the meter. Since almost all radio work is with a.c. this is very bad, as the meters upset the current rather badly as a rule.

For instance, a common sort of a.c. filament voltmeter is that shown in Fig. 2B.

FIG. 1

and therefore turns the shaft and pointer in the usual way, a hairspring tending to resist the motion. This sort of meter is not very sensitive and one of well-known make takes 300 milliamperes at 15 volts, which is full-scale. This does not mean that the power taken is $.3 \times 15$ watts by any means because the power factor comes in—but it

FIG. 2. ORDINARY VOLTMETERS
does mean that the current drawn is large enough to upset many sorts of circuits. The meter is quite all right for filament voltage, of course. It is likewise all right for any ordinary a.c. circuit.

In Fig. 2C we have another sort of a.c. voltmeter. Here both the rotor and stator are coils. This is known as the dynamometer type of meter and has some special advantages as an a.c. meter, but it too takes a fair current and more power than we like to withdraw from an amplifier or oscillator circuit.

THE STATIC VOLTMETER

There is one sort of voltmeter that can be used for both d.c. and a.c. without drawing enough current (or power) from the circuit to be at all troublesome. This is the static voltmeter, shown in Fig. 2D. The rotor is a bit of thin sheet metal (aluminum for in-

stance) shaped like a slim figure 8 and mounted so as to turn inside of a pair of "quadrants" shaped as shown in the sketch. The whole affair is, of course, a small variable condenser. One side of the line to be measured goes to the rotor and the other side to both stators S1 and S2. The stators then attract the rotor and it tries to turn to the maximum capacity position (inside the stators) against the usual hairspring.

Such a meter is not particularly sensitive but has the very fine advantage that it draws no current at all from a d.c. system (it would be wonderful as a plate voltmeter for small sending sets) and no measurable power from an ordinary 60-cycle circuit. This begins to sound like the thing we are hunting—but it isn't. As soon as we connect such a meter to an r.f. circuit matters are upset, for one can see that it is a variable condenser whose capacity changes with the position of the needle and therefore the tuning, neutralization, etcetera, of the circuit are almost sure to be upset.

What we need is a meter that takes no power from the circuit, that does not act as a condenser—in other words, that acts just as if it were not there—but works. This seems like a silly and impossible thing to demand, but the vacuum tube voltmeter does that very thing so closely that we can say it does so exactly. Even in r.f. amplifiers the meter does not upset matters, and that is surely a delicate test.

EXAMPLES

All this has been rather general. Let us take a definite case. Referring to Figure 3, suppose that we wanted to find the resistance of the transmitting grid leak R, or the capacity of the filter condenser C or the inductance of the filter choke L. The usual amateur does not have a Wheatstone bridge and if he did have the thing would almost certainly not be suited to a.c. work. The grid leak could be measured with d.c. but the choke and condenser must be measured with a.c.

Suppose we tackle the job with the usual meters on hand in a sending station. They usually run about this way:

- Jewell or Weston—0-15 filament voltmeter—d.c.
- Thermo-couple antenna ammeter 0-5—Not good for d.c.—O.K. for a.c. or r.f.
- Weston thermogalvanometer on wavemeter—0-115 mls a.c. or r.f.
- Milliammeter (d.c.) 0-1½ for driver grid circuit.

Now there may be some other meters, and again some may be missing—but let's try it with the ones listed.

Suppose we start with the filter choke as shown in Fig. 3B. The idea is, of course, that if we know the voltage across the choke and the current thru it we can figure its reactance from Ohm's law—

\[ X = \frac{E}{I} \]

If we try it, the meters we must use will be the 0-15 a.c. voltmeter and the 0-5 thermommmeter. These a.c. instruments are
very crowded at the lower end of the scale and we cannot get decent readings on voltages below 5 or currents below 2.

Now if our choke has an inductance of 10 henrys (which is a normal value for a filter choke) the reactance is 3770 ohms at 60 cycles. If we use 10 volts at 60 cycles across the choke the current thru it will be only 2.3 milliamperes. None of the available meters can measure this current and we would have to get a very expensive thermometer. We could push the current up but that would tend to produce saturation of the core-choke, thereby giving an incorrect value of L.

![Diagram of vacuum tube voltmeter](image)

**FIG 5**

Even if we had a pair of meters better fitted to the job we would still find troubles. Suppose that the meters fitted the job and we made a measurement. Are we to do it with the voltmeter connected to Y or to Z? If we connect to Y the voltmeter current goes thru the ammeter and the ammeter reading will be badly off—the voltmeter may draw 300 milliamperes. This would not only throw the current reading badly off but might actually burn out the thermocouple suggested above. If we connect to Z the voltmeter will be off because it measures the voltage across BOTH L and A. The results in either case are inaccurate. They can be corrected—but one must know how and in some combinations the correction is a very large part of the whole result, which means that the results are not at all accurate. We need a voltmeter that draws no current.

**AMPLIFICATION MEASUREMENTS**

To make the thing really bad, let us take a look at the most troublesome measurement of all—amplification. Looking at Fig. 4 we wish to measure the amplification between the points X and Y—in other words, the amplification of the 1st tube and the transformer Tr. No. 2. Imagine what would happen to the amplifier if you tried connecting an ordinary 0-15 voltmeter across it at X and another one at Y. Would it keep on amplifying? Hardly; the meters would short-circuit the amplifier, because their impedance is low and they draw too much current from the system.

So much for the defects of the ordinary voltmeter in radio work. Now for the vacuum tube meter.

**VACUUM-TUBE VOLTMETERS**

By a vacuum-tube voltmeter we mean a combination of a tube, a sensitive milliammeter and the necessary batteries—this combination being so arranged that the reading of the milliammeter is an indication of the voltage impressed on the input of the vacuum tube.

The general connections of such a voltmeter are shown in Figure 6. T is a vacuum tube of the usual 201-A type; MA is a milliammeter having a full scale range of about 1.5 milliamperes (such as is used in the grid circuit of drivers). Weston makes a small instrument having this range, which serves very well for the amateur’s vacuum-tube voltmeters, but for great precision we must naturally use extremely accurate meters.

With the values of filament, plate and grid potentials indicated, the grid of the tube is operating at a point well down on the grid voltage-plate current characteristic, and the plate current will be about one-tenth milliampere. If now an alternating potential is impressed on the input terminals, the grid will fluctuate periodically about this initial bias and, due to the shape of the characteristic, the positive loops in the plate current will exceed the negative loops, so that we have an increase in our average plate current, this increase varying with the impressed alternating voltage. In other words, our plate milliammeter will show an increased reading when the a.c. is impressed on the grid. For example, an input voltage of five volts with the values shown in Figure 5 will increase the plate current from about one-tenth milliampere to one milliampere.

If we calibrate such a vacuum-tube voltmeter by varying the input voltage and observing the reading of the plate milliammeter, we can plot a curve from which we may obtain the voltage for any reading of the milliammeter. A typical curve for such an instrument is shown in Figure 6. While this is the general basic type of vacuum-tube voltmeter in actual practise, there are many refinements applied to fit it for various particular uses. Some of the different types of commercial vacuum-tube voltmeters are shown in Figure 7. Type A is the same as the general type with some refinements to facilitate usage. In manipulating this device the proper A, B and C batteries are used and the plate current is always brought to

---

**TABLE:**

<table>
<thead>
<tr>
<th>V</th>
<th>MA</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.10</td>
</tr>
<tr>
<td>1</td>
<td>0.15</td>
</tr>
<tr>
<td>2</td>
<td>0.20</td>
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<tr>
<td>3</td>
<td>0.25</td>
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<tr>
<td>4</td>
<td>0.30</td>
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<td>5</td>
<td>0.35</td>
</tr>
<tr>
<td>6</td>
<td>0.40</td>
</tr>
<tr>
<td>7</td>
<td>0.45</td>
</tr>
</tbody>
</table>

**FIG 6**
some predetermined value, such as one-tenth milliampere. The impressed voltage is found from the reading of MA and a curve similar to that shown in Figure 6. This voltmeter is very useful for measuring a.c. voltage from one volt up to about twenty volts. The lower limit is set by the precision of the instrument, and the batteries and tube used determine the upper limit, as the plate current cannot increase once saturation is reached.

If the alternating voltage to be measured is superimposed on a direct voltage as for instance, if we were measuring the voltage across the loud speaker in the plate circuit of a tube, where there is both direct and alternating current, the first type V.T. voltmeter would be unsuitable since the bias of the grid will be changed by the d.c. component of the voltage to be measured. To measure the a.c. voltage we must block the grid of the V.T. voltmeter to d.c. and use a grid leak to tie the grid down to a definite potential. This gives us our type B of Fig. 7, with a blocking condenser of about one microfarad and a grid leak of one-half megohm. These values of condenser and leak have been found quite satisfactory over a range of frequencies going from audio frequencies into the radio band.

There are several disadvantages encountered in the use of the type B voltmeter. One is that the device is not frequency free. The type A meter can be calibrated at one frequency and it will be accurate over the whole range. However, there is a change in reading of the type B meter, as we go down in frequency, due to a loss of input voltage in the blocking condenser when the reactance of this condenser becomes comparable with the input reactance of the tube. The best plan is to use as large a condenser as possible, but the larger condensers are expensive and bulky and are likely to be leaky. If they are, some of the d.c. that we are trying to block out comes thru and is impressed on the grid. Therefore, our practical considerations limit the blocking condenser to about one µfd.

A more important limitation of this type B voltmeter is that on strong signals it exhibits a saturation effect, that is, an increase in signal produces little or no further increase in plate current. Our characteristic for this device would follow the curve of Figure 6 for a distance and then would branch off to the right, approaching a horizontal line. This limits the upper limit of our voltmeter to the point at which this saturation effect begins to appear, and this is usually uncomfortably low.

The explanation of this effect is that a heavy incoming signal drives the grid positive, causing it to draw considerable current. This current, passing through the grid leak, forces the grid bias down and we arrive at a point where the grid bias is forced down to such an extent that it compensates for the incoming signal and there is no increase in plate current. To avoid this it is necessary to make our C battery large enough to prevent the grid from swinging positive. For instance, if we wish to attain a maximum value of ten volts of a.c. input, our grid bias must exceed this value and will preferably be about twelve to fifteen volts. Of course, if we use a large C battery, we must increase our B battery also in order to avoid working below cutoff.

Up to this point little has been said about the sensitivity of these devices. It is evi-
dent that we will obtain more accurate results if we use precision instruments, but there is a limit even with these. For example, if we set our no-voltage plate current at one-tenth milliampere, our lowest measurable voltage is that giving the low, readable change in plate current. We might use a precision meter having 1½ milliamperes full scale.

Let us say that an input of ½ volt on the grid changes the plate current by ten microamperes, or one-one hundredth of a milliampere. Our plate current has gone from .100 to .110 milliampere, which is a very small change even on a precision meter. It is easy to see that a voltage of one-half volt is going to be hard to measure. It is this consideration that fixes our lower limit with the above mentioned types of V.T. Voltmeters but there is a third type which is capable of still greater accuracy, and this is shown as type C.

It is noticeable that this type is identical with type B except that there is a battery and resistance shunted across the meter. This is called a bucking-out battery. Its purpose is to circulate a direct current thru the meter, equal and opposite to the plate current, so that the net current thru the meter is zero.

In other words, all the d.c. plate current is detoured around the meter thru the bucking-out battery.

If the plate current is changed, however, by the imposition of a voltage on the grid, this change in plate current will manifest itself on the meter in the plate circuit. It is thus possible to use a very sensitive microammeter in this place, as it does not pass the one-tenth milliampere plate current, and this microammeter will make changes of a few tenths of a microampere easily readable. In this manner it is possible to measure accurately as low as one-tenth of a volt, whereas the other types will not go below a volt.

There is still one other type of voltmeter which is the most sensitive of all and which is of great usefulness in r.f. measurement work where very low voltage levels are used. This type, shown as type D, is called the condenser-leak voltmeter to distinguish it from the others which are called negative C detectors. The first three types depend upon the curvature of the plate current-grid voltage characteristic for their rectification, whereas the fourth uses the principle of cumulative grid rectification, employed in our radio receivers, to obtain greater sensitivity.

This voltmeter is identical with type C except for the addition of a .00025 µfd. grid condenser, a 4-megohm grid leak and the absence of the C battery. There is one fundamental difference in the operation of the two types of voltmeters. The negative C voltmeter causes a rise of plate current when a signal is impressed, whereas the condenser-leak type causes a decrease. This means that the microammeter must be connected in the opposite way from Figure 7C in order to read correctly. In the type D voltmeter, the bucking-out battery is larger than in the type C since the plate current is higher due to removal of the C battery.

When using a sensitive meter and a bucking-out battery, it is customary to use either a multi-range meter, such as those made by Rawson and Weston, or to use a shunt.
across the meter, so that the normal plate current can be brought down on the scale before being bucked out. The bucking voltage is now adjusted until the meter reads zero, when it can be shifted to a more sensitive scale, or the shunt removed. The user must be very careful to either shunt the meter or go back to a higher range before tuning the tube or disconnecting the bucking-out battery, as otherwise the meter will be burned out.

It is evident that a V.T. voltmeter of this last type needs very accurate adjustment of the bucking-out voltage. This is more easily accomplished by the use of a variable resistance than by changing the bucking-out battery. Also, there is less danger of accidentally burning out the meter by shifting taps on the battery with the meter on a sensitive scale.

Figure 7E shows an r.f. V.T. voltmeter of the 7-E type with a few refinements for accurate adjustment of the bucking-out battery. The 5000-ohm variable resistance gives a rough adjustment and when the range has been shifted to the very sensitive scale, the potentiometer can be used to bring the pointer to an exact zero. A typical calibration curve for such a V.T. voltmeter is shown in Figure 8.

The accompanying photographs show some typical voltmeters of the above types.

If this layout is used in a.f. work, the vacuum tube voltmeters are of the 7-A type. If it is at r.f., they are of the type shown in 7-E. This is one case where only a V.T. voltmeter will serve the desired purpose, as any other voltmeter placed across the secondary of T would not simulate the actual load at all and we would get a very erroneous value of gain. This set-up is used...
to measure the gain thru various types of r.f. and a.f. transformers at various frequencies.

In connection with the measurement of amplification, another characteristic of V.T. voltmeters comes in handy. Since the change in plate current depends upon the wave form of the impressed signal, we will obtain different readings if we reverse the impressed voltage, unless it is of a symmetrical wave form. This is because one side of the wave form is higher than the other in a distorted wave form and the average values of each side are different. Therefore, if the voltage is impressed on the grid one way, the top average will determine the reading of the voltmeter, whereas if we reverse the voltage the other average is the determinant. We can thus check the wave form of an oscillator by connecting a V.T. voltmeter to its output thru a reversing switch, and if the reading changes on throwing the switch, there are harmonics present.

Another use of V.T. voltmeters is in the measurement of high impedance. Figure 13 shows a set-up for the measurement of high inductances at low frequencies, with biasing current circulating thru the coils. It is seen that the method consists of connecting a resistance in series with the impedance to be measured, and placing a V.T. voltmeter across each. The resistance is adjusted to make both meters read alike when its value equals the desired impedance. When measuring chokes with d.c. the measurement is made as shown, using two chokes and splitting the battery in equal halves, as shown, so that no d.c. is impressed on either V.T. voltmeter. This method can be used to measure large filter condensers by connecting them between the points X X instead of the chokes. An extremely useful application of the V.T. voltmeter is that illustrated in Figure 14, which shows a wavemeter with an attached vacuum tube voltmeter. In ordinary wavemeters we are limited in precision by the resistance of our measuring instrument unless we indicate resonance by a meter in the oscillator which is often inconvenient. In this wavemeter the V.T. voltmeter replaces the usual milliammeter or bulb and is placed across the precision condenser. The only resistance in the tuned circuit is that of the coil and condenser, plus some dielectric loss, and a small loss caused by the input of the V.T. voltmeter being less than infinite in resistance.

If our coil is low in power factor, we can construct a wavemeter which is extremely accurate and sharper than most other wavemeters. In this particular wavemeter the 4½ volt battery supplies plate as well as filament for the 199 tube for economy of parts. If greater sensitivity is desired it may be obtained by placing a B battery in the plate circuit, but for our purposes the 4½ volt battery was quite sufficient. This wavemeter is shown in the accompanying photo, Figure 15.

There are many other purposes to which vacuum-tube voltmeters will lend their adaptabilities, but these are among the most common and the most important, and will serve to show the great utility of such a device. It can be easily seen that the scope of this instrument in the field of radio measurement is vast indeed, and that it occupies an enviable position among radio instruments. When we consider that this instrument serves to give us comparative, constructional data from which to design our transformers, our coils, our condensers and even our radio sets, it is evident that this one instrument is easily one of the most useful in all radio work.

![Strays](https://example.com/strays.png)

8ASQ wants to find out, "Does the relay relay relay?"

3CDQ has been working oiACD and not 6ER as stated in the January issue.

We are told by 8RL that any stations tuned in on his Grebe Synchrophase may also be heard on 10, 20, 40, 80, 100 or 200 meters on his CR-18 located two floors above it. These sets certainly act like sisters under the cabinets.
A Ten-Cent "Bug" Key

By George P. Taylor

I have a "bug" that cost me actually only a thin dime; and that was for the necessary nuts and screws.

In 1925, QST described a home-made bug but it was of the double-bar type. The one I will describe is of the single bar type and is a bit easier to construct.

0, 1, 2, 3, 4, and 5 are small metal brackets about 9" wide and bent at right angles, being screwed to the base with ½" wood screws. The brackets were not threaded for the machine screws, it was simpler to use a nut on each side.

The base is of wood (6¼" x 2½" x ¾"). The arm 6 is of the same metal and size as that of the brackets and about eight inches long before being bent and twisted. The knob or "thumbbeater" 7 is a cylindrical piece of wood 1¼" in diameter and ½" long.

The dot contact extension and the vibrator arm 8 and 9 respectively, are of spring material. I made them from an old corset stay. The vibrator 9 is 3/16" wide and 1¼" long from the opening of the thimble 10 to the beginning of its free end on the main arm. The whole length is about 4".

The bearing X. The little bridge F is of 8" metal strip. A hole is drilled in its center as shown in the diagram, and a machine screw is inserted and soldered to F—also a portion of the screw where it protrudes from F is coated with solder. A similar hole is drilled in the main arm 6. The solder on the screw is filed until it will slide easily into the hole just drilled in the main arm. A nut and lock nut are put on and you have a pretty good bearing. Mine has given me no trouble. A drop of oil will help it.

The wiring is dotted. No binding posts need be used. Connections are just made to the wood screws that fasten the brackets to the base.

The adjustments are a bit tedious I will admit, but all finished you will be proud of the action of your handiwork.

In adjusting, start at the springs. With all "set-screws" clear adjust the main arm so that when idle it lies parallel to the sides of the base and with the springs A and B fairly taut. Then set stop 4 up close to the main arm. When the main arm is against the stopping post 4 the dot contact 8 should rest lightly against its other contact. The dash contact 5 is brought up close to the contact on the main arm 6. The arrester 1 should rest against the thimble weight 10 when the arm is idle.

Further adjustments can be made by touch and with a buzzer. Varying the stopping post 4 the slightest degree will change the speed of the bug. Incidentally, this is a nice helpful factor.

I built the thing one afternoon with a soldering iron, a screw-driver and a drill. I hooked it to my regular key and use either according to my moods.

My outfit doesn't look all-fired neat but it's effective. In the same way I am no artist with the pen or this description would be plainer and in fewer words, but I think it's all here.
Electrolytic Filter Condensers

By Louis F. Lenck

SINCE my transmitter was put back into operation last fall my tone has invariably been reported as "pure d.c." The answer lies in home-made electrolytic condensers with a 50-to 100-henry choke coil in the regular "Brute Force" filter shown in Fig. 1. A very ordinary filter will give a smooth output if very lightly loaded but large condensers help greatly to keep the output smooth when the load is increased. A really large capacity in paper condensers becomes very expensive—and that's where the electrolytic condenser comes in.

Of course much depends on the proper adjustment of the set. Frequently the tone of the transmitter can be improved very greatly by simply using a grid leak of 2 or 3 times the usual r.f. resistance. The plate current will be reduced and the antenna current generally will not fall in proportion. Changing the r.f. choke, loosening the coupling and dropping the input (fewer grid turns) all help to improve the tone. It isn't necessary to wait for reports—just listen to a weak harmonic of the transmitter with your own receiver.

The best proof that these things are really worth while is that by simply ignoring them one can produce any sort of a rough tone (r.a.c. or even a.c.) from a good d.c. generator or even a storage battery.

The axe I want to grind, however, concerns the formation of the plates in an electrolytic condenser. My first attempt along this line was not all that could be desired, in fact I ruined a couple of good electrolytic rectifiers trying to use them as a source of d.c. to form the condenser plates. The instructions I was following stated that a.c. positively was not of any use except to ruin condenser plates that were already formed. Well I didn't even get the plates started to forming with my chemical rectifier. I found that the current required at the beginning of formation was entirely too heavy. It ran up to 100 mills or so per sq. inch at the very beginning.

My next thought was to take the condenser to a power plant where d.c. was available. This was a very fine idea except that it is quite a trick to move a "pie plate stack" condenser across a room without spilling a good share of the electrolyte.

THE PIE PLATE CONDENSER

Here is the method eventually evolved. Stacks of aluminum pie plates are used. Suitable plates can be purchased at S. S. Kresge's 25c stores for 10c each. Assume we have 750 volts of R.A.C. to be filtered. Allow 60 to 70 volts per plate. The voltage will tend to build up to peak value where large capacities are used in the filter. It is therefore possible to get $1.4 \times 750 = 1050$ volts of d.c. at no load. However, the resistance of the transformer, rectifier and choke (and the load due to slight leakage through the condensers themselves) will pull this down. You will still get 750 volts if the load put on the condenser is not too heavy. Allowing 65 volts per plate we find that 11 plates are required. One of the plates in a stack is simply an electrode so we will use 12.

Now suppose we have them all properly stacked and spaced and we are ready to put in the electrolyte. Put the condenser just where you expect to use it. Now fill each plate with electrolyte made by dissolving ammonium phosphate or borax in distilled or rain water. Make a concentrated solution using cold water. Fill the plates to within $\frac{1}{2}$-inch of the top and add $\frac{1}{4}$-to $\frac{1}{2}$-inch of ordinary automobile cylinder oil. The oil is only to prevent evaporation or creeping out and crystallization of the solution.

FORMING

The apparatus required for forming is as follows:

- 110-volt source of a.c.
- 2 clips
- 1 electric iron or toaster
- 1 40-watt lamp with socket
- Some lamp cord for making connections

The apparatus is connected as shown in Fig. 2 which is almost self-explanatory.

The ammonium phosphate is probably the better since there is less difficulty with "creeping" of the solution, also because there is a lot less tendency to corrode the aluminum if it is impure.—Tech. Ed.
The 40-watt lamp merely acts as an indicator.

Fix one clip on the upper pan and the other on the one below it. The condenser at first acts very much like a short-circuit and the lamp will glow brightly, but the heavy initial charging current (above 5 amperes) will cause the plates to form rapidly at first. The lamp will immediately begin to get dimmer. At the end of about one minute it will be fairly dim. Now move the clips down one plate each and treat the next pair of plates the same way. By the time you have given each of the 12 pairs one minute treatment you will find the whole condenser quite warm to the touch. Let it stand until the next day or until it is cold. Repeat the forming process as before but you can continue a little longer this time as the condenser will not heat so readily as it did the first time.

Repeat this forming process a couple of times more or until the lamp shows very little light or none at all (current going through both lamp and iron always).

The condenser is now practically formed and can be connected directly into the filter. It will have a leakage current of only 5 to 15 milliamperes and a capacity around 5 µf. After being in use for a while the leakage current may be still less. It sometimes gets as low as 3 mls.

It is a good plan to give the condenser a little attention about once every four or six weeks to see that the leakage current is low and remains so. This can be done by putting a 0 to 100 range milliammeter temporarily in series with the condenser. It can also be done by the use of a wooden handled screwdriver. Short-circuit each pair of plates in turn with the current turned on. A fat spark can be drawn from each pair that is still properly formed. In case one or two pair show a weak spark or no spark at all use the original a.c. treatment on them and they will again do their duty.

CAUTION: While forming do not let the solution get so hot as to boil. This will ruin the film already formed and it seems to be harder to form the second time. In fact, do not let the plates become uncomfortably warm to the touch. The cooler they are kept during formation the better.

Do not try to fill the plates too full of solution. It will tend to creep out and to crystallize along the edges. This will be especially harmful if it soaks into any wooden or fiber spacers you may have used.

Fig. 3 shows a convenient way of making a rack for pie plates. Aluminum lightning arrestor cones can sometimes be secured from power companies. They discard these plates even if only very slightly defective. Get them if you can and also the spacing washer as they are great. They are easy to mount and space and have about twice the area of pie plates.

Electrolytic condensers of this type have two principal virtues. One is cheapness. Your filter can boast of 20 miles with about the same cost to its owner as if it had 4 miles of the ordinary paper dielectric variety. The other is that too high a voltage will not wreck it. Of course the thought of the work required to make one may give a fellow "that tired feeling" but how about the "feeling" one experiences at the pit of the stomach about the time he unexpectedly blows up a bunch of paper condensers?

Just how near pure d.c. will this filtered a.c. give? With 15 µfds. across each end of a 50-to 100-henry choke the twenty meter signals from this station have been reported as "pure D.C." about a third of the time and as "D.C." in every other case where a report has been received.

The two curves of Fig. 4 show how the leakage current through the condenser varies as the voltage across the condenser.

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2. The capacity of each section depends on the area of the plates and the voltage at which the condenser is formed and used. Forming at 100 volts should produce a condenser with a capacity around 7 microfarads per square inch of plate area, or about 300 microfarads per plate. Since the sections are in series this must be divided by the number of plates. There are 11 plates in the string described therefore the resultant capacity is about 45 microfarads. Practically the capacity usually comes out lower. But even 20 microfarads is a good capacity. -Tech. Ed.
is varied. Note that it would be a waste of good pie plates to allow any less than 60 volts per plate, also the leakage increases very rapidly after a certain voltage is passed. According to the lower curve it seems as if 80 or 90 volts would be a safe upper limit. This is not the case, however, as sometimes they do not work out quite as well as the one from which the curve was drawn. 70 volts should be the upper limit.

If 110 or 220 volts d.c. is available no doubt it would do as well or better using the above plan of forming.

By using the above plan each plate is formed separately. All plates will behave about the same when the condenser is put into service. This is not usually the case when a number of plates in series are all formed at the same time from a high voltage source. Some will not start forming as quickly as others and these will turn out to be "duds". Our chem rectifiers are usually formed in series. Did you ever see one without a couple of "duds" in it?

The new Raytheon type BH rectifier tube has several things about it which should make it a nice low-power transmission device. The maximum a.c. input voltage is 350 per anode. The starting voltage is 105 and in their standard B-eliminator circuit it will deliver 200 volts at 85 milliamperes. The regulation with the new tube is extremely good, the 90-volt drop in the tube remaining constant for drains of from 20 to 85 milliamperes. For use with a 201-A tube in a small transmitter, the Raytheon rectifier should be quite the berries.

Our friend Doc Bidwell of Washington suggests that DuPont’s Duco Household Cement is the latest thing for sticking anything around the shack providing the material to be stuck to is not rubber. Doc says the Duco stuff is superior to the colloidion-celluloid compounds we have been using on coils, etc.

R. Palmer, SPY, makes the following suggestion for adapting the UV bases to UX sockets. A fonc-cord tip is soldered over the filament prongs and the lower ends of them clipped off. The illustration shows how.

5ANL had a close shave. He had some storage batteries on charge and one of the caps that had been removed and laid to the side of the vent hole fell back on it and sealed it up again. He took the clip off the terminal without shutting off the charger and the spark ignited the gas in the cell. It threw acid into his eyes and over his face and hand. As he was only about a block from a doctor, he shouted for some one to take him there. He arrived in less than five minutes and was fixed up immediately. This quick work probably saved his sight. Take this as a warning fellows and always turn off the charger before you take the clips off the battery. Don’t use any naked flames near batteries either.
The report of this section is brief this time because we are in a betwixt-and-between position at the moment when this must be written, that is to say the end of February. This applies to almost all of our activities, as follows.

THE NEW PROGRAM

Before starting a new "session" it is naturally necessary to gain reasonably complete information as to the past year's work. Some members of the section, perhaps 10%, have been very good about keeping in touch thru the year. Another 40% or so reported when requested, mainly sending in first rate reports. The other half should have received a follow-up request before this but we have been short of time because of a combination of things, a short month, the usual winter peak of correspondence, the annual meeting of the Board of Direction and the necessity of produced to a number that can be supplied with material, or else the original estimate on material raised greatly. As this is read the work will be under way. The problem is naturally a slow one and will take perhaps 6 months until a report can be made.

THE 5-METER WORK

Our 5-meter experiments are in a curious shape. After many months of work we finally started testing in the middle of January, and tests by 2EB and 10A were run twice daily and almost all day Sundays throughout February. 2XM, 2GSM and 9EHT joined in at intervals. Many foreign observers listened and 2EB, which was the most powerful of the stations, was heard in Missouri, Kansas (state) and in Italy, also many times in Hartford by the writer. In addition to this 2EB and 2NZ established two-way contact as was explained in the "flash" on page 58 of the March issue. This contact was found very reliable at all sorts of hours.

So far—so good. We feel encouraged, but we must wait for reports from our distant observers before a complete report can be made. Rather than to make two reports the present one will be let go with the high-points mentioned above. By the time you read this we will have received information from the network and will send mimeographed details to the members of this section. The next issue will, accordingly, contain full information.

FURTHER 5-METER TESTS

Naturally after 2 years of 5-meter work Phelps and the writer felt as if it were high time for a little aid to appear. Our only consistent cooperation had come from Norvell Douglas of 9EHT at Lawrence, Kansas. It is therefore a pleasure to report that any number of additional testers has appeared, many of whom are doing excellent work and are anxious to continue the tests. More tests will certainly be run but will perhaps not be announced thru QST as this takes entirely too much time. For instance—suppose that we study the return on the last series of tests and by the end of March have complete plans for another test. The announcement could then go into the "next available" issue of QST, which would be the MAY issue—and we would have to sit around until then to allow even the U. S. A. men to get in on the test. When foreigners are considered it becomes plain that one must allow another month to pass.
and that a plan made late in March cannot be put into international action until JUNE—unless we find a means faster than QST.

In the late test this was done. Thru the relay system of the League many long detailed messages were sent to Europe, South America, Asia and Africa and a regular correspondence maintained by Mr. Ross Hull of this Section with Australia.

The details of that piece of relay work will appear in next month’s report. A similar method of contact will need to be used the next time, which will mean during April or May. Amateurs in the U. S. A. will be notified by broadcast from 1MK and other stations in the A.R.R.L. broadcast system; see page IV in the Communication Section of the March issue.

ADDITIONAL STATIONS ON 5 METERS

During the tests, in spite of the many announcements, very few stations joined the transmissions. They have now begun to turn up and the sending network for the next test will seemingly be much larger. Meanwhile, to aid others in getting started, the transmitter at “EB” is shown herewith. It is a frame, taken from a ship’s transmitter of the spark days, with all the essential machinery ripped out and nothing but the meter board retained. The automatic key took the curse off those dreary weeks and weeks of sending during the months from November until this time. It is very likely that this key will have much more work if we may judge by requests received from Australia and England.

SPECIAL NOTE

As has been mentioned before, this Section is not especially “sold” on any one sort of experimentation. We are very sure that it takes all sorts of experimenters to make a radio league. The man who thinks in terms of integral calculus is welcome—but so is the lad that is finding out some small matter by pure cut and try. Quite often the cut-and-try man if he will think things over and keep trying, has a very excellent chance of doing something worthwhile. He is most welcome, fully as welcome as his mathematical brother in the radio fraternity.

Another matter—The reports of this section have been bearing the signature “R.S.K.”, which, incidentally, applied to the whole report and not only to the last paragraph as many of our correspondents seem to think. The signature does NOT mean that this is a one-man section. The reports are written after conference with Ross Hull, “QST’s Information Service” who also operates the Section and are edited by him before they go into QST. Any action in the section is taken after asking the members and after a conference which usually includes the writer, Hull and Westman, QST’s Assistant Technical Editor.

—R. S. K.

Clyde Anderson sends us this photo of his collection of deceased transmitting and receiving tubes. If this is supposed to be a funny stray we will go out and attend a couple’s funerals for entertainment.

4NH suggests a good new “Q” signal.

QTZ? “Are you using crystal control?”

QTZ “I am using crystal control transmitter here.”
4JR, Gastonia, N. C.

THE operator at 4JR first became interested in radio in 1919 but did not get actively started in amateur radio until the fall of 1928 when 4JR officially got started. The present arrangement got off to a good start since the transmitter panel and meters were purchased from 5AEC shortly after he won fame in the trans-Pacific tests. The transmitter uses one 50-watt tube in an inductively-coupled series-feed Hartley circuit. Plate supply comes from a transformer, rectifier and filter arrangement, the tube receiving 1,100 volts when the power company is in a good mood and lets the transformer have 110 volts at its primary terminals. The chemical rectifier is mounted in a large box under the left end of the table. It is composed of 48 jars plus the purest aluminum and lead Morris could get. This rectifier has been in use over two years, has been cleaned only once during that time and is still going strong. The filter consists of an RCA 40 henry choke in the positive high voltage lead, with two µfd. of condenser across the line at each end.

The plate and filament transformers are home-made. The filament current is controlled by a Bradleystat in series with the primary, the Bradleystat and filament voltage meter being mounted on the front of the table at the left. In every part of the circuit where there is a chance of any r.f. getting away in the wrong direction, r.f. chokes have been inserted. The normal plate current is around 130 m.a. The primary inductance consists of ten turns of RCA helix mounted on glass towel rods and spaced by wood "beads" which have been boiled in paraffin. The antenna inductance is space-wound on notched wooden strips glued a cardboard support.

A small series condenser is used in the counterpoise lead. This condenser is mounted on a bakelite panel on the wall next to the transmitter. On the panel a small switch lever to the right of the primary condenser is used to short-circuit part of the grid leak when changing from 80- to 40-meter operation. For 40-meter work the antenna system is operated at its 2nd harmonic and for 80-meter work fundamental antenna operation is employed. Things are so arranged that the only change necessary when QSYing from 40 to 80 meters is the throwing of the small switch in the grid leak circuit and setting the primary condenser at a different and known setting.

The antenna is a single wire 105 feet long from the set to the far end. It is glass insulated. The far end is supported on a 65-foot pole. The station-end of the antenna is supported by means of a 24-foot 2 x 4 on top of the house. The counterpoise is also a single wire, having a total length of 95 feet. Both antenna and counterpoise leads are brought through a plate glass
window pane. As the op is a "southpaw" the power control switch, the antenna changeover switch and the keys are mounted at the left of the receiver where they can be handled easily.

The receiver uses the standard detector and one stage of audio frequency amplification arrangement in a Weagant circuit, a small series antenna condenser being used. The receiving coils are home-made and cover all of the amateur bands. To the right of the receiver can be seen the home-made wavemeter which is a very valuable addition to the station.

The outstanding accomplishment of the station and the record of which the operator is most proud is the consistent schedule that has been maintained with 8CEO, Oakmont, Penna. This schedule has been in force since the station was first placed on the air in the fall of 1923. Plenty of DX work has been done, including contacts with twenty-two countries in all continents except Asia. The operator is not a DX hound, however, as 4JR has participated in all Communications Department relays and tests since coming on the air. A goodly number of messages are handled each month, the average being around 50. The station was constructed and is owned and manned by Robert S. Morris of 418 South Broad Street. A nifty layout.

6DCQ, Phoenix, Arizona

Guy N. Carter is the owner and operator of this station which is located at 509 North First Street. While not an old timer, he had been a telegraph operator and broke into amateur radio after serving an apprenticeship as a BCL. Having tried everything in this field from crystal to super, he turned to the shorter waves for his amusement.

The transmitter is a loose-coupled Hartley affair. The plate supply is obtained from a Westinghouse motor-generator set and an iron core choke that came out of an electric light meter is placed in the positive lead with a 1-ufd. condenser shunted across the line each side of it. The inductance consists of copper ribbon wound in the form of a pancake on bakelite strips. The winding starts at two and a half inches from the center and continues with a spacing of one quarter inch until twelve turns are had. The antenna coil is of the same construction but has only six turns. The grid portion of the coil is tuned with a Cardwell 500-muf. condenser. It has been found that this allows the changing of wavelength to be accomplished quite easily. However, it is made a point to keep the wave exactly the same at all times and a wavemeter employing a thermo-galvanometer for a resonance indicator is used for checking it. The grid and plate condensers are supported by their leads which are about three inches long.

The antenna is tuned by a Cardwell condenser of 500-muf capacity and another one of these condensers with half the plates removed is in the counterpoise lead. With a coupling of about four and a half inches, the wave is reported sharp and steady.

Shunted around the key, which is located in the center tap lead from the helix, is a half mile of capacity in series with a thirty-ohm rheostat. As yet, there have been no complaints about clicks.

The transmitter is mounted on a shelf about two and a half feet above the operating table. It is on sponge rubber to overcome vibration. The motor-generator is also mounted on rubber in back of the receiving set on the table. This makes the machine very accessible both for cleaning and lubricating. The commutator is kept in good shape with the aid of 00 sandpaper as any arcing between segments causes a roughening of the note.
The location is an excellent one for the antenna-counterpoise system. The set is on the second floor of a two-story house and the vertical length of the antenna is a piece of No. 1 copper wire, about 27 feet long that runs directly through the ceiling and roof thru two porcelain tubes. This, of course, calls for the use of an extraordinarily good natured landlord. The horizontal length of the antenna is a cage affair, 15 feet long, of four No. 12 copper wires soldered to 10-inch copper rings. This antenna has been found to be the best of many that were tried.

The counterpoise runs directly out of the window back of the transmitter to within about 4 feet of the ground and is a two-wire fan. They are of No. 12 wire and are anchored about 15 feet away from the building, being 30 feet long with the outside ends 25 feet apart. The counterpoise insulators are 10-inch porcelain ones and the antenna uses strain insulators, also of porcelain. The mast and all guy wires, which are broken up every few feet with insulators, do not get within 10 feet of the antenna.

The receiver is a detector and one step. The circuit being the same as used by Schnell on his Australian trip. There is no sense in trying to remember all the names under which it operates. The receiving antenna is 100 feet long and fastens to a 70-foot mast. The large receiving set is a super which can be worked on the lower waves by inserting small coils. On top of this is the portable GBCB outfit.

BCLs in Arizona, for stations received and distance in miles, over a period of 10 days.

The two switches by the 6DCQ sign are for changing over from the motor-generator to 90 volts of wet "B" batteries for low power work using either a 201-A or 199. As will be seen by the circuit, it is impossible to turn on the plate supply until the filament switch has been closed.

To date, DX is oz, oo, na, aj, op, oh, nc, nm and all U. S. A. It is hoped that this winter our friends across the Atlantic may be worked with the same 7½ watts which I prefer to call the little fifty-watt bottle, my UX-210.

9DNG, Lawrence, Kansas

9DNG is the station of Fergus S. McKeever and occupies a sleeping-porch on the second floor of the house. The house is situated on University Heights and is about one hundred and fifty feet above the city of Lawrence. The first transmitter was put in and operated during the latter part of 1926.

The antenna consists of a 2-wire, vertical fan, 32 feet long. The counterpoise is of the same length and type but is hori-

(Continued on Page 67)
excellent and the WAC certificate earned in a single night. There have been so many different countries worked that a list would look like the index to an atlas. Many of the various expeditions have also been worked.

Besides being SCM for Kansas, 9DNG is an ORS, OO, WAC, RCC and TTY. Traffic is never turned down and quite a little international schedule and traffic work is accomplished.

If you have tried the Ford coil filter described in the March, 1926, QST and did not get very good results, your trouble may be in that your coils have been wired up differently than shown. SCAJ tells us that he found that your coils have been wired up differently than shown. SCAJ tells us that he found

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**Amateur Radio Stations**

(Continued from Page 62)

zontal. This has been found to give excellent results and is the best of all those tried.

The transmitter employs an 203-A in a Reinhart circuit as shown. The plate supply obtained from an Acme 600-watt transformer is converted into d.c. by the aid of a synchronous rectifier and brute force filter. An "S" tube is placed in the positive lead to take care of the sparking at the rectifier brushes. The input varies from 250 to 800 watts depending upon the plate voltage being used. It is usually 550 watts and an antenna current of 2.2 amperes is obtained on 38 meters. A separa-

rate 300-watt filament lighting transformer is used and keying is done in the primary of the plate transformer.

The receiver is a Schnell and capacitive antenna coupling has been found to be superior to inductive coupling. The DX is superior to inductive coupling. The DX is superior to inductive coupling.

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**Strays**

If you have tried the Ford coil filter described in the March, 1926, QST and did not get very good results, your trouble may be in that your coils have been wired up differently than shown. SCAJ tells us that he found...
NEW ZEALAND

R. V. ROBERTS, oz1AE, sends us some news concerning the New Zealand Association of Radio Transmitters. A constitution has been drawn up and accepted by the present 70 members and will stand until after the first election of permanent officers and Executive Committee. While no definite action has been taken regarding an emblem, it will probably be a diamond similar to the A.R.R.L. one, but showing a counterpoise instead of a ground. The letters N. Z. A. R. T. are appropriately arranged about the antenna-counterpoise system.

It is hoped that some of the U. S. stations will return to 80 meters and be QSO “oz” again. It’s a long time since one did! Several of the boys are taking portable sets with them on their travels and hope to be QSO the world on 199s and 201-A’s. Among these are 1AA, 1AE, 1FO, 2GA, and 4AO. They would appreciate reports. 1AF is visiting Australia and anticipates having an excellent trip. 1FQ is expected to increase power shortly as he has just obtained a 1000-volt motor-generator set.

D. G. Kennedy with his wife and two children are the only white people located on Vaitapu of the Ellice Islands in the Pacific Ocean. Two years ago he came to New Zealand to be operated on for appendicitis and there met Frank Bell, oz4AA, who acquainted him with amateur radio. After learning the code, he built a short-wave transmitter and for the last two months has been QSO New Zealand. As he normally receives mail but twice a year, these contacts become of extreme importance to him and anyone hearing his call, DGK, would be doing a great favor in endeavoring to raise him. He will be glad to get all sorts of news and general interest reports. We are indebted to E. A. Shrimpton for this news.

WEST AFRICA

We have several reports of stations hearing and working foPM, located in Ebolowa, Cameroon, West Africa. This is also a case of a white man, Edwin Cozzens, being away from civilization and depending upon short-wave radio for his news and contact with his friends. As his home is in San Jose, he will appreciate contacts with that part of the country so that he can get some messages there. He is working on 33 meters with a nearly d.c. note. While he was home on a visit last spring, he met the gang at San Jose who took him in tow and helped him get his outfit together. He was heard calling 6CKV by 6HM who called him and raised him. As 6CKV had had the most to do with getting his outfit in shape, 6HM arranged a schedule between them for the following night. 6CKV, being but 75 miles from 6HM, could not be raised directly due to skip distance effect, but remembering that 6CKV had a sked later with am2SE, 6HM passed the dope to the Singapore station, who in turn handed it back to 6CKV. This constitutes a relay of some eighteen thousand miles in order to advance a message 75 miles airline! Tie that!

AUSTRALIA

Several of the Australian stations have been heard along the East coast of the U. S. between three and four o’clock in the afternoon. This corresponds to the early morning (for bankers) hours.

1BMS remarks that if the “oa” stations insist on tuning through the U. S. A. band from the bottom up that they can expect no other condition than jamming on the lower end of that band. Everyone naturally
wants his signal to be the first one to be run across and we all hop way down. There are many good stations on the higher end of the band (39-42.5 meters) calling “oa” and “of,” all night with no response. I believe that if the Aussies and Zedders would tune from the top down once in a while and give those at this end of the spectrum a chance, it would encourage them to spread out more. Also, let them discontinue working those stations that insist in sneaking down to 35 meters. Some of these stations hold WAC certificates. NO wonder!

We understand that oa5WH and nJ2PZ have been working both ways around. The DX between Adelaide and Jamaica in one direction is 9,950 miles and in the other it is 14,950. Fortunately, this is not a freak condition in the general accepted opinion of a freak, as it has been done seven times already!

SOUTH AFRICA

Our monthly letter from Oxenham, foA4L, contains the following. “It is the middle of summer here and very hot. Conditions are still very good for DX work and good performances are being put up by some of our low-powered men. foA3T has worked Australia with ten watts; foA3T has worked Malaya with five watts and many like performances are taking place. A2DJ is now well on the air again after a spell of shifting his place of dwelling. A5X, A. J. Jacobs, of Johannesburg, one of our best known men, has been doing very good work these last three months, during which he has been QSO some 25 countries.

“To A5X goes the honor of being the first “fo” to work New Zealand. This is a much cherished desire of all the gang. He worked oz1CX on Christmas night. In an endeavor to work all continents in one night, he was successful in working eg6FD, oa5WH, a82PO, eb5Q1 and nu1LC. This is mighty nice work. His transmitter consists of a T250, 250-watt input, Marconi valve fed with 2200 volts of r.a.c. from two MR1 Marconi rectifier tubes. The tuned grid and plate circuit is used and the wavelength is 35 meters.

“There are about fifty active stations and approximately 100 licenses have been issued. Australian stations are coming through well now as are Brazilian, Argentine and Chilean ones. The “nu’s” are plentiful also. The 30-to 40-meter band is getting full of commercial stations these days. Apparently they have found out like the hams that this band offers the best DX. Let’s hope that the amateur is not squeezed out altogether.”

CZECHOSLOVAKIA

As mentioned in last month’s news, amateur short-wave work is prohibited in this country. There are, however, several stations working under cover and all QSL cards should be sent in plain envelopes giving no indication that they are destined for an amateur radio station. The Radio Club of Czechoslovakia, which consists mostly of BCLs and a few interested in short-wave work, publishes a monthly magazine which always contains articles regarding the construction of transmitters and receivers for short waves so as to interest as many of the BCLs as possible in this phase of radio. In this manner, the number of amateurs will increase and so add to the strength of those already existing, thus making government sanction more probable.

There is a 5 Kw. broadcasting station (W.E. make) owned by a company called “The Radio Journal”. They publish a paper containing the programs for the following week; thus the name. All persons owning a receiver must pay a monthly tax of ten crowns (about 30 cents U. S. money) to the post office department. A part of this is turned over to the broadcasting company and this company is strongly advising the government not to permit the operation of short-wave stations. They fear interference to their programs as well as a loss of revenue due to a widespread interest in amateur work if such operation becomes permissible.

There have been some changes made in the manner in which calls will be assigned. The intermediate will be “ec” followed by a number designating the location and the call will consist of two letters after the number. Those stations in Bohemia will use a 1; those in Moravia, a 2; those in Silesia, 3; in Slovakia, 4; and in Podkarpatska, Russia, 5.

IRELAND

The following is quoted from a letter from Frank R. Neill. “The Northern Ireland stations continue to do splendid work and it is satisfactory to record that the recent low-power tests, under the auspices of the R.S.G.B., were won by eg6YW. The previous low-power work of 6YW is well known and it is, therefore, not surprising that he was the best station in the British Isles during the tests. On five watts, contact was had with the whole of Europe, also many U.S.A. and Canadian stations. eg6MU, another well known station, secured third place in the tests, being QSO many U.S.A. and Canadian stations as well as being heard in India and many other distant places with an output of five watts. Two other stations, 5MO and 5WD, also worked the U.S. on 5 watts or less, so that, when it is remembered that there were only about a dozen stations in Northern Ireland taking part in the tests, these results are very satisfactory.

“At present, good DX continues to be done. 2IT is now going on increased power
using crystal control and has no trouble working up to a dozen or more U.S. stations any evening. Recent results include speech to Australia, two-way working with New Zealand, North and South America, Mosul, India and many other places. Time has been limited of late but regular work is now being undertaken again. 6MU, on between 60 and 75 watts input, is doing splendid work, having recently worked Indo-China, Australia, New Zealand, India, (on two and a half watts input on one occasion), Mosul and other places. It is expected the station will be on crystal control by the time these notes are in print. Excellent DX has been done by 6SQ on about one half watt input and other active low-power stations are 2BB, 6HI, 5CH and 6QJ.

5NJ, on an input of 75 watts, has had most consistent DX results during the last few months. Countries worked include China and Borneo (for first time from Ireland), also Australia, Tasmania, South Africa (all parts), New Zealand and sundry South American stations including Uruguay, Argentina and Brazil. For some reason, the station is always weak in the U.S.A. The best DX yet done was the raising and working of oz3AR from 11 a.m. until 1 p.m. GMT—possibly New Zealand has never been worked so far from this end, before.

"In the Free State, things seem quiet, and few stations report doing DX. eo11B is, however, making up for the silence of the others, as he has been QSO a large number of U.S. stations lately on 7 watts input. On this power he is usually able to get 'across the pond' any evening, being R 5 to 6 in the U.S.A. His DX is most consistent and good. eo14C has put up a record by working the Straits Settlements on 10 watts, this also being the first two-way contact between Ireland and that country. He is also doing excellent DX work with U.S.A. I have not heard from the other eo's lately."

SHIPS

HM is a Honduran ship with a rough 500-cycle note working on about 37.4 meters. He has been working several of the U.S. stations when off the east end of Cuba bound for New York. LW, who has been working quite a few stations, has been reported off Cuba. Mickey Doran, of the S.S. Stockton, has built a new short-wave receiver and expects to turn in a bigger list than ever before. The City of San Francisco, RXY, is out again with the old operators, Harper and Cohn, who expect to work the usual short-wave overtime. A sister ship, City of Panama, is also installing a short-wave outfit and is expected to work out a regular schedule. The "Panama"s call is RXZ. QSLs on RXY go to E.E. Harper, 3110 L Street, Vancouver, Wash'n. We have not the dope on the operator for RXZ but believe the Harper address will do for him also.

Quite a few of the fellows have been working and hearing CR10. The QRA is: S.S. Canadian Fisher, QRH about 425 meters with 250-cycle note. Send all QSLs to 22 Selkirk Avenue, Montreal, Canada. MO2 is a ship in southern waters. We have not the full QRA and would appreciate receiving it. SJB and SGL are Swedish boats in transatlantic service. XG is a boot­leg call used by a boat bound from New Orleans to N. Y. C. and then to South America. He uses a 210 on 36.7 meters. 9BPM reports working ARCX who gives his QRA as the Norwegian whaler, S.S. Nilsen Alonso, near the South Pole. His wave is 33 meters.

ITALY

ci1ER, Santangeli, writes us the following news, "During December and January, conditions for DX work were very bad here on the 40-meter band. I have tried some experiments on the 20-meter band and have come to the conclusion that constant traffic is possible between Italy and England at noon. For far-away stations such as WLL, WIK and some U.S. stations, signal strength increases from 15.00 to 20.00 GMT. QSS, however, is bad on this band. Recent regulations on transmitting stations has suspended my traffic but in spite of this, I am always working with the call of REX. QSLs on this call should be sent to me. I am now beginning some new experiments on 5 meters and hope to have some reports on it soon."

SOME NEW ONES

FMH has had his call changed to IFMH. His QRA is J. Fred Mejia, 14a Avenida Norte No. 21, San Salvador, Rep. of Salvador, C.A. He has been QSO with several U.S. stations and is working on 42.5 meters with a near d.c. note. QSLs for fa4A go to W. Falk, Box MS2, Abed, Abyssinia, Africa. He is on about 34.6 meters and has a steady q.c. note. sc6NAD is an authorized experimental station and sc2BL is a general amateur station. Both are operated by Gustavo

NEW EMBLEM OF THE S. A. R. R. L.
Vierling, P. O. Box 1658, 237 Pedro Montt Ave., Valparaiso, Chile. V4lAJ is the call used by V. K. Paice, Pacific Cable Station, Fanning Island. Mail goes via Sydney, Australia. This island is in the Polynesian Group and should use the intermediate of "coo." The QEA of OPZ (zero PZ) is J. Zwerina, 64 Favorite St., Vienna, Austria. He now signs euZ. His wave is 45 meters and not a.c. QSL's to 6hl should be sent to W. Horak, Quellen Strasse, Vienna, Austria. shBZL is located at 61 Hadfield Street, Georgetown, Demerara, British Guiana. The operator is J. P. Tasker or possibly Mrs. Tasker who also pounds brass. Tasker is the chief operator at the local government commercial station and has had quite a bit of trouble in getting the necessary equipment for the short-wave set. He has finally got things going and has been QSO several foreign stations as well as U. S. ones. nrCTO may be reached at P. O. Box 115, Cartago, Costa Rica. He works on 32 meters with an a.c. note. es2CO is Luka Sannahina, Helsinki, Suomi (Finland). German Y4 is now signing 4YAA. el5B is Bjørne Lindemann, Bjerndalen 31, Bergen, Norway. 6JI is L. Jenny and R. Haas, Via Radio Zentrale, Salzburg, Austria.

WAC

It seems that there are still some stations who are holding out on the WAC certificates. We find that nu4BL was eligible for some time and didn't know about it until recently. Look over the logs, fellows, and shot in those cards.

There has been some confusion as to what continents the various outlying islands belong to. We will consider an island that is closer to one continent than any other continent and that is farther from your station than the nearest point on the mainland of the continent, to be the equivalent of a station on the continent. It is understood that this applies to such islands that lie along the coast of the continent and do not include such unattached groups as the Hawaiian Islands.

These stations are members: nu60I, nu6HM, nu1AAO, nc4GT, np4SA, nu9ZT-9XAX, eb4YZ, nu8DNG, op8AA, nu2APV, op1AU, nuoACL, nu51F, eg2IT, eg5NJ, op1CW, f01SR, nu1CM, nu1CMX, eb4RS-3AA, nu7T, nu1CH, es9TC, nu5TW, nu6CTO, op1RD, nu9BSK, nu4TN-4SI, am2SE, eg5XY, sc2LD, es5CS, nu2CRB, on28 H, nu7VH-TTM, nu2MK, nu2AHM, nu2GYX, su2AK, su1BU and eg9SZ.

RE: INTERNATIONAL TESTS

Attention! All Hams in localities outside the mainland U. S. and Canada.

As a number of letters and radiograms have been received asking about the Relay Party which will be held May 9 to 22 inclusive, here's the dope in brief for all of you.

1. Read pages 28 and 29 of March QST—also page 8, this issue.

2. During the tests work as many U. S. and Canadian stations as possible.

3. Each station worked will give you a short test message with a special number. This counts one in your score.

4. Write a reply of eight or more words, give it the same serial number, and send it through a different U. S. or Canadian station than the one from which you got that serial number. This counts three in your score.

5. Work as many stations as you like to run up the score. The it's not possible to get more than 4 points for each station worked, you can doubtless work many stations during the contest. Turn in your confirmation promptly at close of the tests (see Rule 7).

The U. S. wavelength bands that will be used lie between the following wavelengths (meters): 18.7—21.4; 37.5—42.8; 75.0—85.7; 150—200. Canadian amateurs use the same waves and will also be found on 52.5 meters for work with British Dominions. The U. S. gang has recently begun to use twenty meters a lot and foreign amateurs who can use 23 meters will find it to their profit to do so in these tests to make 100% use of the 24-hours in every day.

A word of caution: North American amateurs working outside their assigned wavebands will disqualify both themselves and stations they handle test messages with and make it impossible for either to receive an O.F.C.S. certificate in case they should qualify for it. So see that stations you work are well INSIDE whatever band they are near before you call them. You should use any wave permitted by your government's regulations.

Better get your station ready for the tests NOW. If you can't receive on 29, 40, and 80 meters you are handicapped in the tests. The transmitter should be able to QSY quickly from one band to another too to make best use of all the operating time.

Do the best you can in the May tests and let us have a report of each and every score for QST. Even if it proves to be only "1" due to hard luck in burning out a tube we want it just the same.

Here's luck to all. Looking forward to May 9 and to your reports.
Correspondence

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

Cut 'Em Down

"Holmeleigh" Hillside
Prestatyn
North Wales

Editor QST:

As two hams who have spent many hectic and sleepless nights in pounding the brass with the gang, we crave a small space in your most excellent journal for the purpose of addressing a suggestion or two to the "nu" ops on the subject of CQ calls.

In the first place, we propose that fifty be regarded as the absolute limit for consecutive CQs! As a rule, we're satisfied that it's intended for a general call when you have come over with forty. Remember, fellows, it's the "wee sma' hours" with us, and, torn between the lust for another QSO and a longing for bed, things like that make the spindle prickle.

Secondly, gang, and perhaps this is the more important, please let us know where you intend listening for answers. Give us a "CQ OZ", "CQ SB" or "CQ EG" and you will find that your percentage of CQs answered will go up with a rush. For our own part, we have now made a definite practice of studiously ignoring all your CQs except those which specifically ask for EG. What is more, we have reason to believe that a considerable number of other EGs are doing the same. It is also safe to say that on any night we have never heard more than three CQs to Europe.

Now, fellows, we are eager and ready to work you—all of you; but, you perpetrators of those dud CQs, we don't like the colour of your whiskers! Cut 'em out, and get down to brass tacks. We also thank all the boys who have been and intend to be QSO us.

GA, OMs, for your own sakes—it's up to you.

Yours faithfully,

---George A. Manley, eg6YQ
---E. Menzies, eg5MQ

Non-Arrival of QSL Cards

22nd and Jay Streets
Lincoln, Neb.

Editor QST:

When I was on the air regularly, I often received cards reporting working my station, or hearing it, at times which I could not find in the log. However, I usually sent the desired card anyway, feeling that I might have forgotten to enter the transmission.

A few days ago, I received a card from another "9" who appears to have worked with me recently, although my station has not been on the air for over six months.

He is evidently a beginner, and we are hearing much from beginners nowadays on the failure of their brethren to QSL. I wonder how much of the complaint is due to circumstances such as this.

If his ability as a receiving op is bad, he should make sure of the other man's call before sending out cards. If the other man's sending is bad, he should never have tried to work him. The above should help the new man to be pretty certain about his reception of cards.

Sincerely yours,

---D. G. Anderson, 9BNU

The Other Side

892 Southern Blvd.
Bronx, N. Y.

Editor QST:

Here I am, and I'm squaking about the anti-QSL hounds. I want to say something.

It's great sport for the "old-timers" to have schedules and all those pretty nick-nacks, but what about the time when they first got into the game? They were not so interested in traffic handling, I'll wager.

I'll bet they tried to collect as many QSLs as they could plaster on the wall. They had the CQ fever at all hours of the day and night. Well, I'm the same way, and many other new hams is, too. I'm still QSLing and collecting QSL cards, if the other fellow is sporty enough to send me one. I always QSL the minute after I work somebody. No delay at this shack, no sir! But still, I have to wait months for the other fellow's card.

---Irwin C. Kodar, 2BBC

Hollow Signals

Mass. Institute of Technology,
Cambridge, Mass.

Editor QST:

Mr. Kenneth Trost's letter, headed "Is It Fading?" in the February QST, calls forth this explanation of the phenomena
received signals, here the amplitude signals of an evening on stations such as other steady second path transmission the to the receiver are undoubtedly "sky" paths the writer. If there is no ground wave, or on these results in the change of tone noted by "hollow" signals on stations Revera! though one of which gives a relatively steady signal. The characteristic of the ground signal is that it is always quite steady (no fluctuations in intensity), and further, it is generally weak compared with the sky signal, under favorable conditions of reception, as judged by the volume of signals at the receiver. Now, when the conditions for the refraction of waves in the upper atmosphere change, with the time of day most particularly, the sky wave intensity may drop, until this is of the same order of magnitude as the direct or ground signal. Fast fading of the sky wave under these conditions results in the change of tone noted by the writer. If there is no ground wave, or other steady second path transmission, the received signal goes through the usual gymnastics characteristic of short wave, received signals, where the amplitude swings more or less rapidly through a large range. The tonal change described is particularly noticeable on stations carrying an appreciable amplitude modulation, but no frequency modulation, such as crystal controlled 500 cycle a.c. supply transmitters. Here, the sensation of beats is sometimes produced, caused most probably by the shifting of the phase of the received signals via the two paths. The changes in tone are readily observable during the course of an evening on stations such as NKF and WIZ when receiving in this locality.

It is a much rarer occurrence to obtain "hollow" signals on stations several thousand miles away, but occasionally they are heard. In this case, both transmission paths to the receiver are undoubtedly "sky" paths (though they probably bump the earth at one or more points between the transmitter and receiver and bounce off again), one of which gives a relatively steady signal at the receiver, compared to the other. To readers who are interested in short-wave transmission theories, may I call attention to an article by W. G. Baker and C. W. Rice of the General Electric Company, in the A. I. E. E. Journal, March, 1926.

Very truly yours,

James K. Clepp

Aurora

33 Sugar Street
Niagara Falls
New York

Editor QST:

I have been much interested in the correspondence in QST on aurora effects. On the last occasion, on which I noticed the suppression of short-wave signals during aurora display (both 80- and 40-meter bands being practically blank on the receiver) it was observed that a few stations came in here with fair and even loud signals on the 40-meter band. Practically all of these stations lay in a southerly or almost southerly direction from here. This may or may not have been fortuitous. I intend upon next occasion to make a record of the stations heard under such conditions, and suggest that interesting and useful data might be collected on such nights if a few hams, instead of shutting down the receiver in disgust, would spend an hour or two in listening for and recording such stations. This may or may not be a useful and interesting job for the "Experimenters' Section". I offer the suggestion for your consideration. I should be glad, if you wanted, to act as a clearing house for observations in the matter, and do my best to correlate them and see if they show any sort of regularities.

It is quite possible, of course, that the fact that the only stations heard under the conditions mentioned were southern stations may be due to cessation of operation of northern transmitters under these circumstances while southern transmitters, being presumably less affected, continued operation.

Yours very truly,

—F. A. Lidbury

A Hot One

137 Osborne Terrace
Newark, N. J.

Editor QST:

It was with a great deal of amusement and still more indignation, that most old timers paused over a letter headed with a caption "A Good Suggestion" in the January QST.

Divide us into groups, dubbing us this and that! Who will do this job? Louis XVI had a great knack of dividing his kingdom!

I had the experience of a QSO with the originator of the "Good Suggestion" just before his endeavor to relay the message mentioned to that "5". His answer to my call was "2AQW" (twelve times) a.m. Then followed a little speech exactly the same as was given to two other hams previous to my QSO. I noticed that he did not
managed to decipher a long difficult message
cherry, "73 and cuagn".

this letter and get a good laugh. Most of
message again. Is it any wonder that the
"5'' chewed the knob off his key?

Regarding that "5". The poor fellow
managed to decipher a long difficult message
and asked for a QTA on the signature.
The message was promptly repeated and
sent double at that! Again the signature
was slurred. The "5" attempted to con­
vey the fact that his state of mind was not
"5'' chewed the knob off his key?

"Sure", clicked 3-, and let forth the
message again. Is it any wonder that the
"5" chewed the knob off his key?

A year or so from now, 3- may read
this letter and get a good laugh. Most of
us will laugh now at his debut as a "traffic
man" and his noble effort to substantiate the A.R.R.L.
ien which was never
stronger than at the present time.

—Ben Rabinowitz, 2AQW

Handbook Again

Editor QST:

Several weeks have passed since I was
most agreeably surprised on opening the
envelope containing "The Radio Amateur's
Handbook" which I had ordered almost
as a matter of course. From preliminary
announcements read none too closely, I
thought I was ordering probably an en­
larged issue of "Rules and Regulations of
the Operating Department" and knowing
that QST publications were all excellent, I
felt assured of a dollar value.

Imagine the delightful shock I received
when first noting the total size and then,
when I discovered, that before me was a
real manual for the transmitting amateur.
Right then and there, I knew you should re­
ceive a letter of praise and congratulation
but I put off writing until time and ac­
cquaintance with the publication would pre­
vent an outburst of enthusiasm too hastily
inspired. Today in the January QST, I
find Mr. Warner's editorial apologizing for
delays in delivery, and thus, I am re­
minded of my promise.

Perhaps, you have never noticed it, but
books for the amateur which he could really
use and enjoy have appeared at the rate
of only one for each epoch. Yours is one
of these rare productions which will not
easily be forgotten. I feel my contact with
wireless literature has been a little more
extensive than that of the average ham as
first of all, it was through reading that I
came upon the hobby and since, I have
had a sincere affection for radio books.
There are many technical writers who have
attempted a "radio amateur's handbook"
but a simple essential requirement for suc­
cess seems to be that the author must be a
ham himself.

In the days before the Radio Act of
1912, we had but one book and this was
"Wireless Telegraph Construction" by A. P.
Morgan (Van Nostrand, N. Y., 1910). From other literary endeavors as well as
from his connection with Adams-Morgan of
Paragon fame, it seems certain that this
gentleman was one of the pioneers whose
sparks disturbed the ether for other pur­
pouses than to handle paid messages and in­
spire the purchase of gilt edge stock cer­
tificates of doubtful market value.

The outlook of the second period of ama­
teur radio was dismal indeed, for was there
not the strict limitations of the Alexander
wireless act to be reckoned with: power
must be cut to one kilowatt, wavelength to
200 meters, and fatal results to radiation
from inductive coupling to be expected.
The one bright light was "Experimental
Wireless Stations" (published by the
author, Minneapolis, 1913) by Philip E.
Edleman, an experimenter extraordinary,
as demonstrated by this volume and other
literary productions. But, in spite of the
handicap of meagre advertising, the gang
came to seek this repository of knowledge
for constructional details of amateur trans­
mitters and receivers. QST came to the
rescue in 1916 when this source of facts
became obsolete, and fortunate indeed was
this, for the burst of DX activity in 1917
and in post-war days was made possible by
the A.R.R.L. organization.

The third period was marked by the rise
dx and brings us to Ballantine with
his justly famous "Radio Telephony for
Amateurs" (McKay, Phil., 1922) with
a title that must be apologized for, particu­
larly with phone's association with the BCL
in the doubtful days of anti-amateur feel­
ings.

This brings us to the present era which
is certainly one of short-waves, and your
book is the gospel. With its assistance,
breaking into the game will be simple.
Only old-timers who struggled with word­
of-mouth information and dry texts, having
little bearing on amateur work will be able
to appreciate fully what it means.

May I extend my heartiest congratula­
tions.

Sincerely yours,

—L. S. Hillegas-Baird, 2HO
Under the title "Transmitting Hints" on page 49 of your December issue, you printed a paragraph which stated that the term "Ur QSB fb" was all bunk.

I want to object violently. The writer of the article apparently advocates a very strict interpretation of the International List signals. I advocate a very liberal one.

The "Q" list was made away back in the days of rock-crushers for the purpose of facilitating the handling of commercial traffic and not for two hams having an informal short-wave chat. Since no one has volunteered to make an entirely new list of abbreviations for the amateur he has used the old ones but very, very indiscriminately.

Try and apply the "Ur tone fb" principle to some other "Q" signals? Why pick on QSB? For instance, you couldn't say, "Qrm nil" or "Qrm vy bd", for, if you interpret them strictly, you become "You are being interfered with nil" and "The atmospheres are strong very bad". The ham, however, interprets them liberally and knows what they mean even though the International List meanings make them seem nonsensical. If you apply the meanings strictly, you must say, "Ur not being interfered with at all" instead of "Qrm nil". No abbreviation means precisely the former expression.

And so on down the list. Very few signals can be taken strictly and still suit the amateur's wants. If we can't get a new list, we'll use the old one in such a manner that is convenient to us and understandable to the other fellow. How many of the gang will support me in interpreting the "Q" signals liberally? —A. Gurtcheff, ZAVE.

Tuned Plate and Grid

78 Ealing Rd., Wembley, Middlesex, England

Editor, QST:

I have just read with interest, in the January issue of QST, the second article of your series “How Our Tube Circuits Work".

I would refer to your remarks on the Armstrong circuit, towards the bottom of the right-hand column of page 30.

I remember reading in an English paper, the "Model Engineer" about three years ago, an article in which the author described some experiments he had conducted to determine whether the plate or grid circuit controlled the frequency of oscillation in an Armstrong oscillator. I forget who the author was but as far as I can remember he was a wireless man in the Air Force and appeared to be an authority. He wrote another article about the same time on "Duplex Telephony".

He found, as far as my memory serves me, that the circuit with the greater capacity in it determined the wavelength. That is to say, if the plate circuit contained more capacity than the grid circuit, the set oscillated at the frequency of the plate circuit and vice versa.

I have always utilized this fact in operating my own transmitter using the tuned-grid and tuned-plate circuit with no magnetic coupling between the respective coils. I use, for 45 meters, five turns in the plate coil with about .0001 μfd. across it and in the grid circuit I use six or seven turns with correspondingly less capacity. I use a power input of up to 50 watts. I find that no shifting of wavelength occurs and all stations always report that my signals are pure d.c. and very steady, in fact, I am sometimes asked if I am using crystal control. Using 19 watts, measured input, I have been heard in every continent, so I don't think there is much wrong with the QSB especially as stations in South Africa, etc., say that I am a pleasure to copy. Don't think that I am blowing my own trumpet for I am just trying to show that the QSB is steady.

With best wishes both to yourself and QST, which gets better and better.

—Bernard J. Axten, eg-2VJ.

Agencies Wanted For New Zealand

Reputable firm in New Zealand, with long experience of Radio trade and good connection with retailers in that Country, has vacancies for two Sales Agencies for American or Canadian Radio Receivers and Components, also Batteries and Phones, to act as sole Distributors.

Only first-class houses will be considered. Details and terms to

A. E. HAY & CO.

Southern Cross Bldg. P. O. Box 1392
AUCKLAND, NEW ZEALAND

RADIO OPERATORS WANTED

THE EASTERN RADIO INSTITUTE can train you quickly and thoroughly because:

MODERN AND EFFICIENT METHODS
THOROUGH INSTRUCTION under staff of LICENSED COMMERCIAL OPERATORS
MODERN APPARATUS including SHORT WAVE TRANSMITTER
POURTEEN years a RADIO SCHOOL
THE OLDEST, LARGEST and MOST SUCCESSFL school in New England. RECOMMENDED BY THE A. R. R. L.

Day or Evening Classes Start Every Monday.

SPECIAL CODE CLASSES

Write for Illustrated Prospectus

EASTERN RADIO INSTITUTE
899 BOYLSTON STREET BOSTON, MASS.
Through this man's invention the Musicone revolutionizes the loud speaker field ... ... ... 

Crosley Radios $29 to $98

Prices slightly higher west of the Rocky Mts.

The Genuine CROSLEY MUSICONE $9.75

10 inch size ... $19.50

GROSLEY MUSICONES

THE CROSLEY RADIO CORPORATION CINCINNATI, OHIO
Powel Crosley, Jr., Pres.

Write Dept. 18 for Descriptive Literature

Say You Saw It in QST—It Identifies You and Helps QST
A, B and C Radio Power

from house current outlet direct into your radio with no more attention or thought than you bestow on a vacuum cleaner or your electric iron.

This wonder box weighs only 13 lbs., stands 9 inches high and is 1 inches wide and is about half the size of an ordinary A storage battery. It is a mechanical device transforming ordinary 110 volt 60 cycle house lighting power into smooth, quiet radio energy for the new Crosley radios without slightest interference and with the certainty of an electric motor. Price, $50

Crosley radios designed for use with this marvelous power supply are the AC-7, a 6 tube table model at $70., and the AC-7-C, a 6 tube console at $95. See these wonderful sets at any Crosley dealers, or write Dept. 18 for descriptive literature.

Crosley sets are licensed under Armstrong U. S. Patent No. 1,113,149, or under patent applications of Radio Frequency Laboratories, Inc., and other patents issued and pending.

THE CROSLEY RADIO CORPORATION
Powel Crosley, Jr., Pres.
CINCINNATI, OHIO

No batteries to fuss with.
No more batteries or battery charger to water.
No failure of the power plant just as you sit down to a fine program.
No batteries to recharge.
No batteries to renew.
No apologies to make to callers because "the batteries must be getting low".
No upsetting the house to have the radio serviced.

NO MORE annoyances from the vital power supply end of your radio. A snap of the switch is the only demand your radio makes upon you from NOW ON.
does your set need a little
SPRING CLEANING?

How often are you compelled to replenish your set with new apparatus because of its failure to stand up under usage? Why not have a Spring Cleaning session right now and stock up with REL Products. They will afford you endless satisfaction from every standpoint.

REL can supply you with everything in the Short Wave line, and from one end of the list to the other, "Quality Products" holds good.

TWO SHORT WAVE ACCESSORIES

Special Short Wave Coil Kit—designed specially for those short wave circuits that require separate primary, secondary and tickler coils. Wavelength range of three secondary coils, 15-100 meters when tuned with .0001 mfd. condenser.
Six Coils (3 Secondaries, 3 Primaries or Ticklers) with base mounting
PRICE $6.00 PER SET

REL Transmitting Inductances—Flatwise wound on glass. The inductance that you must eventually use.
Type 1—(40, 50, 150 meters wavelengths)
Type 2—(120 meters and less)
Single Unit, either type, with three clips $3.50
Double Unit, either type, with six clips $11.00

Have you sent your two bits for your catalogue yet? Come clean with yourself—you need it with its complete store of Short Wave dope—send today. P. O. money order or currency.

REL Owns and Operates Experimental Station 2XY on 15.1 Meters, 19607 Kilocycles, Crystal Controlled,

Radio Engineering Laboratories
27 Thames Street, New York City
Three KARAS Parts That are Vital To the Success of Your Receiver

To get the three great essentials of Straight Frequency Line Tuning, Maximum Volume with Highest Quality Reproduction of broadcast voice and music, and unbelievable Selectivity and Sharpness of tuning, you must use these three vital "key" parts in your receiver: Karas Orthometric Straight Frequency Line Variable Condensers, Karas Harmonik Audio Transformers and Karas Micrometric Vernier Dials.

Kit manufacturers agree that these parts absolutely insure the successful operation of their receivers if you use them as specified. Note the names of the leading kit manufacturers in the panel in the center of this page, and their recommendations of Karas parts for their kits. When you build any of these sets be sure to use the Karas parts that are specified by the kit manufacturer.

Karas Orthometric Condensers are scientifically designed so as to give absolutely straight frequency line tuning. Every point of the dial of a Karas Condenser is exactly as stations are separated and allocated by the government. There is no crowding or bunching of stations with Karas Orthometrics. In addition these marvelous condensers are built as accurately as a high grade watch, with all metal parts of fine brass, and the highest quality of hard rubber dielectrics. The special eccentric Karas plates are die stamped from tough brass sheets and soldered at every point of contact. Rotor has pigtail connection, and rotor plates and frame are grounded to prevent body capacity effect. Karas Orthometrics have lowest losses known. They have no measurable loss.

Karas Harmonik Transformers are all stage ratio high inductance, high impedance low distributed capacity type which give more total distortionless amplification of fundamental harmonics and overtones that can be obtained with any cheaper transformers. Harmonics are perfectly matched, carefully shielded, and their scientific construction absolutely insures the maximum amount of amplification of all frequencies. Price each $27.00.

Karas Micrometric Vernier Dials are made of Bakelite, with gold inlay markings, and have a 0 to 1 vernier ratio, which produces a fluid-like smoothness of operation and a fineness of tuning that is close to 1/1000th of an inch. With these great dials on your receiver you can actually bring in stations that you never before heard—hard-to-get stations that have always eluded your skill in tuning with old style dials of low ratio. We ask you to try Karas Micrometrics on your set for 10 days at our risk. If they do not delight you and satisfy you perfectly, return them to us for the refund of your money.

Your dealer can supply you with Karas parts for any of the sets listed in this advertisement. Or, if you prefer, you may order direct from us by filling out and mailing the coupon. SEND NO MONEY. Simply hand the postman the price of the parts, plus a few cents postage. Remember, to get the results that the kit manufacturer guarantees you should use the Karas parts he specifies. To insure getting the superb qualities of these receivers,
IN ORDER TO FILL A VERY PRESSING NEED, we have commenced the manufacture of two new transmitting condensers, and have discontinued the Type 183-B.

THE NEW CONDENSERS will be known by type numbers T-199 and T-183. Both will have much heavier plates than have heretofore been used, and much greater comparative spacing. These changes, combined with a buffing process which absolutely removes all rough edges and inequalities in the surfaces of the plates, result in an ability to withstand very high voltages. YOU CAN NOW BUILD WITHOUT FEAR OF BREAK-DOWNS in your tuning condensers. The table shown just below gives the suggested CARDWELL CONDENSER for each of the popular tubes and voltages. Owing to the many possible circuits and combinations of inductance and capacity we cannot state positively either that the indicated size is necessary, or that it will invariably stand up, but the table is correct as far as is possible to determine.

In anticipation of a very large demand for these condensers, we have set the price at only $10.00 for both sizes. Remember, you order Transmitting Condensers direct from the factory. All good dealers carry CARDWELL Receiving Condensers.

### TRANSMITTING CONDENSERS

<table>
<thead>
<tr>
<th>Type</th>
<th>Price</th>
<th>Capacity (Mmfd.)</th>
<th>Airgap (Inches)</th>
<th>Spacing between Plate adjacent Thick-rotor plates</th>
<th>Length (Back of panel)</th>
</tr>
</thead>
<tbody>
<tr>
<td>141-B</td>
<td>$4.25</td>
<td>245</td>
<td>.30</td>
<td>.025</td>
<td>2.375</td>
</tr>
<tr>
<td>123-B</td>
<td>5.00</td>
<td>249</td>
<td>.35</td>
<td>.025</td>
<td>2.375</td>
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<tr>
<td>127-B</td>
<td>6.00</td>
<td>284</td>
<td>.30</td>
<td>.025</td>
<td>4.000</td>
</tr>
<tr>
<td>164-B</td>
<td>8.00</td>
<td>217</td>
<td>.070</td>
<td>.025</td>
<td>4.000</td>
</tr>
<tr>
<td>147-B</td>
<td>10.00</td>
<td>440</td>
<td>.070</td>
<td>.025</td>
<td>6.500</td>
</tr>
<tr>
<td>167-B</td>
<td>12.00</td>
<td>217</td>
<td>.070</td>
<td>.025</td>
<td>6.500</td>
</tr>
<tr>
<td>T-199</td>
<td>16.00</td>
<td>330</td>
<td>.684</td>
<td>.025</td>
<td>6.500</td>
</tr>
<tr>
<td>T-183</td>
<td>16.00</td>
<td>110</td>
<td>.171</td>
<td>.025</td>
<td>6.500</td>
</tr>
<tr>
<td>166-B</td>
<td>17.00</td>
<td>297</td>
<td>.219</td>
<td>.064</td>
<td>10.250</td>
</tr>
</tbody>
</table>

*Double stator, capacity of each section.*

### RECEIVING CONDENSERS

<table>
<thead>
<tr>
<th>Type</th>
<th>Capacity</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>191E</td>
<td>75</td>
<td>$3.75</td>
</tr>
<tr>
<td>167E</td>
<td>140</td>
<td>4.00</td>
</tr>
<tr>
<td>168E</td>
<td>166-B</td>
<td>4.25</td>
</tr>
<tr>
<td>169E</td>
<td>340</td>
<td>4.75</td>
</tr>
<tr>
<td>192E</td>
<td>500</td>
<td>5.00</td>
</tr>
</tbody>
</table>

The Allen D. Cardwell Mfg. Corporation
81 Prospect Street
Brooklyn, N. Y.
Our Oldest Friends are Readers of QST

Back in the days when the General Public had hardly more than heard of radio—when an amateur really was an amateur—the Acme Apparatus Company started the manufacture of transmitting apparatus.

Naturally the readers of QST were among our first friends—the real Lovers of Radio, the Devotees, the Pioneers, who talked to each other through space, years before the public even dreamed of doing it.

Acme has not forgotten those days. Acme still makes transmitting apparatus for its oldest friends. If you have any trouble in getting it at your dealers, please do not hesitate to write to us direct for it, and we will see that you are taken care of.

Today, Acme is a year ahead in the two most important ends of radio reception—quality and elimination. For quality, Acme offers the new Amplifier in three stages, first, resistance coupling, second, transformer coupling, and last, resistance coupling with impedance leak; as well as three styles of loud speakers that give, "reproduction without distortion."

See Acme's contributions to quality and elimination at any good dealer's, and send 10 cents for new Acme booklet, "Power Supply for Radio Sets."

ACME APPARATUS COMPANY

ACME — for amplification

Say You Saw It In QST—It Identifies You and Helps QST
The Famous 425 Group

These two instruments give the radio operator the greatest assurance of proper electrical conditions at the lowest cost compatible with accuracy. Model 425 Thermocouple Type Ammeter overcomes the disadvantages of the hot wire expansion type and perfectly solves the problem of measuring high frequency currents as well as low frequency alternating currents, as well as being accurate on D. C. Model 425 Thermo Galvanometer or Current Squared Meter is a most sensitive instrument for the measurement of A.C. of either low or high frequency and differs from the Ammeter in that it has a number of thermocouples to increase its sensitivity arranged in the form of a Wheatstone Bridge.

WESTON ELECTRICAL INSTRUMENT CORPORATION
158 Weston Avenue, Newark, N. J.

STANDARD THE WORLD OVER
WESTON
Pioneers since 1888

Tinytobe
Fixed Condensers
Four Tinytobe Fixed Condensers are used in the new Official Browning-Drake Kit-Set. Designed by Glenn H. Browning and F. H. Drake. Tinytobes are a new TOBE product—small capacity condensers of higher insulation and smaller phase angle than are ordinarily found in similar condensers of any construction. Send for special pamphlet Q-4.

Tobe Deutschmann Co.
Engineers and Manufacturers of Technical Apparatus
Cambridge, Massachusetts
A MARVELOUS DEVELOPMENT IN VARIABLE CONDENSERS

If You Were Told:

That a variable condenser existed which will give spacing between stations TEN TIMES greater than has heretofore been possible with variable condensers;
That a vernier dial is not needed in order to make fine adjustments for good tuning, but that the condenser itself is the vernier;
That this condenser has just two plates, gradually feeding into each other, causing the most sensitive and minute variation in capacity that has ever been obtained with variable condensers of this capacity;

Would You Believe It?!

You'll surely have to, after having used the new HELICON.

In search for something better than the old condensers with their semi-circular plates, radio engineers placed on the market the “straight-line wave-length” and the “straight-line frequency” condensers. All of them, however, did not get away from the limited space on 180 degrees on the dial; namely, a half turn. The vernier dial was resorted to, in order to increase the accuracy of tuning. This was not an improvement in the condenser itself.

Radio was up against one big problem, apparently not solved; namely, HOW TO SPREAD OUT THE WAVE BAND ON A VARIABLE CONDENSER FOR FINE TUNING!

The solution has been found in this new helical, cone-shaped plate design.

Instead of having only about 6.25 inches on a regular four inch dial when tuning from maximum to minimum capacity, imagine this distance increased ten times! To 62.5 inches! More than FIVE FEET of tuning space! The forty-meter amateur band, for instance, spread out over ten inches on the dial instead of just one inch. And no trimmers!

A special four inch dial with sliding indicator records not only the number of revolutions but also the position in each revolution. It is mounted directly on the shaft of the condenser. Five complete turns are indicated.

The HELICON has been pronounced mechanically and electrically A-1 by some of the best radio laboratories in which it has been tested.

COMPACT—NATURALLY SELF-BALANCED—BUILT TO PRECISION—AS ONE RADIO FAN SAYS: “By far the best condenser for short wave receivers ever designed.”

THE HELICON

RADIO CONDENSER CORPORATION
PEORIA, 215 Federman Bldg. Dept, 5, ILLINOIS

SAY YOU SAW IT IN Q S T — IT IDENTIFIES YOU AND HELPS Q S T
THE SUPER SYNC
The Synchronous Rectifier That Can Be Filtered

The Super is the only synchronous rectifier that can be filtered with ordinary type of filter circuit. This rectifier is adaptable to both high and low power sets as it easily handles up to 4000 Volts.

The commutator on the Super is eight inches in diameter and by reason of its large diameter it can handle higher voltages without breakdown. Eight brushes mounted in pairs ninety degrees apart serve to conduct the current. These brushes are mounted on a rocker arm so that they can be adjusted for proper commutation.

The commutator is turned at a synchronous speed by a 5/8 H.P. Synchronous Motor. This motor can be supplied for either 110 or 220 Volts 50 or 60 cy.

PAT. PENDING
PRICE $75.00 F.O.B. ST. LOUIS, MO.

MARLO ELECTRIC CO., 5241 Botanical Ave., St. Louis, Mo., U.S.A.

Add the new Balkite Combination to your radio set now—with your "A" battery it supplies all radio power automatically from the light socket.

Ask your radio dealer
FANSTEEL PRODUCTS CO., INC.
North Chicago, Ill.
TWO WAYS you can be sure of Your Wavelength

1 By using an accurate wavemeter with a resonance indicator lamp

By placing a Type 358 wavemeter tuned to your proper wavelength close to your transmitter while it is being operated, you have an excellent means of determining whether or not you are on your wavelength.

If your transmitter is properly tuned, the indicator lamp will light every time you touch the key. If the lamp does not light, you may know that your transmitter is off wavelength and should be re-adjusted.

TYPE 358 AMATEUR WAVEMETER, Price $2

The Type 358 wavemeter is especially designed for amateur use in checking wavelengths. It covers a range from 15 to 220 meters, by interchanging four coils of low loss construction. These coils are carefully wound on threaded Bakelite forms, thereby insuring accuracy and permanence of calibration. Coil ranges are as follows:

Coil A 15 to 28 meters
Coil B 26 to 56 meters
Coil C 54 to 114 meters
Coil D 105 to 220 meters

Type 358 wavemeter, with calibration chart $22.00

2 By controlling your shortwave transmitter output with a quartz plate

The Type 276A Quartz Plate is intended for use by amateurs in controlling the frequency of transmitters.

The plates are grounded to oscillate at one specified frequency only, and thus limit the output of the transmitter to one particular wavelength.

Type 276A QUARTZ PLATES are supplied at random frequencies between 1750 and 2000 k.c.

They provide harmonics in 20, 40, and 80 meter plates and may be used for transmitter control on these wavelengths. Calibration is to ½%. All plates are guaranteed to oscillate when used as directed.

Type 276A Quartz Plate .............................................. $15.00
Type 356 Quartz Plate Mounting ................................ 1.00

Other General Radio apparatus for amateur shortwave use includes

Receiving and Transmitting condensers
Coils and Coil Forms
Vacuum Tube Socket
Audio Transformers
Rheostats
Potentiometers
Stand off and Antenna Insulators
Hot Wire Ammeters

WRITE FOR CATALOG 926-A

GENERAL RADIO CO., CAMBRIDGE, MASS.

A. R. R. L. MEMBERS ATTENTION!

You are not all located within shopping distance of a dealer stocking General Radio parts. Remember that we will deliver, post paid, anywhere in the United States, any of our radio parts on receipt of current catalog price.

Also if we can be of help to you in supplying technical information, we will welcome your correspondence. Have you a Bulletin No. 926 in your file? If not, a post card will bring it.

SAY YOU SAW IT IN QST—IT IDENTIFIES YOU AND HELPS QST
"B" Eliminator 
**TESTING**
Problem Solved by

**Sterling**

Model R-415

TO GET full value from your "B" Eliminator you must know that your "B" Power is delivering the right amount of voltage to detector, amplifier and power tube.

Low resistance voltmeters suitable for testing batteries are worthless for testing "B" Eliminators. This specially designed High Resistance Sterling is accurate for both.

Whether this voltmeter is used in your business or for your own set, it is essential if you want the facts about any "B" Eliminator.

**It is the Universal Voltmeter for the Amateur**

**R-415**

Sterling voltmeter meets the special needs of the amateur in a variety of ways—for testing the output of D. C. Generators, and for every other purpose calling for a high resistance voltmeter.

Never before has a laboratory instrument been available at a price so reasonable.

**Sterling**

**R-415 VOLTMETE**R

A laboratory meter at the remarkably low price of $8.50

Also Model R-417. A New 150v. Sterling A. C. Meter for Testing A. C. line current and all A. C. Circuits...........................$7.50

THE STERLING MFG. CO.
2331 Prospect Ave.

90 Volt Power Unit

**$12.75**

Hums, line noises, etc., positively impossible with this new advanced unit. Plug in and forget Non-arid and noiseless. All detector and intermediate voltages plainly marked. Simpler to hook-up than dry cells. Operates any type set 1 to 12 tubes.

Greater volume and clearness guaranteed. If not thoroughly satisfied return all complete for complete refund. Guaranteed 2 years. For 110-120 volts A. C. 25 to 60 cycle current. 90 volts, $12.75; 112½, $15.25; 135, $17.50; 157½, $19.50; 180, $21.00; 202½, $25.00.

Also built for D. C. current 110 and 22 volts at only $3.00 additional, any size above. Ample stocks—same day shipments. Simply say—ship C.O.D. or write for my interesting literature, testimonials, etc.

B. HAWLEY SMITH, 332 Washington Ave., Danbury, Conn., U. S. A.

"Windham" Wire Former

An complete and handy tool for electricians, radio set builders and mechanics. It will accurately form loops or eyes for No. 4, 6, 8 and 10 screws, make easy radius and sharp right angle bends, has flat jaws and wire cutters. This tool is made of the best quality steel, dropped forged and carefully tempered in oil.

We guarantee every tool against defects in workmanship and materials and will promptly replace or refund money on any found defective by purchaser.

**Price $1.25 Each**

Ask Your Dealer

Manufactured by

THE GOYER COMPANY

Willimantic, Connecticut
THERE has been a great deal of misinformation on Browning-Drake published by over-ambitious radio writers. In fairness to the radio public, it has become necessary to present a standard assembly to be known as the "Official" Browning-Drake Kit Set, which is now on the market. The increased selectivity and rare sensitivity of this new assembly will prove a pleasant surprise.

Parts for this new assembly are now ready. These include:

- Browning-Drake Corp. Kit ..................... $25.00
- Foundation Unit (including drilled and engraved front and base panels, sockets, fittings, etc.) ....... $15.00
- Neutralizing device ................................... $ 1.00
- Resistance Cartridge ................................... $ .75

The above, together with the necessary specified parts furnished by other manufacturers, costs less than $65.00. Booklets containing complete constructional data are available for twenty-five cents, or the booklet with five full size blueprints for one dollar. Get your parts TODAY and build the new "Official" Browning-Drake Kit Set.

[Dealers: Some of you amateurs are dealers. If so we invite you to write for further information. The new kit set presents new opportunities.]

BROWNING-DRAKE CORPORATION, BRIGHTON, MASSACHUSETTS
Houdina Radio Control Co.
Radio and Electrical Engineers
1107 11th St.
Kaukauna, Wisconsin

Address to
Nov. 20th 1928

Electric Specialty Co.
225 South Street
Stamford, Ct.

Gentlemen:

This is to advise that we have been using an "ECLIPSE" Dynamotor for almost two years to supply the plate current for the tubes of our Radio Station "TEXAS" which we use to control "America's first Radio Operated Automobile."

This Dynamotor is operated on 6-8 Volt Storage Battery source and we have found it functioning properly at all times, under all conditions and in all kinds of weather.

We do not hesitate to recommend "ECLIPSE" products because we know they are reliable.

Respectfully yours,

ECLIPSE RADIO CONTROL CO.

RECEIVERS
TRANSMITTERS - EQUIPMENT

Ensall Radio Laboratory Equipment is built to a quality standard. Built for use in Amateur Stations, on Board Sea Going Yachts, Cruisers, etc. The Most Rigidly Designed Equipment Available. Highest Quality Parts employed in our Receivers, for Amateurs or Professionals, and in our Transmitters, Self Rectified and Master Oscilla or Designs. Special Equipment built to order. Quotations furnished upon receipt of data covering the equipment you desire. Transmitters, of any Type Reconstructed.

We cater to Special Marine Installations. Quotations on request.

Ensall Radio Laboratory
1208 Grand View Ave. Warren, Ohio
"Pioneer Builders of Short Wave Apparatus."

QST Oscillating Crystals

Do YOU KNOW that we are specialists in grading crystals for POWER use? DO YOU KNOW that our crystals give maximum output without interference in series with the crystal? DO YOU KNOW that if the crystal you use requires a series inductance you are taking a chance of cracking it? WHY TAKE ALL THESE CHANGES with a crystal that is not especially made for power use. Our crystals are POWER CRYSTALS and require no series inductance. Prices for grading crystals for use in the amateur bands as follows:

- 30 Meter band crystal ........ $25.00
- 100-170 Meter band crystal .... $15.00

We make the frequency of the crystal accurate to better than one part in one thousand. We are at your service to grade you a crystal to any frequency between 30 and 10,000 Kilo-cycles. We will be glad to quote prices on your particular requirement.

Scientific Radio Service
The Crystal Specialists
P.O. Box 86, Dept. I, Mount Rainier, Md.
The circled part of the inset picture of all of the Dudlo Factories shows the new plant's location and relative size.

**a NEW Wire Mill**

**a NEW Enamedle Wire**


In the large and finely equipped new Wire plant, shown above, Dudlo Engineers are producing an improved enameled wire that sets a standard never before approached.

Dudlo special coated enameled wire now possesses an unheard of flexibility and elasticity.

It has greater dielectric strength, gives greater resistance to heat, is more enduring and better looking.

It can be bent without injury or cracking. High operating temperatures do not lessen its efficiency.

These qualities are due to the special Dudlo system of baking, improved materials and other new features of Dudlo development.

Dudlo enameled wire is made in sizes No. 10 to 44, American Wire Guage.

One experience with Dudlo Enameled Wire will do more than anything else to explain to you why the world's leaders in the manufacture of electrical apparatus look to Dudlo as the unfailling source of supply of quality magnet wire and coils.

DUDLO MANUFACTURING CORPORATION

FORT WAYNE, INDIANA
**Sturdy—Reliable—Accurate**

Many amateurs owe their long distance records and their general transmitting success to Jewell instruments.

The famous Jewell Trio patterns Nos. 54, 64, and 74, made radio history.

Jewell transmitting instruments are as popular today as ever.

Our radio instrument catalog No. 15-C is available to amateurs on request.

Jewell Electrical Instrument Co.
1650 WALNUT ST. - - CHICAGO
"27 YEARS MAKING GOOD INSTRUMENTS"

---

**When the Signal Fades—**

Change the range of your resistors to meet changing characteristics of the set and accessories.

*It Works!*

INTERNATIONAL RESISTANCE CO.

---

**ENAMELED ANTENNA**

- Best outdoor antenna you can buy.
- 7 strands of enameled copper wire; maximum surface for reception.
- Prevents corrosion and consequent weak signals.

*The Original Celatsite*
—a tinned, copper bus bar wire with non-inflammable "spaghetti" covering, for hook-ups. 5 colors; 30-inch lengths.

We also offer the highest grade of "spaghetti" tubing for Nos. 10 to 18 wires. 5 colors; 30-inch lengths.

Send for Complete Folder of Acme Wire Products
ACME WIRE CO., DEPT. S, NEW HAVEN, CONN.

---

**ACME WIRE**

**MAKES BETTER RADIO**

Make any Good Receiver BETTER

ACME & CO., PROVIDENCE, R. I.
"We've cut down our come-backs with Faradon equipped sets"

Manufacturers who equip their sets with Faradon Capacitors free themselves from the complaints and returns caused by condensers of lesser durability.

In assignments where condensers must stand up—in Amateur Traffic, Direction Finders at sea, and in Automatic Railway Signals—here Faradons have proven their sheer dependability.

For twenty years Faradon experts have combined skill and highest quality materials to make capacitors for each particular need. Faradon engineers are always ready to cooperate with manufacturers having under consideration special equipment which cannot be taken care of by the more than 200 standard Faradon Capacitors ready for prompt delivery.

WIRELESS SPECIALTY APPARATUS COMPANY
Jamaica Plain : Boston, Mass., U. S. A.
Established 1907

Faradon

Electrostatic condensers for all purposes

SAY YOU SAW IT IN Q.S.T.—IT IDENTIFIES YOU AND HELPS Q.S.T
Hams Attention!
Don't Miss These Specials!

Holtzer-Cabot Motor-Generator
½ kW 600 cycle. We have been fortunate enough to secure a limited stock of these absolutely new and guaranteed motor-generators, and are clearing them out at

50-WATT SOCKETS $1.50

Holtzer-Cabot Headset
Just unpacking a lot of these phones—super-sensitive and quality-built. Just the thing for amateur use. Everyone new and guaranteed.

SPECIAL

Price-Cut on Condensers
Rathbun 11, 15, 17 and 23-plate.
Rathbun price, $5.00
Kellogg 5 or 11-plate 5-16 in. shaft.
39¢ 3 for $1.00

Other Condenser Bargains
Federal Transmitting Condensers...
Factory Double-spaced...
King-Cardwell 11-11 plate, Dual Condensers...

<table>
<thead>
<tr>
<th>Telephone</th>
<th>2 MFD Condensers</th>
<th>Plug-in Coils</th>
<th>Hand Microphone</th>
<th>Apco Trickle Charger</th>
<th>Hi Frequency Buzzers</th>
<th>A Few R C A Transformers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keys</td>
<td>49¢</td>
<td>85¢</td>
<td>$12.00</td>
<td>$9.00</td>
<td>$5.95</td>
<td>75¢</td>
</tr>
</tbody>
</table>

NOTE! WE ARE COMPLETELY SOLD OUT OF:
Federal and Branden Headsets.

Radio Surplus Corporation
Send for our list of New Panels. All sizes
250 Washington Street, Boston, Mass.

Mr. Ham:

HAM—marllund Low-wave Condensers and Coils and HAM—marllund Transmitting Condensers are built to standards of accuracy you appreciate.

Low-Wave Receiving Condensers
Available in two sizes—11 and 15 plates; standard-spaced. Either 'Midline' or 'SPL' curve. Also double-spaced in 11 plate size only. Maximum capacity, 100 mfd. —maximum capacity 3 mfd.

Transmitting Condensers
Built to withstand high potentials. The low losses and high quality of Hammarlund construction are emphasized in this class of work, where ordinary condensers are impossible. Three sizes with maximum capacities of .0004, .0002 and .0001.

Low Wave Receiving Coils
Space-wound on a dielectric of very high quality, 6/000 in. thick. No. 16 copper wire, green silk over cotton insulation, 10 turns per inch, 8 in. in diameter. Coils average 30 in. in length and are cut to desired size.

If your dealer cannot supply you write us direct.

Hammarlund MANUFACTURING CO.
424-436 W. 33rd Street, New York City

RELIABLE Transmitting Capacitors

OB-224 2, MFD 2000 Volts Direct Current $4.00
OB-475 4, MFD 2000 Volts Direct Current 7.50
OB-921 2, MFD 1000 Volts Direct Current 2.10

We make Good On Defective Capacitors. Merchandise will be sent Postpaid and Insured to Licensed Amateurs upon receipt of full remittance by postal or express money order, check or cash by registered mail.

BRIMBERG & ORTH
277 Broadway
New York, N. Y.

Loud Speaker Reception GUARANTEED With MULTIVALVE ONE TUBE SET OR KIT

<table>
<thead>
<tr>
<th>MULTIVALVE TUBE with blue prints</th>
<th>MULTIVALVE TUBE AND COILS with blue prints</th>
</tr>
</thead>
<tbody>
<tr>
<td>$6.50</td>
<td>$7.50</td>
</tr>
</tbody>
</table>

Complete Assembled Kit of Standardyne $19.75 Multivalve Set ready for wiring

In cabinet $31

SPARKS RADIO SERVICE CO.
Dept. T, 35 West 25th Street, New York, N. Y.
Keep your car batteries properly charged

Charge both directly from electric light socket with the

REG. U.S. PAT. OFF.

Elkon 3 Ampere Charger

Even if the Elkon 3 Ampere charger were not equipped with the Elkon Rectifier its simplicity, effectiveness, and general economy of operation would still make it a pronounced success.

But, equipped with the ELKON BONE DRY rectifier, it occupies an exclusive and unique position, far in advance of any similar device.

It operates at considerably less cost than other types of chargers... and without attention.

It is bone dry, operating without acids, alkalis, tubes, moving parts or water.

It is rugged, strongly built, can be taken or used anywhere, so that it is ideal for charging both "A" batteries and car batteries.

Simply connect it to light socket, turn it on, leave it on. It will not overcharge, because it has the inherent Elkon Tapering characteristic, by which the charge decreases as the battery becomes replenished.

It causes no interference, it makes NO NOISE, it has nothing to burn out, break, spill, or spoil. Short circuiting cannot harm it.

As the size of radio sets is increasing, as well as the number of hours of daily use of the set, this charger is becoming more and more popular in all parts of the country. An almost indefinite life of service, at low operating and upkeep expense.

Descriptive Circular on Request
At dealers everywhere $17.50 Pacific Coast price slightly higher

Elkon Works

Weehawken, N. J.
FILTER CONDENSER BLOCKS

For Working Voltages of 200, 300, 400, 600 and 1000 Volts D. C.
Flexible leads for connections eliminate all possibilities of leakage from soldering.

AEROVX WIRELESS CORPORATION
60-72 Washington Street
Brooklyn, N. Y.

New Transmitting CONDENSERS

TYPE B, illustrated, has 6” diam. rotor plates, 1/4” plate clearance, breakdown voltage 3,000, etched scale, polished handle, pointer and locking device.
100 mmf. $36.00  200 mmf. $48.00
150 mmf.  42.00  300 mmf.  60.00
Counterweight extra 4.50
Panel Mounting Brackets 3.00

TYPE A is similar, but with 10” diam. rotor plates and with plate spacings of 1/4”, 1/2”, and 5/8”, for breakdown voltages of 8,000, 12,000, and 16,000. Either type may be ordered any capacity.

PORTABLE S. W. TRANSMITTERS

Complete portable 75/50 Watt Transmitters with Power Supply and accessories for your summer trip or as an emergency standby, $55.
Including a Complete Xtal Oscillator Unit, $2.70.
P. A. and Freq. Doubler 50 Watt, $45; 50 Watt, $55.
We furnish full instructions how to adapt these Units to your personal Knitlers.
Write for Quotations on complete Ham and Commercial Transmitters and Power Installations.
TRANSMITTING EQUIPMENT LABORATORIES, 3682 Woodlawn Ave., Los Angeles, Calif.
Thordarson Amplification
Reproduces Every Note

No note of any instrument—not even the faintest harmonic—can escape Thordarson Amplification.

Leading radio set manufacturers know this secret of musical reproduction. That is why you find more Thordarson transformers in quality receivers than all competitive transformers combined.

Whether you are buying a complete receiver, or whether you are building your own—if you enjoy music—be sure your transformers are Thordarson's.

Thordarson Electric Manufacturing Co.
Huron and Kingsbury Streets—Chicago, Ill.

Send for this free booklet
"Power From the Light Circuit"

SAY YOU SAW IT IN QST—IT IDENTIFIES YOU AND HELPS QST
GET THE BEST! Gross S/W Products

Plug-in Transmitter Coils

These coils are now available for plug-in transmitter, using the tuned grid tuned plate circuit. Winding alterations made in a few minutes by plugging in another coil and using variable condenser.

Complete set of coils for 20 or 40-meter bands, Price.................. $11.00

Complete set of coils for 80 or 80-meter bands

Gross Short-wave Recorder, three tubes, latest parts available, complete $55. Transmitter Kits and Parts in stock.

Dealers and jobbers write for discounts on our full line. A high grade receiver instrument at 1/2 the usual market price. Built into compact, carrying case of genuine solid oak leather handle on top with removable case. Coil extremely low loss making a very low resistance wavemeter either the false lamp or ammeter type will easily respond to an oscillator using 20 volts or less on the plate of the tube. Coils fit into cover, when not in use. Calibration letter t for 1%. Guaranteed. Checked against Proo oscillator using a maximum of 10 points for each curve, no imaginary curves drawn from 0 to 4 points. Six months curve furnished with each coil.

Type 1-12 with flash lamp indicator for 20, 40, 80, 80-meter bands........ $15.00

Type 1-9 with flash lamp indicator for 20, 40, 80 and 200-meter bands... 18.75

Type 1-9 with ammeter indicator for 20, 40, 80, 80-meter bands........ 20.00

Type 1-9 with ammeter indicator for 20, 40, 80 and 200-meter bands, 25.00

Type 1-9 with ammeter indicator for 20, 40, 80, 80-meter bands........ 34.00

J. GROSS & CO., Manufacturers, 30 Park Place, New York

CARTER

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HEAVY DUTY

Resistance Units

Half Size

All Resistances 1/4 to 1000 Ohms

For vacuum tube filaments circuits to reduce 6 volts to 5 volts without the use of a variable resistance also for use with U.V.199 tubes. There are many other uses for these resistances which are set forth in our illustrated booklet.

Mailed free on request.

Any dealer can show you why

In Canada: Carter Radio Co. Limited, Toronto

ARTER RADIO CO.

CHICAGO

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“RADIO THEORY AND OPERATING”

By

Loomis Publishing Company, Dept T, 405 9th St., Washington, D.C.

Gross S/W Products

Plug-in Coils

Since wound, the most efficient form of winding, extreme ruggedness another feature; will stand handling and rough treatment without injury. Novel antenna coupling coil will permit any degree of coupling up to 5 inches. These coils can be obtained for use in the 20-meter band to the broadcast range. General Radio Plug and Jacks used; the most efficient plug-in system available.

All illustrated complete range 15 to 150 meters, Price........... $11.50

Base and Primaries complete with one coil for 80 meter band, 50 to 150 meters........................... $5.00

Base and Primaries complete with one coil for 80 meter band, 50 to 80 meters........................... $5.00

Here and Primaries complete with one coil for 40 meter band....................... $5.00

Plug-in Coil only, 130 meters to 250 meters....................... $10.00

Plug-in Coil only for Broadcast reception....................... $15.00

You can add one stage of R F amplification to your short wave receiver. Write for full particulars and prices of coils for this purpose.

Gross Wavemeter

J. GROSS & CO., Manufacturers, 30 Park Place, New York

“RADIO THEORY AND OPERATING”

By

Loomis Publishing Company, Dept T, 405 9th St., Washington, D.C.

Become a Radio Operator

Learn in the Second Port U. S. A.

Radio Engineer located here. Opportunities for employment second to no other port. Most ideal location in the U. S. A. to come for training. Practically 100% of radio operators graduating on the Gulf during past four years trained by Mr. V. E. M. D. M. Supervisor of Instructors. All graduates agreed to date.

Day and Night Classes, enroll anytime. Write for Circular.

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New Orleans, La.

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WE Can Save You From 10 to 50 Percent on all Standard National Parts and Accessories.

Send for Our Bulletin on Radio Parts.

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60 BRANFORD PLACE

NEWARK, N. J.

CARLTON

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HEAVY DUTY

Resistance Units

Half Size

All Resistances 1/4 to 1000 Ohms

For vacuum tube filaments circuits to reduce 6 volts to 5 volts without the use of a variable resistance also for use with U.V.199 tubes. There are many other uses for these resistances which are set forth in our illustrated booklet.

Mailed free on request.

Any dealer can show you why

In Canada: Carter Radio Co. Limited, Toronto

ARTER RADIO CO.

CHICAGO

SAY YOU SAW IT IN Q S T — IT IDENTIFIES YOU AND HELPS Q S T
Thanks to the co-operation of members of the A-R-R-L, De Forest has further developed the Type-H tube to a point where it fills all the requirements of amateur transmission. The result is still more uniform performance with extended filament life.

Technical Data

**INPUT RATING 150 WATTS**

- Plate Voltage: 500—2000
- Plate Current: 50-100 MA.
- Fil. Voltage: 10
- Fil. Current: 2.35A

**HR Thermionic Rectifiers**

Will Operate Two H Tubes

- Fil. Voltage: 10
- Fil. Amperes: 2.35
- Plate Voltage A.C.: 2000
- Plate Mill Amps.: 200 Max
- Voltage Drop: 300 at 200 Ma

**PRICE** $16.00

Price, $18.00
Parcel Post Prepaid

Sold and Shipped Direct
Upon Receipt of Money Order
TRANSMITTING APPARATUS

TRANSMITTING INDUCTION:

<table>
<thead>
<tr>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsen No-Loss, Patented 30-50 Meters</td>
<td>$4.95</td>
</tr>
<tr>
<td>Arsen No-Loss, Patented 20-50 Meters</td>
<td>$4.45</td>
</tr>
<tr>
<td>R.E.L. Wound, Single Pole</td>
<td>$2.85</td>
</tr>
<tr>
<td>R.E.L. Double Coils with Roots</td>
<td>$9.80</td>
</tr>
<tr>
<td>New Auto. 10 &amp; 20 or 40 Meters</td>
<td>$10.25</td>
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VARIABLE TRANSMITTING CONDENSERS:

<table>
<thead>
<tr>
<th>Description</th>
<th>Price</th>
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<tbody>
<tr>
<td>Carthage 90972, 2000 volt</td>
<td>$3.26</td>
</tr>
<tr>
<td>Carthage 90973, 3000 volt</td>
<td>$5.60</td>
</tr>
<tr>
<td>Carthage 90983, 6000 volt</td>
<td>$6.10</td>
</tr>
<tr>
<td>Hammarlund 90965, 6000 volt</td>
<td>$6.50</td>
</tr>
<tr>
<td>Hammarlund 90985, 9000 volt</td>
<td>$7.25</td>
</tr>
<tr>
<td>National 90918, 2000 volt</td>
<td>$8.75</td>
</tr>
<tr>
<td>National 90918, 3000 volt</td>
<td>$8.50</td>
</tr>
<tr>
<td>National 90918, 5000 volt</td>
<td>$12.95</td>
</tr>
</tbody>
</table>

HIGH VOLTAGE FILTER CONDENSERS:

<table>
<thead>
<tr>
<th>Description</th>
<th>Price</th>
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<tbody>
<tr>
<td>Sanamco 1 Mil., 500 volt</td>
<td>$1.65</td>
</tr>
<tr>
<td>Sanamco 2 Mil., 1000 volt</td>
<td>$2.19</td>
</tr>
<tr>
<td>Sanamco 4 Mil., 1000 volt</td>
<td>$2.69</td>
</tr>
<tr>
<td>Leeds 2 Mil., 2000 volt</td>
<td>$5.90</td>
</tr>
<tr>
<td>Frentine 2 Mil., 200 volt</td>
<td>$5.18</td>
</tr>
<tr>
<td>Frentine 1 Mil., 2000 volt</td>
<td>$8.25</td>
</tr>
<tr>
<td>Faradon 1 Mil., 1250 volt</td>
<td>$2.25</td>
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</tbody>
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BY-PASS (BLOCKING) CONDENSERS:

<table>
<thead>
<tr>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sanamco 0.05 &amp; 0.10 Mil.</td>
<td>$0.50</td>
</tr>
<tr>
<td>Faradon 0.05, 500 volt</td>
<td>$0.85</td>
</tr>
<tr>
<td>R.C.F. .005, 500 volt</td>
<td>$0.85</td>
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</table>

GRID LEAKS:

<table>
<thead>
<tr>
<th>Description</th>
<th>Price</th>
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<tbody>
<tr>
<td>Ward Leonard, New 500 Ohm Center-tapped</td>
<td>$2.15</td>
</tr>
</tbody>
</table>

ANNOUNCING

Federal Super 65 A. F. Transformer

Super 65 and Super 65A Audio Frequency Transformers are the latest development of Federal Engineers in transformer structure. They exemplify all of the splendid qualities of Federal superiority in transformer manufacture and now offer greater efficiency of reproduction.

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Compiled and published by S. Gernsback in one volume of 138 pages (size 9 x 12 inches) containing 1930 definitions, 549 photographs, drawings and diagrams and a classified cross index. All circuits, new and old, are described by word and picture; every part and apparatus used in Radio is explained by photographs and drawings. Hundreds of letters from leading Radio Experts and Engineers proclaim this encyclopedia an invaluable addition to everyone's library as well as a necessity to a Radio Scientist or Student.

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SAY YOU SAW IT IN Q S T—IT IDENTIFIES YOU AND HELPS Q S T

98
No Noise ~No Hum in this "B" Eliminator

This B eliminator gives reproduction qualities to your radio that heretofore came only from fresh new B batteries. Quiet in operation, supplying proper voltage and current, reproduction in the loud speaker is not faulty. The Amrad B eliminator employs the famous Mershon condenser as the principal capacity unit. This condenser has many times the capacity of any other eliminator condenser and constantly provides a sufficient supply of energy for correct reproduction of any tones that may come through your radio.

There are no variable adjustments to get out of order or be misused. It is free from break-downs, the Mershon condenser having such a large capacity that any excessive voltage surges are eliminated; the charge being absorbed. This also protects the receiving set against punctured parts or insulation break-downs.

It is quiet in operation, no line noises—interference or distortion. It furnishes a steady current supply to the set assuring perfect reproduction. The power unit is housed in a steel box and mounted on a metal base, and finished in black enamel.

This remarkable B eliminator is one of the many famous products of the Amrad Laboratories and is a tribute to the Amrad Engineering skill and the influence of mass production methods of Powel Crosley, Jr.

Write Dept. 4D7 for Descriptive Literature

AMRAD CORPORATION
Medford Hillside, Mass.
Ward Leonard Electric Company announces a booklet of interest to radio dealers, experimenters, and engineers. Resistance assumes major importance in radio as higher voltages and currents are employed in power supply units. "How to Use Resistance in Radio" tells the proper use of resistance and outlines many of the new A.C. and D.C. power circuits. It will be sent postpaid for 15c.

Ward Leonard Electric Company
MOUNT VERNON, NEW YORK

Resistor specialists for more than 35 years.

FOR EVERY BEGINNER
THE SIGNAL PRACTICE SET
Complete in every detail with high grade key, true tone adjustable high pitch buzzer and brass plate. $68 $9.90

SIGNAL WIRELESS KEYS
Strongly made with gold silver contacts. Heads parts polished and lacquered. Very
reliable units. HK#4 in, K.W. $2.99 HK#4 in contact $ .50
HK#4 in. 95% 75% 1% 3.90

SIGNAL ELECTRIC MFG. CO., Menominee, Mich.

NOW IS THE TIME TO BUY
PLUG-IN COILS
AND BE SURE TO GET TECO

Coil No. Wavelength Megacycles Price
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2 18.5—31 3.5—19 $2.50
3 39.6—62 4.5—10.5 $2.50
4 56—112 2.6—5.5 $2.50
5 107—216 1.3—2 $3.00
Bottom Mounting strip, $1.50
Antenna Coil, $1.50

COMPLETE SET, with Antenna
Coil and Bottom Mounting $7.50
Strip . . . . . . . . .

Each Set in Polished Cabinet

OTHER TECO PRODUCTS
Short Wave Receiver, Tuning Range, 10
to 200 meters, $27.50.
Short Wave Transmitter, $39.50.
50-watt Socket; has cast aluminum frame, phosphor-bronce springs, and Albino in-
sulation, $1.50.

Full Specifications Upon Request

Transmitting Equipment Co.
19 Stuart St. Boston, Mass.

Cascade Power Tube
Breaks the Dam in Your Receiver

The very tones that start out over the air come true
to your ears through a CASCADE POWER TUBE. You get it all—volume, range, clearness.

CASCADE POWER TUBES are made exclusively to our specifi-
cations, under patents, by one of the foremost laboratories at the cen-
ter of the tube industry.

Backed up by a thirty-two year old corporation of first
credit and business repute. Sold only direct to users. You get the dealer's profit in the extra quality of the tube. $3.00 each postpaid.

Cascade Tubes are also made in Type O1X and shipped direct at $1.50 each postpaid. Specify whether you want detectors, oscillators, audio or radio amplifiers. Tested sets made up complete for neodymynge, amplifiers and all standard cir-
cuits. Enclose cash or money order. Tubes shipped immediately.

The Lacey Williams Company
1890 East 40th Street, Cleveland, Ohio
MEETING the highest radio standards—shipped to you in the most convenient knocked-down form for easy assembly. These Box Shields are made of heavy Aluminum (.080"—No. 12 B. & S.) and are supplied 5" x 9" x 6", which will cover most requirements. If the size does not meet your exact needs, change it—Aluminum is easy to work.

Manufacturers can obtain these shields made to their exact specifications or they can secure the necessary corner-post moulding and sheet to manufacture under their own supervision.

Those who use Aluminum have ample proof of its advantages. Insist on "Alcoa Aluminum", ask your dealer or write us.

"ALCOA ALUMINUM"
Is furnished to manufacturers in the following forms:
Sheet for shields, chassis, variable condensers, cabinets, Panels finished in walnut and mahogany, Die and Sand Castings, Screw Machine Products, Foil for fixed condensers, High Purity Rods for rectifiers, Stamping, rod, wire, rivets.

ALUMINUM IN EVERY COMMERCIAL FORM

ALUMINUM COMPANY of AMERICA

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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.

American Radio Relay League, Hartford, Conn., U. S. A.

Being genuinely interested in Amateur Radio, I hereby apply for membership in the American Radio Relay League, and enclose $2.50 ($3 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 Clubs 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 send him a sample copy of QST? ..................

.......................................................... 1927

Thanks!

SAY YOU SAW IT IN QST—IT IDENTIFIES YOU AND HELPS QST
Buy Amplification Not Tubes

Amplification is one of the vital things in a Radio Receiver. Amplification is necessary for tone quality—for selectivity—for distance—for everything that makes radio enjoyable.

The illustration above shows the amplification comparison between a dual control Stromberg-Carlson 5-Tube Receiver and a typical single control 6-Tube Receiver.

Single dial control does not allow for antenna tuning, consequently the amplification of 10 taken for the tuned antenna is missing. And even the extra tube used before the detector in the single dial set does not compensate for this loss. For this tube is merely a coupling tube—and as such has a relative amplification of only 2 as against 10 when compared with the first radio stage tube in the Stromberg-Carlson.

Further, in this Stromberg-Carlson through the use of perfectly balanced and shielded circuits, the tube in the second radio stage also has an amplification of approximately 10, while the less efficient circuits of the typical 6-Tube single control receiver produce only an amplification of approximately 6 in each of their last radio frequency stages.

Assuming that the remaining tubes in each Receiver correspond as to amplification, the total amplification of this 5-Tube Stromberg-Carlson becomes 768,000, as against 55,296.

Therefore, you can readily see why the single control set described above, although having more tubes than the dual control Stromberg-Carlson, will not give as great total amplification.

If radio were sold on a basis of amplification—which is more important than "number of tubes"—the Stromberg-Carlson 5-Tube Receiver with its total amplification of 768,000 should sell at about thirteen times as much as the above cited 6-Tube single control Receiver. That is, if prices were based on amplification and if $100 were taken as the price for the typical 6-Tube single control receiver, then the Stromberg-Carlson 5-Tube No. 501 Receiver, which now can be purchased for $180, would sell at $1,300.

Stromberg-Carlson Telephone Mfg. Co.
Rochester, N. Y.
A FEW MORE LEFT
NAVY TYPE CG-1162
5 WATTS PILOTRONS
(MFD BY GENERAL ELECTRIC CO.)
NEW, IN ORIGINAL CARTONS
Filament Voltage 7½ Volts,
Filament Current 16 Milli-amps,
Safe Plate Voltage 500 Volts,
Plate Current 40 Milli-amps.
Also Used as Power Amplifying Tube
STANDARD BASE
PRICE ONLY $1.00 EACH

Hams Here You Are
2000 VOLT FILTER
GUARANTEED
TRANSMITTING CONDENSERS
2-MFD—$2.99
4-MFD—$4.99
R. C. A. .000025 Transmitting
Condenser, 10,000 Volt-UC-198
.000007—.0000018 U.G. 196—$7.95
U. S. Signal Corps Spark Transmitters
Has Pancake Inductance 002
500 Volt Spark-Condenser Spark-Coil
for J. C. W..... $2.95
Large 45 Volt "B" Battery . . . $1.69

NEW, IN ORIGINAL CARTONS
Filament Voltage 10 Volts,
Filament Current 5 Amps.
Safe Plate Voltage 550 Volts,
Plate Current 100 Milli-amps.

FREE RADIO GUIDE

Laboratory Product
Crescent Lavoe Resonances
For Distortionless Amplification.

SPECIAL TO AMATEURS
Our new amateur dept. in charge of J. M. Moore, RCA, has everything that amateurs desire. The famous Round-Back Radio Guides will tell all. Send for free copy.

Special to Average Receivers

Crescent Radio Supply Co. 1 Liberty St., Jamaica, N. Y.

Never Before At This Sacrifice Price
HIGH VOLTAGE
KENOTRON RECTIFYING TUBES
MODEL U. V. 217
A. C. Plate Voltage 1500 volts. Filament Voltage 10 volts.
Used with U. P. 1016 Power Transformer or similar Transformer.
These Genuine R.C.A. U. V. 217 Tubes are very efficient Rectifiers and they will pass plenty of current and voltage for 50 watters and H Tubos and also can be used for 250 watters. Every tube is brand new and packed in original carton.
List Price $26.50 ea.
EXTRA SPECIAL, $12.50 EA.
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CUTS LEARNING TIME IN HALF

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The quickest, easiest and most economical way of learning Morse or Continental. Replacing all other means, improves operating ability to a remarkable degree. Especially reproduces actual sending of EXPERT operators. The only instrument that sends MORSE and Continental in the exact form used in everyday work. Equivalent to experience. Thrice the cost of Morse, since it contains as many words with one roll or tape as any other instrument, and SIX ROLLS are furnished. Dustproof cabinet. With or without key and sounder. Or buzzes. Complete graduate course in Morse or Continental with each instrument. Send TODAY for descriptive literature.

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NEW YORK CITY

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Built Around the Famous AERO Transmitter Coils

Here's a new transmitter that is sure to appeal to every true amateur! Compact and pleasing in appearance, it has a really remarkable range on low power. Embraces flexibility to a heretofore impossible degree, because it is built around the famous AERO plug-in coils. Two pairs of AERO coils cover the entire band, 16.5 to 90 meters, without gaps, and are instantly interchangeable. These coils operate perfectly on low power, yet handle in excess of 1000 volts just as efficiently. Read the description of this wonderful transmitter elsewhere in this issue. Then plan to change over to this set. It's really very inexpensive, considering its great range on low power. Here are the AERO Kits you should use, tuning either kit with three good .0005 variable condensers:

**KEY 2040 KIT**
Price $12.00

- Kit contains 2 AERO Coils, 17 to 50 meters each.
- 1 AERO Antenna Coil Mounting Base, 1 AERO Grid Coil Mounting Base, 2 AERO Essential Choke Coils.

If you desire to have this set tune to 90 meters, simply buy two AERO 40 to 80 meter transmitting coils, which plug in the same mounting bases, and work efficiently with the above items.

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Price $12.00

- Kit contains 2 AERO Coils, 38 to 90 meters each.
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Chicago, Ill.

**Price List of Individual Parts**

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In two sizes. Range 17 to 50 meters and Range 38 to 90 meters.  
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Code number Prt. 300 To hold Antenna Coil.  
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**AERO GRID COIL BASE**
Code number Grid. 100 To hold Grid Coil.  
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**AERO ESSENTIAL CHOKE COILS**
The finest choke coil made.  
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Those two features are important to you, the manufacturers of sets and eliminators. Dongan's reputation for being a step ahead in transformer design and a large factory devoted entirely to the production of parts has placed Dongan transformers and chokes as standard equipment in many leading sets and battery-eliminators.

As a source of supply you will find the utmost in cooperation in the Dongan organization.

This is NEW Dongan Transformers and Chokes for use with RAYTHEON BA 350 MA and Q. R. S. 300 MA Rectifying Tubes Write for complete details

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QUALITY PRODUCTS

See that screw

A SCREW DRIVER ADJUSTS AN XL IN EXPOSED PLACES

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Balance out annoying oscillations and save up your circuit to the "peppy" point with a slight turn of the screw. X-L Products specified by experts for all popular models. A slight turn obtains correct tube oscillation on all tuned radio frequency circuits. Neutrodynes, Roberts' two tube, Haining-Drake, Meadmore Silver's Knobout, etc., capacity range 1.8 to 50 micro-microfarads. Price $1.00

Model 0-1 0.001 to .0005 mfd.
Model 0-2 .0005 to .0001 mfd.
Model 0-10 .0001 to .00005 mfd.

Model 0-10 $1.50
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2. Soldering Paste. 2 oz., 5c.; 4 oz., 10c.; 1/2 lb., 30c.; 1 lb., 50c.


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This is a unique 3-range precision moving coil volt-meter made especially for the Radio Service Man. Denver and Denver, it will make all tests more accurate. Receiving sets, tubes and batteries. It is rugged and will last a lifetime, yet will retain its extreme accuracy. Thomson is simple and accident-proof.

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Sales Dept. for Hoyt Electrical Instrument Works
Hoyt makes a complete line of Radio Meters. sends for booklet, "Hoyt Meters for Radio".

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**NOTICE**

This department of *QST* is conducted as a service to members of the American Radio Relay League. Advertisements can be accepted only under the following conditions:

1. "Ham Ad" advertising will be accepted only from members of the American Radio Relay League.
2. The signature of the advertiser must be the name of the individual member or his officially designated agent.
3. Only one advertisement from an individual can be accepted for any issue of *QST*.
4. Advertising shall be of a nature of interest to radio amateurs or experimenters in their own interest.
5. No display of any character will be accepted, nor can any typographical arrangement, such as all or mixed lettering, be used to make our advertisement stand out from the others.
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**THE LIFE BLOOD OF YOUR SET-PLATE POWER.**

Flaming, powerful, permanent, reliable, transformerless, trouble-free, rugged, a bus pro of that's anock-proof jars. It's my gift. Lithium-Potassium solution that's no lye! Com-

tri~ally welded pure nickel connectors insure that transformer is lb. Details, full price list. Frank

you need. No. 12 solid copper enamelled permanently per-

muted. Our w'te day data sheets give you more dope than

pl~te. knock-down kits, parts, chargers. Glass tubes.

Edgeware found copper ribbon, 7 sizes, shipped Jan.

Twelve studied Shortcut two weeks and passed. Called

YOU'RE next. OM. Westinghouse Cooper-Hewitt Mers-

cury. "29P" Rector tubes $1.75 ea., shipped via ex-

press only. New, in original crates, guaranteed. Put a

note on the air that'll kick out. Tubes will run one five

weeks $2.50. Over two years data, circuits. Catalog.

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**WANTED 10 1 mid, 1750 volt condensers. Geo. K. Harb-**

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**AUDIO transformers rebuilt with new best quality wind­**

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tewed. Loud speakers rewound and repaired, two-fifty to

dollars. A. B. Clark, Albia, Iowa.

**HEAVY glass jars, used motors, all radio apparatus at discount. Write for list. F. L. Young, 9CKA, Cornith, Iowa.**

**ENTIRE station of DEGY for sale. Short wave receiver:**

Two stage audio. Aerocoll, General Radio transformers, Marco dials, Jewel voltmeter Walnut cabinet. Three tubes. Short wave transmitter, 15 watts, Millimeter, bakelite panel. Two Radotrons. A very neat job. Radio Cor-
poration power supply ET3620 with five rectifier tubes. Furnishes all power for transmitter. Operates on 110 vol­

type 6 cycle AC. $135 money order takes it. W. E. Dreyer, Alliance, Nebraska.

**OMNIGRAPHIES. Vibroplexes, Transmitters, Chokes,**

Meters, Transformers, S. Tubes, Transmitting Tubes, Recei­

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ceivers, Bought, sold, exchanged. J. R. Ryan, 9CNS, Hannibal, Missouri.

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diamond; also heavy duty filter condensers, choke coil and several meters; sell clean. Trade or sell printing plates for new game never used also trade or sell lot model racing lead toys. Harzains, Oline, Minnewaukan, North Dakota. Write your wants.

**SPECIAL Kennedy long wave receiver with amplifier**

$50.00. Junior Heilman, Butler, Missouri.

**SELL advanced S-8 rectifier, new. 2UY, Walter Condie,**

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**TEN watt transmitter $50. Includes Acme transformer,**

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**FOR SALE—National Radio Institute Correspondence**

Course with Natrometer like new, cheap. Write Julius Heiland, Osgood, Iowa.

**WANTED—Giblin—Remler coils either mounted or un­**

mounted, 600, 750, 1000 and 1500 turns. State condition

and price. Also want to trade brand new unboxed RCA UP1015 power transformer for UP1368 new condition. L. A. Danze, 2980 Lingree Ave, Detroit, Michigan.

**EVERYTHING for the ham: 1/16" sheet lead and**

aluminum, $1.00 per sq. ft, No. 12 "Dynex" solid copper enameled wire, 1 ft, No. 10 "Dynex" solid copper enameled wire 50 ft. A full stock of Acme and Thordarson transformers and choke coils, jeweled meters and all the rest of the stuff to make that short wave transmitter or receiver. Send for catalogue. "Dynex for DX" E. J. Nicholson, SRUS, 1407 First North St., Syracuse, N. Y.

**SNAPS—1500 volts 1 k. w. ring oiled Esco. 110 v. D. C.**

motor perfect condition, $50, or will trade for 500 volt 250 watt Esco new DeForest Q tube 500 waiter with split lead 80. Brand new Epom B eliminator $20.00, 500 watt Acme transformer $18.00. All F.O.B. Miami. Wanted 500 watt Acme transformer. R. B. Ladd, Buena Vista, Florida.

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**NEW transmitter (twenty five watts input) complete with**

D.C. plate supply, tubes and key—for less than cost of parts. Also portable receiver. 8RD, 12694 Northlawn Ave, Detroit, Michigan.

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**TRANSMITTING rheostats for 5-7.5 watt tubes are selling**


**REPORTS each district on request. Shortcut with Append­**

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WANT to trade gas driven, direct coupled, 110 volt generator for high voltage motor-generator. Ideal for battery charging, farm lighting, or boat lighting system. E. Case, 725 Tilton, Atlantic, Wisconsin.

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"MAHOGANY" or black finish hard rubber panels, seven inches wide, twelve to twenty six inches lengths, five cents per linear inch." D. L. Barr, Trenton, Ill.

FIVE watt transmitter for sale. $45.00. Write for description. John Redmond, Clinton, N. Y.

ALL Postpaid. Sangamo filter condensers, 1000 volt work. Each 2 mfd. $3.18, 1 mfd. $3.86. H.E.L. Transmitting inductances, double with glass coupling rods, $2.90. R.E.L. shortwave coil kits, $3.75, Allen-Bradley "RadioMaster" No. 1. $3.95. Allen-Whitt $3.95, 3000 volt plate transformer for 3000 volt plate, $6.95. Allen-Whitt No. 1, 10000-20000 volt variable transmitting grid leas, $4.89. R.E.L. radio frequency chokes, $1.00. General Radio Wavemeters, Type 588, $16.25. Dubbler condensers, Type 102, $0.48, $0.90, $1.22. R. E. L. receiver kits, $2.95. Other prices on request. 3MMS, G. E. Hall, 138 East Gomes Lane, Philadelphia, Pa.

WHY not supply your set with pure "B" current from the new type Edison element lifetime "B" power units of low internal resistance, noiseless operation and recharges from your 110 volt outlet. $10.95, $15.95. Allen-Whitt, "RadioMaster" No. 1, $3.95. Allen-Whitt No. 1, 10000-20000 volt variable transmitting grid leas, $4.89. R.E.L. radio frequency chokes, $1.00. General Radio Wavemeters, Type 588, $16.25. Dubbler condensers, Type 102, $0.48, $0.90, $1.22. R. E. L. receiver kits, $2.95. Other prices on request. 3MMS, G. E. Hall, 138 East Gomes Lane, Philadelphia, Pa.

A NEW Ham Catalog is ready for you, listing much new apparatus besides giving many changes in the "Hamalog." Send for it today, mentioning if you have the T-3 "Hamalog." New stuff includes all 500 volt-1 mf condensers $1.95, 1000 volt-1 mf condensers $2.25, 2500 volt-1 mf condensers $4.25, Aerovox 1500-volt 1 mf condensers $1.75. Tube 2090-volt 5-mf condensers $17.00. UC490 Condensers $2.50. Used 50-inch witters $10.95. "Ham-List" 45, R. Curtis, 1109 Eighth Avenue, Fort Worth, Texas.

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SPELLeed—used UV203A $29, cash; two new G. E. fifteen laboratory models, $15 each. Radiocorp sockets $1.95, U.T.T. magnetohalogen transformers. $5.00. Cardwell 165 General Electric audio transformer, $4. SDMN, Wilkinsburg, Penn.

TRANSFORMERS for Raytheon, UX218 or UX213 tube $25.00, $45.00, Henry choke $3.75. 700 volt, 1000 volt, 1500 volt, 2000 volt for $35.00 paid. Write for list of material. Leitch, 34 South Park Drive, West Orange, N. J.


POWER transformers for 75 watt transforme, filament 75 V., plate 800 volt, center tapped $15.00, $17.00, plate 1100 v., center tapped $10.00, Milliameters, 0-100, 0-200, Rectifier elements, aluminum and lead, pair 15x4", i.e. 29x4", C. O. C. O. cash. Complete list upon request. William Green, 211 West 110 Street, New York City.

TELEFUNKEN 300 watt power tubes, $35, filament 14 volts 4 amperes. Plate 3000 volts: 50 watt tubes $12, filament 10 volts 2 amperes, plate 1000 volts, RCA 1—1500 voltmeter $15. Magnetic modulators 17T 1507 150-34 amps, $4; UT 1357 15-35 amps, $2; Receiver 110 volt 60 cycles, 1500 volt 250 cycles: $5.00. Eastern Electric Information Service, model G7 8 tube super-heterodyne, $50. Inquiries invited. Herman Beyer, 56 Pine Street, New York, N. Y.

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2ATB—Henry N. Whitney, P. O. Box 867, Glen Cove, N. Y.

2MK—E. F. Raymonds, Central Valley, Orange County, New York.

3KP—4828 N. W. 16th St., Washington, D. C.

3NN—Robert R. Achey, Quakertown, Penn.

27B—Henry N. Whitney, P. O. Box 867, Glen Cove, N. Y.

2MK—E. F. Reynolds, Central Valley, Orange County, New York.

3PP—49 West 4th St., Atlanta, Ga.

3SM—A. F. Ekdale (AE) and C. W. Seamans (CS) 119 S. El Molino Ave., Pasadena, California.

4CCG—Geo. Fagerholm, 948 East 72nd St., Suite 6, Cleveland, Ohio.

4GQ—George B. Bairey, 219 S. Swissvale Ave., Edgewood, Penn.

4DEI—Geo. M. Benas, 1801 Genesee St., Utica, N. Y.

4JL—Joseph A. Roell, 2913 15th St., Niagara Falls, N. Y.


9DFW—Frank Zurtik, 21324 Potomac Ave., Chicago, Illinois.

9DLY—Clayton S. Waldradt, White, S. Dakota.

9DG—Headquarters Company, 1st Bn., 113rd INF. Iowa National Guard, Cedar Rapids, Iowa.

9DZT—Parker Gates, 903 Vermont St., Quincy, Illinois.


92SX—Henry Clive St. John, 82 Gibbs St., Rockdale, New South Wales, Australia.

94KD—E. W. Mayer, Box 105, Ensenada, P. R.

91GC—W. Figueroa, Magallanes 1076, Montevideo, Uruguay, S. America.

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Spring is the time to install Radio Convenience Outlets. They enable you to get greater joy from your radio by eliminating all unsightly wires from the room. The Radio Convenience Outlet shown above is for battery connections—batteries can be placed in basement, closet, nearby bookcase or any out of the way place and wires led to radio set in a neat, attractive way.

Take your loud speaker to the porch this summer by using the No. 135 Radio Convenience Outlet. You can also have radio in as many rooms as you wish without removing the set from original location.

No. 137 For Battery Connections $2.50
No. 135 For Loud Speaker $1.00
No. 136 For Aerial and Ground 1.00

We have a very interesting bulletin on Radio Housewiring. Copy on request.

YAXLEY MFG. CO., Dept. S, 9 South Clinton St., Chicago, Ill.
**FOR YOUR CONVENIENCE**

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**REAL RECEPTION!**

Guaranteed to remove the battery nuisance and deliver clearer tone and increased volume. Provides three different voltages at the same time. Each tap adjustable over a wide range, making possible any desired voltage from 5 to 150, absolutely harmonizing "B" current supply to your set. Raytheon tube used as rectifier. No noise or vibration. Contains no acid or solution and will not get out of order. Operating cost negligible.

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**Price, complete $35.00**

**KOKOMO ELECTRIC COMPANY**

**KOKOMO, INDIANA**

---

**FOR YOUR CONVENIENCE**

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An Explanation Of 

AmerTran De Luxe Efficiency

The above curves are plotted from measurements made in accordance with the latest tentative rules of the N.E.M.A. These curves have been proven conservative, and accurately represent the AmerTran De Luxe Audio transformer.

For one and one-half years the AmerTran De Luxe has been used with great success by all those seeking improved audio amplification. The secret of its excellence centers chiefly in the special alloy core material which provides the high inductance needed for the normal amplification of the fundamental base tones. This makes possible an improved coil structure for maintaining the higher frequencies with no appreciable "peak" or "droop" until beyond the useful range.

There is a remarkable absence of the muffling of sibilant sounds and "background"—often noticeable with transformers having "drooping" characteristics.

The AmerTran De Luxe is well made and designed to give long, dependable service. Metal cased and embedded in a solid compound, it is not affected by climatic changes.

The better reception obtained by installing correctly a pair of AmerTrans is final proof of their high efficiency rating.

THE AMERICAN TRANSFORMER CO.
178 Emmet Street Newark, N. J.
Transformer builders for over 26 years

Write for free booklet entitled "Improving the Audio Amplifier," together with other technical data.

The AmerTran De Luxe made in two types for first and second stages. $10.00 Each.

Other AmerTran Products
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Say You Saw It In QST—It Identifies You and Helps QST
Learn to Send the Easy Way

With the Improved Martin

VIBROPLEX

Improves Sending 100%.

Now is the time to get YOUR Vibroplex. A Genuine Improved Vibroplex. This is the BUG you want because it is the best that brains, experience and money can build.

Every up-to-date operator nowadays uses a Vibroplex BUG. He would be lost without it.

It is the EASIEST and BEST way to send. You can learn it in almost no time. You simply press the lever—the Vibroplex does the rest.

There's no tensing of the muscles, no cramp, no nerve strain when you send with a Vibroplex. It saves the arm, prevents lost grip and improves sending 50 to 100%.

The Improved Vibroplex is the pride of more than 100,000 Morse and Wireless operators. It is the operators' greatest asset. It is in use in practically every telegraph office and wireless station on land and sea.

Operators prefer this BUG to the old key because the sending is more uniform, the signals stronger and easier to read and sending effort is reduced to the minimum.

The Vibroplex is the Only Genuine BUG

When you buy a BUG, don't buy a cheap key. Don't be misled by false claims of cheap imitators. There’s only one Genuine BUG—the Vibroplex. Ask any experienced operator. Read this letter from FPO—he knows.

"Enclosing Postal Money Order for $25. Please send your Special Radio Model Vibroplex. Have tried everything else, but am forced to get the best at last. Should have done so at the start."

Latest Improved Model Illustrated

This BUG can be used in the majority of DX circuits. For speed, clarity and precision there is nothing to equal it. Japanned Base. $17. (In Canada, $22.50) Nickel Plated Base, $19.

Special Radio Model

Furnished with extra heavy contact points for direct use in any circuit without relay. Experienced operators say this BUG fills a long felt need. ...... $25

The Vibroplex is the BUG YOU Want

Learn to send the EASY way—with the Improved Vibroplex. If you can use the old key—you can send BETTER and EASIER with the Vibroplex. Its ease of operation will amaze you.

Place YOUR order Now for immediate delivery. Insist on the Genuine Improved Martin Vibroplex. The Vibroplex Nameplate is YOUR protection. Sent anywhere on receipt of price. Money order or registered mail. Liberal allowance on old Vibroplex.

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Japanned Base, $17
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(Say You Saw It In QST—It Identifies You and Helps QST)
Recognition—
And the Indication That
YOU Are Missing Something

The sales of "The Radio Amateur's Handbook" have exceeded all our most sanguine expectations. The second printing, which we expected to fill the demand for the remainder of this year, has now been completely exhausted and a third printing is ready for distribution. Daily sales are greater than at any time since the announcement of the book.

There is only one reason for this. It means that the Handbook is the complete answer to a very real need. It is universally hailed as the most helpful collection of amateur radio information ever assembled under one cover.

If you are a novice, "on the outside looking in" at amateur radiotelegraphy, here is your friendly guide to all the secrets of the game. If you are already a station owner, here is a complete manual of approved amateur practice that leads the way surely to better station performance and better operation. We confidently believe that NO ONE interested in any phase of amateur radio can afford to be without this book at any price. No organization in the world except the A. R. R. L. could assemble such a book and sell it at this low price. Your money cheerfully returned if you don't like it.

Slip a dollar bill in an envelope today and just say "Send me a Handbook", and get that contented feeling that comes with the possession of something really worth while.

"The Radio Amateur's Handbook"
By F. E. Handy, A.R.R.L., Communications Manager
224 pp., QST size $1 postpaid anywhere

AMERICAN RADIO RELAY LEAGUE
1711 PARK STREET HARTFORD, CONN.
An acknowledgment of Our Debt to the Amateur

The growth of our amateur call list to proportions forcing, because of lack of space, the discontinuance of its publication in QST, impresses us with the responsibility accompanying such widespread preference for Burgess products. We feel now, that every effort must be made to maintain our position with the "ham."

To this group, as much as to any other in radio, we owe a lasting debt of gratitude. It is one that we shall repay through constantly striving to make Burgess Batteries give longer and better service always.

BURGESS BATTERY COMPANY
General Sales Office, Chicago
Concerning ES and 73

A GREAT many amateurs new to the gentle art of brass pounding have come to misuse some of our commonest ham phrases with little or no thought as to their origin and less thought as to their exact meaning. With this in mind we are pleased to present a few paragraphs written for The Lighted Key (a monthly letter devoted to the interests of the professional radio operator) by Mr. R. O. Koch, Chief Operator WMW. This is presented by courtesy of that publication. Let's study our operating practices more and not only try to make our sending steady and our signals clear cut but also let's clean up our sloppy usage of such meaningless expressions as "QSB DO", "Best 73's", and so forth.

First let's get at this "es" business. For the one hundredth time—ES IS TAKEN FROM THE AMERICAN MORSE CODE AND IS ALWAYS COPIED "G"—nothing else! Cut this line out and paste it on your tuner panel until you remember it. It's enough to say, "Best 73's ex CUL" in letter writing, but when a man hears you on the air he describes it in those letters ON HIS MESSAGE BLANK, he is going too far. "Es" should not be written for "G" any more than "KK" should appear on the blank to denote parenthesis, or "AS" for quotation marks.

Some little objection might possibly be raised to the use of "es" at all in radio work, maintaining that it is an American Morse character exclusively and not authorized for radio communication. However, men versed in both American Morse and Continental see advantages and disadvantages in each, and as Continental was first introduced to operators who had been accustomed to using American Morse, the result was a more or less hybrid code which we have today.

The Morse letter "C" for example, is a wonderful improvement over the MIM" signal which is officially recognized on paper, and seldom heard on the air. A Morse "C" serves at the same time as a polite inquiry as to whether the air is "clear" for the minute and as a warning that if no immediate reply such as "AS", "ORX" or "QRT" is heard, the station making the "C" will transmit on normal power at once. A fellow will often knock right off his chair with his first warning of high-power (MIM) and the second of the series of three MIM's required by the book will push the diaphragms right through the receiver case! A single, snappy Morse "C" answers the same purpose without breaking any bones or wrecking half the operating shack.

"38" is another oft-abused phrase. Reference to a code book will show the plain figures 13 as meaning, "Best Regards." The addition of a superfluous "s" to it, makes it "Best Regards"—whatever that double "s" may mean. Cut out the "38"s and make it just the two figures, and let "Best so and so" get you used. If 78 means "Best Regards" then "Best 78's" means "Best Best Regards" which looks like a kindergarten effort to express a simple good wish.

Last, but not least, don't be afraid to learn the Morse code, or anything else that will make you a better operator. A knowledge of American Morse will show you a number of advantageous little shortcuts which you can apply to your daily radio work and will help all concerned. In all telegraph work, let brevity, insofar as consistent with good meaning, be your watchword.

More Reports on 20-Meter Work

In MARCH QST (C. D., page III) we discussed what was doing on our twenty meter wavelength band. As this issue has just been distributed there are no important additions we can make at this writing. The good conditions and wonderful possibilities of accomplishment mentioned last month re­main the same, but we have a few more joyful stories to report. Wonderful low-power work is being done regularly over great distances. The new rule for 20-meters seems to be that it is a good wave to use whenever there is daylight at either end of the QSO. That there are plenty of exceptions to this is easily proven, tho. The South American stations on "20" that were mentioned last month con­tinue to be heard and worked with ease at 8 and 9 P.M. QST.

Conditions are getting better on 29 meters day by day in the Northern Hemisphere due to the fact that the aurora is with us. A starter number of the twenty-four hours. "20" is ideal for work all sum­mer long. It is, therefore, suggested that if you haven't yet tried out the possibilities of this band that you read the dope in last QST and get busy at once.

Some of the latest reports follow: From 9AWB (Montrose, Iowa), "I want to say that 20 meters is FB for low power. I use a 281-A tube, magnetically coupled Hartley and 120 volts of dry B-bats for plate supply, operating my single wire antenna on the eleventh harmonic. Best DX worked is ndHIK. The East coast is the usual thing. Calif is worked about every other night with an occasional 7th dist. sta­tion. In the daytime about 50% of the stations called are raised—at night the average falls to about 30%.

1CAW (Fall River, Mass.) says, "Daylight contact in the past 8 weeks up to Mar. 6th: eg2TAO, eg2OD, eg5BY, es5BD, es5MTN (G. Kruse, Bjorholm, Sweden, 22 meters, 25 plate volts, plate input, 5 watts), np4CA, nudAT, nudAW (4 watts, 6, 8 and 9 too numerous to mention here), nc4DW. At night: se3AGA, n6ESK, put6BKX and others. Heard many Nu's from every district, including 2JN-4, eg6WQ, eg6WO. 1CAW reports the South Americans R-6. It's FB to note that he has a daily schedule with eg2TAO and that he has worked most of the stations listed an average of two or three times—these are no passing or momentary contacts.

eg2TAO (Eastbourne, England) sends a list of 20-meter calls heard by him via 9AWB Sun. Mar. 6th. The figures are audibilities in the R nomenclature. Here they are: 1ADM-4, 1APL-6, 1AMU-4, 2TRP-5, 1ARC-3, 2JN-4, 2AMU-5, 2ALP-4, 2ASF-6, 2BMB-4, 2BBR-6, 2HXX-5, 2DON-4, 2BOL-5, 2ALM-4, 2ASK-4, 2ADP-4, 2SCC-4, 2BMB-4, 2BML-4, 2BOL-5, 2ASH-4, 2','WU-3, 2PAC-5, 2ICW-6, 2RY-3, 1ARD-6, 1ANM-4, 1CDP-1, 1CPR-5, 5JO-5, 4BL-4, 2SW-4.

9UB (La Salle, Ill.) has been on "00" since New Year's day and has been reported in QSO's as R-8 in every U. S. and S. Canadian districts. "9UB is on 19.85 meters daily 4 to 6 pm C. S. T. I should be glad to hear from anyone who can arrange schedules for that time. I changed to a straight wave antenna and found it improved the steadiness of my sig. That this might help some of the gang even tho the results were due to just a local condition of mine. Use a fundamental antenna. Handled 18 messages in 15 days and Q5R'd 'em all on time. Who can beat that for 20-meter traffic? What I like best of all is that the old ham spirit is there and a rag chew of an hour is not unusual. Tell the fellows in that Chinese laundry mess on "40" to QSY to "20" and get in on some real fun."
1ZL (Bridgeport, Conn.) with a 30-foot Hertz in the attic using a 5-watt with 20-watts input recently worked egHS, egVC, efYOR, nu4DW, nu3GC, 4BZ, 4BL, 4DM, 4LH, 4CN, and 7EK. 35's were worked—other U. S. districts in proportion. FBMX, RIY, (Ridgewood, N. J.) has worked the west coast a number of times, often in the evening between 9 and 10:30 pm EST. Here are a few of the calls of stations he has worked on 20-meter schedules to determine faster than distance duration schedules to determine faster than 100% 20-meter schedules daily with nc3NI and nu6AAC, have been worked after 2000 EST on 2000. 1590, 1600, 1610, etc. from zones with no antenna coupling at nc9AI. (signed) Thompson.

All that we can say in addition is "keep up the good work." If you haven't a set that operates on 20 meters get busy right away and fix your outfit so it will work. You will notice that you can get something new out of the outfit and do that you have never done before. It is a pleasant and profitable time during all the coming months.

—F. N. H.

Amateur Co-operation in San Diego Emergency

By Juan Rodríguez, 6CCG, Route Manager, San Diego Section

On Feb. 16th, something began to happen when the wires went out in the vicinity of San Diego following an exceptionally heavy three-day rain. Amateurs at once got on the job and a number of amateur stations made a good record in the emergency. It is also interesting to note that during those hours when the regular communication lines were broken, all the radio traffic was being handled by amateur operators, with the exception of one call, which was worked by the official radio station.

Some of the outstanding work was done by one of the local Official Relay Stations, 6DAU, who handled many thousands of words of press traffic for a period of several hours. 420 words of press and private traffic were handled. 6XJX's father took press messages from the Los Angeles office of the Federal Telegraph Co., whose lines were out, to 6DAU's station and then phoned the press to the San Diego Union as fast as it was received. The radio link was broken at about 9.15 p.m. due to skip distance and the use of "frequencies" for unknown reason. It was then that the signs falling off slowly at first and dropping out suddenly at that time.

6XJX took press messages of United Press for the San Diego Sun from 6BZJ at Pasadena. 6FP originated a number of important messages for Los Angeles which were phoned from Pasadena. 6DAU got a fine appreciation letter from the San Diego Gas and Electric Co. for his good work in this. During the emergency, 6BSN was on the air at 6AKA's station handling commercial traffic for the Western Union Co. as well as other important traffic. 6BRQ in Los Angeles was right on the job to give 6AKA the news. 6XCP deserves a lot of credit for his good work.

6BAS, another ORS, was unable to be at his own station but set up at the radio room of the Southern California Sanitary Districts office, worked nearly all day handling his own traffic via amateur radio. 6XJX handled some messages for Los Angeles, as well as 6CCG, 6SH, 6BRQ, 6BAS, 6BAS, and 6BRQ on 20-meter schedules to determine faster than distance duration schedules to determine faster than 100% 20-meter schedules daily with nc3NI and nu6AAC, have been worked after 2000 EST on 2000. 1590, 1600, 1610, etc. from zones with no antenna coupling at nc9AI. (signed) Thompson.

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Some of the outstanding work was done by one of the local Official Relay Stations, 6DAU, who handled many thousands of words of press traffic for a period of several hours. 420 words of press and private traffic were handled. 6XJX's father took press messages from the Los Angeles office of the Federal Telegraph Co., whose lines were out, to 6DAU's station and then phoned the press to the San Diego Union as fast as it was received. The radio link was broken at about 9.15 p.m. due to skip distance and the use of "frequencies" for unknown reason. It was then that the signs falling off slowly at first and dropping out suddenly at that time.

6XJX took press messages of United Press for the San Diego Sun from 6BZJ at Pasadena. 6FP originated a number of important messages for Los Angeles which were phoned from Pasadena. 6DAU got a fine appreciation letter from the San Diego Gas and Electric Co. for his good work in this. During the emergency, 6BSN was on the air at 6AKA's station handling commercial traffic for the Western Union Co. as well as other important traffic. 6BRQ in Los Angeles was right on the job to give 6AKA the news. 6XCP deserves a lot of credit for his good work.

6BAS, another ORS, was unable to be at his own station but set up at the radio room of the Southern California Sanitary Districts office, worked nearly all day handling his own traffic via amateur radio. 6XJX handled some messages for Los Angeles, as well as 6CCG, 6SH, 6BAS, 6BAS, and 6BRQ on 20-meter schedules to determine faster than distance duration schedules to determine faster than 100% 20-meter schedules daily with nc3NI and nu6AAC, have been worked after 2000 EST on 2000. 1590, 1600, 1610, etc. from zones with no antenna coupling at nc9AI. (signed) Thompson.

All that we can say in addition is "keep up the good work." If you haven't a set that operates on 20 meters get busy right away and fix your outfit so it will work. You will notice that you can get something new out of the outfit and do that you have never done before. It is a pleasant and profitable time during all the coming months.

—F. N. H.
Auckland N. Z. and leaving for Tahiti the last of April.

On Feb. 24, 6AAK was QSO ARDI, the C. A. Larsen. ARDI was copied at the same time by 9NE. This was the first contact in the Antarctic circle but is working her way out QRD New Zealand. 9KV sent a fine report, having kept a schedule with both ARDI (about 30 meters) and ARCX, at present working ARCX each Wednesday and Saturday. Mail should be addressed to Chief Radio Operator, S. S. C. A. Larsen, Care Norwegian Consulate, Dunedin, N. Z.

9ABR worked ARDI for an hour March 10 taking one message. ARDI was on 33.5 meters at the time of this QSO but he is also working on 15 meters much of the time.

Gordon Eight, 4D4Q, and Mr. Wall, 4D4MW are leaving Rome, Ga., about March 25 for a six weeks' cruise from Tampa, Fla., touching at Cuba, Haiti and Panama. The yacht will use the AR 4G4GAW on 110 meters and the portable 4SK on 40 and 80 meters and will attempt to keep in touch with family and friends by amateur radio. Help out by doing your part, gang.

CLUB ACTIVITIES

California—"The Hammer" is a new monthly publication printed at Berkeley. It is of interest to California Radio Clubs and amateurs.

The Santa Clara County Radio Association held a hamfest in honor of the opening of their new quarters. The Club station (6SV) is now on the air and looking for schedules.

CONNECTICUT—The Twin City Radio Club of New Haven installed a new receiver and transmitters and will attempt to keep in touch with family and friends by amateur radio. Later the club held a mid-winter get-together in a club room.

DISTRICT OF COLUMBIA—The Washington Radio Club held an enjoyable dinner recently. Mr. Terrell, chief radio supervisor, Commander Taylor of the Navy's Bellevue Laboratories, and Mr. Hobert of the R.R. Headquarters gave interesting talks. 3AB gave a talk on rectifiers at another meeting of the club.

ILLINOIS—The Chicago Radio Traffic Association is holding regular bi-weekly meetings at the various members' homes. Interesting talks are given at the meetings.

The Chicago Nine Club, better known to members and associates as the "Nine's" has been in existence since December 1925. The organization now boasts 22 peppy members whose aim is devotion of amateur radio and good fellowship through both social and professional functions. The future of this live club is a bright one.

The New Trier High School Radio Club of Kenilworth is still busy constructing its new receiver and transmitter, and expects to get started on the air very soon. Meetings have been held regularly, and code practice has been given to those who desire it in 9V3's shack, December 1925. Can any other clubs beat this record?

MAINE—The Queen City Radio Club of Bangor had many good times during the past year, and plans a still better program for this one. Code practice is a regular feature of its meetings. The officers for this year are 1AQL, 1BFZ, 1FP, 1CDB, and 1JL.

MASSACHUSETTS—The Worcester Radio Association is a new organization which has started its activities by giving a public radio lecture. This is fine work. Keep it up!

NEBRASKA—The Cornhusker Radio Club of Omaha recently held a Nebraska Week contest, in which a silver loving cup was offered to the station that was successful in holding two-way communication with the greatest number of stations in the state of Nebraska. This contest was won by 9ANZ of Lincoln. Congratulations, OM! The cup was presented to him in Lincoln on March 5th.

Last month was a good one for the emergency gang. During the blizzard that raged in the east Feb. 20 the cable between Norfolk, Va., and Cape Charlotte was out and the P.R.R. men came to the rescue with 100% performance. 3CAW, 3AAW, 3AW, 3CAH, and 3AWT at Philadelphia, 3C_GB and 3AH at Norfolk stood a continuous watch handling nearly fifty long and important railroad messages. The traffic went from Norfolk to Philly by radio and from there back to Cape Charles by wire. 3XE, 3A E 50 cycles, dynamo 17Q-13. Spooling through heavy QRM. 1BMS throws further light on 36 meters. 8CUA worked the Ross Sea in the Antarctic. He was Rl-A4, 500 cycles and 13° from the South pole. 6CUA worked ARDI, and SA WT at Philadelphia. 3CEB and SAHI, more congrats are in order!

The same storm struck Concord, N. H. wiping out telephone service to many points. 1AER, 1AQL, and 1BFT-1OC hooked up with ARCX which expedition has been out since December. He says they have about 400 officers for this year are lAQL, lBFZ, 1FP, lCDB, and lUU. Last month was a good one for the emergency gang. During the blizzard that raged in the east Feb. 20 the cable between Norfolk, Va., and Cape Charlotte was out and the P.R.R. men came to the rescue with 100% performance. 3CAW, 3AAW, 3AW, 3CAH, and 3AWT at Philadelphia, 3C_GB and 3AH at Norfolk stood a continuous watch handling nearly fifty long and important railroad messages. The traffic went from Norfolk to Philly by radio and from there back to Cape Charles by wire. 3XE, 3A E 50 cycles, dynamo 17Q-13. Spooling through heavy QRM. 1BMS throws further light on 36 meters. 8CUA worked the Ross Sea in the Antarctic. He was Rl-A4, 500 cycles and 13° from the South pole. 6CUA worked ARDI, and SA WT at Philadelphia. 3CEB and SAHI, more congrats are in order!

TRAFFIC BRIEFS

1CAW hooked up with ARCX, the whaler, the Astilaa Alonso de Bortobert, Feb. 20, 6:30 am EST. ARCX was then on 36.5 meters 900 cycles, steady and 600 steady. His position was given as Lat. S. 77°, Longitute E. 179° which places this whaling expedition in the Antarctic, 3600 miles south of New Zealand and about 18° from the South pole. 4CUA worked ARCX and took a greeting message for A.R.R.L. Eq. On Feb. 23rd 9CNL, in Denver, Colo., connected with ARCX and asked for the whaler's call. ARCX replied messages were handled over the same route which was still in operation the next morning. Later Feb. 24th 6CAW worked 1BMS and the whaler was QSO 1BMS back on the air to take more traffic. Good work in addition was done for the Eagle Hotel of Concord. More congrats are in order!

Mr. Karl Zient, operator of the Zane Grey Schooner Yacht, "Yankee Djoan," KNT, sends us word that the gang can teach him by radiograms through HAG-10C or FX1. He has been unable to run the short-wave outfit all he would like due to the fact that the gas-engine power supply causes a troublesome noise at night. 9ARA worked KNT at Whangaroa, N. Z. on March 10 taking a message for EQ asking the gang to watch for KNT signal. KNT worked on Monday and Thursday nights (U.S. time) on 80 meters. KNT has a schedule with 6ASQ, will be fishing north of N. Z. until mid-April then anchoring at
With the Route Managers

By Lawrence A. Jones*

This little column of ours is now three months old. We have accomplished more than seems possible in so short a time. Reports are getting in every month, and more and more of you fellows are getting into the swing of the RM work. Keep it up!

And now we take pleasure in introducing seven new RMs.

N. Y. C. and L. I.: Joseph Toman, 2ANX.
So. Minn.: Kenneth Wolf, 9CAJ.
So. Texas: Herwood Cline, 9GW.
Wisconsin: J. G. Kemmeter, 9DLD.
Tennessee: Polk Perdue, 4F1.
Vermont: Clayton Paulette, UT.
Rhode Island: George M. Mathewson, 1BDQ.

Before very long we'll have at least one RM from every Section, and then watch the reports roll in. And fellows, please send along some suggestions as to what you would most like to see in this Route Manager column, won't you? Like every new thing it will have to undergo various changes before it becomes just what we want.

Once more we have a traffic map to present. Try originating a few worth-while messages and routing them over some of the lines shown. The heavy lines denote cross-country routes that are working in fine style. Next month we shall probably be compelled to limit the map to what might be termed "trunk line" routes, as there is not sufficient space to include all the local schedules that are now in operation.

And now we have an announcement to make. Your reports are growing to such proportions that it will be impossible to include them in detail as we have done the past two issues. There is a wealth of valuable information contained in the reports, and it is a matter of much regret that all of it cannot be given to you in QST. So won't you send some suggestions as to what you would most like to see included in future issues, or perhaps make a suggestion as to what you would like us to include in the next route map?

Another most noticeable thing about these messages was the surprising rapidity with which messages pass through territory that has been whipped into shape by RM work. A great many messages from distant points were delivered here in much less time than ones coming from nearer points. And this is due to schedules and reliable traffic operation brought about by you fellows. In almost every case it was the Section which had no active route manager, in which messages were delayed the longest. That should be proof enough that your work is not in vain, and that it is going to bring country-wide traffic handling up to standards that the League can be proud of. Progress in this line is bound to be slow at first, but it is sure.

Also another thing of interest is the increasing number of messages originated at or near large cities. We have accomplished more than seems possible in so short a time. We have accomplished more than seems possible in so short a time. We have accomplished more than seems possible in so short a time.

Suggestions and matter that will be of general interest are particularly desired. This will enable us to print things that will possibly be of more interest to everyone concerned than the previous lists of operating hours.

Start some activities such as have been suggested, and report on the results. Some of you RMs in the Midwest might get together and try to form some reliable traffic routes running north and south. East and west through routes seem to be in good shape, as is also in the three or four valuable cross-country ones shown on the map. Five-point systems between RMs ought to be of value, as well as many other activities that you may think up yourselves. Let us know of your activities along these lines and before long this column can be chock-full of information of value to all.

A goodly number of messages were recently originated at many points east and west through routes, all bound for 1MK. These were traced at our request in order to get some dope on traffic conditions. Complete results are not yet available, but some information of interest has already been obtained.

One of the most striking features is the ease and rapidity with which messages pass through territory that has been whipped into shape by RM work. A great many messages from distant points were delivered here in much less time than ones coming from nearer points. And this is due to schedules and reliable traffic operation brought about by you fellows. In almost every case it was the Section which had no active route manager, in which messages were delayed the longest. That should be proof enough that your work is not in vain, and that it is going to bring country-wide traffic handling up to standards that the League can be proud of. Progress in this line is bound to be slow at first, but it is sure.

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P R O V I D E N C E, R. I.; 2nd Lt. Carl Emerson, Sig-Res., 1AKN and 2ACD keeping the Net schedules. 2ADO and 2APW kept his schedules with 2SO from 2CVJ and 3AAI have done remarkably good work in the past month: Thirteen A. A. R. S. certificates are issued by the A.R.R.L. to the following officers assigned to us once in a while. 78 until next month.

**OFFICIAL BROADCASTING STATIONS**

Changes and Additions

(Local Standard Time)

1BVR (4:25) noon, Mon. Wed. Sat.: 2APD (87) phone Wed. 9 pm. (76.5) 9.30 pm, (37.5) Thurs. and Sat. 7 pm; 8ZJ (88.84) 2 pm Sun., 7.30 pm Tues. (75.7) 9 pm Thurs.; 8BDD (99) phone 7.30 pm Mon. Wed.: 8RC 10 pm Sat. 1AOX (90) 7.30 and 10.30 pm 1AOX (19) Sun. 2pm.

**BRASS POUNDERS’ LEAGUE**

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Just as was the case in February QST, we find the honor roll of brass-pounders trying to outgrow its QST space. For this reason, we again list the 25 highest stations first, following the same routine with those of all others that qualified by virtue of consistent operating with message totals in excess of the 100 mark. We take a hop ears with 1AOQ just a short distance below. The long list proves that every operator is right on his own for traffic. The operator of every station that rated should be proud of the fact that he is one of such a fine bunch of good ops—and for his part in the general good work.
Traffic Briefs

An APG kept a schedule with SCK for upwards of 16 days at 7pm daily, giving him reports on his father's condition from the hospital where he is receiving treatment. There is no apparent skip effect between Hawaii, Alaska, and Oklahoma City and the schedules have proved practical and reliable under all circumstances. FR!

April 15 to April 30 inclusive 2XAI will send tests from a 4 pm to 6 pm EST to ascertain audibility, fading, and keying throughout the U.S.A. Crystal controlled transmitter working on 43 meters will be used. Further tests will be made. Amateur cooperation is requested. Address all reports to Mr. Gundrum, Manager WAZQXAI, W. E. & M. Go., Newark, N. J.

nc4cu is a detective

A check up of the log sometimes reveals interesting facts about station operators in a naw. This is believed to be the first chess game ever played by amateur radio between two British Dominions.

2XAI has a regular schedule with Radio Station NLAX, Antigua Island, Lesser Antilles, West Indies. NLAX is on 32.5 meters, and uses one UX210 with 80 power supply. The op is an American from Virginia and he unfortunately is a leper his cards are QSL'd by a doctor on the island which we might state for the benefit of those not expert in foreign languages. He knows stuff in amateur radio and can jam with the best of you. A radiogram to 2XAI will bring you the latest dope. To operator "Bill" at NLAX, greetings. OM. We are sure you will find many friends over the air. 73.

March QST (page II and III) listed stations having reliable foreign contact to help in routine important experimental messages to certain countries. The March issue is at the office of *1AEN. France *1AEN. England *1C3N, Germany *1BMS.

S8FM again will begin his Saturday and Sunday tests on 32 meters, 11.50 meters, and 6.25 meters using standard test frequencies.

9CTO just forwarded another radiogram from n81FMB saying that he had made QSO's with 37 U.S. stations in five weeks and that we could count on him for the coming international tests. We already know a bunch of stations in the U. S. and Canada that will be looking for Zan Salvador to add to their list of countries and boost their score, OM.

Don't forget the Midwest Division convention. See you at Ames, Iowa, April 15-16.

So many of the West coast fellows work on "100" exclusively that short distance QSO's are quite an accomplishment. 6HH-BCV recently put in a neat stunt—a bit of unusual routing but good relaying just the same! One morning he had a message for 6HM but of course this station was weak due to the skip distance. As it was known that 6HM had a schedule with Singapore 2SE, the message was given to this station and shortly after it was given back to 6HM and promptly delivered. Next day 6HB worked am22E on schedule and got the answer from 6HM. Some QRS, a total of 9,400 miles—19,000 miles each morning in ten minutes!

Here's a scheme that ought to be more generally adopted. Stations in one locality ought to swap lists of five point schedules and cooperate in handling traffic. Example: SA1E and SA1WT in Washington have schedules with many points several times each week. 3AB schedules stations in Cleveland, O.; Philadelphia, Pa.; and Northumberland, Pa. 2W1T schedules Williamsport, Pa.; Baltimore, Md.; Norfolk, Va.; Trenton, N. J.; and Hartford, Conn. Traffic is swapped by land phone daily. Several stations can cover a great many points in this way without much overlap and wasted effort. If any particular stations get swamped with traffic they help each other out.

The U.S.N.R. gang in the 7th Naval District recently sent greetings from the mayor of Orlando to the mayors of Jacksonville, Tampa, Lakeland, Belle Isle and Fort Myers. Replies were returned by amateur radio from each point in quick time, between ten minutes and one hour being required by the different messages.

n8BE4 (ex n83VH-9CS) is at Nyack, Warren West, Bermuda. He says it's a ham's paradise with wonderful receiving conditions. Licenses are issued of wavelengths of zero to 199 meters, CW, ICW or phone!! The Bermuda Radio Act is ideal as a model for countries where the total number of stations operating is small tho it would be impractical for any part of a continent the size of North America. The principal restriction is to a power of 29 watts but that doesn't mean anything in these days of low-power DX. There are no quiet hours below 126 degrees. The local radio store carries everything up to 60-watters. QST comes once more; you may be sailing for Bermuda?

March QST (page II and III) listed stations having reliable foreign contact to help in routine important experimental messages to certain countries. This month there are the unusual S8FM's. France *1AEN. England *1C3N, Germany *1BMS.

S8FM has a break-in system but often finds it impractical to announce that fact when calling QG as the tuner cannot be worked efficiently during the calling. As soon as he has finished he may run across a station relaying that he can work at once. If he then transmits a long dash saying "ok it", "ok", the station calling will sign immediately and the QSO can start right then perhaps saving several stations a lot of calling and unnecessary QRM if they all use break-in as every good station does these days.

VI

QST FOR APRIL, 1927
DIVISIONAL REPORTS

ATLANTIC DIVISION

Del-MD-D of C — SCM, A. B. Goodall, 3AB —

Delaware: 3ASIS may be heard entirely on 40

meters after 10.30 pm with an extremely good

RAC punch. 3AJH however, has been heard on

50 meters for 30 minutes.

Maryland: 3GJ continues to be active on 40

meters. 3RF reports personal activity, having

worked several foreign stations during the closing

month. SACW is also active for the DX, having worked

an Irish and Italian station within the last four weeks.

6FU has remodeled his transmitter. 3VI is still

giving us phone reports but forgot to tell us his

schedules. 3BVR and 8PS are active but they have a

hard job keeping radio work and the academic work

both balanced.

Dist. of Columbia: 3BWT has held the high traffic

mark for so long that it's taken as a matter of course.

3JO, one of the youngest ops, is doing good work with

forges. 8CAK has increased his phone transmitter over to

3JH's and 8PS are active but they have a hard job

managing the school work limits him to

handling traffic with

Crystal sure boosted

the time you have this, Vfl~

meter band.

Please get your reports in by the 26th.

Traffic: 3BWT 384, 3AB 56, 3CCG 28, 3PS 28,

3NR 23, 3RF 19, 3GCJ 16, 3ASO 15, 3JO 4.

EASTERN PENNSYLVANIA—SCM, H. M.

Walleze, 8BQ—The general run of traffic totals

improved quite a little over the slump of last month.

3RF reports that he may only have a few minutes

to improve your traffic total each month. If you

know of any good stations in this section, who are not

GCS, drop the phone in on our form 1F and try to

line 'em up. Keep 8EU in mind on your skeds. By

the time you have this, we expect to have an

RM working in Phila. to help you fellows out down there.

Please get your reports in by the 26th.

SSM set the pace for Phila. 3CBT swings a mean

key. 3AWT ran up very well, also. 3BIP's 80 m.

work has improved! 3SCMQ is in the will again

without a sked. 8EU churned out loads, as usual,

2000 v, and 50's don't get along for 3AVK.

Look at 3GQ's total! 8DFE sure puts PRR traffic

thru. The sky was at 8ing. 3ASO has changed

his phone transmitter over to 80 meters having just

dropped down from 175. 3NR is on 80 meters nearly

exclusively now as school work limits him to

handling traffic with

his phone transmitter over to

3JH's and 8PS are active but they have a hard job

managing the school work limits him to

handling traffic with

Crystal sure boosted

the time you have this, Vfl~

meter band.

Please get your reports in by the 26th.

Traffic: 3BWT 384, 3AB 56, 3CCG 28, 3PS 28,

3NR 23, 3RF 19, 3GCJ 16, 3ASO 15, 3JO 4.

Traffic: 3BWT 384, 3AB 56, 3CCG 28, 3PS 28,

3NR 23, 3RF 19, 3GCJ 16, 3ASO 15, 3JO 4.

Traffic: 8EU 801, 3CBT 141, 8CMO 134, 3SM 132,

3NP 129, 3PY 5, 3T,W 8, 3BUV 2, 3AlG 1.

Traffic: 8EU 801, 3CBT 141, 8CMO 134, 3SM 132,

3NP 129, 3PY 5, 3T,W 8, 3BUV 2, 3AlG 1.

Traffic: 8EU 801, 3CBT 141, 8CMO 134, 3SM 132,

3NP 129, 3PY 5, 3T,W 8, 3BUV 2, 3AlG 1.

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3NP 129, 3PY 5, 3T,W 8, 3BUV 2, 3AlG 1.

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3NP 129, 3PY 5, 3T,W 8, 3BUV 2, 3AlG 1.

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3NP 129, 3PY 5, 3T,W 8, 3BUV 2, 3AlG 1.

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3NP 129, 3PY 5, 3T,W 8, 3BUV 2, 3AlG 1.

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Traffic: 8EU 801, 3CBT 141, 8CMO 134, 3SM 132,

3NP 129, 3PY 5, 3T,W 8, 3BUV 2, 3AlG 1.
of a move on foot to rid the gang of these pirates and believe rue gang they should be gotten rid of.

Traffic: SGI 243, SXE 222, SCEO 173, 8CWT 126, 8CFR 65, 8ABW 61, 8DQG 39, 8AGO 82, 8BBL 28, 8HRI 26, 8VE 25, 8DVH 22, 8CUP 21, 8BR 19, 8FY 15, 8GK 15, 8DVO 12, 8OK 10, 8SCW 7, 8AYH 4, 8LHY 3, 8SCW 2, 8JYH 2, 8HWW 2, 8TBR 2, 8AYG 2.

SOUTHERN NEW JERSEY—SCM, H. W. Densham, 3ZH-3EZI has come back into the traffic game now. He has a fine total that has ever been turned in from the Jersey antenna. 3CFJ was one of the sufferers but is again on the job at 3XE. 9QW was reported to the SCM, as using phone on 300 meters recently. That's bad business for any one who does not want to lose his QRS.

Traffic: 3ZI 72, 3SJ 29, 3CFG 60, 8UT 36, 8CBX 8, 3CO 6, 8BFW 8, 3EP 8.

CENTRAL DIVISION

OHIO—SCM, H. C. Storeck, 3HYN—Well gang, here's another month and another report and this fellow SCA, ex8BVR again takes the cake for handling messages, 8BAU running a close second, the SCM sends maps of routes which he has shown with his report. 8BAU just received his OWLS appointment from 8AM. 8GZ says A4s says A4s comes in FP at PM EST, 8DGW, a non-ORS, comes third with a good mag. total. 8BNN is using remote control but blew some more grid leaks, 8CBM has a fine total on 30 meters and 3ZH is also using remote control. 8DSY says he can't use his DC note when the wind blows his serial. 8AYS is keeping it down and is on the air 40 for 40. The summer brings players every day with 8DEP at 9 PM. 8DBM just caught up with QSL cards from 20 months back. He 8BFL leaves us again until June. 8CAX has been testing on 20 with XIQ. 8CQU blew his 50 and Kenotrons at the same time. 8ALU sent 26 "real" messages and feels how many would turn out. Two were delivered. 8AVX is on 20 and reports not much traffic. 8DO and 8CFB are combined but 8DO is a mere shadow of his former self. 8SAQ turned DX hood entirely. 8SLW must have YLs and a guilty conscience because he promises to do better this month. 8SAQ is going strong for an ORS. 8AYO will be on with VHF control soon. 8ARW has been teaching code to 8CVX in a new build in Greenville. 8SYL has made his new set work in fine shape. 8CHB now has a mercury arc rectifier. 8SAD has been working long hours on 30 meters of stepping out FB. 8KCI has been on 20 for a while. 8SKM has an antenna working but is plastered with BLC trouble now. 8BBH is with us again with a small portable and turns in a good report. 8BBU is busy with school. 8AHF is having trouble making his H tube perk, 8AZU is QRW school. 8AWX is using a new 50 watt station in his room at Purdue, call 8BGW. 8ASX and other members of the Club have a fine total. He is one of the old timers in Kentucky—SCM, D. A. Howard, 9BQH—traffic. 9CLO at Evansville. 9CVX is in on the PRR tests. 9ACR is trying to get the Indianapolis Radio Club traffic prize. 9ARW lost one of his rectifier tubes so is on with raw AG. 9AXO has an amateur friend who has put the club on 20 and 8DKL has turned DX hood entirely. 8SLW must have YLs and a guilty conscience because he promises to do better this month. 8SAQ is going strong for an ORS. 8AYO will be on with VHF control soon. 8ARW has been teaching code to 8CVX in a new build in Greenville. 8SYL has made his new set work in fine shape. 8CHB now has a mercury arc rectifier. 8SAD has been working long hours on 30 meters of stepping out FB. 8KCI has been on 20 for a while. 8SKM has an antenna working but is plastered with BLC trouble now. 8BBH is with us again with a small portable and turns in a good report. 8BBU is busy with school. 8AHF is having trouble making his H tube perk, 8AZU is QRW school. 8AWX is using a new 50 watt station in his room at Purdue, call 8BGW. 8ASX and other members of the Club have a fine total. He is one of the old timers in Kentucky—SCM, D. A. Howard, 9BQH—traffic. 9CLO at Evansville. 9CVX is in on the PRR tests. 9ACR is trying to get the Indianapolis Radio Club traffic prize. 9ARW lost one of his rectifier tubes so is on with raw AG. 9AXO has an amateur friend who has put the club on 20 and 8DKL has turned DX hood entirely. 8SLW must have YLs and a guilty conscience because he promises to do better this month. 8SAQ is going strong for an ORS. 8AYO will be on with VHF control soon. 8ARW has been teaching code to 8CVX in a new build in Greenville. 8SYL has made his new set work in fine shape. 8CHB now has a mercury arc rectifier. 8SAD has been working long hours on 30 meters of stepping out FB. 8KCI has been on 20 for a while. 8SKM has an antenna working but is plastered with BLC trouble now. 8BBH is with us again with a small portable and turns in a good report. 8BBU is busy with school. 8AHF is having trouble making his H tube perk, 8AZU is QRW school. 8AWX is using a new 50 watt station in his room at Purdue, call 8BGW. 8ASX and other members of the Club have a fine total. He is one of the old timers in
ity just stop off at Lexington and look up the gang.
9E9F is an ORS again. 9BCI and 9WR are new ORSs. 9WR is a newly appointed 0-0 with a twenty-two-buck General Wave-meter so you fellows off the coast have nothing to be ashamed of, as he is running 80 meters. 9BJY has waiting key troubles. 9ABR worked on 2RC on 88 meters. 9AGU is a new call for the area and will be on soon. 9BH in working really hard and has fm-8ST on 39 meters. 9ALM is getting HD reports from the west coast with a couple of 210 tubes. 9AJM is a new call in the work force and is still handling all of his traffic thru reliable schedules. 9EI has been temporarily dismounted—due to a visit from 9CDN. 9ELA and 9BOW are new ORSs and will have schedules soon. 9AWV is a new station in Bowling Green.

Traffic: 9RO 16, 9CWW 90, 9BWW 45, 9BAA 52, 9AGU 23, 9ALM 29, 9WR 28, 9ABR 27, 9ARU 18, 9HP 6, 9GC 2.

WISCONSIN—SCM, C. N. Crapo, 9VD—9EK has schedules with NAJ, 9DTK, 9VD, 9C01, 9DXE, 4DM and 1AMU. 9DLD had his biggest early month so far. 9DJQ has schedules with 9DTK, 9VDX and 9C01. 9C01 has schedules with 9BQG, 9CY, 9EDM, 9DLD, and 9EK. 9FJY is improving his traffic total. 9CPT is having lots of trouble with his battery. 9EDM also has a new March radio map so not much time for news. 9AVG is on the air every day around 8 to 9 am. 9ACR and 9CVR have been on 9AVG's air 9CAV worked Australia twice and was heard in Chile once. 9BWO worked 3 Aussies and 1 N. Z. last month. 9EHP believes good routing of messages will still be encouraged. 4AEU and 9ALA are installing a transmitter at a school and will be on air in a couple of weeks. 9BIB has a new CC set perking and expects to re- transmit soon. 9HEG has been on much this month. 9EEF's transmitter has been increased to a 7½ watter. 9ARE has a 400 watt set which will be in operation now.

Route Manager's Report: More schedules are urged linking Wisconsin hams with the Minn. Route Manager. The 40 meter hams of our Section can best make contacts with Wisconsin as it is about 9000 ft on the 40 band.

Traffic: 9KEK 329, 9DLL 188, 9DLQ 71, 9C01 59, 9FJY 55, 9CPT 54, 9AGD 53, 9REL 53, 9JET 52, 9AVG 50, 9CVR 49, 9BWO 18, 9DCX 40, 9AFZ 19, 9VD 17, 9EEF 13, 9HEM 9, 9AEU 7, 9BIB 4, 9RM 2.

ILLINOIS—SCM, W. E. Schwalter, 9AAW—A message is counted as one message when received and another to another as one message is counted as another message. Please bear this in mind when making out the monthly reports. Although our route manager xeroxer is fixed to the 9Y5X he is still on the job. Write him for schedules. 9AAE has changed from Armour Institute to Crane College. 9AFF reports national guard units coming to work for another ORS appointment. 9AGQ and 9ALK hope to get a schedule in the near future. 9ARU has been on only two days recently. 9BOW handled a big bunch of traffic in April with the new parts for his receiver. 9CCT seems to have shifted from traffic to operating B- battery. 9BKL has QRM from basketball. 9CCT sold his large transmitter and is now working on 40 and 80 meters. 9OK1 picked up a message for a new amateur in Keewatin soon. 9OK1's call is going good. 9DRG is a close second and his mercury arc gives him a nice DC note. 9BOW handled a big bunch of traffic with Illinois. 9BOW handled a big bunch of traffic with Illinois. 9BOW has a 20 meter 170 watt AC set to the convention and learned that it would not work inside the building. 9BOW is an Army-Amateur station in Sioux Falls. 9DRY is a new station in Sioux Falls. 9DRY is a new station in Sioux Falls. 9DRY is a new station in Sioux Falls. 9DRY is a new station in Sioux Falls. 9AKM is now on the air. 9LEK is using a new oscillator set in the meantime. 9BBT seems to be improving his traffic total. 9CCT had a new 80 meter crystal soon but is using a 210 while waiting for a new 80. 9BQG is planning to build a new traffic set which will be in operation as soon as the basement of his home is dry. It was flooded with 3 ft. of water in a recent thaw that covered about everything, including his radio shack.

Traffic: 9ABY 69, 9CWN 50, 9AKM 39, 9CWA 27, 9EHO 24, 9KV 19, 9CTW 19, 9CKI 19, 9HYR 19, 9DST 18, 9BHM 13, 9DWM 11, 9CJS 9, 9DST 8, 9BBD 6. 9BOY 5, 9BFW 4, 9AGG 4, 9ARM 5, 9DZ 5, 9BTK 5, 9DLC 2.

DAKOTA DIVISION

NORTHERN MINNESOTA—SCM, C. L. Barter. 9EGU—9ABY is a new ORS and leads the Section in traffic this month. FB. 9CWN operates regularly at noon and nights and keeps the schedules. 9AKM is another new ORS showing nicely in all ways, and says he will be in the RPL when he gets the new parts for his receiver. 9CWA reports a new 80 meter crystal is coming soon. 9EHO complains that he can get no dependable schedules. 9KV seems to have shifted from traffic to operating B-battery. 9CCTW is building a new low-power 5-meter crystal set which will be in operation as soon as the basement of his home is dry. It was flooded with 3 ft. of water in a recent thaw that covered about everything, including his radio shack.

Traffic: 9ABY 69, 9CWN 50, 9AKM 39, 9CWA 27, 9EHO 24, 9KV 19, 9CTW 19, 9CST 19, 9HYR 19, 9BHM 13, 9CJS 9, 9DST 8, 9BBD 6. 9BOY 5, 9BFW 4, 9AGG 4, 9ARM 5, 9DZ 5, 9BTK 5, 9DLC 2.

SOUTH DAKOTA—SCM, F. J. Beck. 9BWD—The chief item of interest this month was the convention at Huron on Feb. 25 and 26. Over half the amateurs in the state were present. A lampoon put on by the Huron Radio Club. 9XI and Crozier of S. D. State College gave fine talks. Everyone had a fine hammy time. 9DWN won the traffic prize. 9DRG is a close second and his mercury arc gives him a nice DC note. 9BOW handled a big bunch of traffic with Illinois. 9BOW handled a big bunch of traffic with Illinois. 9BOW won the traffic prize. 9DRG is a close second and his mercury arc gives him a nice DC note. 9BOW handled a big bunch of traffic with Illinois. 9BOW handled a big bunch of traffic with Illinois. 9BOW handled a big bunch of traffic with Illinois. 9BOW handled a big bunch of traffic with Illinois.
SOUTHERN MINNESOTA—SCM. D. F. Cottam, 98YA—Not much work except convention work this month. Fellow's, when a convention has the presence of men like Handy, Hebert, Reimartz, Schnell, Hoffman, Prof. Jansky and a lot of others, it going to be a win. Overload worth of prizes to be given away. Come and get yours!

9XI comes forward by working a total of 456 stations on which 153 were foreign. 9DBC is on 20, 40 and 80 for traffic. 9EF0 bought two 204 tubes and blew one the first crack. 9DBW is on all bands, crystal controlled. 9EFK has a UX210 with 4 coil Micsenser and 106 Fr. 9BHZ on 40 and 80 keeps 2 skeds. 9AUU keeps 4 skeds. 9CAJ says, "Haw, haw, I blew my nifty" 9CIX keeps to skeds. 9AIR is on all bands. 9DWO gets good results from this country but can’t QSO foreign. 9DBP keeps one schedule and works some. 9DZA has a new panel-and-transmitter. 9DPE is building a 100 watt set. 9AWM attended the South Dakota convention and reports a very good time. 9DEQ has had the power QRN cleared and is doing much better work. 9COS had a general breakdown; shot his tube, transformer, etc. 9GI has been out of the city during the last month. 9A9U and 9CYA are doing wonders. 9HJIX stuck in traffic thru this Section should address your letters to Polk Perdue in care of WSIX, Spring­field, Tenn.

9BYA-Not much work except convention W(.1rk this month finds us with a route manager, Job. All stations are being supplied with the names of all ORS managers in their vicinity. This is absolutely necessary so that the Inter-borough traffic routes can become a success. The Route Managers are being supplied with the names of all ORS under them and when they request the ORS cooperation and it is not given and the fact is made known to me, I will consider that sufficient breach of the regulations and cooperations to immediately cancel that ORS certificate. The day of having an ORS certificate as a centerpiece for QSL cards is past. Either an ORS is what it seems to be or he isn’t an ORS at all. This warning is final

9DHP still hangs on with report cards. The 2AAN-2ADH combination has 2AXR for its call. 2AXH-2AXW is QRW—it’s the YLs. 2ABD is the silent wonder. 2BZ is QRMed by exams. 2BYH is holing the Europeans to a change. 2B2F is busy after the conventions and is doing much, 5ARB’s latest DX is Italy and France using 2 UX-210 in self-rectifying circuit. 5AFQ has a bug on battery plate supply. 5AUB has a new rectifier and says his two H tubes work too much. 5ARB’s latest DX is Italy and France using 2 UX-210 in self-rectifying circuit. 5AFQ has a regular transmitter on 30 meters and 5AUB works on the 80 meter band during daylight and the 80 meter band at night. 5API is on the 40 band and has a regular schedule with Memphis. 5KR sent his report to 5BQ via the radio telephone to the Technical Manager who has been laid up with a bad foot. 5ASG has installed a new rectifier and says his two H tubes work fine. 5APK is trying to build again.

Traffic: 5APK 82, 5KR 85, 5AGS 23, 5QQ 16, 5ANP 36, 5A9U 9, 5API 18, 5A9B 17, 5A9U 6.

HUDSON DIVISION

EASTERN NEW YORK—SCM. Earle Pencox, 2ADH—QSL leads by three wavelengths. 2ANV is second messenger and now boasts a USA districts certificate as a centerpiece for QSL cards. The 2AAN-2ADH combination has 2AXR for its call. 2AXH-2AXW is QRW—it’s the YLs. 2ABD is the silent wonder. 2BZ is QRMed by exams. 2BYH is holing the Europeans to a change. 2B2F is busy after the conventions and is doing much, 5ARB’s latest DX is Italy and France using 2 UX-210 in self-rectifying circuit. 5AFQ has a bug on battery plate supply. 5AUB has a new rectifier and says his two H tubes work too much. 5ARB’s latest DX is Italy and France using 2 UX-210 in self-rectifying circuit. 5AFQ has a regular transmitter on 30 meters and 5AUB works on the 80 meter band during daylight and the 80 meter band at night. 5API is on the 40 band and has a regular schedule with Memphis. 5KR sent his report to 5BQ via the radio telephone to the Technical Manager who has been laid up with a bad foot. 5ASG has installed a new rectifier and says his two H tubes work fine. 5APK is trying to build again.

Traffic: 5APK 82, 5KR 85, 5AGS 23, 5QQ 16, 5ANP 36, 5A9U 9, 5API 18, 5A9B 17, 5A9U 6.
IOWA, S.C.M., A. W. Kruse, 9BKV—February proved to be a busy month for Iowa and the SCM certainly appreciates your fine cooperation, OMs. The RM reports excellent traffic lanes throughout the Section. 9BKV has enough schedules to keep him busy all night. ZCZC, the RM, has a plug-in receiver working FB. 9EQJ has a big stack of messages leaning toward the BPL. 9BNW works DX on 40 and CW on 80. 9CQG is off of a job and has lots of time to pound brass. 9DLR is going strong and reports 20 meters FB for traffic both day and night. 9BNW burned out of midnight about the BP again. 9KFS is hammering on brass at 9DVG, Iowa Nat'l Guard station at Cedar Rapids. 9OGV has applied for ORS. 9DAU continues hisconsistent ion on 40. 9AMG installed an MG and now gets fine reports on 40. 9BES blew another H tube. 9DVV, another newcomer, is looking for someone to work on QSL. 9CQG is changing his transmitter for remote control. 9DSL doesn't get much time to pound brass. 9DEA had QRM from power leaks and couldn't work any schedules. 9CS kept schedules on 9LG and 9OG on 40. Traffic: 9BKV 400, 9CZC 350, 9EQJ 203, 9BNW 176, 9GGY 161, 9DLR 124, 9DGV 121, 9DEA 10, 9CS 8.

NEW ENGLAND DIVISION

Connecticut—S.C.M., H. E. Nichols, 1BM—Conditions generally thwart the state are undergoing a healthy increase both as to traffic handling and enthusiasm. We are now approaching our annual E. Div. Convention where your SCM hopes to meet all of the boys hand to hand. Our slogan will be “On to Hartford.”

Traffic: 9DXY 355, 9AL 75, 9CJT 2, 9BEW 2, 9AW 8, 9DFR 6, 9BYJ 1, 9BEW 8, 9ADS 1, 9DI 64, 9BOQ 2, 9DAC 100, 9BO 4, 9BR 213, 9BQ 1.

QST FOR APRIL, 1927
IADW with his many schedules is surely covering his section of our state with wonderful success. This used to be considered a poor spot for radio but IADW has proved them wrong. Now he has a card from Czecho-Slovakia reporting his sigs. IATG, a new ORS, handled a msg for a ship operator of that country. The 2 bands he used on his trip were 15 and 20 meter CW and 40 meter SSB. The color of his hammer and with this noted flavor is still hitting the high spots by working two French and one English station in the early afternoon.

We are happy to report that 1FD is still under the weather and unable to operate. Our sincerest wishes, OM, that you will be back with us again soon. 1BQH took traffic for all points at the New Haven Fire Prevention Exposition. 1CTI reports working schedule and sends in a very nice total.

Traffic: 1AWD 166, 1BJK 138, 1BMG 123, 1BHM 128, 1ICT 105, 1BYM 150, 1BQH 50, 1KP 62, 1AOX 40, 1BEZ 36, 1ATG 26, 1CKP 19, 1BG 11. 1ACO 12, 1LZ 6, 1IV 4, 1AVX 4, 1ITD 6, 1IM 10, 1BKG 48, 1BHW 37.

EASTERN MASSACHUSETTS—SCM, R. S. Briggs, 1BV—This month brought an increase of traffic over the previous month and there are promising signs of further increase. The SCM, is arranging an efficient traffic net and asks all to please cooperate.

Traffic: 1GMX 48, 1ABW 36, 1AKG 35, 1APK 11, 1BEZ 24, 1BKG 48. 1BHW 53.

NEW HAMPSHIRE—SCM, V. W. Hodge, 1ATJ—The RM, 10C-1BF, leads us all with a total of 1158. He didn't originate it all, either and average six months. 1BFZ reports a quite a run this month and is doing good DX. 1XJ pounded out 211 and worked Bermuda on 76. 1AER kept the Boston Wire Chief in touch with his local Wire Chief for over 3 hours during the recent blizzard when the wires were down. 1ASA was at the other end. 1AER helped on this, too. FB, OM, 1BQH is having a lot of trouble with its receiver. 1ASR is again in action and is a prospect for ORS. 1BQH has worked 72 different foreigners since Jan. 25th. 1IN has increased his position to 50 watts with more reliable operation. 1AEF, a good ORS prospect, had a big total. The SCM took a vacation and QSY'd to 20 meters and found plenty of DX down there. Hawaiian DX is a report of 1BQH. Let each of us know of any schedules to gain the BPL. There must be a report of R5. 1IN has been doing a good job in the Branch office in North Carolina by schedules with 4NH.

Traffic: 1LO 695, 1AOQ 767, 1AEF 378, 1ATJ 351, 1IP 211, 1AER 97. 1YB 15, 1AVL 51, 1AQS 44, 1IQ 25.

MAINE—SCM, Fred Best, 1BHG—To keep our Maine Section up with the head-liners, where she belongs, it is necessary that more of us become members of the BPL. It is easy, fellows. If you can't be on more than once a week, it is possible by means of schedules to gain the BPL. There is no reason why any ORS not being in the BPL every month. Let's see some action fellows.

Traffic: 1IQ 1188, 1AOQ 767, 1AEF 378, 1ATJ 351, 1IP 211, 1AER 97. 1YB 15, 1AVL 51, 1AQS 44, 1IQ 25.

RHODE ISLAND—SCM, D. B. Fancher, 1BV—From the looks of the traffic reports, this month, too many of our gang are working on 40 meters where there are plenty of DX. Now let's make some sets that can QSY up to "90" and more interest in the FB traffic work that's going on up there. Starting the first of May, all Rhode Island ORS must handle at least 10 messages per month or have certificates canceled. We're going to put this Section on the map and beat some of the bigger ones. Remember, fellows, the FIRST org, line will be sent me on the 26th of May must show at least 10 messages or a good excuse for not handling them.

Traffic: 1IQ 1092, 1BEZ 36, 1AMU 17, 1API 11, 1BIW 9, 1EEI 7, 1AEEI 6, 1AWE 5, 1DKB 2, 1IMO 2, 1AI 21.

Vermont—SCM, C. T. Kerr, 1YAI—We must have it left so we work off the traffic honor again this month. He has just added ORS and CRM and expects all the fellows to hang with him as things are now going to be worked. Help him all you can. 1BQF has just applied for an ORS. 1TJ is off the air indefinitely. 1PN is showing signs of life. 1BJB is on little now. 1BWB has blown up, willed, and is doing good in Canada. 1FR and 1BDX are very busy with their BCL business. 1AJG and 1AC are both on 35 meters about every other night.

Traffic: 1IT 43, 1BEB 2, 1AJS 35.
1AD is back from his trip to the Orient. He repaired two sets from Honolulu. The trouble is said to be due to bad rectifier elements. 7ACN, 7ACK and 7HK are Nampa for the time being. 7BY handled two WU messages when he was there, and 7ACN reports working with a pair of VT14's. He has a 210 now. Norquest says he will be back on the air soon. 710 is back on the air with a new rectifier for his 250-watt Hartley. He reports working fine due to transformer breakdown but is now perking along. He has been busy all month keeping various schedules and is on the air consistently. 7AJK is on most every night after 10:30 on 80. 1AKM and 1AKZ are on 20 meters. 1AMZ got a new set on 77 on his vacation. 1APL says he has been using new schedules. 1BD, 1AAS and 1COS are working DX. 1AZW relayed an important death message nearly direct in about 8 hrs. 1BKQ are on consistently now. 1EO is on daily from 6 to 7 on 80 meters. 1GR kept two schedules. 1ZX is more or lessactive according to the Press of the Clark Radio Club.

Traffic: 7ACG 41, 1ACL 74, 1AGA 141, 1AJK 18, 1AJM 9, 1AKZ 7, 1AMZ 27, 1APL 152, 1ASU 6, 1AUO 11, 1AWZ 23, 1AW 43, 1BKE 48, 1BD 4, 1EO 20, 1GR 2, 1FPY 4, 1ZX 6.

NORTHERN DIVISION

IAD—SCM. Henry H. Fletcher, 7ST—7DF is doing real work these days. 7QC is trying to rebuild his set. 7ABB has a new rectifier and is out for DX. 7GW is the new OO for Idaho. 7QA is working on the IR and he carries his portable transmitter with him. 7AGK and 7HK are back on the air with 210a. 7TO is back on the air with a phone. 7YA has been rebuilt and seems to be getting out fine. 7CQ is on with a phone and 7CW is the port of call of 72N. 7TJ is on occasionally. 7CW has been a 210 now. Norquest says he will be back on the air soon. 7TQ is back from SL and is perking along. 7ABB is getting in line for ORS and will be with the gang soon. 710 is back on the air with a new rectifier and is doing fine. 7CQ is on the air now and pounding the brass once more. 7ITU is putting in a "50" for real traffic work. There will be seven new ORS as soon as the schedules are completed. Other new stations are hereby cancelled—that is, all ORS certificates with the N. S. prefix or the large numbers are no good. Representative BPL has cleared all ORS numbers with new ORS numbers with the SCM.

Chief RM McLafferty and his assistants are to be complimented this month on the fine report sent in. They have a good scheme kept in operation by his RMS—he forwards them an RM bulletin which is fine stuff.

6AYC sustained a broken arm and is temporarily paralyzed as far as station work is concerned. He has a second op. 6CTX works East Coast daylight on 20 meters. 6APA uses Zepelin antenna and is changing all of East Coast stations to that system. 6BZU says his set works as good on 80 as on 40. 6BBM has a 50 watt going now and works better than ever before. 6BWS 87, 6CDU 87, 6BJI 85, 6GDCQ 21, 6BWH 42, 6BBJ 16, 6AK 4, 6BBY 46, 6BZM 2, 6ARK 2, 6AZM 2, 6AXM 2, 6BBJ 2, 6AXU 50, 6ACT 50.

SACRAMENTO VALLEY—SCM, C. F. Mason—The report this month was received via Western Union which proves than an SCM can report if he really wants to.

Traffic: 6AYC 627, 6RJ 160, 6CTX 35, 6APA 21, 6CB 18, 6GDU 17, 6BHM 16, 6AMI 11, 6BKC 5, 6BBZ 2, 6AFT 50.

ARIZONA—SCM. D. B. Lamb, 6AN0—6AZM reports that his dynamotor is shot and that he will be off the air indefinitely. 6CDU is off for a little while making a super-regenerative rectifier. 6DCQ seems to be having great success with his fone. 6BJI has been using fone with 25 cycle supply and is getting out good. 6BWS, RM for western Ariz., is working the DX now. 6AJF is also looking for fone. 6FZ was heard pounding the brass recently. 6BZU uses a sideswiper and he can use it, too. 6APA is the op at 6YB most of the time. They still have the DQ but they are planning on making a few changes in the rectifier. 6CUW uses fone and has a nice modulation. 6CAP is another ham that is on occasion. 6AN0 does most of his work in daytime as he has QRM from theater work nights. Some of you fellows better come out of it and work because the SCM is no mind reader. Let's hear from a few of you.

Traffic: 6BWS 27, 6BDU 37, 6BJI 85, 6DCQ 21, 6FR 45, 6AZM 2, 6AN0 50.

HAWAII—SCM. John A. Lucas, 6BDL—This report to QST by radio Fort Shafter oh 6BDL via am-6LH: The air between Hawaii and the West Coast is cleared for better DX stations on the mainland can be heard and worked during the entire time. The traffic totals show that more stations are needed on the job, tho. A number of new stations reported. There will be seven new ORS as soon as all requirements are completed. Other new stations

QST FOR APRIL, 1927

PACIFIC DIVISION

EAST BAY SECTION—P. W. Dann, SCM, 6ZX—The report this month was not so good as only eleven reported against about nineteen for last month. All old ORS certificates are hereby cancelled—that is, all ORS certificates with the N. S. prefix or the large numbers are no good—those who have been assigned EB numbers are OK as long as you report but from now on three months a notification by the SCM. If you fellows with old numbers wish to have a new ORS and to continue in the good old game, write the SCM.

Chief RM McLafferty and his assistants are to be complimented this month on the fine report sent in. They have a good scheme kept in operation by his RMS—he forwards them an RM bulletin which is fine stuff.

6AYC sustained a broken arm and is temporarily paralyzed as far as station work is concerned. He has a second op. 6CTX works East Coast daylight on 20 meters. 6APA uses Zepelin antenna and is changing all of East Coast stations to that system. 6BZU says his set works as good on 80 as on 40. 6BBM has a 50 watt going now and works better than ever before.

6BWS 87, 6CDU 87, 6BJI 85, 6GDCQ 21, 6BWH 42, 6BBJ 16, 6AK 4, 6BBY 46, 6BZM 2, 6ARK 2, 6AXM 2, 6BBJ 2, 6AXU 50, 6ACT 50.

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QST FOR APRIL, 1927

XIII
From Burbank comes a good report from 6AIO.

Traffic: 6BYV 19, 6ANQ 1, 6APG 25, 6LCLK 12, 6AQW 55, 6LHT 16, 6AKS 37, 6BAV 16, 6AKW 7, 6COLL 16, 6HT 44, 6CQO 32, 6CMT 31, 6FR 35, 6BDG 85, 6DQO 2, 6DOO 81, 6DWE 5, 6DZM 4, 6DXU 18, 6BUX 9, 6BUK 11, 6AIO 10, 6BV 6, 6CTY 4, 6AGG 117, 6BJS 125, 6BX 270, 6ALZ 313, 6BHJ 407, 6NADA ~CM, 6CM, 6UO ~Traffic: 6ABM 115, 6CDS 72, 6UO 16, 6CGH 9.

SAN DIEGO—SCM. G. A. Sears, 6BQ—This is the first report from the new San Diego Section. 6BXI feeds in messages handled closely followed by 6DAU and 6DDP. 6BQ reports, however, that he is handling traffic on 20. A message from Headquarters was delayed to 3 Z, in 2 hours and 15 minutes. 6BQ got it on 20 meters in 2 hours and 15 minutes after it started. FR, OMS, 6LH is on 20 and at night. 6DG is bothered by power leak. 6CTP sticks to his 20-A with B bats. YLs keep 6DBZ and 6BAS in line. 6BQ is again in full activity for the C-cs going now. 6AKZ is not on account of business. 6MB is experimenting with phone.

Traffic: 6BXI 135, about 132, 6BDG 3, 6LH 4, 6CCG 15, 6BGQ 29, 6BF 9, 6CTP 6, 6SB 6, 6HAS 2.

SAN FRANCISCO—SCM. G. W. Lewis, 6BZ—ARW still continues to lead the Section for traffic. 6CCR has been doing very consistent work on 20 meters. 6CHK is now located in San Francisco and signs 6PN—the present QRA is 605 Lemworth St., Apt. 410, 6DAW and 6EH have a code practice schedule for beginners, 6DAW for traffic. 6GW has a school to originate traffic. 6GW has his tuned plate and grid perking on 80 meters. 6VH has been working on the 20-Meter bug and likes it. He is now doing good work on 20 meters and covering about everything that is worth QSOing.

Traffic: 6GW 177, 6CCR 50, 6VR 42, 6GW 55, 6DAW 19, 6SW 19, 6CHE 15, 6PN 9, 6AEH 4, 6COA 4.

ROANOKE DIVISION

VIRGINIA—SCM. J. F. Wohlford, 3CA—3KU is on 41.5 meters now using tuned plate and grid circuit. 3TN works ex-6GM and 6IOV on a 210. 3KU is operating from Leavenworth St., Apt. 805, 3WM is putting in a crystal controlled station, sent a message to 6FR on Sat. night. 3NL is not on account of business but has now power at his own shack. 3RS will be ready to work on 40 and 80 soon. 3A1TL, 6CTP, 6GHZ, 6JZB, 6JZC, 6JZD, 6JZE and 6JZF, 6JZG are working foreign DX. 3ZB and 3CA are building tax control sets now. 3HZD is QRW.

Traffic: 3CLK 108, 3KU 31, 3SAI 2, 3BSG 5, 3CMQ 23, 3CMQ 8, 3VW 7, 3ZP 2.

NORTH CAROLINA—SCM. R. S. Morris, 4JR—Send in your report promptly on the 20th whether you are an ORS, belong to the ARRL or what. We want YOUR report. We have a position as Official ORS kept for someone. 4JR is on 20 meters and covering about everything that is worth QSOing. 4JR reports he is only operating one schedule with 3SN, the Army Station. 3HN is on regularly.

3CH is a new station heard at times. 3NM is just on the air and asking for traffic for Charlotteville University and 3AT. 3NM has a new 210 transmitter with old B batteries, a local radio store. Hi. 3GZ is putting in a MO-PA circuit. 3BM is back from a Florida trip and is busy as a bee. 3KG operates the set at 1800 S. Leavenworth St., Apt. 805, 3NTL is on 20 for good he has 210 meters and covering about everything that is worth QSOing. 3NB reports he is on regular duty.

4CH is a new station heard at times. 4NH is on 20 meters and covering about everything that is worth QSOing. 4JR has been working on the 20-Meter bug and likes it. He is now doing good work on 20 meters and covering about everything that is worth QSOing. 4JR reports he is only operating one schedule with 3SN, the Army Station. 4HN is on regularly.

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4BY has QRM from the college faculty. 4SJ is QRV but manages to knock off a few with a lone 2000.

Traffic: 4MI 123, 4RY 87, 4DB 80, 4JR 55, 4PS 36, 4BX 30, 4OH 22, 4JS 25, 4NH 18, 4UV 11, 4TS 7, 4RF 6.

WEST VIRGINIA-SCM, C. S. Hoffman, Jr., 5BDX-5WK on 1 kW, 600 cycle crystal-controlled set. 5BDX uses a Hertz and is fixing up a 50 watt set. 5DBM is on at 28X. 5CKK sends in a good report; has been QRV on account of fair day running 5SDK worked 1CHK and ec-2CC.

5BTD visited Wheeling. 5DOH is putting in a new set. 5CDV is planning to go to school. 5BSU is putting in a lot of listening ambition and is still required to cooperate with ex-8AMD, RM of that Section. 5ALG reports via 8VZ. 5MV makes another swing down 60. 5AVM is working on 6-6CXY. 5DUM has schedules with 6L1DLU and 6AD. 5BJS worked WPA.

Traffic: 5SY 628, 5ECK 45, 5AEC 33, 5HUB 27, 5NH 13, 5DCM 23, 5AUD 7, 5BRU 6.

ROCKY MOUNTAIN DIVISION

COLORADO-SCM, C. A. Stedman, 9GCA-9GAA is holding down his schedules in fine shape with a good pair of 9GARs. 9BGN must go good race and with the help of several schedules piled up in a fine total. 9GDJ is giving a new type of aerial a try and doing nice work. He reports good soon. 50A is going strong in Auburn. 5FI is on the air with good reports good work. 5ID was QSO Europe 14 times in one week. 4TR is building a new rectifier out of pot bottles. 4DM is doing some 5-meter work. 4LG says two more good 60's have gone in recently. 4BL has been admitted to WAC. 4LK sends in a fine report for his first month as an OBS. 4VS is active again and also using a new one. 4YJ has been trying one and found it OK.

Traffic: 4CK 26, 4OB 16, 4TK 16, 4DK 79, 4TR 112, 4DM 204, 4LQ 35, 4BL 16, 4LX 113, 4US 30, 4QY 22, 4AL-SC-PB-SCM, H. L. Reid, KJK. South Carolina. A new station in the state. 4BNDU is putting in new set. HHTX has schedules with 7CPI this month. 4SO is the only station in South Carolina. 4WVS is putting in new set. Huntington amateurs are reporting from Dist. 2 this month. However, much work was done.

Traffic: 4WVS 828, 5ECF 45, 5ACZ 33, 5HUB 27, 5NH 13, 5DCM 23, 5AUD 7, 5BRU 6.

WEST GULF DIVISION

OKLAHOMA-SCM, K. M. Ehret, 5APG-5AQY has too many YLs and school work to keep any schedules. 5ADO is too QRV for traffic on the amateur band. 5ANL had lots of QRM on 80 last night. 5AVY recently reported QRM on 20 from his new transmitter working on 40 as soon as he gets time to put up an antenna. 5QL is ordering a 2500 volt MG to massage the plate of his 250 watt set. It knocked off some good DX with his 50 watt MO-PA set. 5ARD is still hard at it with a 7½ and Kenotrons. 5AKA had an argument with the power company over the voltage drop caused by his MG. 5AVV traded his transmitter to 5KD and is planning a new MO-PA to take its place. 5SW swings a nasty sideswiper whenever he can get time from building superhet. 5BDV knocks 'em cold with his MO-PA on a Zepplin, antena.

5AMA's 30 watter went west after working much DX and is replaced with a Wonderful 60 watt MO-PA set. 5BQ0 is getting his first report in years. Glad to hear from you, OM. 4TS has schedules with 5STV this month.

Traffic: 5JY 19, 5AV 29, 5YJ 41, 5AFS 7, 5NL 4, 5FP 29, 5DF 37, 5DL 77, 5OA 106.

FLORIDA-SCM, W. F. Grogan, 4QY-4CK is keeping schedules. 4OB is doing good work with rare keeps. 5ACZ is working fine and found it OK.

Traffic: 4CK 26, 4OB 16, 4TK 16, 4DK 79, 4TR 112, 4DM 204, 4LQ 35, 4BL 16, 4LX 113, 4US 30, 4QY 22, 4AL-SC-PB-SCM, H. L. Reid, KJK. South Carolina. A new station in the state. 4WVS is putting in new set. Huntington amateurs are reporting from Dist. 2 this month. However, much work was done.

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SOUTHEASTERN DIVISION

ALABAMA-SCM, A. D. Trumm, 5AJP—Well, fellows, 'ama about the reports this month? Coming in mighty slow.

5AJP and 5AK have been away every week-end when QRM from school permits. 5NL is back on the air now and getting along fine. 5ALD is on the air now. 5AKH was just on the air now. 5ALD knocked out too much and is working on a new set. 5AKH has put in a 500-watt crystal-controlled set. 5BBO has been doing most of his brash pounding in conjunction with 5JY at 5JY. 5AFS has been heard very little of lately but his work is now working fine. 5JY now has a 50 watt ham set and will be on soon. 5BK has gone kerrug. 5AV is making things hop around Selma and is now working with 2 210A's. 5ELX will be on for 20 meters this month. 5AOA is working fine now at Gaden. 5DF is in the light again working like a Trojan. 5DL and 5AC have been having one grand time at Mardi Gras this month. However, much work was done.

Traffic: 5JY 19, 5AV 29, 5YJ 41, 5AFS 7, 5NL 4, 5FP 29, 5DF 37, 5DL 77, 5OA 106.

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Traffic: 4WVS 828, 5ECF 45, 5ACZ 33, 5HUB 27, 5NH 13, 5DCM 23, 5AUD 7, 5BRU 6.

SOUTHERN TEXAS-SCM, W. B. Forrest, Jr., 5AJT-5ACL has a schedule with 50-ASB on 20 meters. 5SP is on 38 MHz and is planning to go 40 meters. 5BQ0 is working fine with 50-PA set. 5ANK has schedules with 5STV this month.

Traffic: 5AKH 60, 5VU 47, 5SSH 7, 5WW 2, 5JP 2, 5NW-5MZ 4.

SOUTHERN TEXAS-SCM, E. A. Sahm, 5VK-5HW has been appointed Route Manager. Get behind him, fellows, and use your traffic. 5AKH is a new San Antonio ham. Welcome, OM. 5HS is on daily from 6 to 7 on Sundays. 5HE is doing his usual good work. Traffic handled by hams always goes 5WP is on the air with two fifty-watt sets. 5RR formerly 5MR has finally gotten his set up and is ready to go. 5AVI-5ARF have changed to a vertical Hertz and are working on 20 meters. 5BQ0 uses a real 500-watt crystal-controlled set. 5FK does a great deal of relaying for college boys.

Traffic: 5JY 19, 5AV 29, 5YJ 41, 5AFS 7, 5NL 4, 5FP 29, 5DF 37, 5DL 77, 5OA 106.

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CANADA

MARITIME DIVISION

NOVA SCOTIA—SCM, W. C. Barrolet, 1DD—1DA is Cape Breton has been working all Europe with a UX-210. 1DM and 1AR are changing over to low power and using UX-210a, 1DF is getting a new installation this month. 1DD had the pleasure of working a new Maritime station 1AP. 1CX is suffering from a frost collector. 1H is also suffering from a frost collector. 1IAE is going strong. 1DJ is the only Halifax station on the air these days. 1DQ has been working a low frequency repeater in the early hours of the morning.

Traffic: 10X 8, 1DD 21, 1AE 5.

PRINCE EDWARD ISLAND—SCM, W. H. Hyndman, 1BEZ—1CO is doing good work on the 20 meter band. 1AP, the new station, is progressing well.

Traffic: 1CO 4, 1BEZ 1.

NEW BRUNSWICK—SCM, T. B. Lacey, 1EI—Another month has gone with renewed activity in N. B. 1IAI has just returned from his honeymoon in the N. E. States and is receiving the good wishes of the gang. (Why not teach her the code, OM?)

Northern Dist.: 3BS has been out on 40 meters. 3A V has been playing with crystals. His brother is on a Mediterranean cruise on the Empress of France. 3AW has a new station on 40 with a "fiver" but has lots of pop and will be a good ORS soon. 3AAL is on 80 meters. 3AIW is on 40 meters but for some unknown reason fails to report. 3CJ is a newcomer who is doing good work on schedule. 9AL has been working 51.125 in by the 20th of each month.

Traffic: 3AL 103, 3KT 85, 3HP 46, 3EL 40, 3AG 38, 3NI 81, 3AL 28, 3BL 27, 3FC 25, 3FU 16, 3CS 14, 3TM 12, 3GR 11, 3CS 8, 3AFP 7, 3JT 7, 3DC 2, 3LW 2, 3IA 2, 3CR

VANALTA DIVISION

ALBERTA—SCM, A. H. Asmusen, 4GT—The SCM was in Edmonton last week and was surprised to see such ham activity. 4HM has a fine layout of equipment but works very well and the using an H tube and is on consistently, with 4HP as second op. 4AH has two H tubes in crystal control on 50 MHz but has only one H tube working. 4DG is now stepping out FB and expects some real DX reports from all the igloo hut gang. 4EL and 4AN are reported on, soon. 4QO has not seen his emitter for nearly a month on account of scarlet fever at home so the OW has been at the key with no assistance and worked the first real DX from that station. 4AL was QSO 4RD and got an R4 report. 4QO and 4AF can QSY to 20, 40 & 80 and they both were QSO Hawaii. This section will soon be on 30 meters. Watch for QSO all stations in his district Sun. afternoons.

Traffic: 4DG 8, 4AP 7, 410 18, 4DG 18, 4GT 6, 4AF 4, 4AO 4, 4AN 3.

BRITISH COLUMBIA—SCM, E. E. Brooks, 5BM—Amateur activities are very brisk in and around Victoria this month and quite a number of new stations will soon be on the air. The Victoria Radio Club reports their ham class is doing fine. 5AX has a Zep antenna working and reports fine results. 5GW is building a power transformer. 5A1 still works OA and DX stations with 25 watts. 5AV keeps schedules with 5AC and is QSR Nc-408S any night. 5CT hears lots of DX but still is unable to work anyone. 5AM finds 80 meters has better operating conditions. 5DK puts in 25 signs from Vancouver with a UX-170 and 200 volts B batteries. 5GO and 5GP are trying out 20 meters and report Success.

Traffic: 5AJ 54, 5GO 24, 5AV 14, 5CT 2, 5AM 1.

QUEBEC DIVISION

QUEBEC—SCM, Alex Reid, 3BE—Last month’s hamfest was well attended. Fred’s latest wavemeter and other instruments were the envy of the gang. 2EQ made his last appearance at a hamfest and certainly enjoyed himself. 2EQ is moving to new QRA’s and will be off the air for a few weeks. 2BG has a Sunday schedule with nc-8AZS. 2DN reports he is on the air every night for 42 meters, 2BO and 2AV are both getting out well. 2AV turned into a traffic bastion. 2BM has rebuilt it and is getting much better results. 2DO is sure putting a nice DC note out. 2AU has his crystal set going FB now. UX-2AN is rebuilding and will block on the air about mid-May.

Traffic: 2AL 18, 2DN 8, 2AV 10, 2BG 10, 2BE 9, 2DO 6, 2AU 12, 2AK 5.

ONTARIO DIVISION

ONTARIO—SCM, W. Y. Sloan, 9BJ—Eastern Dist.: 3JL again makes the BPL. 3KF is running a 500 volt a.m.祝福可能 and was heard enjoying a good rag-chew Wednesday nights on 326.

Southern Dist.: 3CS has a streak of hard luck: First, during a heavy windstorm, his mast attempted to do the "black bottom" but collapsed the efforts of all. After a temporary mast the 50 watt departed from this life. 3CS now has a new mast and a WE 250 watt. 3FM is back on 80 meters, 3CM is working from the embarrassing attentions of the B. C. Lo.

Northern Dist.: 3BX is getting out on 40 meters and reports 3BG will be with us again soon. 3DG is on the 80 meter band with the bit. 3DI is back again with a vengeance and working eg-6HS on 20 meters. 3HP is on regularly when his work permits.

Central Dist.: The fellows in this District are apparently down to business. 3BZ has traffic schedules on 80 meters. Que is quite busy building a new set, but has been on and handled some traffic. 3CT has been idle this month but is all peped up and will be on for sure next month. 3AW has a new set of 300 watts and temporarily in favor of 4L4. 3BT has a new 203A and an H tube. 3CR blew one "fiver" but was on the air immediately with another one. 3CM reports he is a "fiver" and a "peanut" went west this month at his station. 3BL has been doing very good work with about 25 watts in a new station. 3EA has also done very good work on schedule. 9AL has been playing with crystals. His brother is on a Mediterranean cruise on the Empress of France. 2A is a shortwave receiver. 3AJ has had the misfortune to burn out the bearings on his MG. MXER but the signs are getting out just the same. 3BR has a new set of 400 watts with a big "fiver", but is still using the "fiver" and gets out very well. 3DN is free from most of his worries now and should make a good ORS. 9DJ is active on 14 meter and is doing very good work after midnight on nights when QSN is not so bad. 9AM spends such time as is available on the 20 meter band. 3MV has been on regularly but despite warnings, has been very much off-the-waves. 3N is heard on 520 occasionally and also on 80 but for some unknown reason fails to report. 3CJ is a newcomer who is doing well. 3EM is still QSO when he can and will be a good ORS soon. 9AG is on 89 meters and also on 525. 3CD is heard on occasion.

Traffic: 3JT 103, 3KT 86, 3HP 46, 3EL 40, 3AG 38, 3NI 81, 3AL 28, 3BL 27, 3FC 25, 3FU 16, 3CO 14, 3BR 14, 3BG 11, 3CS 8, 3AFP 7, 3JT 7, 3DC 2, 3LW 2, 3IA 2, 3CR

PRAIRIE DIVISION

MANITOBA—SCM, F. E. Rutland, 4DF—Activity this month has been very brisk with several new DX records for this Section being hung up. Traffic has been reaching new records, with DX and ORS being handled on 40 meters, while DX has been accomplished on both 40 and 20 meters. Four new ORS have been appointed. Three new comers have opened up while as many more are newcomers have opened up while as many more are

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QST FOR APRIL, 1927

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