QST

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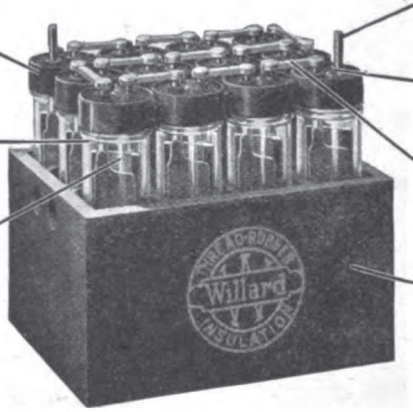

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QST

A Magazine Devoted Exclusively to the Radio Amateur

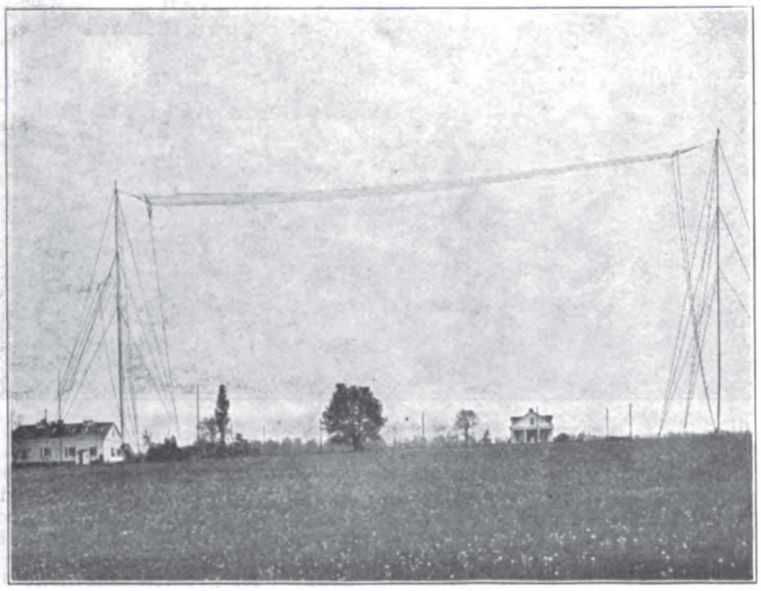
3ZO---An Amateur Paradise

RADIATES there a ham with soul so dead who never to himself hath said—"Gee, if only I had the jack wouldn't I have a bird of a station!"

Such a station is that of Mr. Horace A. Beale, Jr., of Parkesburg, Pa., a director in our A.R.R.L. In fact Mr. Beale has three of them, 3ZO, 3XW and 3OI. This story, however, concerns itself chiefly with the main station, 3ZO. It almost ruins us financially to pay for cuts of 1% of the good photographs available of 3ZO alone, so 3XW and 3OI are reserved for a future occasion.

Say, fellow amateurs, can you imagine a station with a minature Bureau of Standards for a "shack", a half dozen or so good masts, four or five operating rooms, ten receivers and twenty transmitters, the latter running everywhere from single 5-watters up to sets using four 250-watt tubes? Say, how would you like to be turned loose in such a place for a week or so!

Just such a place Mr. Beale has built for himself at 3ZO. It is impossible to do this station justice in our limited space, and the photographs and descriptions herein can only hope to cover the high-lights of this remarkable station.



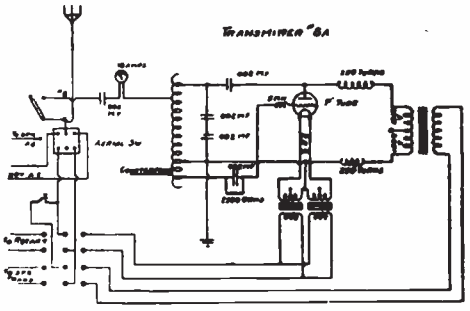
The Aerial System at 3ZO

First off, 3ZO has for its quarters the entire second story of a frame building, especially outfitted for the purpose. There is a main office and operating room, several small sound-proof operating rooms, a complete work-shop, a store room, a sleeping room, a kitchenette—everything. All the walls are lined with sheet zinc for shielding. An elaborate plug and jack system makes

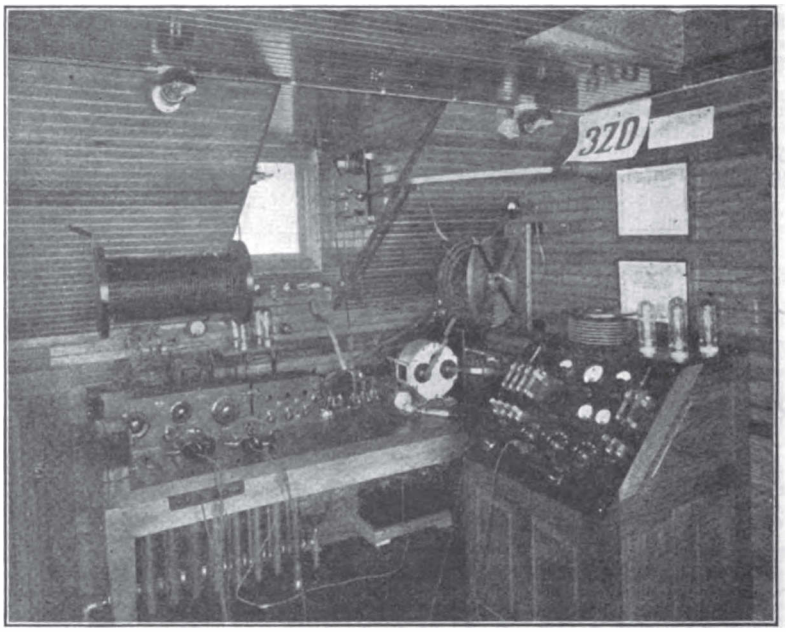
it possible to plug in on any receiving booth from any other receiving station, and enables the owner to be plugged in anywhere from his desk chair.

Mr. Beale has surrounded himself with an efficient personnel for handling the activities of his station. Mr. Thos. Appleby, Jr., of Philadelphia, is the radio engineer of the station and has designed practically all of the equipment. The station is under the direction of Mr. Wynne Colman, who also builds the apparatus to Mr. Appleby's specifications, assisted by Mr. Edward Sandrus. There are two operators, Miss Bertha Hilton, "B", and Mr. Fred Mergenthaler, "F". Miss Cora Hilton, stenographer and record-keeper, and Mr. Warren Thompson, official chauffeur for the traffic department, complete the personnel.

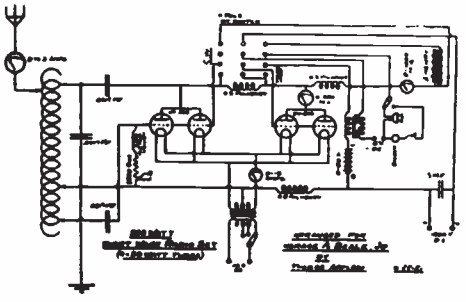
Pausing to get a good breath, we pass to a description of the masts. There are several small ones but two real ones that



are worth talking about. These are of welded steel tubing, 200 ft. overall, standing 15 ft. in concrete and rising 185 ft. above the ground. Spaced about 375 ft. apart, these masts support a 5-wire flat-top on which a DeForest ½ k.w. arc set operates on a wave length of 2500 meters under the call 3XW. Up to a short while ago the 375-meter work was done on a slanting flat-top 145 ft. long which was attached to the nearest mast at a point 105 ft. above the ground. More recently the big flat-top has been taken down and a single wire 200 ft. long suspended by hempen ropes between the two masts, with a slanting lead about 200 ft. long running down to the station. The aerial has a fundamental of about 500 meters and by means of a series condenser transmission is

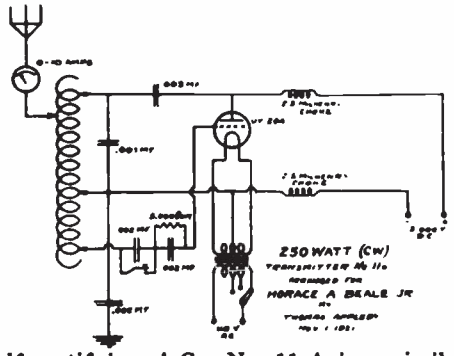


The Main Operating Table



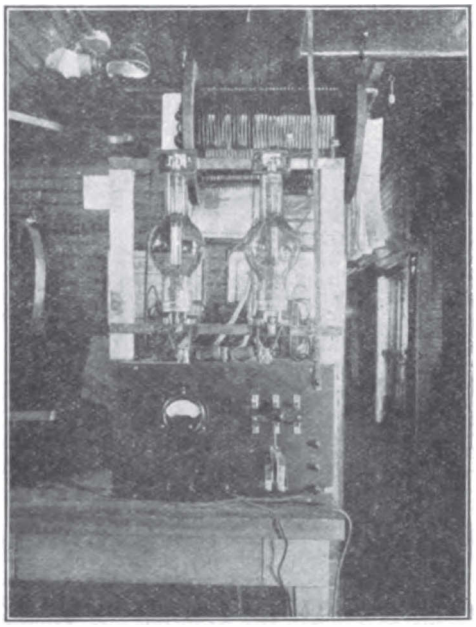
effected on 375 meters with much better results than on the old slanting flat-top.

Besides a half-dozen or so DeForest phones and various home-made phones of small power, something like fifteen transmitters have been designed at 3ZO and most of them actually constructed. Not all of them, of course, are still in commission, and we don't even know what some of them were. No. 4 was the spark set as shown in one of our photographs, but this has now been junked and only C.W. is used. No. 5 is a phone using four 50-watt tubes, two as oscillators and two as modulators, which is the beautiful cabinet set with the slanting panel to be seen in the same photograph with the spark, and of which we present the wiring diagram. No. 8, behind the receiving set in the same photo, was a 375-meter telegraph set using four 50-watters in an A.C. self-rectifying circuit. Since the view was made this set has been replaced by No. 8-A, using a single 250-watt "P" tube, wiring diagram shown, also



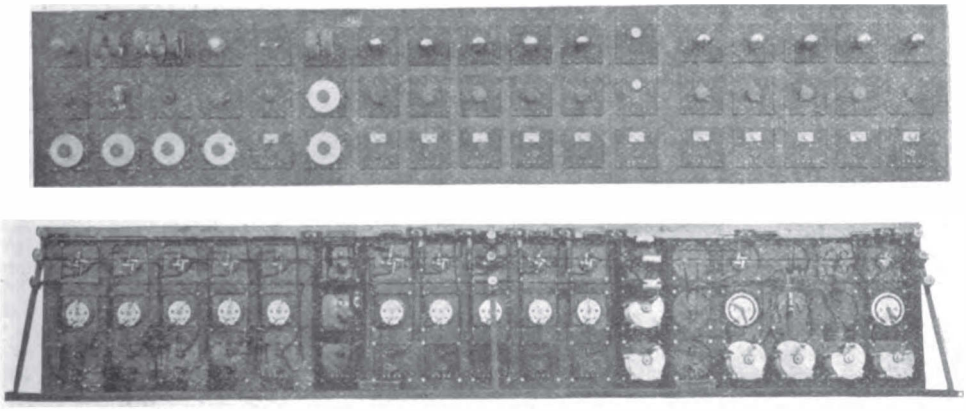
self-rectifying A.C. No. 11-A is a similar set using one U.V.204 but on 3000 volts D.C., and its hook-up also is presented. No. 13, of which we have a photograph, is a beast employing two 250-watt U.V.204's on 375 meters, also self-rectifying. Then there's No. 14, a 200-meter transmitter working on a small two-wire aerial we forgot to tell about, which uses two U.V.203's with A.C. on the plate. The diagram for this set is shown too.

No. 11, the pride of them all, is still in course of construction and considerable ex-



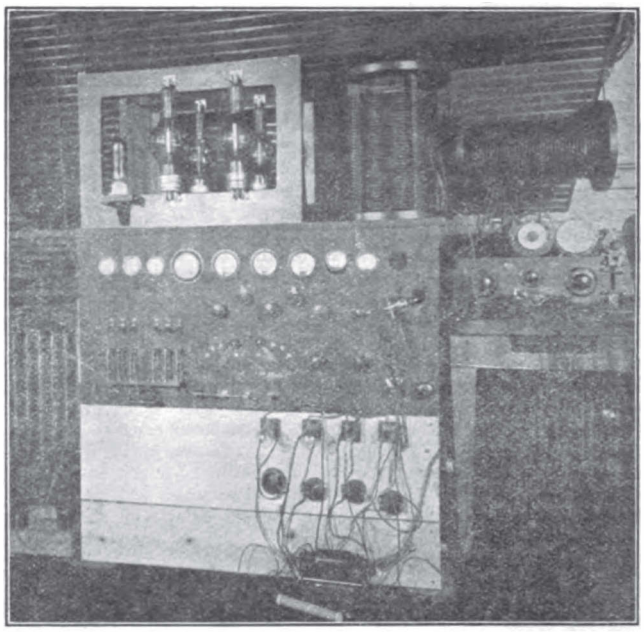
The No. 13 Transmitter

perimenting is being done with it to get all features correct before it is finally built up into a good job, as all of 3ZO's sets are. In the photograph, then, we see a temporary panel of boards on which the various meters and controls are mounted until the preliminary work is completed. This set has a main battery of four 250-watt tubes and is a phone, two of the tubes being



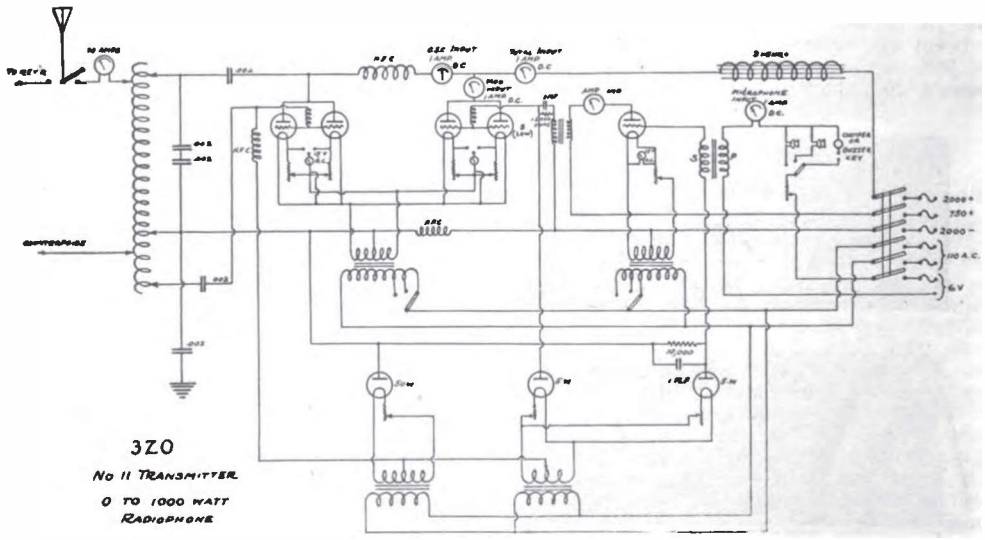
Front and rear views of the Superbeterodyne

oscillators and two modulators. The 50-watt tube to the right of the big fellows is a speech amplifier. The secondary battery of tubes at the bottom have a most novel function, and the reader is referred to the connection diagram of this set for further details. (This is the way it was the last time we heard from Mr. Beale, but gawdnose what Tom Appleby's done to it by now.) In the hook-up three tubes are seen in the bottom portion—one a 50-watt and the other two 5-watters. In the No. 11 set great trouble was experienced with grid leaks and nothing that would satisfactorily leak the oscillator grids was found until a 50-watt tube was tried for this purpose. The connection from the grids runs to the filament of this tube, its plate completing the circuit to the grounded filaments of the oscillators. Then merely by adjusting the filament brilliancy of the 50-watt "leaker" and hence its electron emission, the resistance is varied and the leakage current controlled. It was found desirable to control the negative bias on the modulator grids and on the grid of the speech amplifier in the same manner (i.e., by a leaky condenser), and the two five watt tubes shown control respectively the modulators and the amplifier. Otherwise the circuit is conventional—a Hartley oscillator with constant-current modulation. In so elaborate a set the diagram of course looks complex with its various voltage supplies, chokes, filament transformers, etc., but if it is carefully studied it will be seen to be nothing more than the phone circuit with which most of us are already familiar.



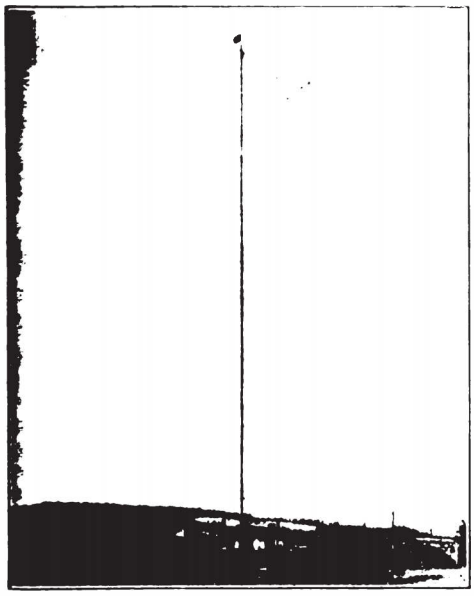
The Big No. 11 Transmitter

We almost overlooked the generator room. Of course it takes a young power-house to supply 3ZO. First there's a 17 k.w. D.C.



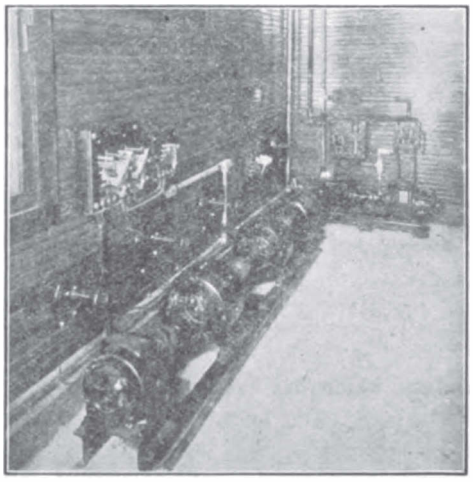
machine, giving 110 volt direct current for any desired purposes, and a small Crocker-Wheeler motor-generator unit giving 500 volts, neither of which show in our photo. At the other end of the room are two more machines. We forgot to ask what the one was against the distant wall, being lost in admiration for the beauty in the foreground. This is a special machine, of Eck make, rated at 1.5—2 k.w. at 3000 volts output. At the far end is the induction motor which drives it and at the near end is the separate excitor for the generators, while the latter, two in number, are in between all coupled in a row thru flexible couplings. It is a beautiful machine and incidentally attains full speed in two seconds.

In the line of receiving apparatus 3ZO



How'dya like to have a mast like this?

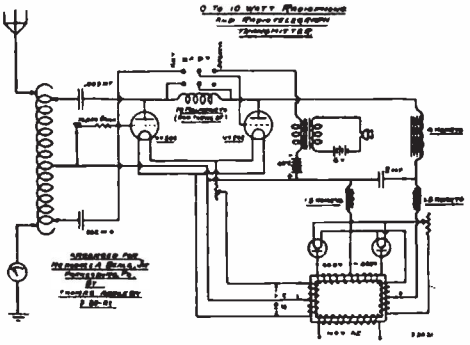
is almost as well outfitted as it is in transmitters. There's a honeycomb set with built-in detector-three-step, a miscellany of outgrown sets, while the main dependence is put upon a Grebe CR-3 with Grebe companion tube equipment. In one of the smaller operating rooms where the No. 5 phone set is now located is an "Aeriola Senior" operating with two steps of audio amplification which Mr. Beale has built up using the new Westinghouse coated-filament tubes which are a standard part of the "Aeriola Senior", in conjunction with Acme transformers. In another room with the 200-meter C.W. set is a Westinghouse "RC" and likewise an Armstrong superheterodyne built up at the station. This is an immense set, stretching all the way across the room, and is composed of fifty-one DeForest "units". Referring to the photographs, three sets of honeycomb coils are to be noted. The first two are for



A Corner of the Generator Room

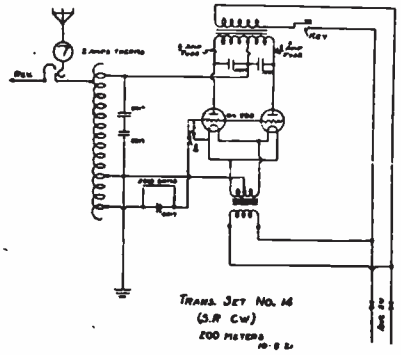
the separate oscillator; the next group of three are for the first detector which by the way uses regeneration, whence the third coil; while the next pair couple on the radio-frequency amplifier of five stages. The last five tubes are audio amplifiers. No provision seems to have been made for a second detector in this set, nor does it appear in the wiring diagram we have, and this probably accounts for the rather unsatisfactory performance so far obtained from it.

Then there is 3OI, a portable station consisting of a small special house mounted



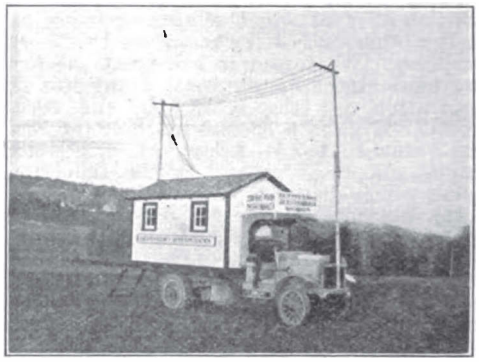
on a 5-ton truck and sporting a neat little flat-top overhead. Inside the house is a roomy operating table, an oil stove, and a Delco gas-engine lighting outfit which also furnishes juice for sets from time to time installed therein. 3OI is devoted primarily to

the interests of the Chester County Radio Assn., an organization of several hundred



members which has been fathered by Mr. Beale.

We could go on and on—there's ten times as much equipment and supplies at 3ZO



Portable Station 3OI

as in the average supply store—but what's the use? 3ZO is a monumental station, and Mr. Beale is to be congratulated!

Rotten Broadcasts

By The Old Man

SAY, Son what are we coming to, anyway! If this daggone broadcast stuff keeps on increasing something is going to bust open. The air is so chock full of jingles and jazz and foxtrots and speeches and advice as how to peel potatoes and bedtime bunk that it isn't fit to breathe any more. Darned if I don't think folks will be going crazy pretty soon.

Time was when a man could go home after work, eat his supper and read the paper, play with the kids awhile, and then put the phones on and spend a pleasant evening telegraphing around over the various states, passing the time of day with old friends and making new ones, while the little wife sat alongside fixing the socks and the children's clothes. Now-a-days it takes a brave man to light the bottles and put on the phones. From three hundred meters to four hundred it is one grand smother of stuff they call music and speechifying and what-not, all tangled and snarled up until if you listened to it long enough the bats would begin to show in your belfry, as sure as hellsamantrap. I used to be able to stand for it, when it was only 8XK and later, KDKA, and a couple of amateurs grinding out bum phonograph records. But when the whole blooming country starts to yapping and yowling and hollering, and all of them trying to bawl their heads off on three hundred and sixty meters, it just simply unseats a man's reason. I tell you one thing—if they don't go easy pretty soon, not only will the great American public degenerate into a lot of snickering imbeciles but three hundred and sixty meters will get worn out and we shall never be able to get her back to normal. Just think of asking any wave length to carry all this hogwash, night after night, month in and month out! Old three sixty was a good old wave, but she will never be able to look her neighbors in the face again when these broadcast hounds get through with her. I swear I don't believe she will ever be able again to carry a respectable dot and dash.

What in blazes they all think they are getting out of broadcasting beats me. What can any one possibly get out of shooting a lot of stuff out that he can't tell about himself? He really does not know if it is getting out good, bad, or indifferent, nor whether any one is listening to him or not. And yet he will squander his money and sit up all night and wear his nervous system down to the quick, building a broadcast station so he can play worn-out phonograph records into it, hour after hour. What possible fun can there be connected with this sort of thing!

It makes my blood boil sitting at my little old set and listening to this butchering of perfectly good radio weather. Who started this foolish business anyway? And what in heaven's name are you chaps up there in Hartford doing, that you let this dagbusted slop get going? You have the Wouff Hong right there at hand. Goshamighty I would have worn the old blunderbuss out before I would have let these musical itsaboos get started. Some day I am going to crank up the flivver and run up there to Headquarters and commandeer that Wouff Hong weapon and also the Bloody Retty-

snitch, which I am told Kruse built down at the Bureau of Standards. Then by Heck, with the Uggerumph between my teeth and possibly with my Old Betsy going along with her wild-cat screetch, just to give atmosphere to the occasion, I am going to run amuck among the broadcasters. There will be less and better broadcasting and the fear of God will be in the heart of every designer of a modulation transformer when I get through. By gravy, I have remained quiet for some time, after smashing in the slats of the Young Squirt and strewing his vitals over the landscape, but I'm not going to be meek and humble any longer. My dander has risen, I smell of burning insulation, and nothing but gore and wrecked radio telephone broadcast stations is going to satisfy me.

I don't blame Mr. Hoover for calling a Conference. I would have called somebody a worse name than that. It's high time some conferring was done. In fact, it's time somebody conferred a wallop upon somebody and got this mess straightened out.

Why Mr. Hoover overlooked me and my Old Betsy in this matter passes understanding. Between Old Betsy and me we would have saved a lot of valuable time, and report has it that Mr. Hoover believes in saving time. All that would have been necessary would have been for Mr. Hoover to advertise for every owner of a broadcast station to come to Washington and take his place in the line. Then I would have borrowed a respectable 220 volt, five horse induction motor from "LC" over at NSF and hooked her up to Old Betsy. As fast as Mr. Hoover had questioned the Broadcasters and satisfied himself as to their guilt, I would feed them feet first to Old Betsy. We could have turned the residue over to the garbage collectors to haul away. A couple of days would have done the job. The five horse motor might have to be wiped off before we returned it to "LC" and possible the Old Girl might need some cleaning up, but that would have only taken a few minutes. Think what a lot of trouble would have been sunk for keeps. The air of an evening would have returned to its old-time sweetness. The kids could go on with their Ford coils and their sticky vibrators and their horrible fists, and at ten o'clock we older birds could have come onto the air and handled traffic and have had all the old time thrills and have got enough and gone to bed by midnight. Oh Boy! And to think it used to be that way once!

But 'tis not to be any more. The Secretary of Commerce saw fit to have me and Old Betsy remain in the Eighth District, and instead of spitting on his fists and wading in, with my assistance, he preferred to call in the High Brows and allocate wave lengths and urge in polite language that radio apparatus, controlled lock stock and barrel by a certain corporation, be freely available and at reasonable prices. That's the gentlemanly way to do it, I confess. But dod blast my suspenders if I believe it will clear up the air around three hundred and sixty meters nor get fifty watt tubes down to four ninety eight in the department stores. Gosh, but I wish he had consulted me in this matter. By Golly, you know boys, I believe I would have made a record on cleaning up that job.

Daggone that squawking soprano at KTPA! She certainly has yowled enough by this time. Gurrd, but why did she select that thing to sing! Sounds like a funeral dirge badly out of adjustment. I

"I would feed them feet first to Old Betsy"

wonder if the proprietors get samples of the goods before they accept them. Impossible! They certainly never would have put this squall out onto the air if they had heard it first. Some kind of inspection is needed. Zowie, she puts my teeth on edge! Oh dear, I wish I were dead! That female has catawalled now for a full fifteen minutes. Here Kitty, I need thee. Poor woman, I suppose somebody loves you. I'll bet a cooky you haven't an idea in the world what you are doing. Could any woman in her right mind yowl away like that if she realized a quarter of a million of her fellow countrymen were writhing in anguish and wishing to gawd she would hurry up and get it over with. Say, as I sit here smoking myself to death and cursing broadcasting and waiting for the time to come when I can tickle that old key, I can't help thinking of my sins and how different everything is in radio from what it used to be. It used to be that we had only ourselves to fight. It was all in the family then. But now the public are in the game. The dumbbell with the hundred dollar receiver—the kind that knows no difference between 200 and 500 meters—is the one we must watch now. He wants SILENCE, and doggone little of that, and every time he hears any-

thing in the air except what he wants to hear, whether it is static or induction or a bubbly "B" battery, he froths at the mouth and writes his chum Senator Snigglefritz in Washington that the amateurs are spoiling this wonderful radio which is just beginning, and that a law ought to be passed at once shutting the amateur up. And by Heck, the old fat slob

"Final Authority has started up!"

firmly believes he is right. He really believes that Citizen Radio began with his buying a receiving set and learning how to get KDKA. He never heard of our A.R.R.L. He never has had a glimmer pass over his benighted intelligence that the amateurs ever did anything but annoy broadcast listeners. He is so sunk in black ignorance that he never heard of Paragon Paul Godley, nor 9ZN nor K. B. Warner, nor the Candlers of St. Marys, nor the Transcons nor Fred Schnell, nor 4GL, nor by golly, T.O.M. He is a solid citizen and consequently he is a bad one to have fighting you. But some day the light of knowledge will bore through his dome and he will be around wanting to join the Radio Club and asking what's the best way to learn the code.

Listen—yes, the Pittsburgh Yowler has finished. Mr. Flannigan is now going to favor with a violin solo, with Miss O'Houlligan at the piano!! Lord help the poor suffering listeners to-night! Listen to that piano thump, and mind the vacant spots in the violin playing. This will most likely be another ten-minute bout. And all this perfectly good battery juice going to waste. I wonder why I don't kick this junk into the river and take up auction bridge? Gee, but I wish I were dead!

Ohmy gawd Final Authority has started up! That's his fone. I know the sixty cycle hum. Now listen to him count and whistle "Rock of Ages". He's off. His voice sounds as though he were inside a tin cracker box. Listen to her wheeze. Blots out everything from the bottom of the scale on my tuner up to the top of the long wave coil. Ye gods and little fishes! I simply cannot endure it. Let's put out the bulbs and write a bit to kill time.—Stand still a minute, Kitty.

My next door neighbor has it in for Final Authority. Somehow he found out who was responsible for the big noise in the air and he asked me the other night whether something couldn't be done about him. I remember the occasion when Final got in wrong with my neighbor and it is worth telling, while we wait for the broadcast bull to spend itself. It seems that Final had arranged a coup, as the say in La Belle France. He had copped the big singers at the concert that came to town and after their part of the programme was finished, Final hustled them out to his house and got them to sing into his phone. He had just secured his limited commercial broadcasting license and he thought he was some hot stuff. Some how or other, his phone worked well that night and I will have to confess the singing was pretty good. It woke up the little wife at our house and she paid attention for the first time. She considers most radio phone music as not worth spitting on.

It so happened that on that same night my neighbor decided to give a little phone party at his house. He told me his guests arrived and they waited for KDKA, Detroit

"Wait until the dumb-bells get poisoned with these litle dit-dit's"

and Washington and had just heard the "Detroit News" tell something they were going to do, when—crash—bang—Final Authority came rattling the diaphragms with his special concert. Detroit was blanketed, as was everything else. The guests thought it was Detroit and were thrilled to the marrow bones. But Neighbor Jones had to let the cat out of the bag, and he said that when they found that it was only coming from their own town they lost all interest. They wanted to hear De-

troit. The rottenest jazz from Detroit would have been ten times more interesting than the finest stuff the world afforded from their own town. They wanted the thrill of long distance, and I had to smile as I thought of what we amateurs have been through all the past years. The thing that has held us together and kept the interest up year after year has been just this very selfsame long distance stuff. Daggone if I don't believe it's going to be the same with these dumb-bells. They are going to get fed up with the near-by stuff and the concerts and the speeches giving detail specifications as to how to peel potatoes, and one by one they are going to begin wondering about the little chirps and the little buzzings down on two hundred. By and by some of them will get to know the numerals when they hear them, and then they will borrow a call book somewhere, and when they get so they can catch the district the signal is coming from, it will be all off for the cheap broadcast stuff. They will either slough off completely and sell their sets or will get the bug and become amateurs. That's my guess and I'm not far wrong, for I see the rash breaking out on Neighbor Jones already. Say, isn't it funny, how those little dots and dashes get you? DAH-DAH-DAH-DAH—DIT. DIT - DIT - DIT - DIT-DIT. DIT - DAH - DAH - DAH - DAH. DAH - DAH - DAH - DIT - DIT. Those two quick little DIT-DIT-s on the end mean the good old EIGHTH DISTRICT, and I suppose every fellow has the same home feeling about his own district. Wait till the dumb bells get poisoned with these little DIT-DIT's and it will be all off with the broadcast concerts and the lectures on potato peeling.

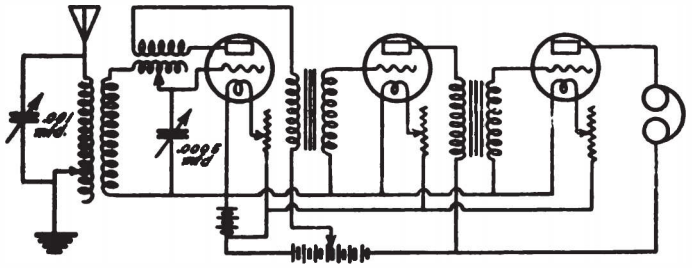
Well, it's ten thirty, boys, and there is old 1AW calling 3ALN and telling him "msgs", and his fist sounds like it might be the Old Chief at the key. Gosh, but it sounds good. Guess I better oil up the Old Girl and get in myself. Seems like a good night and we ought to clear the old pin off by the looks.

Well, old timers, 73 to all of you, and by Heck let's hold fast to our good old dot and dash stuff. GN SK

An Efficient Tuner for Short Waves

By H. J. Goddard, 9ZX,9EE

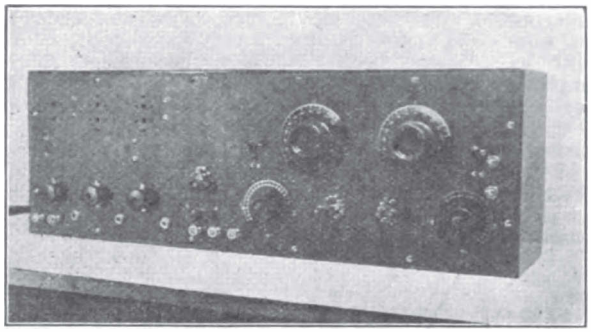
THE short wave tuner described in the following article is offered to the amateur, not as a substitute for an expensive variometer set, but rather as a tuner, easily and cheaply constructed, that will prove nearly if not entirely as efficient as the best standard receivers on the market today. Its range is approximately from 180 to 600 meters, it oscillates freely over the entire wavelength range, and functions equally well for spark, C.W. or phone reception giving wonderful amplification of all signals. It belongs to the tickler type of receiver and uses single-layer coils as inductances. It has been pointed out to the writer that its dead-end losses and the use of capacities are detrimental to efficiency; but, be this as it may, the amateur who constructs one of these tuners is very likely to do as have several others who have tried it—discard his variometer set. Originally described to the writer by Mr. H. J. Burhop, 9ZL, this tuner was designed, so far as I know, by Mr. Melvin Herman, 9FN, and to both of these men I am indebted for the constructional data. I would not go so far as to say that this tuner is better than the variometer set in question; but I do say that in my case at least, it has proven only slightly less sensitive than the variometer set and considerably more selective.



Briefly, the tuner consists of four coils. These coils may be wound upon cardboard tubes if desired but bakelite or formica tubing on account of its greater strength and permanence is to be preferred. Two of these tubes are 5 inches inside diameter and two are 4¾ inches inside diameter. All four are 1½ inches in length (or width). Upon one of the 5 inch tubes is wound 24 turns of No. 26 DCC wire tapped every 6 turns (4 taps). This is the primary wind-

ing. The other 5 inch tube is made up exactly the same as the first and constitutes one half of the secondary winding. Upon one of the smaller tubes wind 24 turns of No. 26 DCC, but taking off no taps; this is the second half of the secondary winding. The remaining small tube is wound with 36 turns of No. 26 DCC, no taps. This is the tickler winding. The direction of winding is immaterial, but all windings may well be in the same direction.

The untapped portion of the secondary

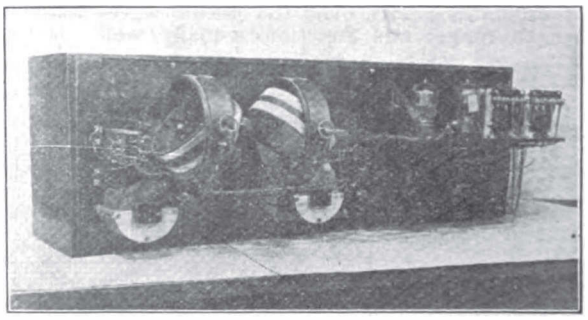


is now mounted upon shafts so that it will rotate within the primary winding. In like manner, the tickler winding is mounted to rotate within the tapped portion of the secondary. We now have what amounts to two variocouplers. These are mounted upon the panel, the two portions of the secondary connected in series and the primary and secondary taps brought out to switches upon the panel. The ends of the tickler winding are connected to the plate and phones as usual; the terminals of the secondary are attached to the grid and filament, and the primary connected to the aerial and ground. A 43-plate variable condenser is connected through a switch so that it may be placed either in series or shunt with the primary and a similar condenser, but of 23-plate size, is arranged so that it may be either shunted across the secondary or cut out altogether. The writer recommends that condensers equipped with verniers be used since the set tunes very sharply.

Suggestions on Operation

To a person unaccustomed to this tuner, it is likely to be disappointing at first. Its selectivity is such that it may be discarded before it is given a fair trial. It is usually best to bring the tickler control nearly to the oscillating point at the outset then varying the primary and secondary controls until the signal is heard, then reducing regeneration slightly until the adjustment of the primary and secondary are completed and the signal strength is the greatest that can be obtained without oscillation. In general, let the inductance predominate. If now the tickler control is manipulated the signals will come in greatly amplified. This tickler control, however, is very critical and a change of even one degree on the scale will make a world of difference.

It will be noted from the accompanying photographs of the writer's set that the condensers are mounted upon the lower portion of the panel. This disposition of the condensers places them where they may be controlled with the arm resting upon the operating table being especially valuable in following a swinging signal which can usually be done by varying the vernier of the secondary condenser without touching the other controls. It might be pointed out that the writer's set is built left-handed; in other words the condenser and switch at the right control the primary while those on the left control the secondary. This left-handed feature is carried throughout the entire set, the right hand tube being the detector, and successive stages of amplification being disposed at the left of the detector. This places the most frequently used controls nearer the body and in the most convenient position relative to the transmitting key. It will be found advantageous to shield the panel, at least in front of the tuner proper, either with tinfoil or copper sheets, these being



grounded. Shielding of some sort is almost a necessity; but the writer finds that shielding of the secondary condenser alone answers very well.

In conclusion the writer wishes to say that he will be very glad to answer any questions regarding the construction or operation of this tuner that may occur to the prospective builder.

The Governors-President Relay

By K. B. Warner

AMATEUR radio again demonstrated its capabilities, and at a most opportune time in the legislative situation, in our A.R.R.L. Governors-President Relay on March 6th, 7th and 8th when messages to President Harding were received and delivered at the White House from forty of the forty-eight states. Messages failed to start from five of the remaining states, while three started but failed for one reason or another to reach Washington. Considering the bad weather that prevailed during much of the tests, that is a splendid performance and again we have the consciousness of a hard job well done.

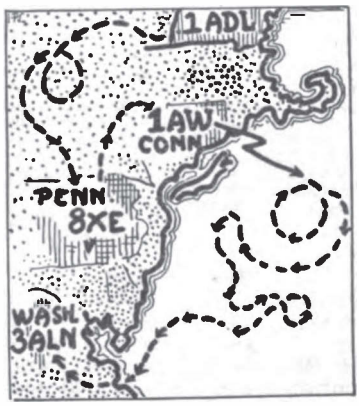
The Scheme

As announced in an earlier QST, the preliminary arrangements were very simple. Our Operating Department prepared a schedule of starting times and the Division Managers were asked to solicit or arrange for the securing of a message to the President from the Governor of each state in their respective Divisions. No hard and fast rules applied in this relay and the work was individual in each state, making real co-operation count. There was no fixed plan for handling the messages, no predetermined routes; they were to move on each of the three nights as opportunity afforded, in all the flexibility of routine relaying. The plan was remarkable in its success and we amateurs showed again that we are what one of the Governors called us: "Minute Men of radio".

The Receiving Machinery

The Washington end was beautifully organized by the Washington Radio Club under the administration of its president, H. A. Snow, 3ZE. At a club meeting two nights before the tests the plans were completed and 3IL, Strang, the club's chief operator, selected as a concentrating station for the delivery of the messages; 3IL and 3ZE as control stations, and 3ZY and 3ALN as the operating stations to work with outside stations who had the messages. Both 3ZY and 3ALN are C.W. and do not interfere with each other. 3ZY was manned by its owner, L. M. Dunnam, and H. J. Wadsworth of 3JJ, while the operators at 3ALN were its owner, H. F. Hastings, and Snow of 3ZE. A perfectly working machine was the result and but one case of avoidable interference marred the performance.

On the first night, March 6th, the atmospherics were awful and logs from all over the country show that operating conditions were generally rotten thruout the land. Nevertheless 8 messages got thru these almost impossible conditions, one direct from a state capital in the form of Connecticut's message which was picked up from 1AW by 3ZE, while 7 others came in by various routes. On the second night static was still bad at 10 p.m. but practically nil after midnight, and messages from 15 additional states were received besides a second receipt of many of the previous night. On the night of the 8-9th the air was very good and a total of 17 more states were corralled, making 40 in all. With 5 not starting and 3 failing to arrive we account for our 48 states. During this



last night as time grew short the gang automatically QSK's messages they knew were safe in Washington the preceding nights, relieving the air of this extra traffic, and all hands concentrated in an effort to locate the missing messages.

3ZY was the star of the Washington team with credit for 27 messages received, while 3ALN got 12; and one, Connecticut's, was received direct by 3IL and 3ZE. Out-of-town honors in the eastern states where the messages were concentrating go to 9ZJ, 4GL, 8AXY and 3ZO.

Delivery of the Messages

A little unfortunately for us, right in the midst of the relays the President left Washington for a short vacation in Florida and was out of the city upon the conclusion of the tests. The messages were delivered at the White House on the 9th by the Washington Radio Club, accompanying the following letter, but had to await his return to the city.

2020 First S., N. W.,
Washington, D. C.
March 9, 1922

Sir:

The attached forty messages from Governors and State officials have been handled entirely by amateur radio operators who are members of the

American Radio Relay League. They are the result of a three days relay known as the "Governors'-President Relay" which was instituted and operated under the supervision of the League. The traffic was handled on the nights of March 6, 7 and 8 in accordance with the plan of operation mapped out by the Traffic Manager. Reception at Washington was effected by two stations of members of the Washington Radio Club which is affiliated with the American Radio Relay League.

The members of the League are always at your command and are willing to do anything in their power to further the interests of their country.

Very respectfully,
(signed) Harry L. Strang,
Chief Operator,
Washington Radio Club

The President,
The White House

Upon his return the President acknowledged the messages with the following letter:

The White House.
Washington.
March 21, 1922

Mr. Dear Mr. Strang:

Returning from his brief southern trip, the President finds the radiograms of greeting from the Governors of States, which were gathered thru the interest and activity of the American Radio Relay League, and forwarded to him.

Availing himself of the courtesy extended by you, he will be glad if your organization will convey to the Governors his appreciations and thanks for their kindly expressions. He wishes me also to thank all the members of your organization who have participated in bringing to him this remarkable greeting.

Very sincerely,
(signed) Geo. B. Christian, Jr.
Secretary to the President.

The Messages

The messages are so interesting that we publish their full text below. We sincerely wish it were possible to give the complete routing of each message but logs are insufficient on some, the fact that some messages were duplicated on successive nights makes it impossible to identify the route of any given night's message, some moved by several routes, and in many cases they were copied out of the air by eastern stations and plunked into Washington ahead of their routine appearance. We will give with each message a list of stations known to have participated in its handling on some one of the three nights as gathered by an inspection of logs at hand, but wish it understood that the lists are not complete and in no sense accurately portray the route over which the respective message moved.

ALABAMA—Montgomery, Mar. 8.—His Excellency, Warren G. Harding, Washington, D. C.—Congratulations on reserve of radio minute men for national emergencies.—Thomas E. Kilby, Governor of Alabama. Moved 5XA to 4GL to 8ZY.

ARIZONA—Phoenix, Mar. 7.—Hon. Warren G. Harding, President, United States, Washington, D. C.—Congratulations on the magnificent heights of your first years administration.—Thomas C. Campbell, Governor of Arizona. Some real participation in this one: 6AAH, 6ZZ, 5IF, 9DSD, 9ACB, 9OX, 8BBU, 8YN, 8VY, 8AGO, 8AXY, 8ALN, 5ZU, 4GL, 9KO, 9BED, 9DMJ, 8AGZ, 4ZC, 8ZY.

ARKANSAS—Little Rock, Mar. 8.—President Harding, Washington, D. C.—Greetings and felicitations on prospect of freeing ourselves of shackles of miles and slow delivery.—Thomas C. McRae, Governor of Arkansas. Known to have passed thru 5JD, 8AOI, 9AGR, 8FT, 8AJV, 8AJX, 8BBU, 8AXY, 8ALN.

CALIFORNIA—Sacramento, Mar. 8.—President Harding, White House, Washington, D. C.—California sends heartiest greetings and best wishes to you and Mrs. Harding.—William D. Stephens, Governor of California. Credited to 6GF, 7MF, 6ZX, 6ZAM, 9AVZ, 5ZA, 9DZJ, 9ZJ, 8ZY.

CONNECTICUT—Hartford, Mar. 6.—President Harding, Washington, D. C.—Connecticut congratulates you upon your assured success of national conference so ably led by you.—Everett J. Lake, Governor of Connecticut. 1AW to 3ZE.

DELAWARE—Dover, Mar. 7.—President Warren G. Harding, White House, Washington, D. C.—Greetings and best wishes from the state of Delaware.—William D. Denney, Governor of Delaware. 3ZO and 3ZY.

FLORIDA—Tallahassee, Mar. 7.—President Warren G. Harding, White House, Washington, D. C.—The people approve your efforts to promote world peace. Congratulations.—Cary Hardee, Governor of Florida. 4II to 3ALN, direct.

GEORGIA—Atlanta, Mar. 6.—President Harding, Washington, D. C.—Greetings to President and Mrs. Harding from Governor and Mrs. Hardwick.—Governor and Mrs. Hardwick. Handled by 4AU, 8AJD, 8BDB, 8ARN, 4FT and 8ZY.

IDAHO—Boise, Mar. 7.—President Harding, Washington, D. C.—Cordial greetings from the state of Idaho.—D. W. Davis, Governor of Idaho. Early routing unknown; 9YAE to 9ZJ to 8ZY.

ILLINOIS—Springfield, Mar. 8.—President Warren G. Harding, Washington, D. C.—Accept Illinois greetings and heartfelt thanks for your efforts to insure world wide peace.—Len Small, Governor of Illinois. Direct 9ASL to 4BY to 8ZY.

INDIANA—Indianapolis, March 7.—President Harding, Washington, D. C.—Greetings from Indiana to the honored President of the United States. Congratulations on the splendid accomplishments your first year.—Governor McCray of Indiana. 9ZJ to 8ZY.

IOWA—Des Moines, Mar. 7.—President Warren G. Harding, The White House, Washington, D. C.—Accept the salutations of the State—Iowa wishes you all happiness.—N. E. Kendall, Governor of Iowa. Passed thru 9DEH, 9AFW, 9AAW, 8WD, 2FP, 8ZY.

KANSAS—Topeka, Mar. 7.—President Warren G. Harding, Washington, D. C.—Kansas sends cordial greetings and felicitations.—Henry J. Allen, Governor of Kansas. Try to figure this out: 9RV, 5MZ, 9DZQ, 8AQR, 5QI, 5XU, 9HI, 9DTA, 9DZQ, 9IF, 8AOI, 9AGR, 8FT, 8AJV, 8AJX, 8ZO, 8ZY.

KENTUCKY—Frankfort, Mar. 7.—President Harding, Washington, D. C.—I am happy to send you the greetings of your thousands of friends in Kentucky.—Edwin P. Morrow, Governor of Kentucky. 9IO, 9EI, 9OX, 9AAW, 8BBU, 4GL, 8ZY.

LOUISIANA—Baton Rouge, Mar. 7.—Hon. Warren G. Harding, Washington, D. C.—American soil and American genius are the cornerstones of American greatness.—John M. Parker, Governor of Louisiana. 5AA, 5JD, 5XU, 9ZJ, 8ZY, 5ZU, 4GL,

5ABA, 8AOI, 9AGR, 8FT, 8AJV,8AJX; but also direct 5LA to 8ZY.

MAINE—Augusta, Mar. 8.—Warren G. Harding, President, White House, Washington, D. C.—I congratulate you upon your first years administration and send you and Mrs. Harding greetings from the state of Maine.—Percival Baxter. 1APO, 1BHJ, 1BBQ, 1ARY, 8FM, 8ZO, 8ZY.

MARYLAND—Annapolis, Mar. 6.—President Harding, White House, Washington, D. C.—The Governor and people of Maryland send their greetings and best wishes to President Harding.—Governor Albert C. Ritchie. 8AJD to 8ALN.

MASSACHUSETTS—Boston, Mar. 6.—Warren G. Harding, President United States, White House, Washington, D. C.—Cordial greetings from Massachusetts which remains steadfast in support of your earnest and successful efforts to establish peace in the world and better conditions at home.—Governor Channing C. Cox. 1XM, 1ZE, 1COA, 1SN, 2OM, 2BEA, 8ZY.

MICHIGAN—Lansing, Mar. 8.—Warren G. Harding, President United States, Washington, D. C.—I take the opportunity afforded to me by amateur radio operators of the country of sending to you my heartiest greetings and well wishes.—Alex J. Groesbeck, Governor of Michigan. 8ZF, 8ZZ, 8BO, 4GL, 8ZY.

MINNESOTA,—Minneapolis, Mar. 8.—President Harding, Washington, D. C.—The state of Minnesota greatly interested in development of radio and appreciates all that you and your administration are doing in its behalf.—J. A. O. Preus, Governor of Minnesota. 9XI, 9ZJ, 8ZY. 9YAE.

MISSOURI—Jefferson City, Mar. 6.—Hon. Warren G. Harding, President, Washington, D. C.—Through our Missouri marketing bureau broadcasting station I salute you by wireless.—Arthur M. Hyde, Governor of Missouri. 9ACB, 9ARQ, 9ZB, 5XU, 9YM, 9ZJ, 8ZY.

MONTANA—Helena, Mar. 7.—President Harding, White House, Washington, D. C.—Montana is confident of her future under your administration—Montana sends greetings.—Story, Lieutenant Governor. 7XB, 7ZU, 7LY, 9AVZ, 9HI, 9DMJ, 8WI, 8AXY, 8ALN; also 9YAE to 9ZJ to 8ZY; also 9WU to 8BO to 4GL to 8ZY.

NEBRASKA—Lincoln, Mar. 8.—President Warren G. Harding, Washington, D. C.—Sincere good wishes for success in problems that confront you.—F. A. McCeove (instead of Gov. McKelvie.) 9AGR, 8AOI. 8FT, 8AJV, 8AJX, 8BBU, 8AXY to 8ALN.

NEVADA—Reno, Mar. 8.—President Warren G. Harding, Washington, D. C.—Greetings from Nevada transmitted by the nation's brightest boys and girls.—Emmett D. Boyle, Governor of Nevada. 6QR, 6AAH, 6QR, 7LY, 7ZU, 9AVZ, 9WI, 9DEH, 9AAW, 8EB, 9YAE, 9ZJ, 4GL to 8ZY.

NEW HAMPSHIRE—Concord, Mar. 7.—Warren G. Harding, President United States, Washington, D. C.—For peace and the hope that it inspires New Hampshire is profoundly grateful.—Albert O. Brown, Governor of New Hampshire. 1BAE, 1ADL, [illegible] 1XM, 1ADT, 2TS, 8ZO, 8ZY, 8XE, 1AW to 8A[illegible]

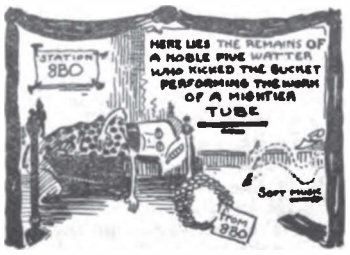
NEW JERSEY—Trenton, Mar. 7.—President Harding, Washington, D. C.—I welcome the opportunity to extend greetings by the latest demonstration of the genius of our youth—the wireless.—Governor Edwards. 8ZO to 8ZY.

NORTH DAKOTA—Bismark, Mar. 8.—President Harding, Washington, D. C.—North Dakota congratulates you on your stand on the Great Lakes to St. Lawrence tidewater route believing the completion of such a project will materially aid in the development of this great northwestern country.—R. A. Nestos, Governor of North Dakota. 9FX, 9WU, 8BO, 4GL, 8ZY.

OHIO—Columbus, Mar. 7.—Warren G. Harding, President of the United States, Washington,D. C.—Benefit of wireless such as to warrant every possible encouragement.—Governor H. L. Davis. 8BBU 8AXY to 8ALN.

OKLAHOMA—Oklahoma City, Mar. 7.—President Harding, Washington, D. C.—May your efforts to limit armaments be successful.—J. B. A. Robertson. Governor of Oklahoma. 5HK, 9DMJ, 8ARD, 9CS, 9AAW, 9WI, 8WD, 2FP to 8ZY.

OREGON—Salem, Mar. 8.—President Harding, Washington, D. C.—Boys of the Radio Association of Salem, Ore., branch of the A.R.R.L. ask me to convey greetings for them to you by radio and extend to your their most sincere compliments and good wishes.—Ben W. Olcott. 7MP, 6AGF, 9IF, 9DTA, 5XU, 9ZJ, 8ZY.



PENNSYLVANIA—Harrisburg, Mar. 7.—Warren G. Harding, President, White House, Washington, D. C.—My dear Mr. President—It gives me pleasure to extend to the President of the United States the greetings of nine million loyal and patriotic Pennsylvanians—I am pleased indeed to assist amateur radio operators in their efforts to popularize this very important system of telegraphy—Cordially yours.—William C. Sproul, Governor of Penn. This "book" via 8AGT, 8AQR, 8AAY, 8ZO and 8ZY.

RHODE ISLAND—Providence, Mar. 6.—Hon. Warren G. Harding, Washington, D. C.—Hearty congratulations and best wishes for future.—Emery J. SanSouci, Governor of the state of Rhode Island. Only record 8AJD to 8ALN.

SOUTH DAKOTA—Pierre, Mar. 8.—President Harding, White House, Washington, D. C.—Appreciating value of wireless and interested in A.R.R.L. South Dakota sending greetings—W. H. McMaster, Governor of South Dakota.—9DEH. 9AAW, 8EB, 7LY, 7XB, 5HK, 9DMJ, 9WI, 9DSD, 9AVZ, 9PL 8AXY to 8ALN.

TENNESSEE—Nashville, Mar. 8.—President Warren G. Harding, White House, Washington, D. C.—No better service to the country could be performed by Congress and your administration than to authorize the completion of the Muscle Shoals project and the acceptance of Ford's offer to lease it.—A. A. Taylor, Governor of Tennessee. 5FV, 8SP, 8ALN.

TEXAS—Austin, Mar. 7.—President Harding, Washington, D. C.—The federal prohibition law permitting federal judge to assess light punishment for violation of that law encourages those criminally inclined to become professional bootleggers.—Pat M. Neff, Governor of Texas. 5ZU, 4GL, 9YAE, 9ZJ to 8ZY.

UTAH—Salt Lake City, Mar. 8.—President Harding, Washington, D. C.—Best wishes for the success of the national relay.—Chas. P. Mabey, Governor of Utah. 6ZAJ, 6SJ, 6AFD, 9XAQ, 9APN, 9YAE. 9ZJ to 8ZY.

VERMONT—The President of the United States, Washington, D. C.—Greetings and best wishes from the Green Mountain State.—James Hartness. 1ARY, 2AAB. 8FM, 1XM, 8ZO, 8ALN, 8ZY.

VIRGINIA—Richmond, Mar. 7.—President Warren G. Harding, Washington, D. C.—May I take

advantage of this opportunity to send you greetings on behalf of the Old Dominion?—E. Lee Trinkle, Governor of Virginia. 3BLF, 3ZY.

WASHINGTON. Olympia, Mar. 8.—President Harding, Washington, D. C.—Congratulations on a successful year.—Louis F. Hart, Governor of Washington. 7ZP, 7BC, 7BK, 7VZ, 7HI, 7XB, 9YAE, 9ZJ, 3ZY.

WEST VIRGINIA—Charleston, Mar. 6.—Pres. Warren G. Harding, White House, Washington, D. C.—West Virginia sends greetings by radio to President Harding.—E. F. Morgan. 8SP to 3ZY.

The Messages That Didn't Arrive

Some of the governors were out of town, some ill and some too busy, and three messages got hung up en route, so that eight states were not heard from in Washington:

COLORADO—None of the logs received report anything on this message and it is believed that it never started.

MISSISSIPPI—Didn't start on Mar. 6th or 7th but left 5YE at 11:15 p.m. C.S.T. on the 8th and apparently got stalled in the Ninth District until too late.

NEW MEXICO—No message furnished by the governor in response to the District Superintendent's request.

NEW YORK—It is difficult to believe that New York's message could have failed but such is the case. It left Albany via 2PV, to 2BM in Hudson, N. Y., who gave it to 2DA in Poughkeepsie on the last night. The latter acknowledged it and endeavored to QSR but finding it impossible to raise anyone thru the QRM, and knowing it was the last night, endeavored to QSK it back to 2BM. We must record that the message was stuck at 2DA.

NO. CAROLINA—The governor declined to take part and no message was started.

SO. CAROLINA—No message started.

WISCONSIN—Instructions to District Superintendent miscarried and no message was secured from the governor.

WYOMING—Message left 7ZO on the 7th to 9WI, who gave it to 9DMN. Later it was recorded at 9AZA in Wisconsin, who was heard late on the last night making valiant efforts to unload it on somebody east but to no avail, and it died there, to the best of our records.

Gleaned From Logs

That Arizona message must have been greased. It went thru to the east every night with precision. On one night for example we definitely disclose its relaying thru five stations in an elapsed time of 13 minutes. That's real relaying! Not only did the Arizona fellows see their message moving nicely by "short" jumps but on the last night 6ZZ on his C.W. gave it direct to 8AGZ in E. Cleveland, whom he works regularly, a distance of 2000 miles. The latter couldn't raise anyone in Washington, however, and in desperation gave it to 4ZC in Florida, who QSR'd.

A few of the routes traversed were ludicrous. For instance the New Hampshire went to 1XM on the first night but apparently died there and on the second night 1ADL gave it to 8XE in Pennsylvania as the only DX he could raise. The latter heard 1AW working Washington and so passed it back to New England, making the perfectly wonderful routing 1ADL-8XE-1AW-3ALN. Sounds more like tennis.

9ZJ, Indianapolis, has the distinction of being the station putting the largest number of messages into Washington for their first official receipt there. His log is interesting:

"Mar. 7-8. 11:17 p.m. Mo. msg. reed fm 9YM. 11:33 p.m. Texas msg. from 9YAE. From 1:20 to 1:25 a.m. worked 3ZY, giving him Mo., Tex. and Ind. msgs. 1:41 a.m. Idaho messages from 9YAE. Gave this to 3ZY at 2:02 a.m.

"Mar. 8-9. Fine night. 11:06 p.m. Washington msg. from 9YAE. 12:20 a.m. Minn. msg. from 9YAE. 12:30 a.m. Mo. msg. from 5XU. 12:32 a.m. Minn. msg. again from 9XI. 12:34 a.m. Ore. msg. from 5XU. 12:38 La. msg. from 5XU. 1:14 a.m. Utah's from 9YAE. From 1:45 to 2:10 a.m. worked 3ZY, giving him Utah, La., Ore., Minn., Mo., Wash., and Ind. msgs. 2:18 a.m. Nevada's de 9YAE. 2:35 a.m. Calif.'s from 5ZA. Gave Cal. and Nev. msgs. to 3ZY at 2:50 a.m. 3:02 Mont. msg. from 9YAE; gave this to 3ZY at 3:14 a.m." (All figures in Eastern Time.)

9YAE did great work in the northwest country, handling the messages from Texas, Idaho, Washington, Minnesota, Utah, Montana and Nevada—all passed to 9ZJ.

8BO with a single 5-watt tube covered some remarkable distances, handling the Montana and North Dakota messages from 9WU in Ellendale, N.D., and the Michigan message from 8ZZ. On the 8th, calling 3ZY, 4GL replied with a "Shoot" so he stepped on 'er and 4GL QSL'd for 1, 2, 3 in his w.k. style. 8BO had barely given his "tnx nil nw" when the only 5-watter on the premises gave a sigh and turned over dead. It was a great end for a good tube and 8BO thanks his Lady Luck it held out until he QSR'd. Some distances for real relaying on one tube.

Another remarkable bit of C.W. work

was that of 5LA, New Orleans. 5ABA in Baton Rouge, securer of the message, phoned it to 5LA as his set was "out". 5ZAB, the starter, failed to start the message and 5LA as substitute dumped it right into 8ZY at 10:35 p.m. on the 7th and again on the next day he did the same thing at 10:09 p.m. 5LA uses three 5-watters with 1.9 amps. in the aerial.

1SN had a rotten time with the Massachusetts messsage on the second night. All evening long he tried to raise somebody who could copy him but no soap until 1:36 a.m. when finally he got a GA from 2OM. After resending some jammed parts he got an OK at 2 a.m. and his log shows his relief: "The rep of Mass. is saved—by 2OM, hero!"

5ZU got the Texas, Louisiana and Arizona messages and, hearing 4GL cranking that Ford of his, dropped them on him at 30 per and got the usual "OK 1, 2, 3". Three minutes later he had the satisfaction of hearing his messages going north from 4GL. Hill did good work, a batch of the messages passing thru his station.

That Utah message could tell a rotten story. 6ZAJ started it to 7MP on the 6th and was about half way thru it when the power went off. The trouble wasn't located for several days, when it was discovered that a neighbor had cut one of his distant-control wires to stop the lights flickering. What an opportune time! Meanwhile 6ZAJ phoned the message to 6SJ in Salt Lake but the latter blew his condenser when he tackled the job and had to phone it to 6AFD. Finally it got started via radio at 10:20 Mountain Time on the 7th, 6AFD to 9XAQ to 9APN, and reached Washington OK on the last night.

3ZO relayed the Penn., New Jersey, Delaware, Kansas, Vermont, New Hampshire and Maine messages. At 1 a.m. on the 9th he learned that the messages from Maine and New York had not yet reached Washington and made special efforts to pick them up. The New York one never was found but the Maine one was got from 3FM at 2:15 a.m. and given to 3ZY at 2:34. It didn't leave Maine until the last night, suffering various delays in local stations before it left the state.

9AVZ of Pierre, S.D., pulled a good one. On the second night he had the Nevada message safe on his pin and—but let his log tell the story:

"12:05 a.m. Went to bed and set alarm for 2 a.m.

"7:05 a.m. Woke up. Didn't hear alarm at 2 o'clock. And Nevada message still on the hook! Called CQ but nobody on."

But he got it off OK that night to 9WI!

Acknowledgments

The greatest praise and thanks are due the Washington Radio Club for the good work that made possible the success of these tests. We understand the fellows there, particularly the ones officiating in the relay, are forming a Sun Dodgers chapter of the Boiled Owl fraternity, and none will dispute their eligibility!

Thanks and congratulations are extended all the participating stations, and Headquarters also wish particularly to thank the large number of operators sending in logs for the nights in question, whose kindness in this respect has made available the data for this article.

Police Chiefs Relay

By F. H. Schnell, Traffic Manager

DURING the month of March we enjoyed the success of the Governors-President Relay, which was the gathering of a number of messages and delivering them to one central point. The Police Chiefs Relay will be just the reverse of that. We are going to have one message which is to be distributed all over the United States and Canada by the A.R.R.L. and DELIVERED to your police chief.

The International Association of Chiefs of Police will meet in San Francisco during the week of June 19th. Chief August Vollmer, who is head of the organization, is going to invite every police chief to the convention and he is going to invite him by amateur radio. He will send a message which can be given to your police chief by you and he is counting on the A.R.R.L. to DELIVER this message to every police chief in every village, hamlet, burg, city or town in the United States and Canada. WE CAN AND WILL DO IT. We must DELIVER it or the police chief will be without an invitation. We could set down definite schedules for the handling of this message but in order to derive some fun and a great deal of competitive sport from it we want every A.R.R.L. member to do his bit towards the success of the relay. Therefore there will be no schedules, no definite stations to handle it. We shall be "minute men of radio". We are going to have some real fun and plenty of excitement. Don't miss it! It makes no difference if you operate just a receiving station—you can supply messages and DELIVER them

and that is all that is necessary. There will be plenty of transmitters.

Here is the scheme:

Dates—June 3rd, 4th, and 5th.

Time—Sometime between 10:00 P.M. and midnight your local standard time some station will break loose with the message. The call letters of this station and the time of starting will not be made known. The message will come as a surprise right out of a clear sky. It will be broadcasted once at ten words a minute, each word being sent twice. Once a station broadcasts the message, that station will cease firing. That will be the start of the message.

The next thing to do is to copy it exactly as it is sent. Make at least two copies of the message. Then DELIVER one copy immediately to your police chief and have him sign the other copy with the date and time of receipt. (Have a heart and don't get him out of bed at two or three in the morning; get one of his representatives to sign for the message if the chief cannot be reached at that ungodly hour.) The copy of the message bearing the signature of the recipient must be sent to the Traffic Manager, 1045 Main St., Hartford, Conn., in order that we may determine how many messages were delivered. This is very important. After you have DELIVERED your message and gotten your receipt, it is your turn to broadcast the message sending at the rate of ten words a minute and repeating each word twice. After you have broadcasted it once, cease firing.

The things to remember are these—make two copies of the message; DELIVER one to the chief and get his signature on the other; return the one bearing the chief's signature to A.R.R.L. headquarters (THIS IS MOST IMPORTANT BECAUSE IT IS THE ONLY WAY WE CAN DETERMINE THE EXACT NUMBER OF MESSAGES DELIVERED — DON'T NEGLECT THIS—WE WANT TO DELIVER ONE IN EVERY PLACE THAT BOASTS A POLICE CHIEF OR SHERIFF); broadcast the message only once sending each word twice at ten words per minute—give the little fellows a chance to copy it. Be sure and include your call letters when you send the copy of the message to the A.R.R.L. that we may give credit to every station DELIVERING a message. You yourself must report this.

An Electromagnetic Changeover Switch

By Harold L. Olesen, Ex-2BQT

IN laying out a station the owner generally finds that he has the choice of a long roundabout antenna lead and the changeover switch within easy reach of the receiver or a short direct antenna lead and the changeover switch out of reach. Obviously each layout has its advantage and likewise its faults. For the owner who is going to do a lot of work the out of reach changeover switch is a bother—it delays coming back and generally means jumping up to reach the switch. On the other hand the indirect antenna lead often causes trouble and is to be avoided whenever possible.

The photograph shows a very simple device that puts an end to the antenna changeover switch location problem. It consists of a double pole double throw switch operated remote control by the aid of solenoid magnets. The construction is so simple that no detailed drawing need be given. The following notes will be of general interest.

Size of switch base 1x8x11"

Size of blades ⅛ x ⅝ x 7½"

Distance between blade pivot centers 3⅝"

Size of solenoid tube 1x9" ⅛" thick

Size of each coil 2x3x¼"—wire only

Size of plunger ¾ x 3½".

Wire—about one pound of #26 DCC on each coil when used on 110V. A.C.

Trumbull switch lugs used by remounting them on fibre blocks.

The coils must be spaced apart slightly so as to make the centers of the coils far enough apart that the plunger will be out from under one center when under the other. The length of travel of the plunger is determined by the distance between coil centers.

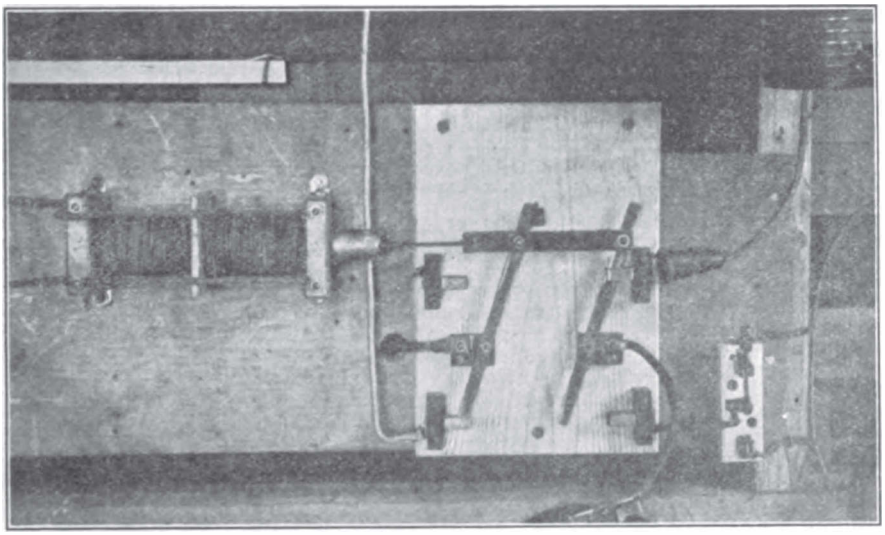
The easiest way to adjust the finished switch is to change the length of the arm that connects the plunger to the cross arm on the switch blades. Shorten it if the blades do not travel far enough to the right and lengthen it if they do not travel far enough to the left.

It is important that the tube be slotted lengthwise if a metal tube is used and the solenoid is to be operated on AC, in order to minimize any eddy current losses.

This switch can be located at any convenient place that will make the antenna lead as short and direct as possible. The control buttons are placed near the transmitter key at 2BQT. The transmitting key is located directly in front of the sounder and the control buttons to the right of the key. The rheostat and switch on the front edge of the table are in the 110V. AC leads

to the transmitter. By this arrangement the station can be operated from a seated position in front of the receiver or from a position in an adjacent building where a second receiver and a second set of key, sounder, buttons, rheostat. and switch is located.

For those who desire that the changeover switch turn on the power to the transmitter a third blade can be added between the present two. For those who are not using the tuned counterpoise-ground system the second blade can be used for power or may be omitted.



Report on Receptions by British Amateurs in the Transatlantic Tests, December, 1921

By Philip R. Coursey, B.Sc., A.M.I.E.E.

Mr. Coursey is assistant editor of the "Wireless World" and the "Radio Review", England's leading radio periodcals, and, as our readers recall, was in charge of the arrangements on the other side in our A.R.R.L. Transatlantic Tests. In this interesting article he tells us the story of the tests from the viewpoint of the British amateur.—Editor.

FROM the British point of view the most striking feature of the recent Transatlantic Tests is the establishment of the fact that low power 200 meter signals have been heard over long ranges even with the limited aerial facilities allowed in Great Britain. For the first regular Transatlantic Test that was organized, i.e., in February, 1921, a remarkable amount of enthusiasm was shown, even by users of the simplest types of receiving apparatus, and the failure of those tests definitely to establish communication seriously damped the ardour of many for the second series of tests.

The failure of the first tests (February, 1921) I do not in any way attribute either to our listeners on this side, or to the apparatus they were using, but simply to the fact that the tests lasted only three nights. In the tests just completed, I think we have conclusively shown that the transmission of the signals across the Atlantic cannot be relied upon to take place *every* night, as the atmospheric phenomena in the intervening space are too variable. Hence in the February tests lasting only three nights, the chances that anything would be heard were, as we see now, quite small—we should indeed have been very lucky if anything at all had been picked up on that occasion.

That being so, it may well be asked why signals from American amateurs have not been intercepted in this country before now. The reason, I think, is to be found in the five hours difference between our Greenwich Mean Time and your Eastern Standard Time (or the still greater difference between G.M.T. and the more western states), coupled with the fact that as a general rule, very very few of our men sit

up till the "wee sma' hours" of the morning unless there is something special to listen-in for. Since no relay work or the transmission of ordinary form of messages between amateur stations is allowed in the British Isles, there is no inducement to listen-in over long periods, unless the incentive is provided by some special signals or tests, such as the recent ones.

If one may draw conclusions from the articles and comments published in QST and other American radio magazines, the opinion has been held apparently, by many in the United States, that the main reason why American amateurs signals have not been previously heard in England is not that stated above, but rather due to the "inferiority" of British receiving apparatus, and statements have more than once been made to the effect that if we used "regenerative" receivers with variometer tuning all would be well. In this connection, one or two points may well be borne in mind; viz:—

1—Although given the same general principles, radio workers in different countries may develop apparatus along different lines, it by no means follows that the resultant products differing both in appearance and in mode of use, are necessarily in any way very different in effectiveness and efficiency.

2—The fundamental principle of "regeneration" is primarily that of *feeding back* amplified energy from the plate circuit of the tube to the grid circuit. This being so, the exact mode in which the feed-back is effected is not of first importance provided that it is capable of fine adjustment and its use does not interfere with the proper functioning of the receiver. Variometer tuning of the plate circuit provides a fine adjustment for getting the valve into the sub-oscillatory position which is so desirable for the reception of spark signals, the feed-back being mainly through the inter-electrode capacity of the tube plus any other stray coupling that may be present. "Reaction coupling" (as we generally call it) of the plate circuit back to the grid is a more positive way of accomplishing the same result especially when the reaction (or "tickler") coil is tuned, in which condition we frequently use it.

3—Since all the pre-war British amateurs' radio apparatus was confiscated by the British Post Office during the war and removed into Government stores, the resumption of wireless activities after the war in nearly every case necessitated the building of new apparatus—the earlier apparatus when returned often not being in a fit state for use again. Naturally then under these conditions C.W. apparatus is used almost exclusively, with the result that our present receiving apparatus is in most cases designed primarily for C. W. work—in which case the sub-oscillatory state of the tube is not required—since it must either be oscillating, for "audodyne" reception, or a separate heterodyne oscillator tube must be used. The former is naturally the method most favored by the average radio amateur. For this arrangement the tuning of the anode circuit is effected quite as easily with a fixed coil and a variable condenser as with a variometer, and in fact in some cases the former method has advantages.

4—The value of the tuned plate circuit is quite well recognized by most British amateurs and was employed by the most successful receiving stations during the Tests, for the stages of radio frequency amplification used in front of the detector tube. Of couse Mr. Godley as a visitor was granted more privileges than are normally allowed to the British amateur, who except in special cases is restricted to an aerial with a *total* amount of wire including down leads of not more than 140 feet, or 100 feet if only a single wire is used. Hence a companion of the ten or eleven stations heard by our amateurs on aerials of this size, with the twenty-three heard by Mr. Godley on his aerial of 850 feet is not so unfavorable, especially as only one Britisher used more than six valves all the time. It may here be of interest to note that 1BCG was read on a set consisting of two valves and a crystal detector by J. R. Forshaw of Omskirk near Liverpool.

To turn now to greater detail of the results—these are summarised in the cable-

1ARY Spark Heard in France

QST is in receipt of a letter from Dr. Pierre Corret, editor of the French amateur radio magazine "La T.S.F. Moderne", advising that one of their readers, Mr. G. Perroux, of Paris, on February 5th copied the signals of 1ARY, University of Vermont, Burlington, Vt., on their spark set.

Mr. Perroux used a single-wire antenna about 35 ft. long with a slanting lead-in about 55 ft. long. The tube equipment consisted of one valve as a regenerative detector and three valves as audio-frequency amplifiers.

It is most remarkable to contemplate the reception of spark signals in France on this simple equipment! Mr. Perroux agrees with us that it is an unquestioned freak. He came in on the end of a transmission just to hear ".....ar 1ARY" and no further signals were received, but this much was copied without the slightest doubt as to the identity of the station.

Congratulations all around on another peach of a record—and *spark* this time!

Cape Girardeau. The same old routes are in operation besides this new route. 9AJN at Jefferson City clears thru 9MC in Roodhouse, Ill., very easily in daylight.

PACIFIC DIVISION
J. V. Wise, Mgr.

C.W.		SPARK	
Stn.	No. Msgs.	Stn.	No. Msgs.
6ZB	37	6ZZ	194
6AK	4	6GT	176
6ZX	2	6ZX	155
		6HP	107
	43	6OL	32
		6FH	30
		6ZB	1
			695

Southern Section—Lack of promptness in submitting reports is mainly responsible for the apparent poor showing of the Southern Section. A fairly large volume of traffic is really handled, but due credit cannot be given in QST unless we know of it by some other means than hearsay. Contrary to expections, no regular traffic routes have been layed out, owing to the extreme difficulty of finding a sufficient number of stations willing to stand regular watches; however, there are enough stations operating at will to ensure messages going through in reasonable time.

C.W. is making a better and better showing, aided by the fact that so many of the reliable sparks are changing to the new order; long distance jumps east will soon be almost exclusively handled by this means. The fact that C.W. still has some drawbacks is apparent in that it cannot be copied satisfactorily in San Diego through NPL arc mush on 375 meters, although a powerful spark carries through.

The new Pacific Plan of traffic regulation, with its machinery for enforcement, is solving the QRM problem for all time. This plan having been endorsed by all Pacific Coast Radio Clubs, it is not surprising that amateurs are making the traffic officers' job an easy one by a universal willingness to co-operate for the common good.

The only known exception to this rule is in San Diego, where a small group of operators have combined in an effort to evade the new rules and use the air according to their own sweet will, without regard to anyone else's convenience. The most industrious members of this group have been barred from all further participation in A.R.R.L. work, and all stations are requested to note their calls, so that no traffic may be handled with them. The list follows: 6HH, 6ADA, 6AEH, 6BKH. The license of 6HH having been revoked by the Department of Commerce, the boycott will not apply against the persons to whom it is reissued. 6BKH, under his old call, 6XZ, has already been under A.R.R.L. boycott for about a year.

District "A" (Arizona)—Our worst QRMers, the 6's, have been QRZ all season. Traffic from the west comes through very well from nearly all the C.W.'s, even the 5 watt stations; about forty messages were received from 6XAQ, who is doing exceptionally good work. Going east, about 100 messages each way were handled with 5IF (C.W.); other eastern stations regularly worked are 9DSD, 5ZAK, 5XU, 5IR, 5ZAC, 9AEG, etc. The majority of the work in Arizona is handled by 6ZZ; others doing good work are: 6AAH, 6ASV, 6GS, 6AFP, 6ZC. 6TV cleared traffic west very well for a time on spark, but is no longer heard and is supposed to have closed up.

District "B" (Arizona)—Riverside County reports only one station handling traffic, 6GT. As heard on the air, there have been many stations in this district showing increased activity. Among these are the following, which are doing good DX work; 6GT, 6FK, 6OE, 6EV, 6BAZ, 6TW, 6ACJ, 6AHF, 6AGK, 6AKC, 6AQY, 6AUC, 6BJV and 6AJH. Inactive hams please note that 6AJH, still on his back in bed following his fall with his mast, has his headset on the major part of the day and is doing all in his power to help put District "B" on the map. 6ZB's 20 watt C.W. has been copied in New Jersey, according to a card recently received. 6BAZ, our sole YL (OW) has reached out as far as Sacramento on her ½ K.W. spark. 6FK and 6AGK will soon be added to the C.W. ranks. Now you fellows in District "B," let's get together and get all of our reports in when they are due, so as to have a real showing in the future.

District "C"—The natural trend is toward C.W.; nearly all the good old sparks are gone. C.W. stations now handling regular traffic are: 6JD, 6ZG, 6EN, 6KA, 6CU, 6KY, 6RR, 6EA, 6EB, 6ZN, 6ALU, 6XAQ, 6JD aand 6EN are both using two 50 watt tubes, 6KA and 6RR are using one 50 watt, and the rest are using one or more 5 watts. On February 22nd, 6KA exchanged greetings with 8JL, Cleveland, Ohio, and 6EN handled traffic with him without QTA on either end. 8JL reported that both could be read with the phones on the table.

6EN has also handled traffic with 8XV, and is going to establish a definite transcon schedule with him. Nearly all the sparks that are handling traffic are in or around Pasadena; among them are: 6MH, 6OL, 6OM, 6ADL, 6ACY, 6AMN, 6ALD, 6ALU, 6LC, 6GP. (6LC is so loud in San Diego that he often cannot be distinguished from a local spark.) An Assistant District Superintendent will be appointed for Pasa-

dena. Los Angeles is the star region for traffic.

District "D"—The only two stations heard in this district are 6ZU and 6AIF C.W. and spark.

District "E" & "F"—We find the old reliable on the job as usual. 6TU and 6OX in particular are doing excellent work followed closely by the Santa Cruz fellows 6AS reports the gang doing fine work, but to get any material out of them to be used in a report, so far, has been impossible,.

A number of stations in the vicinity of the Bay have been copied by 6ZAC in T.H. so this proves the stations are O.K. and all we need is a word from their operators Adjoining District "F" is District "G." This Disrtict will also have a District Superintendent next month. 6EX and 6AH are kings of sparks in Oakland yet; and have been on the job very regularly. 6HP in Richmond is doing fine work and on little power too.

District "H," 6GF, Superintendent—This district has suffered the loss of most of its A1 stations this last month. The rebuilding bug hit them all at once, altho we have no word of an increase in wages. 6FH, and 6ZX, were left to handle most of the work and had little trouble in doing it. Both these stations are now equipped with C.W. and spark, 6ZX using C.W. on 375 and 200, spark on 200 only.

District "I"—The only station heard in this entire district last month was 6AIX, who goes north fine, but not south, and for this reason he can only get a limited amount of traffic.

District "J"—6BIP has made his appearance on the air with a good spark set. 6ZO is back in Reno and is installing a C.W. and fone set. 6MO has been reported as QRK in Washington, D. C. However, he is not handling traffic regularly. A spark in use at 6UO. 6AJR of Reno has been an old reliable all this last month. His spark is making good now.

ROANOKE DIVISION

W. T. Gravely, Mgr.

Heavy sleets and storms have played wild with a good many stations in the division this month but still the old faithfuls have been on the job and traffic has moved through with fair rapidity. The number of C.W. stations is on the increase.

8SP has joined the ranks of the illustrious for his sigs have been heard by 6AME and 7ZS. He has now been heard in every district. Fine work, OM, hope you will be able to make an every-day thing out of it soon. West Virginia leads in the number of msgs. handled and in general efficiency for the month. There are now several stations that form almost constant watch, probably the star station being 8AXY who is using spark to fine advantage. 8AFD, 8WD and 8AEU all spark doing fine work. 8AXY is reported to stay up all the time. Wonder how he ever finds time to sleep. 6's and 7's are copied by him 'most any time.

Virginia seems to be quiet for the time being, due to several good stations being out on account of sleet and sickness of operators Several daylight stations have been opened up, among them being 3BLF and 3BIH. There is need of a good station in Petersburg—who wants the job? General activities for the month have been a little under par.

North Carolina is gradually getting in better shape. There have been added several new C.W. stations during the month, one at Asheville and another at Shelby. Stations in general have been doing very good work but bad weather conditions have somewhat hampered activities. Asheville is within daylight range of Winston-Salem who has a daily schedule with Danville 3BZ. Charlotte, Shelby, Greensboro and Salisbury are all on within daylight range of the Manager's station, making it easy for the Division Manager to communicate with the whole Carolina end of his route by short jump routes.

Traffic in general for the month has not been up to the previous months' record. Several stations that had previously handled considerable traffic have been out with aerial trouble, on a number of occasions. Co-operation is the thing that will get results for the division and if everyone is on the job and puts some life into things then the old division will go to the top and hold the place that the Manager hopes for it to assume.

DELTA DIVISION

H. E. deBen, Acting Mgr.

C.W.		SPARK	
Stn.	No. Msgs.	Stn.	No. Msgs.
5LA	42	5DA	75
5JB	21	5AA	69
5WF	7	5JD	69
	—	5KC	36
	70	5YE	15
			264

Relaying in the Division slackened up to some extent during the past month due mainly to the steadily increasing QRN. However, we are determined not to give Old Man QRN another summer victory and accordingly are working out short jump relay routes throughout the Division All stations desiring appointments on these routes are invited to communicate with their District Superintendent. It is hoped that by organizing short jump relay routes, with stations located from 50 to 100 miles apart, and with the aid of

C.W. that we will be able to pierce the worst QRN. In this day of radio frequency amplification, loop aerials, and highly efficient transmitters, the feat should not be a difficult one to accomplish.

Arkansas—5JB, Roy Disheroon, has been appointed City Manager of Hot Springs and is doing fine work with his C.W. set. 5UE has been appointed official relay station for Conway. 5JD continues to do good work. 5ZL has just returned from St. Louis chuck full of pep and a head full of knowledge—we know things are going to wake up now. Bro Jawn learned a lot about controlling QRM out St. Louis way and will no doubt show us how it's done.

Louisiana—5KC has been handling a goodly bit of traffic of late and his sigs continue to increase in strength. Two newly licensed stations now on the air: 5ABA 10 watt C.W., and 5AAT ½ K.W. spark at Baton Rouge, also plenty of squeak boxes. 5ZAB out of operation due to remodeling and installation of C.W. transmitter. Manard, City Mgr. of Nola, reports that the only stations working DX are: 5HO on 50 watts C.W., 5LA on 15 watts C.W., and 5AA on ½ K.W. spark. 5HO, a newcomer in the League, has a 50 watt bottle pouring 3 amps in the antenna and has been reaching out to real respectable distances. 5LA is still using 15 watts but gets out even better than formerly.

Mississippi—5YE is still the only DX station in the state of Mississippi and is indeed well capable of taking care of all Mississippi traffic. 5YE has handled much traffic during the past month.

Tennessee—All DX stations continue to do good work in spite of bad weather conditions. 5FV is heard nightly and is handling his portion of the traffic. 5KU has been appointed City Manager of Memphis. Mr. King has a 20 watt C.W. set which is putting the traffic over in fine style. 5DA continues to defy the elements out his way and we take the liberty to predict that this will be one station that will cause OM QRN to utter a groan.

ONTARIO DIVISION
A. H. K. Russell, Mgr.

C.W.		SPARK	
Stn.	No. Msgs.	Stn.	No. Msgs.
9AL	30	3EI	32
3EI	5	3JL	18
	—	3GN	17
	35	3BA	14
		3QJ	4
			—
			85

March has been excellent for relay work, but as usual the D.M. has the greatest difficulty in coaxing the different districts to make reports, and he hereby appeals to the various members of the A.R.R.L. throughout Ontario to unite in an effort to make the monthly report a really representative report of relay work throughout the division. We have this month only reports from the Districts Nos. 2 and 3.

Gowan reports aerials springing up like mushrooms all over his district. 3TP has opened up a phone transmitter and if he can be induced to use CW he will give 3BA a run for his money. 3QJ is being changed to 3TY. 3SB is still putting in that CW set. 3GN states that sigs from Toronto are rarely heard there, and then QSS very badly, tho strong and steady in Windsor. He reports 3MN clears London traffic regularly, and 3DL helps out lots. Tillsonburg 3RV and 3TA are both good.

Toronto district No. 3 has done well. 3EI reports working as far as Miami, Florida, with his ½ K.W. while 3JI, a new 5 watt tube set, in nine days from opening up handled 5 messages and worked to Iowa.

No reports have been received from other districts but Rogers 3BP was heard working 6BO one night this month on his C.W. set.

The new laws are not yet in force in Canada, but an inkling that they are easing is that Ottawa has issued an order that on opening of navigation all C.W. stations are empowered to carry on on the winter wave, i.e., 200 meters. Spark stations on the contrary return to the summer footing, i.e., 50 and 100 metres. That sounds like ding dong bell for the poor old pebble squashers.

NORTHWESTERN DIVISION
H. F. Mason, Mgr.

What's the matter, fellows? Don't let the first splash of summer static, or the radio telephones get your goat. Stay on the air, and be one of our RELIABLE stations. With the coming of summer it's going to be harder to clear traffic, and we need your help. We are calling on EVERY station to send in a report of activities to his nearest division officer on the 15th of the month. Don't let yours be missing.

Eastern Section—Traffic has been moving in good shape, although many of the operators were off on account of the flu a good part of the time. 7ZU and 7XB report few messages handled. 7LY also indulged in the flu, but was on strong during the Pres.-Gov. relay. The C.W. fever has at last taken the state of Montana and there will be a couple of good CW sets in Helena soon, and a 20 watt set at 7XB which will be followed by a 100 watter. They plan to work both Seattle and Chicago direct. F.B., 7MP of Bozeman takes the honors for most messages handled this month, and has worked 54 stations, even in spite of a crippled condenser.

Central Section—Activities in this section have taken a dip since 7NL, 7FI, and 7ZS are off the job. This leaves 7ZM

and 7YA on 375 the only stations handling any amount of traffic, and even 7YA reports hard times. As this section is depended upon for handling practically all of the eastern traffic from the western part of Washington and Oregon, it is essential that at least one good 200 meter station be on the job.

Washington Section—Puget Sound statons continue to work consistently, especially to the south. Stations handling the bulk of the traffic are 7BC, 7BK, 7QB and 7HI. 7GE at Pasco, Wash., is also doing good DX, but no reports. 7QB has a schedule with 4CB (Canadian) to handle eastbound traffic on C.W. Down at Grays Harbor, 7SC is installing C.W., I.C.W., spark and fone, and reports activities on the increase since he arrived. 7KJ and 7NN are the principal stations there at present.

Oregon Section—7KE, newly appointed D.S. at Myrtle Point, Oregon, reports that he is working easily into the 6th District, covering 600 miles on a quarter kilowatt. 7OX is putting up a half K.W. set for DX work.

In Portland: 7DP has been clearing traffic on C.W. Sparks who have been doing DX are 7JW, 7ZT, 7GJ, 7ED and 7ZJ. The number of messgaes handled, tho, is extremely low, and is a very poor showing against what these stations have done in the past. 7ZK of Vancouver, Wash., is back on the job, surprising the fellows with a 500 cycle spark. No reports from Eugene or Salem although 7MU at Salem is reaching out on spark since 7TJ has gone to sea. 7HD, D.S. at Seaside, has his transmitter going again and is QSA through the division.

EAST GULF DIVISION
B. W. Benning, Mgr.

C.W.		SPARK	
Stn.	No. Msgs.	Stn.	No. Msgs.
4GL	475	5XA	192
4BY	329	4EZ	56
4FT	200	4AU	55
4II	142	4GN	46
4BF	121	4BI	45
4BQ	65	4HS	35
4YA	48	4GM	25
4CO	40	4FD	24
5XA	36	4DZ	12
4AZ	30	5GI	13
4ZE	30	4DH	9
4EL	25	4GU	5
4IW	25	5ON	1
4GE	18		518
4AS	15		
4ZF	10		
4BK	9		
5ZI	1		
	1619		

Florida—4ZE is trying some of the new tuners for the coming season. He has a regular route now with 4DZ, which opens South Florida. 4FS has completed his C.W. set and is in line for traffic. 4BC continues to do DX and is improving his set for summer work. 4DZ is doing regular work with 1BQE, 3EZ and 4GN. This opens South Fla. in good shape. 4AW, our last winter's standby, has started a C.W. set. W. E. Wood, 4BS, has gallantly offered a report for Miami and we thank him. Miami has 10 licensed amateurs, with sets ranging from spark coils to 1 K.W. sets; 4ES has a good station and is going to install C.W. At St. Petersburg the local club is building a set to specifications and are having nightly code practice. 4IW, C.W., is on the air and does regular DX. 4BF broke loose about three weeks ago. This fine station has already been reported QSA on the Pacific Coast several times.

4II has been reported QSA in Burlington, Ia., and Newmarket, Ontario. Supt. Harrod is pleased to say that every city manager has been striving this month to show that the land of Palms and Placid Lakes contain real radio men. 4ZC is doing fine work, having worked into 34 states and Canada.

Alabama—City Mgr. Ansley of Birmingham reports that their one and only spark DX station, 5GI, was closed down for the most of the month, following a complaint made to the R. I. that he, 5GI, was interfering with radio-phone reception—the receiving station making the complaint was located about two blocks away and using two steps of R. F. amplification!!! Hi. 5GI has been given permission to open up again. This trouble of interfering with radio-phone reception will probably cease if the plans of the B'ham Wireless Assn, are adhered to. 5ZI, C.W., has broken through to 5XA and 8ARS and has handled one message. He reports that there are six licensed amateurs in Anniston. Mr. J. K. Moore has been appointed City Mgr. of Gadsden.

In Montgomery, City Mgr. Brooks reports that all DX work has been given up due to the fact that all the possibilities are spending their time listening to the phone concerts. (We wonder if they listen all night. DX work doesn't start before 11:00 P.M.) 5NI has given up blowing condensers on his rock crusher and is building a low powered phone set. 5XR has installed C.W. City Mgr. Barnett of Mobile advises that the Radio Inspector recently visited Mobile and assisted by the chief operator of NGT tuned all the amateur statons there. 5KB is on 200 and 5JZ on 195 meters. Two new 5 watt C.W. stations are 5ACO and 5ACB.

5XA in Auburn has been the old standby and is still trying to do the work that 20

or 30 stations ought to be doing in this state. The 10 watt C.W. set is putting out .8 of an amp. and 750 miles is easy work for it.

South Carolina—4LA at Spartanburg has been absent from that city for some time and communication between 4LA and 4EG has been suspended. 4EG has established communication with 4AS at Macon, Ga. 4LA, 4IB, 4HR, 4HG and 4FI are in operation. Supt. Etheredge thinks that much progress will be made by his state during the next month and that we will have some reliable relay routes through the state by May.

North Georgia—Supt. Hight reports ports his district quite active during the past month. Extreme interest in radio has been exhibited by citizens in general. 4BQ made a talk before the Kiwanis Club of Rome, his subject being "Amateur Wireless and The American Radio Relay League." By request he repeated this talk before the Rotary Club and the Berry's Industrial School. 4BQ's CW signals are being heard all over the United States and Canada; he had 42 reports from the Pacific Coast in 20 days of operation, such reports including Vancouver, B. C., Seattle, San Francisco, Los Angeles, and Sacramento.

Middle Georgia—Midville 4GN has no trouble in working Fla. stations, having handled traffic with 4EZ. 4FD junked his CW for spark again. 4DH is putting in a 50 watt CW set. 4AS in Macon has been reaching all over the country with his new 10-watt CW set and is handling a good bit of traffic. 4GU, also on 10 watts of CW, has been stepping about over DX. 4BW reports that he has at last found a condenser that will hold his gravel grinder and is getting over the back fence. 4JH has installed a 50 watt CW set in place of his 10 watt and is in line for relay work at the present writing. 4BK swore off radio again. (HI—This is the fifth time Rankin has quit in the past 6 months. He will come back in a few days—he always does.)

South Georgia—That famous combination of 4GL, 4BY, 4EL, and 4GE smashed all our traffic records again this month and seem to be real angry that Atlanta had the nerve to nose them out of first place last month. Supt. Hodge reports that steady communication is held with Florida stations 4ZC, 4BF, 4IF, and 4II. Reliable communication is had with 5XA of Auburn, Ala., and 4FT of Atlanta. Won't some of you new radio men of Talbetten, St. Marys, Waycross, Boston, Valosta, Beuna-Vista and other places get in touch with Supt. Hodge? In Atlanta, 4FT was decreased somewhat this month due to the fact that the "Atlanta Constitution" is using the station temporarily for a broadcasting station.

DAKOTA DIVISION
Boyd Phelps, Mgr.

All district superintendents are busy lining up stations in the smaller towns for summer relay routes over which messages must be handled to insure delivery. The Southern Minnesota District is particularly lively in this respect and it had occasion to show its worth during the isolation of the Twin Cities when storms cut off all communications.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of QST, published monthly at Hartford, Conn. for April 1, 1922.

County of Hartford } ss.
State of Connecticut }

Before me a Notary Public in and for the State and county aforesaid personally appeared K. B. Warner, who, having been duly sworn according to law, deposes and says that he is the business manager of QST and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, The American Radio Relay League, Inc., Hartford, Conn.; Editor, Kenneth B. Warner, Hartford, Conn.; Managing Editor, (none); Business Manager, Kenneth B. Warner, Hartford, Conn.

2. That the owners are: (Give names and addresses of the individual owners, or, if a corporation, give its names and the names and addresses of stockholders owning or holding 1 per cent. or more of the total amount of stock). The American Radio Relay League, Inc., an association without capital stock, incorporated under the laws of the State of Connecticut.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent. or more of total amount of bonds, mortgages, or other securities are: (If they are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear on the books of the company but also, in cases where the stockholder or security holder appeared upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is.....(This information is required from daily publications only).

K. B. Warner

Sworn to and subscribed before me this 24th day of March, 1922.

Wm. Lacey Wells, Notary Public
(My commission expires February 1, 1925.)

Who's Who in AMATEUR WIRELESS

B. W. Benning

"Our Genial Division Manager"—as all the fellows in the East Gulf call him—was born in Atlanta, Ga., March 9, 1897. Having been interested in electricity since 1909 he was the easy victim of the bite of the wireless bug in 1913. The first symptom of this awful disease was inflicting a coherer and other miscellaneous junk upon the household. In 1915 he graduated (with all due honors) from the spark coil class and for two hideous months radiated so much QRM on the DX men of the city that they threatened several different kinds of murder. He was finally taken into the Atlanta Radio Club and educated by pre-war 4CL, 4BY, 4AT, and 4DG. Installing a 2 K.W. open core transformer with electrolytic interrupter in 1916, he blossomed out with the call 4DX. "DX" was a good call but didn't mean anything.

During the war he served in the Navy

(*Concluded on page 54*)

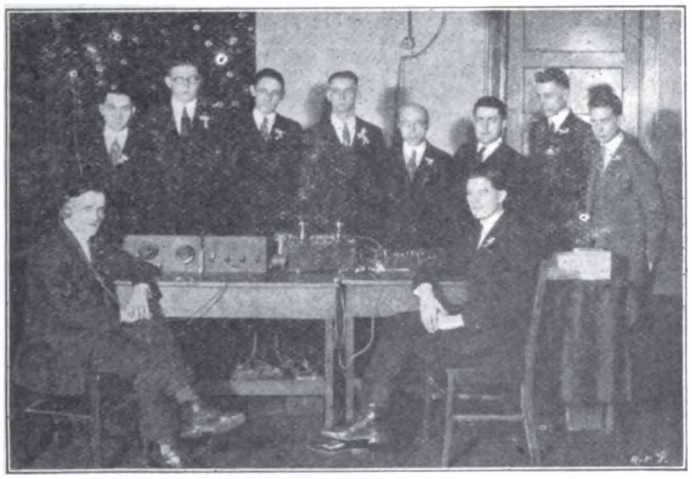
Albert J. Lorimer

Born Nov. 7, 1897, at Farnham, Quebec, Canada, our Quebec Division Manager launched his radio career soon after. Troubles with land-line telegraphy in 1912 turned his interests to radio. Passing from the coherer to the potato detector stage, and from the spark coil to the quarter kilowatt, this rival of Marconi stepped forward in the world.

In 1915 he moved to New York City and entered the service of the Western Electric Co. When the lid was lifted he was located in Montreal and operated Canadian 2BF with a ½ K.W. quenched outfit and worked 2TF at Schenectady with fair regularity. Later when the resulting QRM hindered VCA the spark set was gotten rid of and a 250 watt I.C.W. installed, resulting in a great increase in range. 2BF is now being relocated at Farnham and will soon be heard from.

CLUBS wishing information on how to become affiliated with the American Radio Relay League can secure same by addressing a letter to the Traffic Manager, A.R.R.L., 1045 Main St., Hartford, Conn., who will be glad to furnish the necessary application blanks. There is no charge for affiliation. Every good radio club, society, or association is eligible for affiliation.

The Detroit radio clubs have adopted a novel scheme for enforcing their regulations. They have several blanks of different colors which are used to report violations. When a station is violating the regulations several amateurs sign a blank and send it to the station and another copy to the radio inspector. For the first offense a blue blank is sent for warning. No mention is made of other colors except red—and a red blank means action by the radio inspector. The scheme works splendidly and as yet no one has received the "red ticket".



Officers and members of the High Power Committee of Roselle Park Radio Club, and set used at radio dance. Left to right, Wm. Pinter (sitting); M. C. Lane, P. J. Larsen; C. A. Reberger, sec.; R. H. Horning, president; G. Bosler, vice-pres.; H. T. Ryder, treas.; F. Schiffle, J. Smith, and H. Luttgens (sitting).

Roselle Park (N. J.) Radio Club

The first affair attempted by the club was a dance with the music furnished by WJZ through the courtesies of Major J. Andrew White and W. A. Easton. The dance was held February 24th.

Interesting lectures are given every week and one of the most important of all will be a lecture by Paul F. Godley, our hero of the Transatlantic Tests. His subject will be the "regenerative receiver". The club extends an invitation to surrounding organizations of the second district to send their delegates to this meeting which will be held on Tuesday evening May 9th at 8 P.M. sharp.

The officers are R. H. Horning, pres.; G. Bosler, vice pres.; C. A. Reberger, secy.; H. Ryder, treas.; H. Luttgens, traffic manager; P. J. Larsen, technical advisor.

The following papers were received during the month and we advise all of you to read your local paper as some very vital points can be cleared up in your locality through the medium of such means for distributing information.

Totem Radio News—official organ of Totem Radio Club.

Delta Division News—by Delta Division A.R.R.L.

The Radio Log—by Radio Club of Brooklyn.

The Michigan Radioist—by Central Michigan Wireless Association.

The Oscillators—by Radio Engineering Society of Pittsburgh.

The Modulator—by Radio Association of Greater New York.

The Oscillator—by Y.M.C.A. Radio Club of Sioux Falls, S.D.

Kickbacks—by Twin City Radio Club.

Scenic Highway Radio Club (Clinton Ia.)

The club held its anual election February 13th and is pleased to announce the following names to serve for 1922: G. A. Gummeson, pres.; W. Pringle, vice pres.; G. Stukas, sec'y-treas.; J. Baker, corres. secy.

Four operators will handle traffic on the new 1 K.W. spark set which is in operation. Single circuit tuners are used extensively by members of the club. (Come on—give us some dope on them.—T.M.)

Ypsilanti (Mich.) Radio Association

The meeting of the past year consisted of code practice and lectures. The membership has nearly doubled in that time though there are but three licensed amateurs. F. N. Furlong has been elected president vice F. F. Sims who left for the Naval Academy.

Southern Ontario Radio Association

New officers for the coming year were elected at the last regular meeting: R. E. Moore, pres.; K. S. Atkinson, vice pres.; R. C. Hunt, treas.; C. R. Waage, secy. The advisory committee consists of D. Aitchison, W. Baker, and R. Bridwell. The welcoming committee—C. Lane, G. Brett, and J. Green. The traffic committee—R. Moore, R. Bertrand, and H. Wilson.

Haddonfield (N. J.) Radio League

New officers for the coming year are: E. Farrington, pres.; J. L. Barnes, vice pres.; E. Braddock, secy.; G. Barnes, treas.; J. G. Haydock, chairman of technical committee.

Regular meetings are held every other Saturday evening at the home of Thomas Sherrod.

Fort Worth (Tex.) Radio Club

The semi-annual election of officers was held March 2nd. The following officers were elected: Prof. O. R. Garrett, pres.; R. L. Harris, vice pres.; M. Smith, secy and treas.; O. Yeary, sgt.-at-arms. Prof. Garrett will start a series of lectures that will cover the field from beginner up.

Mystic Valley (Mass.) Radio Club

At the last meeting new officers were elected for the year of 1922: E. Baker, pres.; L. Gordon, vice pres.; E. D. Austin, secy.; L. Hitichens, treas. The club will be glad to exchange correspondence with all radio clubs. Address all mail to the secretary at 1 Kern St., Malden, Mass.

Philadelphia Amateur Radio Association

At a meeting on March 6th, a paper on "British Aircraft Tube Transmission" was read by W. B. Martin.

Photo of Roselle Park Radio Club members and their apparatus, on the night of the affair

Some very amusing questions on radio which were taken from a New York newspaper were read by the president. A discussion on "radio frequency amplification" was led by H. Van Sciver. The discussion was fully covered. (We would like to know the result of the discussion.—T.M.)

Hudson Amateur Radio Club (N. Y. C.)

The Hudson Amateur Radio Club meets Saturday evenings at the Columbia Preparatory School, 301 West 8th Street, New York City.

Mr. Stern of the Western Electric Company spoke on various types of antenna in common use; Mr. Gawler of the Radio Corporation of America spoke on the history of the Amateur Radio in the New England States, and Mr. D. S. Brown of the Radio Club of America gave an interesting talk on the theory of vacuum tubes with their application to modern receiving circuits. Mr. C. G. Kilbourne, our Vice President, also spoke on getting the most out of our C.W. sets. We have also been favored with short talks by different members of the club.

Over sixty percent of the members are licensed amateurs holding either first or second grade licenses.

The club is a member of the Second District Executive Council.

8AGZ Heard in Hawaii!

The latest station to be reported by Mr. Dow, 6ZAC in Hawaii, is 8YT, formerly 8AGZ, the station of Mr. C. J. Carter at East Cleveland, Ohio. 4500 miles on 100 watts, 375 meters. Fine business!

Regarding the article on loop reception by 3ZY in last QST, the experiments have been continued and it was found that the large two-turn tickler was not as good for regeneration as tuning the plate circuit with a variometer, and the latter plan has been adopted. All of the secondary was then placed on the loop itself. The result now is that with two stages of audio amplification a lot of DX C.W. is being heard readably all over the room.

To check the possible effect of the antenna, the set was taken to a vacant lot—and better results got than ever.

Irving Vermilya, "VN", 1ZE-ex-1HAA, "Amateur Number One", old-time brass pounder, manager of Marconi's old WCC, and more lately Senior Shift Engineer at WSO, Marion, Mass., left the employ of the Radio Corporation on April 10th to become the manager of the new radio department of a New Bedford firm, Slocum & Kilburn. Going to carry everything from crystals to 99-stage amplifiers, VN says, and even going to run a 250-watt broadcaster. Regular pirate!

We know that all of Familiar's friends join us in wishing him best of luck in his new job.

"To hell with C.W."—1ZE, August 15, 1921.

"I am now in favor of passing a law against all sparks—no excuse for them."—1ZE, March 31, 1922.

Who put the broad in Broadcast?

The Weston Elec. Inst. Co. of Newark, N.J. announce the appointment of the following Sales Representatives:

Shiefer Electric Co., Inc., with offices at Rochester, Buffalo and Syracuse, for upper New York State and Erie, Pa.

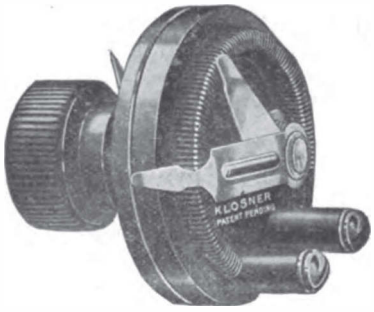
L. D. Joralemon, Otis Bldg., Philadelphia, for Pennsylvania, Delaware, Maryland and District of Columbia.

Warren C. Graham Co., Carondelet Bldg., New Orleans, for Louisiana, Mississippi and Lower Alabama.

The Anthracite Radio Shop, P. O. Box 3, Scranton, Pa., of which Roy C. Ehrhardt is treasurer, has succeeded the Shotton Radio Mfg. Co. in that city, the latter company now being located in Albany.

S. M. Kintner, who is well know for his research and engineering work in the development of radio apparatus, has been appointed manager of the research department of the Westinghouse Electric & Manufacturing Company, succeeding C. E. Skinner, who has been made assistant director of engineering in the Westinghouse company. He will be located in the research laboratory building near East Pittsburgh, Pa.

Here is an illustration of a new vernier rheostat, the Klosner, which is especially designed for gaseous detector tubes requiring critical adjustment. In addition to the regular rheostat winding it has a



second resistance consisting of a single turn of the same wire running around the base of the device and provided with another contact arm. A single knob actuates either slider, the shaft to which the vernier is attached pulling out to engage a clutch on which the main contact arm is mounted.

The young lady across the way says she heard that nice Mr. Hanson of 9XM say he had gotten rid of his corona. She supposes the poor man will have to keep up his correspondence in long-hand hereafter.

The young lady says Mr. Hanson said the stations along the Mexican border just eat up all the C.W. he can feed them. She says she just can't keep up with all those new breakfast-foods anyhow!

9YAE of Le Mars, Ia., informs us that at present they use spark instead of C.W. as reported in the March issue.

Allow us to extend our condolations to A. Ham Wright. He asked a friend what he could do with his pet Tron tube having a broken-off grid lead and was advised that it would make a fine bobber for a fish line. He is now being held by the County Game Commissioner on a charge of fishing with lights!

A new way to test amplifier tubes: tap with a hammer to determine the degree of hardness.

We understand WLB-9XI is broadcasting potatoes on 485 meters. Moral: Run your lead-in to the dining room.

DID IT EVER OCCUR TO YOU THAT:
An old 4D coil has a good filter condenser in the base?
It is NOT more blessed to give than to receive in radio?
When giving long calls you might fade out before you get to your call?
200 meters was meant to use?
At the rate VT's are being manufactured the world's supply of vacuum may soon be exhausted?
The study of radio will drive you nuts sooner or later?

G. R. Hammond, of Olwein, Iowa, sold out 9ZQ and turned in his Special a year ago with the foolish idea he would quit radio. Now he is back again as 9HE. Radio can't be quit!

1BN is now W. A. Jecusio, 47 Day St., Ansonia, Conn.

8SE has moved to Box 1044, Uniontown, Pa.

Ad in "Denver Post": "Wireless receiving set with andiron doctor, cheap". Why use vacuum tubes?

Breathes there a Ham with soul so dead,
Who after reading QST for Feb.
Did not exclaim aloud with joy,
This is my Native Land, "Oh Boy!"

Read 'Em and Weep

8BO of Detroit has been using a single five-watt tube for nine months and on it has handled traffic with 4BF of St. Petersburg, Fla., 9WU of Ellendale, N.D., and is consistently heard by 6XAD.

8HJ of Elmira, N.Y., has been heard very QRK on 10 watts by 6XAD.

4GL (described in February QST) using three five watt tubes has been reported 1700 miles west of Vancouver.

2AYV has been reported on 10 watts over a foot from the phones by 7JS at Anacortes, Wash., using one tube.

5ZA uses two fifty watt tubes, one as oscillator and one as modulator, and has been reported on phone very loud in Canada, New Jersey, Virginia, Minnesota, New York, and many other places 1,000 to 1,800 miles distant.

6ZE has again been copied in Hawaii, this time with eight-tenths of an ampere from two five-watt tubes.

6ZZ has been heard on one tube, one wire aerial, and one-circuit tuner at Watertown, Mass., also at 1BWD at Calais, Me.

6PT on five watts and 6KA on C.W. and spark have been heard QSA on one tube by 8FT.

8SP of Fairmont, W. Va., using 10[illegible] watts C.W. has been copied by 6AMF, Riverbank, Calif., and 7ZS, Pullman, Wash.

4CO has been reported by Canadians 5CN and 9BD, both of Vancouver, B. C., and has heard 6XAD, 6ZZ, and 6ATG.

8AGZ sends us a list of 34 Pacific Coast stations who have heard him.

8AGO of Pittsburgh reports working 6BO for a half hour on fifteen watts, very QRK and slight QSS.

The statement made in the January QST concerning the first time a First District station had heard a Sixth District station has caused considerable comment and incidentally has brought in a lot of good records. Arthur E. Ericson at Beverly, Mass., reports that he has heard 6KA and 6ALE at least twice a month, confirming all reception, previous to that mentioned in QST.

In this day and age of everyone getting interested in radio we find the best "experts" behind the counter selling tuners in department and hardware stores. The following is quoted from a circular letter of a large concern: "—capacity up to 400 meter wave length on one battery and higher with two batteries." Also in "The Wireless Man" by F. A. Collins, "The sending key is similar to that of the telegraph. except that it is unusually large and made entirely of wood...At a signal the powerful dynamos are released and the whirr and rush of the machinery sudenly fills the air. As the wooden key is pressed the thundering report of the spark stuns one's ears...."

Wot tha Dosh Dat!

Two hams were testing out a VT.

First Ham: "The first test we are going to run will tell whether it is a stable tube or not."

Second Ham: "How does a stable tube act? Hey?"

First Ham: "It makes a hoarse noise in the phones."

Word has reached us that our fellow amateur William R. Klorig of 4404 W. 16th St., Chicago, passed away on Dec. 29th. He had many friends among radio men in Chicago and those outside may re-

(*Concluded on page 54*)

With Our Radiophone Listeners

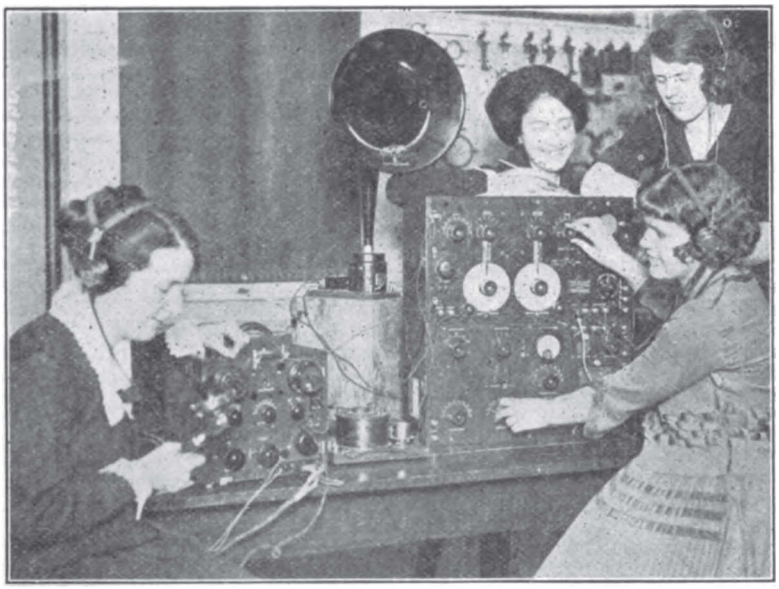
The following is the revised schedule of the Amrad station WGI (formerly 1XE) at Medford Hillside, Mass., wave length 350 meters: Police reports nightly at 7:55 p.m. followed by sermons and music on Sunday, business reports on Monday, bedtime stories for children on Tuesday and Thursday, special music on Wednesday, code practice on Friday, and news on Saturday.

The University of Wisconsin, call WHA, has been a prominent pioneer in the middle-west broadcasting, doing it solely from the amateur standpoint. Daily, except Sunday, from 12 noon to 12:25 the market report and weather forecast is sent by 4 K.W. spark on a wave of 485 meters. This is immediately repeated on the same wave by phone, together with special notices and announcements. On Saturdays the complete program for the coming week is given. Time signals are sent at 12:55 p.m. The regular concert is sent on 360 meters Friday evenings from 8 to 8:45, and in addition a lecture on radio subjects is given on the same wave Saturday afternoons at 1 p.m.

We note with interest the department stores entering the broadcasting field. In Philadelphia we have WFI—Strawbridge & Clothier, WIP—Gimbel's, WOO—Wanamaker's, as well as WGL—T. F. J. Howlett, ex-3AWI.

The Doubleday-Hill Electric Co., of Washington, D. C., wish to announce that their new station WMU will put on a program every afternoon from 4:30 to 5:30 and also Thursday and Friday from 7:30 to 8:30.

The Atlantic (Ga.) Journal's station WSB broadcasts concerts on 360 meters and news bulletins, market reports, and weather reports on 485 meters.



—Photo by Underwood & Underwood

RADCLIFFE COLLEGE GIRLS OPERATE NEW RADIO STATION—These students are sending messages to their parents in various parts of the country by radiophone from Radcliffe College, Cambridge, Mass. Miss Eleanor Brennan is shown seated at the right, "tuning in." At the left, speaking into the transmitter, is Miss Katherine Miller of Salem, Ohio. Standing in the rear is Miss Margaret Cunningham taking down messages and Miss Susanne Dunn, of Erie, Penn., is listening in.

Broadcast Stations

The Department of Commerce announces the following list of licensed broadcast stations as complete up to March 10th.

All of these stations employ the 360-meter wave for the broadcasting of music, concerts, lectures, etc., and those marked with the asterisk (*) in addition broadcast market or weather reports on 485 meters, the official wave for that class of work.

Owner	*Location*	*Call*
Allen, Preston D.	Oakland, Calif.	KZM
American Radio & Research Corp.	Medford Hillside, Mass.	WGI
Atlantic-Pacific Radio Supplies Co.	Oakland, Calif.	KZY
Ramberger, L., & Co.	Newark, N. J.	WCR
Bible Institute of Los Angeles, Inc.	Los Angeles, Calif.	KJS
Church of the Covenant	Washington, D. C.	WDM
City of Chicago	Chicago, Ill.	WBU
Cox, Warren R.	Cleveland, Ohio	WHK
Crosley Mfg. Co.	Cincinnati, Ohio	WLW
DeForest Radio Telep. & Teleg. Co.	New York, N. Y.	WJX
Detroit News, The	Detroit, Mich.	*WWJ
Doubleday-Hill Electric Co.	Pittsburgh, Pa.	KQV
Doron Brothers Electric Co.	Hamilton, Ohio	WRK
Duck Co., Wm. B.	Toledo, Ohio	WHU
Dunn & Co., J. J.	Pasadena, Calif.	KLB
Electric Lighting & Supply Co.	Hollywood, Calif.	KGC
Examiner Printing Co., The	San Francisco, Calif.	KUO
General Electric Co.	Schenectady, N. Y.	WGY
Gilbert Co., A. C.	New Haven, Conn.	WCJ
Gould, C. O.	Stockton, Calif.	KJQ
Hamilton, Mfg. Co.	Indianapolis, Ind.	WLK
Hatfield Electric Co.	Indianapolis, Ind.	WOH
Herrold, Chas. D.	San Jose, Calif.	KQW
Hobrecht, J. C.	Sacramento, Calif.	KVQ
Howlett, Thos. F. J.	Philadelphia, Pa.	WGL
Karlowa Radio Co.	Rock Island, Ill.	*WOC
Kennedy Co., Colin B.	Los Altos, Calif.	KLP
Kluge, Arno A.	Los Angeles, Calif.	KQL
Kraft, Vincent I.	Seattle, Wash.	KJR
Lorden, Edwin L.	San Francisco, Calif.	KGB
Marshall-Gerken Co.	Toledo, Ohio	*WSZ
Metropolitan Utilities District	Omaha, Nebr.	*WOU
Meyberg Co., Leo J.	San Francisco, Calif.	KDN
Meyberg Co., Leo J.	Los Angeles, Calif.	KYJ
Missouri State Marketing Bureau	Jefferson City, Mo.	*WOS
Montgomery Light & Water Power Co.	Montgomery, Ala.	*WGH
Newspaper Printing Co.	Pittsburgh, Pa.	WPB
Northern Radio & Electric Co.	Seattle, Wash.	KFC
Palladium Printing Co.	Richmond, Ind.	*WOZ
Pine Bluff Co., The	Pine Bluff, Ark.	WOK
Pomona Fixture & Wiring Co.	Pomona, Calif.	KGF
Portable Wireless Telephone Co.	Stockton, Calif.	KWG
Precision Equipment Co.	Cincinnati, Ohio	*WMH
Precision Shop, The	Gridley, Calif.	KFU
Radio Construction & Electric Co.	Washington, D. C.	WDW
Radio Corporation of America	Roselle Park, N. J.	WDY
Radio Shop, The	Sunnyvale, Calif.	KJJ
Radio Telephone Shop, The	San Francisco, Calif.	KYY
Reynolds Radio Co.	Denver, Colo.	*KIZ
Rike Kumler Co., The	Dayton, Ohio	*WFO
Rochester Times Union	Rochester, N. Y.	*WHQ
Seeley, Stuart W.	East Lansing, Mich.	*WHW
Service Radio Equipment Co.	Toledo, Ohio	WJK
Ship Owners Radio Service	New York, N. Y.	WDT
Union College	Schenectady, N. Y.	WRL
University of Minnesota	Minneapolis, Minn.	*WLB
University of Wisconsin	Madison, Wis.	*WHA
Warner Bros.	Oakland, Calif.	KLS
Wasner, Louis	Seattle, Wash.	KHQ
Westinghouse Electric & Mfg. Co.	Springfield, Mass.	WBZ
Westinghouse Electric & Mfg. Co.	Chicago, Ill.	KYW
Westinghouse Electric & Mfg. Co.	Newark, N. J.	WJZ
Westinghouse Electric & Mfg. Co.	East Pittsburgh, Pa.	KDKA
Western Radio Electric Co.	Los Angeles, Calif.	KOG
Western Radio Co.	Kansas City, Mo.	*WOQ
White & Boyer	Washington, D. C.	WJH
Wireless Telep. Co. of Hudson County	Jersey City, N. J.	WNO

Practically all of the above stations have concert hours various evenings in the week. We have received many of their schedules, so many in fact that it would completely fill an issue of QST if we tried to print them. Most of the above have printed sheets for distribution, giving the evenings per week of concerts, lectures, news, etc. We therefore suggest that our readers interested write to the prominent stations in their vicinity and ask to be put on the mailing list for the weekly announcements of the coming week's program.

The photo on this page shows the station operated by the Signal Corps at Fort Wood, Bedloes Island, New York Harbor. The broadcast service is sent on 1400 meters with a 3K.W. set every evening from 9 to 9:55 p.m., call letters WYCB. The development of interest among amateurs and the establishment of contact with them by this and other means, will, it is hoped, result among other things in making practicable the building up of a complete radio net of qualified amateur stations who can and will be willing to assist the regular Army radio net in the transmission of official business during emergency or otherwise.

An Appeal!

Have you ever listened in to a concert and heard a lot of funny (?) noises, squeals, howls, etc.? With a good three-step amplifier and loud-speaker the family may be enjoying a concert when suddenly there will be a roar like a fire siren tearing thru the room that will make you jump. Or it may moan and groan, sending the children scampering to their mother; or render a hair-raising shriek not unlike that of a woman being murdered,—all in the midst of an otherwise beautiful concert or Unkle Wiggily story. Such occurences happen nightly in most cities.

The trouble is not with your outfit, neither is it due to amateurs sending, in the strict sense of the word. The trouble is caused by the listeners themselves!

Briefly the action is this: under certain conditions a receiving set may act as a miniature transmitter. Signals from such a set often carry several miles so it is not unnatural that with several such sets in the same block the noise may be terrific. This transmission only happens when the set is oscillating. Single circuit tuners, such as are common on the market for broadcast receiving because of their simplicity of operation, are especially violent in sending out waves.

After adjusting the tuning element of the set it will be noticed that when advancing the "tickler" or "regeneration" control the signals will increase in loudness up to a certain point. At this point there is a click or thud, beyond which the set oscillates and produces waves of its own. This condition is to be guarded against for the reasons stated above—it makes a transmitter out of your receiver.

—Photo by Underwood & Underwood

W. D. Terrell, Uncle Sam's Chief Radio Inspector at the Department of Commerce, who has been simply deluged with work since radio reception became a popular pastime. Mr. Terrell, boss of the amateurs, is known, respected and admired by the entire A.R.R.L.

Broadcasting stations have a "carrier wave" on which the voice and music travel but which is inaudible unless the receiving set is adjusted to the oscillating condition. In tuning slowly with the set oscillating these waves first become audible at a very high pitch and as the tuning knob is slowly

—Pitcher by Underwood & Underwood Every other magazine has published this picture so we suppose we might as well too. Originally entitled "Send Me a Kiss by Wireless," members of our staff respectfully suggest that the title might be improved—for example, "Radio teLEGraphy versus telephony," or why not "See the Shaft—on the Variometer."

turned the note decreases in pitch until it is so low it is inaudible for a short space, then rises to the higher audibility limit as the rotaton is further continued. In this short space where the "carrier wave" is inaudible, music and voice *may* be picked up, which may or may not be badly distorted. This is just the stunt many of our listeners proceed to do. During this time their receiving sets are sending out waves which almost surely interfere with other listeners.

We do not mean to bring wrath upon such people as we believe not one in a hundred realizes what he is doing. We want you to know for your own information what happens and incidentally to take considerable blame off the shoulders of amateurs who own transmitting stations.

In Canada, England, and several other countries receiving stations are required to be licensed because of the interference it is possible for them to produce. We hope this will not be necessary in this country. It will not be if the listeners can co-operate as relay amateurs have learned to do in the past.

Do not adjust your receiving set as described above. Keep it in a non-oscillating condition. The "tickler" or "regeneration" (whichever it is called on your set) should be kept well below the oscillating point, for tho the signals increase enormously when on the edge of oscillation, they will be badly distorted and as a general rule not as understandable. Don't interpret us as meaning weaker signals are clearer. The tuning should be as near perfect as possible so as to be on the exact wave and the most energy utilized. What we mean is, for the clearest and most understandable reproduction, do not "crowd" the signal too much by excess regeneration, and above all, for the sake of your neighbor, do not allow your set to oscillate.

B. W. BENNING

(Concluded from page 46)

and Marine Corps. Graduating from the Naval Radio School at Paris Island, S.C., in June, 1918, he did his share of guard duty just missing going to France as the Armistice was signed. In March, 1919, he was shipped to Port-Au-Prince, Haiti, where he nursed the generators and punched brass at NSC until discharged in October. He returned to Atlanta and stood the commercial exam, erecting station 4BZ in February, 1920. His present ambition as D.M. is to put the East Gulf Division on the top of the traffic percentage column and keep it there.

"STRAYS"

(Concluded from page 50)

member him as in charge of subscriptions to QST at our booth at the National Convention. We deeply mourn his loss.

WOULDN'T IT BE WONDERFUL—

If Henry Ford would buy up all the spark transmitters in the second district and use them for ship moorings?

If First Grade Commercial Operator's tickets could be bought like a dog's license?

If static could be used to charge the storage batteries?

Calls Heard

HEARD DURING MARCH

Unless Otherwise Specified

Amateurs reporting lists are requested to see instructions appearing at the head of this department in previous issues, and to observe the following additional instruction.

(4) In order to distinguish between spark and C.W. stations, list spark stations from 1 to 9 in the usual manner, and then make a second paragraph in identical form listing the C.W. stations.

Heard By 6NW While Operating Str. "WTT"

565 miles south of Ketchikan, Alaska, Mar. 1: Can.: 5AZ, 5DA, 5FE, 5NA, 9BD. U.S.: 6AJR, 6BIU, 6EA, 6FH, 6HY, 6IB, 6IC, 6MZ, 6OG, 6OL, 6PO, 6WO, 6VK, 6VX, 6ZU, 7BH, 7GJ, 7KE, 7LO, 7NZ, 7WG, 7YA.

300 miles south Ketchikan, Mar. 2: 6AGF, 6AJR, 6EX, 6IC, 6TU, 6VX, 6ZX.

38 miles south Ketchikan, Mar. 3; 7YA, 7YL, 7ZM.

20 mils south Ketchikan, Mar. 4: 7HD, 7KS.

Heard by Opr. Mexican S.S. "Mexico"

At Guaymas, Sonora, Mexico: 5BI, 5BY, 5EH, 5EW, 5FA, 5HK, 5IF, 5IQ, 5IR, 5KP, 5LB, 5NH, 5NS, 5OF, 5QQ, 5QT, 5RA, 5TD, 5TG, 5VO, 5WC, 5XT, 5XU, 5YG, 5ZU, 5ZW, 5ZAD, 5ZAF, 5ZAG, 6DA, 6GR, 6GS, 6KC, 6LC, 6OL, 6QR, 6ZX, 6ZZ, 6AAH, 6AAK, 6AAW, 6ADA, 6AED, 6AEH, 6AMN, 6ASV, 6AUD, 6AVR, 6BGH, 9AEG, 9YAL, 6GT, 6OD, 6UK, 6AJH, 6APP, 6AOE.

At LaPaz, Lower Calif.: 6AS, 6BG, 6EX, 6GR, 6HH, 6HB, 6LC, 6AFE, 6ALD, 6AWX, 6BGH, 6ZAL, 9BSD.

At Mazatlan, Sinilos: 5AE, 5AL, 5BY, 5HK, 5IF, 5IQ, 5IS, 5JI, 5QQ, 5XB, 5XU, 6HY, 6KC, 6LC, 6OL, 6ZR, 6ZU, 6ZX, 6AEH, 6AFP, 6AMN, 9DZE.

At San Blas, Nayarit: 5IQ, 5JI, 5NK, 5QS, 5XB, 5XD, 5XI, 5XU, 5XG, 6EN, 6JI, 6LC, 6AHF, 6AJH, 6AVR.

At Manzanillo: 5JI, 5QA, 5TG, 5XB, 5XU, 5XG, 5ZE, 5ZAA, 9AEG.

Reported by D. L. Cawman, Operator, S.S. "J. R. Gordon." Detector One-Step

Jan. 22—90 miles east Key West. Spk: 2FP, 3ACE, 3AJD, 4BQ, 4DZ, 4GN, 5ZAB, 5ZAG, 5XU, 8YM. C.W.: 1QN, 3BEC, 3BLF, 3ZB, 9ARK.

Jan. 23, 200 miles east Miami. Spk., 2FP, 2JU, 4BC, 4GN, 9YC, 9APS, 4ZC, 5YI. C.W.: 1IV, 1QN, 2AVU, 4BY, 5EK, 8WA, 8AXK, 8BOX, 8BRL, 9ARK.

Jan. 24, 450 miles east Miami: Spk.: 2FP, 2DR, 2OO, 2OM, 2BJO, 3FB, 3AHK, 3AJD, 4BC, 4DH, 4DZ, 4BF, 5AA, 5NB, 5XU, 8UC, 8XE. C.W.: 1ARY, 2NZ, 3BA, 3DH, 3AJD, 3ZO, 8ADG, 9BLO.

Jan. 25. 680 miles east Miami: Spk.: 1RV, 2FP, 2OM, 3FB, 3HJ, 3ACE, 3AUW, 4EA, 4AU, 4DZ, 8AJW, 8BHD, 8AFD, 8XE. C.W.: 1BKQ, 2AAB, 2AWK, 3DH, 3FS, 3AQH, 4GL, 5FV, 8AQV, 9NX, 9AJA.

Jan. 26, 850 miles east Miami: Spk.: 1HO, 1APO, 1BOQ, 2BM, 2FP, 2OM, 3ARM, 4EA, 4DZ. C.W.: 2DK, 2AAB, 2AUV, 2BRB, 3AHK, 3BEC, 3BLF, 3AQR, 8NI, 8WY, 1BDI.

Jan. 27, 900 miles east Miami: Spk.: 2OM, 2ARY, 1XM, 3FB, 4EA. C.W.: 3AHK, 4BK, 5FV. Heavy QRN.

Jan. 28. 1150 miles southeast New York: 1UN on C.W. Very heavy QRN.

Jan. 31, 1687 miles southeast New York: Spark, none. C.W.: 1XM, 2FP, 8BUM.

Feb. 2, 2100 miles southeast New York: No sparks. C.W.: DF1, 1XM.

March 5th on return trip, 2450 miles southeast N. Y. C.: Spark, 2EL, 2JZ, 1CZ, 1BDT (copied complete msg fm 1BDT). C.W.: 1XM, 2AWL, 2XQ, 4BY, 8XV, 9KP (3000 miles).

Mar. 6, 2230 mi. S.E. N. Y. C.: No sparks. C. W.: 2NZ, 2AWL.

Mar. 7, 2100 mi. S.E. No sparks. C.W.: 1XM, 3BA, 4BQ, 4BY.

Mar. 11, 1400 mi. S.E. N. Y. C., 1AKG on spark; 2NZ, NOF, C.W.

Mar. 12, 1250 mi. S.E. N. Y. C. Spk.: 2TS, 3FB, C.W.: 1XM, 1ZE, 2BML, 4BY, 4GL, 8ADG.

Mar. 13, 980 miles southeast New York: Spk.: 2EL, 1CJA, 1LF, 1COK, 2TS, 2OM, 2AGA, 3FB, 4DZ, 8XE. C.W.: 1BAS, 2BEH.

1VT-1BWD, Calais, Maine

C.W.—1ADL, 1AFV, 1AIP, 1AJF, 1AJP, 1AKG, 1AKQ, 1AKR, 1ARY, (1ASF), 1AWP, (1AZW), 1AZX, 1BAS, 1BBW, 1BCF, 1BDC, 1BDE, (1BDI), 1BEA, (1BEP), 1BH, 1BKO, (1BKQ), 1BKR, 1BLE, 1BOC, (1BQE), 1BQI, 1BRQ, 1BSD, 1BTL, 1BUA, 1BUB, (1BWJ), 1BYX, 1CAK, 1CGE, 1CGS, 1CIK, 1CIT, 1CIV, (1CK), 1CLA, (1CMK), 1COD, 1CZ, 1EZ, 1FD, 1II, 1ON, 1PR, 1PT, 1QP, 1UN, 1XM, (1YK), 1ZE, 2AAB, 2AAG, 2ABZ, 2AJA, 2AJF, 2AWF, 2AWK, (2AYV), 2BA, 2BAK, 2BEA, 2BGM, 2BLP, 2BML, 2BNZ, 2BQD, 2BTJ, 2BTW, 2BUM, 2CBW, 2CBY, 2EH, 2FP, 2NZ, 2OF, 2SQ, 2UD, 2UF, 2VA, 2VH, 2XQ, 2ZK, (3ADX), 3AJD, 3AJU, 3AMW, 3ANJ, 3ANY, 3APA, 3APD, 3AQR, 3BAG, 3BEC, 3BFU, 3BG, 3BHL, 3BNU, 3BP, 3BQ, 3BTK, 3BUQ, 3BUV, 3CG, 3CZ, 3FS, 3HG, 3IZ, (3JJ), 3KM, 3LR, 3NH, 3QZ, 3RW, 3SY, (3TA), 3XL, 3ZO, 3ZY, 3ZZ, 4BHL, 4BY, 4GL, 4KM, 4ZC, 4ZE, 5ZA, 8ACF, 8ACZ, 8ADG, 8ADZ, 8ACK, 8AGV, 8AGZ, 8AIM, 8AIU, 8AM, 8AMK, 8AMN, 8AOO, 8ANR, 8APT, 8AQF, 8ARK, 8ASG, 8AVD, 8AUH, 8AWM, 8AWN, 8AWP, 8AWX, 8AXK, 8BDU, 8BEF, 8BFX, 8BK, 8BLJ, 8BO, 8BUQ, (8CBJ), 8CFS, 8CFP, 8CKM, 8CKO, 8DV, 8HM, 8IQ, 8JO, 8KA, 8KS, (8NB), (8OZ), 8PL, 8QR, 8QZ, 8RW, 8SE, 8SP, (8TB), 8UK, 8VY, 8WE, 8XE, 8XV, 8ZAE, 9AAP, 9AAV, 9AAY, 9AJA, 9ARK, 9AXF, 9BSG, 9BWU, 9CEP, 9DP, 9IO, 9VY, 9WC, 9WE, 9XI.

Spark—1ARY, 1AW, 1BDT, (1BHO), (1BJC), 1BJZ, 1BQA, 1BRQ, 1CHJ, 1CNI, 1GN, 1LZ, 1SN, 1XM, 2BPF, 2JZ, 2OM, 2PV, 3GN, 8BSS, 8ADG, 8XE.

1BOE, Southport, Conn.

Spark—1AA, 1ABZ, 1ADL, 1AKH, 1AJP, 1AKG, 1APO, 1AQO, 1ARY, (1AVW), 1AYQ, 1AZT, 1BCF, 1BDT, (1BGC), (1BGW), 1BJE, (1BKG), (1BM), 1BMT, 1BOQ, (1BQC), 1BQL, 1BRQ, 1BSD, 1BSZ, 1BVB, 1BVH, 1BYT, 1CIL, 1CJA, 1CK, (1CM), 1CNM, 1COK, (1CSP), 1CUS, 1CZ, 1FW, 1GM, 1HO, 1JT, 1OZ, 1RX, 1SN, 1UJ, 1WQ, 1YB, 2ABM, 2ACU, 2ACY, 2AGA, 2AHU, 2AJE, 2AL, 2AWF, 2AXK, 2BFS, 2BFX, 2BJO, 2BK, 2BO, 2BRS, 2BY, (2BZV), 2CT, (2DI), 2DO, 2DX, (2EL), 2FP, 2GK, 2HJ, 2IG, 2JZ, 2NZ, 2OM, 2OX, 2PF, 2RG, (2RM), 2SH, (2TS), 2TU, (2WB), 2WV, 2XK, 3AJD, 3AN, 3ARM, 3ARN, (3FB), 3FP, 3GX, 3GZ, 3NB, 3OU, 3YV, 4AS, (4BC), 4DQ, 4DZ, (4EA), 4GN, 5XA, 8AFA, 8AFB, 8AFD, 8AFG, 8AHH, 9AOT, 9APB, 8ARD, 8AVT, 8AVY, 8XY, 8AYN, 8BAZ, 8BCO, 8BEP, 8BSY, 8CH, 8EO, 8FI, 8FT, 8HG, 8HY, 8KG, 8LB, 8LH, 8NZ, 8PL, 8PQ, (8RQ), 8SP, 8TY, 8UC, 8WC, 8XE, 8YV, 8ZN, 8ZP, 9AAP,

9AGR, 9AIR, 9AZE, 9DCX, 9RC, 9UH, 9UU, 9ZJ. Can. 3BP, 3FO, 3GE, 3GN, 3JL, 3KG.

C.W.—1ABB, 1ABY, 1ADL, 1AJP, 1AOL, 1AWB. 1AZW, 1BDI, 1BEA, 1BGF, 1BKP, 1BQE, 1BSD, 1BUA, 1BVA, 1BWJ, 1BYX, (1CAC), 1CGS, 1CIK, (1CJZ), 1FF, 1II, (1IV), 1NE, 1ON, 1OZ, 1QP, 1RD, (1RZ), 1SQ, 1UJ, (1VQ), 1XM, 2AAB, 2ABZ, 2AEQ, 2AFP, 2AJA, 2AJF, 2AJR, 2AKO, 2ANZ, 2AQU, 2ARO, 2ASH, 2AVU, 2AWL, 2AWS, 2AYV, 2AZZ, 2BCF, 2BDM, 2BEA, 2BEB, 2BEH, 2BFF, 2BFX, 2BFZ, 2BGA, 2BGM, 2BLP, 2BML, 2BMR, 2BND, 2BNH, 2BNZ, 2BPD, 2BQA, (2BQU), 2BQW, 2BRB, 2BSC, 2BTJ, 2BUA 2BUM, 2BYW, (2BZV), 2CAH, 2CBT, 2CBW, 2CCD, 2CEC, 2CFA, 2CFI, 2CFT, 2CFY, 2CHL, 2CIM, 2CIZ, (2CRO), 2DK, 2EH, 2FC, 2FD, 2FP, 2FZ, 2KP, 2KU, 2KV, 2LH, 2NZ, 2OF, 2RY, 2SC, 2SQ, 2UJ, 2VA, 2VC, 2VH, 2WR, 2ZK, 2ZL, 3AAE, 3AAG, 3ALN, 3AQR, 3BA, 3BAG, 3BHL, 3BIJ, 3BIY, 3BLF. 3CA, 3CM, 3IL, 3LR, 3MO, 3NH, 3QZ, 3RF, 3SQ. 3ZO, 3ZY, 3ZZ, 4AS, 4BF, 4BY, 4DC, 4EH, 4GL. 4GU, 4ID, 4II, 4LP, 4YA. 4ZC, 4ZE, 5AAM, 5FV, 5IF, 5KU, 8ABV, 8ADG, 8AGO, 8AGZ, 8AHK. 8AJT, 8AJV, 8ALB, 8AMF, 8AMM, 8ANC, 8AQF. 8AQV, 8AQZ, 8ARK, 8ARW, 8ATR, 8AWM, 8AWP. 8AWR, 8AXC, 8BBD, 8BCL, 8BDO, 8BDU, 8BEX. 8BFX, 8BLT, 8BNY, 8BOX, 8BRL, 8BSS, 8BZH. 8CAZ, 8CBJ, (8CFS), 8CGY, 8CLD, 8CNA, 8CNS. 8COO, 8DV, 8GE. 8HM, 8IQ, 8LB, 8QZ, (8TB), 8UK, 8VY, 8WR, 8ZAE. 8ZM, 8ZX, 8ZZ, 9AAV, 9AKR, 9ARK, 9ATA, 9BRL, 9DAX, 9GC, 9KP, 9UH, 9XI.

1BPR, Cambridge, Mass.—All C.W.

1FO, 1II, 1ON, 1QP, 1RZ, 1XZ, 1YK, 1ZE, 1ADL, 1ARL, 1AWB, 1AZW, 1AZX, 1BEA, 1BEP, 1BES, 1BGF, 1BKP, 1BRQ, 1BSD, 1BUA, 1CAK. 1CGS. 1CIK, 1CJH, 2FD, 2FZ, 2KP, 2KU, 2NZ, 2OF, 2PZ, 2SQ, 2TP, 2VA, 2VC, 2VH, 2WR, 2WT, 2XQ, 2ZK 2ZS, 2AAB, 2ABZ, 2AFP, 2AJF, 2AJR, 2AQF. 2AQU, 2AWF, 2AWL, 2AWS, 2AYV, 2AZZ, 2BAK, 2BCF, 2BEA, 2BEB, 2BEH, 2BEM, 2BFQ, 2BFX. 2BGI, 2BGM, 2BML. 2BNC, 2BNZ, 2BRC, 2BTJ, 2BUM, 2BXD, 2BYW, 2CCD, 2CCU, 2CDA, 2CFA, 2CGQ, 3BA. 3BG, 3BZ, 3CC, 3CG, 3CM, 3FS, 3HG, 3HJ, 3IZ, 3JH, 3KM, 3LR, 3NO, 3PB, 3QV, 3QZ, 3RF, 3RW, 3VW, 3XL, 3ZO, 3ZY, 3ZZ, 3AAD, 3AAY, 3ADT, 3ADX, 3ALN, 3ANJ, 3APS, 3APQ, 3AQH, 3AQR, 3BAG, 3BFU, 3BHL, 3BIY, 3BKS, 3XAA, 4AS, 4BQ, 4BY, 4DC, 4FT, 4GL, 4ID, 4II. 4LP, 4YA, 4ZC, 4ZE, 5FV, 5IF, 8BK, 8BO, 8BU. 8DV, 8GE, 8HJ, 8HT, 8IQ, 8JL, 8JU, 8KH, 8KS, 8LX, 8MP, 8OS, 8QM, 8QM, 8QZ, 8RQ, 8SE, 8SP. 8TB, 8UK, 8VY, 8WR, 8XE, 8XV, 8ZX, 8ACF, 8ADG (dalite), 8AGO, 8AGZ, 8AIM, 8AIO, 8AMK, 8AMM, 8AND, 8ANJ, 8AOA, 8AOG, 8AQF, 8AQV, 8ARK, 8ARW, 8AVD, 8AWM, 8AWP, 8AWY, 8AXC, 8AXK, 8BBD, 8BBK, 8BCI, 8BCL, 8BDO, 8BDU, 8BEF, 8BFX, 8BLT, 8BNJ, 8BRL, 8BSO, 8BSS, 8BTO, 8BUQ, 8BZH, 8BZY, 8CAZ, 8CBJ, 8CFP, 8CFS, 8CKM, 8CLD, 8CNS, 8COO. 8YAA, 8ZAE (dalite) 9EI. 9FZ, 9HH, 9HW, 9IO, 9IZ, 9KP, 9UC, 9UH, 9WA, 9ZL, 9AAP, 9AAS, 9AAV, 9AAY, 9AJA, 9AKR, 9ARK, 9AYH, 9BRL, 9BSG, 9DAM. 9DAX, 9DYN. Canadian 2BG, 3BP, 3CZ, 9AL, 9AW.

F. G. Sands, Danbury, Conn.

C.W.—1ADL, 1AJP, 1ARY, 1AVR, 1AWB, 1AZW, 1AZX, 1BAS, 1BEA, 1BEP, 1BES, 1BDC, 1BGF, 1BGF, 1BKP, 1BKQ, 1BKR, 1BLE, 1BSD, 1BTL, 1BUA 1BWJ, 1BYX, 1CAK, 1CGS, 1CIK, 1CIV, 1CJO, 1CJZ, 1CK, 1CLI, 1COD, 1CPZ, 1CRH, 1DAC, 1EZ, 1FF, 1II, 1IV, 1IJD, 1OW, 1ON, 1QN, 1QP, 1RD, 1RZ, 1TS, 1UJ, 1VJ, 1VG, 1VT, 1XM, 1ZE, 2AAB, 2AAZ, 2ADL, 2AGH, 2AFP, 2AJF, 2AJW, 2AQU, 2AVU, 2AWF, 2AWJ, 2AWL, 2AYV, 2BAK, 2BCA, 2BEA, 2BEH, 2BEM, 2BFG, 2BGI, 2BGM, 2BII., 2BML, 2BNZ, 2BQU 2BRC, 2BRM 2BTJ, 2BUM, 2BYW, 2CBT, 2CC, 2CDA. 2CEC, 2CGQ. 2EH, 2FD 2FP, 2IBZ, 2JJ, 2KU, 2KV. 2NZ, 2OF, 2PZ 2SM. 2SQ, 2SY, 2WI, 2VA, 2XQ, 3AAD, 3AAG, 3ACQ, 3AGT, 3AJD, 3AJN, 3ANQ, 3ANY, 3APA, 3APQ 3AQR, 3AVY, 3BAG, 3BFQ, 3BG, 3BHL, 3BKS, 3BNU, Canadian 3BP, 3BPQ, 3BQ, 3BUV 8BZ, 8CA, 8CC, 8FP, 8FR, 8FN, 8GL, 8GT, 8HD, 8HJ, 8IJD, 8KM, 8LR, 3NH, 3VW, 3WF, 3XL, 8ZAB, 3ZO, 3ZY, 8ZZ, 4BY, 4BQ, 4DC, 4ID, 4II, 4ZC, 5UN, 8ACF, 8ADG, 8ADJ, 8AGO, 8AIG, 8AIN, 8AJT, 8AJV, 8AND, 8ANJ, 8ANR, 8AOO, 8ARK, 8AVD, 8AWM, 8AWP, 8AZZ, 8BDB, 8BDU, 8BEX, 8BIZ, 8BOX 8BUG, 8BXA, 8CBJ, 8DV, 8EV, 8GE, 8HM, 8JS, 8NV, 8OS, 8OZ, 8QY, 8SE, 8SP, 8TB, 8UK, 8ZAE, 9AAY, 9AJA, 9ARK, 9BLO, 9BRL, 9IO, 9KP, 9PF.

Spark—1ADL, 1APO, 1ARM, 1ARY, 1AW, 1BEP, 1BOE, 1BOP, 1BOQ, 1BQA, 1BVH, 1CGS, 1CK, 1COK, 1HO, 2ABM, 2AHU, 2AJE, 2BJO, 2CKF, 2CT, 2EL, 2FP, 2GP, 2GX, 2JZ, 3AAB, 3ACM, 3AIC, 3AJD, 3AK, 3ALD, 3ALN, 3ARM, 3GN, 3GX, 3IJD, 3JW, 3NB, 3OU, 3RW, 3US, 3VW, 3YP, 3YV, 8AHH, 8AHS, 8BRL, 8CFS, 8XE, 8ZA, 8ZP.

2BLL, Paterson, N. J.

C.W.—1ABB, 1AJP, 1ANY, 1ARY, 1ARV, 1AWF. 1BDC, 1BEP, 1BKG, 1BKQ, 1BMO, 1BUA, 1CAK. 1COD, 1XM, 1XX, 3AAY, 3AFB, 3AJD, 3ALN. 3AQH, 3AZR, 3BAG, 3BGL, 3BHL, 3BLF, 3BNU. 3BZ, 3CC, 3CM, 3GN, 3IL, 3LL, 3MN, 3QZ, 3RW, 3VA, 3VV, 3ZO, 3ZY, 3ZZ, 4BQ, 4BY, 4DC, 4FT, 4GL, 4PT, 4ZC, 4ZY, 5AN, 5UU, 8AGK. 8AGN. 8AGO 8AGZ, 8AIM, 8AJN, 8AJP, 8ANR, 8AOA, 8AOO, 8APT, 8AQF, 8ARU, 8AWM, 8AWP, 8AXC, 8AXR, 8AZV, 8BAZ, 8BBD, 8BBK, 8BBO, 8BCL. 8BDO, 8BEF, 8BET, 8BFX, 8BK, 8BNV. 8BO. 8BOX, 8BR. 8RL, 8BUG. 8BY, 8BYE 8BZC, 8CKO, 8GE, 8IB, 8IK, 8IP, 8JU, 8LW, 8MP, 8PT, 8PX, 8QZ, 8RY. 8SE, 8SM. 8SP, 8UK, 8WO, 8WR, 8WY, 8XK, 8XV, 8XY, 8ZAE, 8ZN, 8ZV. 9AAY, 9AAV, 9ARK, 9AWA, 9BDU, 9BMM, 9BRL, 9EI, 9IO, 9KP, 9OU, 9ZAC, 9ZJ, 9Z.. Can. 3BP.

Spark—1ARY, 3AWD, 3NB, 8ARD, 8BSY, 8RQ, 8XE.

2AWF, Albany N. Y.

Spark: 1AA, (1ADL), (1BHR), (1BJS), (1BOP), 1BOQ, 1BQA, (1BQL), (1BRQ), (1BYG), 1COK, (1GM), 1HO, 1QO, (1RV), (1SN), 1UB, 1UL, (1WQ), 2AAF. 2AIM, 2AJE, 2ARY, 2BJO, 2DA, 2DI, 2EL, 2JZ, 2OM, (2RM), 2TS, 2WB. 3ACM, 3AGT, 3AJD, 3AK, 3AN, 3ANJ, 3AQZ. 3ARM, 3BDU, 3BKQ, (3EH), 3FB, 3FP, 3HJ, 3OU, 3QW, 3TA. (3UD), 3YK, 4BC, 4CX, 4EA, 4FD, 8AAP, 8ACF, 8AFB, 8AFD, 8AFG, (8AHH), 8AJT, 9ANW, 8APB, 8AUY, 8AXO, 8BAH, 8BCO, 8BEP, 8BFH. 8BSS, 8BSY, 8BUN. 8DY, 8EO, 8EV, 8EW, 8FT, 8LB, 8LH, 8PL, 8OE, 8QC, 8RQ, 8WO, 8WZ, 8XE. 8YN, 9AAP, 9AAW, 9ACB, 9AGR, (9AIR). 9DCX. 9DFX, 9DIO, 9DWP, (9GX), 9KI, 9MC, 9UH, 9YB, 9YQ, 9ZJ, Can.: 3BP, (3FO), 3GE, 3JL.

C.W.—(1ADL), 1AJP, 1AMQ, 1AWB. 1AZW, (1BGF), 1BVS, 1BWJ, (1CAK), 1CGS, 1CJZ, 1CKP, 1CLN, 1CMK, 1RZ. 1UJ, 1ZE, 2AAB, 2AFP, 2AID, 2AJE, 2AKO, 2ALR, 2AMO, 2AZO, 2AZZ, (2BBB), 2BEM, (2BGI), 2BML. 2BND, 2BRC, 2BUM, 2CAT, 2CBG, 2CFI, 2EH, 2FP, 3FQ, 3KP, 2SQ, 2VH, 2WI, 2WT, 3AAD, 3AAE, 3ADT, 3ANJ, 3ANQ, 3APA. 3APQ, 3ASO, 3AWA, 3BFQ, 3BG. 3BHL, (3BIJ). 3BIY, (3CC). 3CG, 3CM. 3FS. 3HJ. 3IZ, (3KM), 3RI, 3US. 3VW. 3ZN. 3ZO, 4BQ, 4BY, 4CD, 4CO, 4DC, 4EH, 4FT. 4GL, 4II, (4LP), 4YA, 4ZC, 4ZE, 5AAM, 5DA, 5EK, 5FV, 5KU, 8ACF, (8AJT). (8ALB), 8ALV, 8AMD, 8AQF. 8AQV. 8ARW. 8AVH, 8AWY, 8AWZ, 8BDU, 8BEX, 8BK. 8BOX. 8BRL. 8BTO. 8BUN. 8BZG, 8BZH, 8CFS. (8CKO), (8COO), 8DV, 8HJ, (8IQ). 8OW. 8PN. (8QZ), 8RQ, 8VY, 8WR, 8XAE. 8XE, 8ZG, 8ZZ, 9AAP, 9AAS, 9AAV, 9AJA, 9AKD, 9ALH, 9ASL, 9BED, 9BRL, 9DAX, 9EI, (9KP), 9PF, 9ZL, Can. 2BG, 3BP.

2AVE, Jamaica, L. I.

C.W.—1II, 1ON, 1PR. (1RZ), 1VQ, 1XM, 1YK, 1AIP. 1AJP, 1AJS, 1ANR, 1ARY, 1ASF, 1AVR. 1BQE, 1CAC, 1CAK, 1CJH. (2AB), (2FC), (2RY), (2AAB), (2AEH), (2AEQ), (2AJF), (2AMX), (2ATJ), (2AVU), (2BNC), (2BQW), (2BRM), (2BSC). (2BUQ), (2BWA), (2BWV), (2CDW), 3BA, 3BG, 3CA, 3FS, 3GH, 3HG, 3IL, 3LR, 3QZ, 3RP, 3ZY, 3AJD, 3ALE, 3ALN, 3ANJ, 3APQ, 3AQH, 3AQR, 3BAG, 3BEC, 3BFU, 3BHL, 3BOF, 3BQV. 3BUV, 4BF, 4BQ, 4BY, 4CO, 4DC, 4GL, 4JH. 4KK, 4XD, 4ZC, 5FV, 8BK, 8DV, 8HJ, 8HM, 8HT. 8LX, 8NB, 8OS, 8OW, 8QB, 8QM, 8QZ, 8SP, 8VY. 8XE, 8XV, 8ZE, 8ZY, 8ACF, 8ADG, 8AGO, 8AGZ. 8AIO, 8ALB, 8ANC, 8AOA, 8AQV, 8ARK, 8ARW. 8AWP, 8AXC, 8AXK, 8BBB, 8BBK, 8BCI, 8BDB.

8BDU, 8BQV, 8BSS, 8BZH, 8CAZ, 8CFS, 8ZAE, 9DV, 9EI, 9KP, 9PS, 9SO, 9WA, 9WQ, 9ZL, 9AAY, 9AJA, 9ASL, 9BRL, 9BSG, Can. 9AL.

Spark—1HK, 1ARY, 1AZK, (2DO), (2ALB), (2AQN), (2ASU), (2AUY), (2BAU), (2BCK), (2CEJ), (2CGT), (2CJS), 3FB, 3GM, 3HJ, 3RW, 3AGT, 3AIC, 3AJD, 4BI, 4BS, 4EA, 8EW, 8FT, 8MZ, 8RQ, 8UC, 8VW, 8VY, 8WD, 8WO, 8XE, 8ZE, 8AFG, 8AHS, 8AJX, 8ALO, 8ANW, 8AXQ, 8AXX, 8AXY, 8AYN, 8BCO, 8BGT, 8BRL, 9OX, 9UH, 9VL, 9AAW, 9ACB, 9AGR, 9AIR, 9AWZ, 9DMJ, 9DZY, Can. 3GN.

2BYA, Schenectady, N. Y.

Spark—1AA, 1ADL, 1AJE, 1APX, 1ARY, 1AV, 1AW, 1AVR, 1BFZ, 1BJS, 1BRQ, 1BWL, 1COK, 1DZ, 1FR, 1GM, 1LZ, 1RU, 1RV, 1SN, 1SW, 1WQ, 2ABM, 2AJE, 2ANM, 2AWF, 2BK, 2BLW, 2BM, 2BYG, 2CHW, 2CIE, 2EL, 2GX, 2OM, 2PV, 2RM, 2SZ, 2TS, 3ABB, 3AJD, 3ARM, 3ARN, 3FB, 3FD, 3HJ, 3OK, 3QW, 3UD, 3UX, 3VW, 3XM, 3ZO, 4BX, 4EA, 8AAV, 8ACF, 8AFA, 8AFB, 8AFG, 8AHH, 8AHS, 8AIW, 8APB, 8ARK, 8AXO, 8BCO, 8BAZ, 8CX, 8EM, 8OD, 8SP, 3XE, 9OX, 9UH, 9ZJ.

C.D.— 1ADL, 1AFV, 1AJF, 1AJP, 1AMQ, 1APJ, 1ARK, 1ARY, 1AVR, 1ASF, 1AZW, 1BAS, 1BCF, 1BDC, 1BEA, 1BEP, 1BGF, 1BKR, 1BKQ, 1BLE, 1BRQ, 1BQE, 1BSD, 1BSG, 1BUA, 1BWJ, 1CAK, 1CAN, 1CGG, 1CGS, 1CIK, 1CIT, 1CJH, 1CJZ, 1CLN, 1COD, 1CPQ, 1FB, 1II, 1ON, 1QP, 1PT, 1RD, 1RH, 1RR, 1TS, 1UJ, 1UN, 1XAE fone, 1XM, 1ZE, 2AAB, 2ABQ, 2ADP, 2AGD, 2AGV, 2AAR, 2ADV, 2AJF, 2AJR, 2AKO, 2ARZ, 2AUU, 2AWJ, 2AWL, 2AWS, 2AZZ, 2BA, 2BAK, 2BCF, 2BEA, 2BEH, 2BEM, 2BG, 2BGZ, 2BML, 2BND, 2BNZ, 2BQI, 2BQW, 2BRB, 2BRC, 2BTJ, 2CCD, 2CCU, 2CFM, 2CGO, 2CZS, 2FZ, 2IG, 2JJ, 2LP, 2OF, 2PZ, 2RD, 2RP, 2SQ, 2VA, 2XI fone, 2XJ fone, 2VH, 2ZK, 2ZO, 2ZS, 3AAD, 3AAG, 3AAY, 3ADT, 3ADY, 3AIG, 3AJD, 3ALN, 3ANQ, 3ANY, 3APD, 3ARK, 3AQH, 3AQR, 3AS, 3AZO, 3BAG, 3BEC, 3BFQ, 3BHL, 3BIY, 3BG, 3BNU 3BP, 3BRW, 3BOF, 3BTK, 3BUL, 3BUR, 3BY, 3BZ, 3CA, 3CC, 3CG, 3CTZ, 3DM, 3FB 3FR, 3FS, 3GN, 3HB, 3HD, 3HX, 3IL, 3IZ, 3LH, 3LR, 3RC, 3QZ, 3SM, 3TY, 3VW, 3ZO, 3ZW 3ZY, 4BF, 4BQ, 4BY, 4CC, 4DC, 4DS, 4EH, 4FT, 4GL, 4GX, 4ID, 4II, 4LP, 4XD, 5AN, 5BM, 5FV, 5KP, 5NZ 5UU, 5ZA, 8ACF, 8AGO, 8AGZ, 8AIM, 8ANJ, 8AMM, 8AOA, 8AQF, 8AQV, 8AQZ, 8AOO, 8ARD, 8AR , 8AWM, 8AWP, 8AWZ, 8AX, 8AXC, 8AXK, 8BAZ, 8BD, 8BDK, 8BDU, 8RCL, 8BDS, 8BEF, 8BFX, 8BIL, 8BLT, 8BNJ, 8BOX, 8BRC, 8BRL, 8BUS, 8BEF, 8BFX, 8BIL, 8BLT, 8BNJ, 8BOX, 8BRC, 8BRL, 8BU, 8BUR, 8BVK, 8BSS, 8BXA, 8BY, 8BZ, 8BZA, 8BZC, 8BZH, 8CAZ, 8CBJ, 8CGY, 8CKM, 8CKO, 8CNS, 8DV, 8GE, 8IB, 8IQ, 8JL, 8JS, 8JU, 8LW, 8OS, 8PC, 8RZ, 8QD, 8SP, 8TB, 8TF, 8UK, 8VQ, 8VY, 8PT, 8WR, 8XV, 8ZE, 9AAP, 9AAU, 9AAY, 9AKD, 9ANC, 9ANF, 9APB, 9ARK, 9ASS, 9BLO, 9BRL, 8BSG, 9DYN, 9IO, 9KP, 9LQ, Can. 9AL.

3FM, Philadelphia, Pa.

C.W.—1ON, 1QP, (1XM), 1ZE, (1ARY), 1ASF, 1BAS, (1BKQ), 1BSD, (1BWJ), 1CAK, 1CGS, 1CIK, 1COD, 2EH, 2FP, 2NZ, 2UD, 2VA, 2XQ, 2ZK, 2AJF, (2YV), 2BEA, 2BMA, 2RQD, 2BRB, (2BSC), 2BTJ, (2BWA), (3BA), (3EM), (3GH), 3HG, 3IL, 3JJ, 3LR, 3QZ, (3ZO), (3ZY), 3ZZ, (Can. 3BF fone and C.W.), 3AAG), 3AQR, (3ALN), (3BAG), 3BIF, 3BLF, 3BNU, 4BF, 4BQ, (4BY), 4FT, 4GL, 4II, (4YA), 4ZC, 5BM, 5FV, 5IF, 5XA, 5ZA, 8AM, 8BK, 8BO, 8DV, (8EV), 8GE ICW, 8HJ, 8LX, 8QB, 8QY, 8SP, 8TB, 8UK, 8WI, 8VJ, 8VY, 8XV, 8ZG, 8ADG, 8ADR, (8AGO), 8AGZ, 8AJV, 8ALT, (8AMM), 8AGF, 8AQV, 8ARK, 8AVO, (8AWP,) 8AWZ, 8AXC, 8AXK, 8BBK, 8BOX, (8BRL), (8BSS), 8BYE, 8BZH, 8BZJ, 8CAZ, 8CFS, 8CGY, 8CKO, 8ZAE, 9AG, 9DV, 9EI, 9HW, 9HY, 9IO, 9KP, 9UH, 9XM, 9ZL, 9AAV, 9AAY, 9AJA, 9BRK, 9BRL.

Spark—1AW, 1GM, 1AKG, 1ARY, 1BHO, 2GK, 2OM, 2SZ, 2AHU, 8EA, 8EW, 8FT, 8OX, 8RQ, 8UC, 8VR, 8XE, 8AFD, 8ARD, 8AXC, 8AXY, 8AYN, 8ZAC, 9AAW, 9AGR, 9AWZ, 9ZJ.

3CA, Roanoke, Va.

C.W.—1AJP, 1ANQ, 1AWB, 1AZW, 1BWJ, 1CAC, 1CAK, 1CJZ, 1QP, (1VQ), 1XM, 1ZE, 2ADL, 2AJE, 2AQF, 2AVE, 2AYV, 2AZZ, 2BEA, 2BEB, 2BNX, 2CCD, 2CCU, 2FP, 2NZ, 2VH, 2ZK, 3AAD, 3AAE, 3AAG, 3AAY, 3ADX, (3AEV), (3AJD), (3ALN), 3ANQ, 3ANY, 3ANZ, 3APQ, 3AQH, (3AQR), 3AQS, 3AS, 3BA, 3BFU, (3BG), 3BHL, 3BNQ, 3BRL (3BZ), 3CAA, 3CC, 3FM, 3FS, 3GG, 3HJ, 3HX, (3JJ), 3KM, 3KU, 3QV, 3QW, (3QZ), 3TA, 3TJ, (3VW), 3XT, 3ZE, 3ZO, 3ZY, 4ABM, (4BQ), 4BY, 4CL, (4CO), 4DC, (4DS), 4EB, 4EH, (4GL), 4GU, 4HB, (4ID), 4II, 4KC, 4KK, 4LP, 4XD, 4YA, (4ZC), 4ZE, 4YA, (5DA), 5EK, 5FV, 5LA, 5NZ, 5ZA, 8ACF, 8ADG, 8AFD, 8AFZ, 8AGO, 8AGZ, 8AIG, 8AIM, 8AIO, 8AJT, 8AJV, 8ALB, 8AMZ, 8APW, 8AQF, 8AQV, 8AQZ, 8ARK, 8AWD, 8AWM, 8AWZ, (8AXK), 8AXE, 8BAE, 8BCJ, 8BDL, (8BDU), 8BEB, 8BEC, 8BED, 8BEF, 8BEX, 8BGE, 8BJV, 8BK, 8BLT, (8BO), 8BOX, 8BQC, 8BU, (8BXA), 8BZR, 8CAG, 8CAZ, 8CFS, 8CHO, 8CKO, 8CLD, (8DV), 8FT, (8GE), 8HJ 8IQ, 8LB, 8NI, 8RQ, 8SP, 8UK, 8VJ, 8VY, 8WR 8XB, 8XE, 8XR, 8ZX, 8ZZ, 9AAS, 9AAP, 9AAY, 9AIR, 9AJA, 9AJH, 9AKA, 9AL, 9AUT, 9AXK, 9AYH, 9BHG, 9BLO, 9BSG, 9DAX, 9DXW, 9DIF, 9DYN, 9IF, 9IL, 9JO, 9KP, 9LE, 9WA, 9ZG, 9ZE, 9ZL, Can. 8BP, 8GN, 9AL.

Spark—2AJE, 3ABB, 3AOV, 3GN, 3QW, 4AU, 4BB, 4CX, (4EA), 4FD, 5HS, 5PY, (5XA), 8AFD, 8AIZ, 8BSY, 8CGZ, 8FT, 8TA, 8UC, 8XE, 9BK, 9DSO, 9IP, 9LF, 9MC, 9VL.

3IL, Washington, D. C.

Spark—1AMD, 1AW, 1BWJ, 1BYK, 1BZZ, 2AJE, 2AQI, 2BBL, 2BPF, 2BRC, 2BY, 2GK, 2JI, 2JS, 2UD, 2WC, 3AIC, 3AN, 3ARD, 3BPO 3EI, 3FB, 3FP, 3HJ, 3OU, 3ZS, 5EK, 8ABY, 8AFP, 8AHH, 8AJD, 8ARD, 8ARK, 8AUV, 8AXY, 8AYV, 8BCO, 8CKM, 8JZ, 8KQE, 8LB, 8QE, 8TF, 8UC, 8UK, 8WD, 8ZW, 9AAW, 9ARD, 8BRZ, 9DCX, 9OX, 9SK, 9SN, 9UH, 9UU, 9YA, 9YAE, 9YC, 9YQ, 9ZJ.

C.W.—1AJP, 1ARY, 1ASF, (1AWB), 1AZW, 1BDT, 1BEP, 1BGF, 1BKQ, 1BSD, 1BTL, 1BUA, 1BWJ, 1CAK, 1CMK, 1II, 1PT, 1RD, 1UL, (1XM), 1ZE, (2AAB), 2AIC, (2AJF), 2AJW, 2AQU, 2AWF, 22BAK, (2BEA), 2BEH, 2BML, 2BNC, (2BNZ), 2BRC, 2BSC, 2BUM, 2CCD, 2CGQ, 2FAF, 2FD, 2FP, 2FZ, 2KP, 2KU, 2KY, 2NZ, 2WI, 2VA, 2XQ, 2ZK, 2ZS, 3AAD, 3ADT, 3AJD, 3AJE, 3ANJ, 3APA, 3AQR, 3BEC, 3BFU, 3BGZ, 3BP (Can.), 3BPK, 3BUR, 3BZ, 3CC, 3CG, 3CM, 3EI, 3EM, (3FS), 3GN (Can.), 3HG, 3KB, 3QZ, 3VW, (3ZO), 5FV, 5HO, 5IF, 5KU, 5LA, 5NZ, 5XAC, 5ZAO, 4AS, 4AZ, 4BF, 4BQ, 4BY, 4CX, 4DC, 4DS, 4EH, 4EU, 4FT, 4GL, 4II, 4IV, 4LP, 4YA, 4ZC, 4ZE, 6ZZ, 8ACF, (8ADG), 8AGK, 8AGO, 8AGZ, 8AHK, 8AHS, 8AIM, 8AJV, (8ALB), 8ANJ, 8AOO, (8AQV), 8AQZ, 8ARW, 8AWM, 8AWP, 8AWY, 8AXC, 8BCL, (8BDB), 8BDO, 8BDU, 8BEL, 8BFX, 8BK, 8BLT, 8BNI, 8BO, 8BU, 8BZH, 8BZJ, 8BZY, 8DR, 8DV, 8EO, (8EV), 8EW, (8GE), 8IB, 8IQ, 8CAZ, 8CBJ, 8CFS, 8CGY, 8CLW, (8CNS), 8COO, 8JU, 8KH, 8OS, (8OW), 8PC, 8QB, 8QM, 8QZ, 8SE, (8SP), 8UK, 8VY, 8WI, 8WY, 8XE, 8YAA, 8ZAE, 8ZG, 8ZZ, 9AAV, 9ABF, 9AJA, 9AKP, 9AL, (9ARK), 9AXF, 9AYH, 9AYS, 9BDO, 9BRL, 9EI, 9HW, 9IL, 9IO, 9PS, 9RI, 9RZ, 9SO, 9WU, 9ZG, 9ZL.

3ZO, Parkesburg, Pa.—Worked

1II, 1XM, 1ADL, 1AZX, 1BDF, 1BGF, 1BKQ, 8ZE, 8AFG, 8AHS, 8AJX, 8ALO, 8ANW, 8AXQ, 1BSD, 1CIK, 1CJZ, 2PZ, 2AYV, 2BWA, 2CEC, 3BA, 3BZ, 3DM, 3EM, 3FM, 3FS, 3HJ, 3IL, 3JW, 3LP, 3QV, 3QW, 3QZ, 3RW, 3UO, 3UX, 3ZN, 3ZS, 3ZY, 8AAD, 3ACS, 3ADX, 3AIC, 3AJD 3ALN, 3ANJ, 3AQH, 3AQR, 3ARM, 3ASK, 3AUW, 3AWW, 3BJT, 4BF, 5FV 8CV, 8LX, 8VY, 8YD, 8ZZ, 8AWP, 8AXY, 8BBK.

4EZ, Jacksonville, Fla.

Spark—1ARY, 1BEP, 1BOE, 2EL, (2FP), (3ARN), (4AS), (4AU), (4BC), (4BI), 4CG, 4CP, (4CX), (4DZ), (4EA), (4FD), (4FP), (4GM), (4GN), 4GU, (4HS), (4IX), 5GI, 5QA, 5SM, (5XA), (5AAB), 8AV, 8IH, 8ARS, (8BAZ), (8BBU), 8BRL, (8BXX), 9BK, 9GX, 9LF, 9OX, 9QM, (9UH), 9VL, (9AGR), 9DCX.

C.W.—1XM, 1AJP, 1BQE, 2FP, 3BZ, 3AJD, 4BK, (4DS), (4JH), 5DA, 5FV, 6KA, 8IO, 8IQ, 9AAS, 9AZH.

C. E. Watkins, Ft. Pierce, Fla.

Spark—1AW, 2EL, 3AI., 4AS, 4BQ, 5ZA, 8ZY, 9AAW, 9ZN.

C.W.—1XJ, 2EH, 2XQ, 2AAX, 2AKO, 3MO, 3BEC, 4EN, 4II, 4CD 4CY, 4DQ, 4ID, 4XC, 4JC, 4CO, 5KP, 5RO, 5XA, 5XU, 5ZAB, 5ZL, 8BEN, 8BEP, 9DHB fone.

4HZ, Jacksonville, Fla.

Spark—2EH, 3AO1, 3AOV, 3HJ, 3QV, 3ZW, 3ZX, 4AG, 4BC, 4BI, 4CX, 4FD, 4GN, 4GU, 4HS, 4IX, 4XJ, 5AAB, 5AZ, 5CX, 5GI, 5GU, 5KK, 5ON, 5XA, 5XC, 8AAC, 8AFD, 8AOT, 8BSY, 8CH, 8DFH, 8EO, 8IIZ, 8KG, 8NO, 8XE, 8ZO, 9AI, 9AJT, 9APB, 9ARD, 9BHR, 9DQQ, 9GX, 9HR, 9IGE, 9LK, 9UH, 9UU.

C.W.—1AJP, 1ALW, 2BEA, 2DK, 2NZ, 2ZK, 3AKA, 3AM, 3APA, 3AQR, 3AZR, 3BG, 3BHL, 3BIJ, 3BLF, 3CA, 3CC, 3JH, 3LP, 3QZ, 3RV, 4AS, 4BB, 4BQ, 4BY, 4DS, 4EH (fone) 4EN, 4GL, 4GU, 4GX, 4ID, 4II, 4IW, 4JH, 4KM, 4LP, 4XD, 4ZC, 5AAC, 5DA, 5EK, 5FV, 5IF, 5LA, 5LI, 5WO, 5ZA, 8ABV, 8AIG, 8AIM, 8AIO, 8ALB, 8ALT, 8APF, 8BDU, 8BET, 8BFX, 8BK, 8BUN, 8BZU, 8BZY, 8CFS, 8CNA, 8DV, 8GE, 8KH, 8PT, 8XAE, 8XE, 8XZ (fone), 8ZX, 9AIM, 9AL, 9ALV, 9BRL, 9JD (fon), 9JT, 9KP, 9ZL.

5CI, Frost, Texas

All C.W.—4BF, 4BQ, 4BY, 4CO, 4EV, 4FT, 4ID, 4II, 4YA, 4ZC, 4ZE, 5AAM, 5EK, 5FK, 5FV 5IC, (5JG), (5IR), (5JB), (5JG), 5KP, (5MX), (5MZ), (5NR), (5NS), 5NZ, 5OI, 5UU, 5WO, 5XA, 5XJ, 5XU, 5ZA, (5ZAF, 5ZU, 5ZV, 5ZX, 6KA, 6KP, 6FT, 6ZZ, 8AGZ, 8AIM, 8ARD, 8ARW, 8AXK, 8AYV, 8BFX, 8BOX, 8BRL, 8BZY, 8CAX, 8CLD, 8VV, 8VY, 8WI, 8XAE, 9AAP, 9AAS, 9AAV, 9AEQ, 9AJA, 9AJV, 9AKR, 9ANE, 9ARK, 9ATR, 9BAK, 9BAL, 9BAM, 9BF, 9BFG, 9BJB, 9BJI, 9BJV, 9BLO, 9BNO, 9BRL, 9BSG, 9DBV, 9DKW, 9DPF, 9DTA, 9DTM, 9DTS, 9DUC, 9DUN, (9DZJ), 9DYN, 9DZQ, 9EI, 9EX, 9FM, (9FZ), 9GM, 9JI, 9PI, 9PS, 9PW, 9QE, (9RV), 9SL, 9VE, 9XI, 9XM, 9ZAF, 9ZG.

Fones—5XU, 5ZA, 5ZR, 9BNO, 9XM, 9ZAF.

5ABA, 257 Maximilian St., Baton Rouge, La.

2FP, 4AS, (4BF), 4BY, 4BQ, 4EB, 4EH, 4GL, 4HB, 4II, 4KD, 4LP, 4ZC, 5CI, 5DA, (5EK), 5FV, 5HO, 5IF, 5JI, (5KP), 5LA, 5ND, 5NZ, 5OG, 5UU, 5ZA, 5ZK, 5ZX, 8AW, 8AJT, 8AMT, 8AQH, 8BDV, (8BEX), 8BGF, 8BOV, 8BOX, 8DV, 8LX, 8XB, 8XU, 8XV, 8ZX, 9AAD, 9AAS, 9AAY, 9ABS, 9AEQ, 9AIM, 9AJV, 9AKA, 9AKD, 9AKR, 9ARW, 9AYH, 9AYS, 9AZK, 9BBF, 9BDP, 9BJB, 9BMD, 9BNO, 9BOW, 9BOQ, 9BSG, 9DFS, 9DPF, 9DQQ, 9DSM, 9DTA, 9DTS, 9DTT, 9DZG, 9DZQ, 9EGS, 9FM, 9IO, 9KP, 9LE, 9PL, 9QE, 9SJ, 9SL, 9WA, (9ZE), 9ZL.

5TC-5SF, Ft. Worth, Tex.

Spark—4AU, 4DH, (5AE), 5AI, (5AM), (5BQ), (5BY), (5EH), (5EW), (5FI), 5FO, 5HK, 5IF, (5IR), 5JI, 5KC, (5KK), (5KP), 5LB, (5LO), 5MF, (5MK), (5MM), (5NC), (5NF), (5NS), (5NZ), (5OI), (5PE), (5QA), (5QU), 5RA, (5SO), (5SM), 5TG, (5UD), (5UR), (5VF), (5WA), 5XR, 5XD, 5XA, 5XU, (5YG), 5ZR, 6ZZ, 7VV, 8FT, 9AEG, 9AEY, 9AIG, 9ABV, (9ANO), 9ANQ, 9AQE, 9AVB, (9AVX), (9AVZ), 9AOU, 9ASK, 9AYW, (9AMA), (9AMS), (9DSD), 9DQQ, 9DZE, 9DZI, 9FF, (9FU), 9HI, 9MC, 9OI, (9LW), 9WI, 9WT, 9YAK, 9XAQ, (9RY), 9ZAC.

C.W.—1BE, 2ZL, 4BK, 4BQ, 4EL, 4FT (voice and C.W.), 4GL, 4HW, 4II, 4XD, 4ZC, 5AA, 5AAM, 5AMB, (5CI), 5EK, 5FV, 5GA, 5IC, 5JO, (5JG), (5KP), (5KV), 5LA, 5MT, 5ND, (5NK), (5NS), (5OI), (5QS), (5RB), 5ZA (fone and C.W.), 6AL, 6JD, 6JL, 6ZZ, 6XAD, 7AO, 8AGZ, 8ALB, 8AR, 8AYS, 8BET, 8BFX, 8BOX, 8BOW, 8BOX, 8GV, 8II, 8IV, 8VY, 8XA, 8ZAC, 9AAU, 9AEY, 9AKR, 9AVA, 9AY, 9AXI, 9BAD, 9BBF, (9BFG), 9BOA, 9BOW, 9DHB, (9DTA), 9DTM, 9DTS, 9DZQ, 9DZY, 9EK, 9EW, 9IP, 9NX, 9PS, 9QE, 9WD, 9WT, 9ZB, 9ZQ.

6AHS, E. San Diego, Cal.—Crystal

5BY, 5HK, 5XJ, 5XU, 5ZX, 7MO, 7NP, 7ZM, 7ZT, 7XD, 7ZU, 9AEG, 9AYW, 9DZE,

Wanted—More lists of calls from the Sixth District.—Ed.

6OO, San Francisco

C.W.—5ZA, 5FV, 5GV, (6AK), (6EA), 6EB, 6EN, 6GA, (6GY), 6KA, 6KU, 6KY, 6NX, 6PK, 6RR, 6SQ, 6TI, 6VM, (6ZE), 6ZF, 6ZI, 6ZN, 6ZQ, 6ZS, (6ZX), 6ZZ, 6AAT, (6AGP), (6ALV), 6ALU, 6BAK, 6BAW, (6BCR), 6BIR, 6BLA; 7DP, 7GO, 7NX, (7QT), 7ZU, 8BK, 8VV, 8AGZ, 8BRL, 8CLD, 9BRO, 9BJB, 9BSG, 9DTM, 9XAQ, 9ZAF, 9PI, (9WD), 9AAU, 9KP, 9AYS, 9DTH, 9PS, 9AJA.

7GE, Pasco, Washington

Spark—6AH, 6AJ, 6AS, (6BM), 6EB, 6ES, 6EX, (6FF), 6FH, (6GR), 6GX, 6IC, 6IM, 6IS, 6JJ, 6KA, 6KC, 6KM, 6LC, 6NX, 6OH, 6OO, 6PO, 6QK, (6QR), 6ST, 6TC, (6TU), 6UO, 6VK, 6VX, 6XH, 6ZK, (6ZX), 6AAU, 6ABO, (6ABW), 6ABX, 6AEI, (6AFN), (6AGF), 6AHR, 6AIX, (6AJR), 6AJT, 6AMZ, 6ARC, (6ARK), 6ATO, (6AVB), 6BAK, 6ZAM, (7AT), (7BC), 7BF, (7BG), 7BH, (7BJ), (7BK), 7BR, (7BZ), 7CD, (7CN), 7CU, 7CW, 7DP, (7ED), (7FJ), 7GJ, 7GP, 7GQ, 7HF, (7HI), 7IH, 7IN, 7IW, (7IY), 7JV, (7JW), 7KB, (7KE), (7KG), (7KJ), 7KT, 7KV, (7LY), (7MF), (7MP), 7MR, (7MU), 7MY, (7NL), (7NW), 7NZ, 7OH, 7OX, 7TC, (7TJ, (7TO), 7TQ, 7TS, 7UX, 7VF, (7VO), 7VX, (7VZ), (7WG), 7WM, 7YA, 7YB, 7YJ, 7YL, 7YS, 7ZB, (7ZK), 7ZM, 7ZP, 7ZT, 7ZU, 7ZV, 5AK, 5ZA, 9ZX, 9WD, (9AX Can.), (9BD Can.).

C.W.—4CB (Can.), (6AK CW & voice), 6EN, (6GY), (6F), 6AAT, (6ALE), (6AWT), (6BCD), 6XAD, 7AW, 7NF, (7QE), (7RN, CW and voice), 7XF Cw and voice, 7AAV.

7KP, Seattle, Wash.

C.W.—4BQ, 5ZA, 6AAT, 6AIF, 6ALU, 6AWT, 6BCR, 6BDZ, 6CU, 6EN, 6FH, 6GY, 6KA, 6KY, 6NX, 6OO, 6VM, 6XAD, 6ZA, 6ZAD, 6ZB, 6ZF, 6ZQ, 6ZZ, 8AGZ, 9KP, 9PS, 9WD, 9WQ, 9AMB, 9YAE, 9ZAC, Can.: 4BT, 4CB, 5BI, 5CT, 9BD.

Spark—5CN, 6AJH, 6AJR, 6ARK, 6AVR, 6EX, 6GR, 6IB 6IM, 6MH, 6QR, 6TU, 6UO, 6OH, 6XH, 6ZAM, 6ZU, Can. 9BD.

8ASL, Fredonia, N. Y.

Spark—1ARY, 1BOQ, 1BSZ, 1CM, 1HO, 1IW, 2AAM, 2AHU, 2AJE, 2AR, 2ARB, 2ASV, (2AWZ), 2BK, 2CIC, 2DA, 2DN, 2EL, 2FP, 2OM, 2OO, 2QW, 2TJ, 3AGT, 3AJT, 3ARM, 3AWF, 3BY, 3GM, 3HJ, 3LY, 3QW, 4BG, 4BI, 4CG, 4CX, 4EA, 4GN, 4GU, 5AAB, 5HK, 5XA, 8AAV, 8ADQ, 8AFA, 8AFD, (8AHE), 8AHH, (8AHQ), (8AHS), 8AIM, (8AIT), 8AIZ, 8AJT, 8AJV, (8AKQ), 8AMD, 8AMZ, 8ANW, (8AOI), (8ARD), 8ATU, (8AUG), (8AUV), (8AUY), 8AVT, 8AVW, 8AXC, (8AXQ), 8AXY, 8AYC, 8AYI, (8AYM), 8BAZ, 8BBU, (8BCO), 8BDV, 8BEP, 8BFY, 8BID, 8BQC, 8BRL, (8BXC), 8BXX, (8YP), (8CAS), 8CEB, (8CFE), 8CGZ, (8CJM), 8CO, 8CP, 8EA, 8EO, 8EW, 8FT, 8HY, 8IN, 8JJ, 8JP, 8KG, (8LB), (8MZ), 8NO, 8OQ, (8QC), 8QE, 8RQ 8SP, 8TK, (8TY), 8UC, 8UI, (8VH), 8VW, 8WD, 8WE, (8WO), 8XE, 8ZAC, 8ZAD, (8ZO), 9AAW, 9ACN, 9AEG, 9AGR, 9AIR, 9AMA, 9AMI, 9AMT, 9AQM, 9ARZ, (9AVX), 9AWZ, 9AZE, 9BP, 9DCX, 9DKV, 9DMJ, 9DPB, 9DSO, 9DSZ, 9DZI, 9EV, 9GX, 9KI, 9LF, 9MC, 9MQ, 9OX, (9OA), (9UH), 9WD, 9WX, 9WY, 9YAK, 9YQ, 9ZA, Can. (3BA), (3BP), (3EI), (3FO), 3GE, 3KG, (3MO), (3PM), 3JL, 9BJ.

C.W.—1AJP, 1ARY, 1AVR, 1BAS, 1BQE, 1BSD, 1BWL, 1CJZ, 1JP, 1QP, 1XM, 2AJF, 2AWF, 2BB, 2BMI., 2CBW, 2FP, 2NZ, 3AJD, 3AQH, 3AQR, 3BAG, 3BEC, 3BM, 3BNM, 3CA, 3CC, 3CG, 3LR, 3OF, 3SJ, 4AS, 4BQ, 4BY, 4CO, 4DS, 4EV, 4FT, 4GL, 4ZC, 5FV, 5XA, 8ACF, 8ACM, 8AGK, 8AGO, 8AGR, 8AHK, 8AMF, 8ANR, 8APT, 8AQV, 8AWM, 8AWP, 8AXK, (8BBK), 8BDB, 8BDU, 8BK, 8BLT, 8BLW, 8BNE, 8BNY, 8BPM, 8BQL, 8BRL, (8BSF), 8BSS, 8BZH, 8BZY, 8CBJ, 8CG, 8DV, 8GE, 8HJ, 8JP, 8KU, 8LB, 8NB, 8OS, 8SE, (8ZM), 8ZX, 9AAS, 9AJP, 9AKR, 9BRK, 9DKY, 9DTA, 9FU, 9IO, 9QE, Can. 3BP, (3JI), 3SJ, 9AL.

8ATN, Detroit

Spark—2SZ, 2AHU, 2AJE, 3KG, 3TJ, 4BI, 4BQ, 4BY, 5FU, 5ZA, 5ZZ, 5XA, 9AR, 9YB, 9YC,

9YM, 9ACB, 9AOU, 9AYW, 9ARK, 9BLJ.
C.W.—1UQ, 1ZE, 1ANQ, 1AQJ, 1AJP, 1ARY, 1AWS, 1BKQ, 1BUA, 1CAK, 2BL, 2BP, 2CA, 2SV 2TG, 2ZK, 2ANY, 2AQH, 2AJE, 2AJW, 2BEA, 2BEB, 2BIU, 2BLJ, 3BL, 3BG, 3BL, 3NH, 3RF, 3AJK, 3AQR, 3BEA, 3BHL, 3BRL, 4BQ, 4BY, 4DC, 4DS, 4ID, 4ZC, 4ZY, 5CH, 5LA, 5WO, 5ZA, WX5, 8BK, 8DU, 8LF, 8LU, 8MG, 8OW, 8SP, 8XE, 8XK, 8ZA, 8ZR, 8ABO, 8AGO, 8ALM, 8AMM, 8ADG, 8AOZ, 8AWP, 8BBB, 8BED, 8BCI, 8BCF, 8BDB, 8BDU, 8BEF, 8BFX, 8BFZ, 8BGH, 8BRL, 8BRM, 8BUN, 8BZH, 8BZO, 8CAZ, 8CEE, 8CTZ, 9AW, 9EI, 9FQ, 9FZ, 9KP, 9WA, 9WW, 9AAW, 9AJA, 9AJK, 9AKD, 9AKR, 9ANQ, 9AOU, 9ARK, 9AYN, 9AYW, 9AJ, 9BBU, 9BEA, 9BBU, 9BED, 9BLO, 9BRL, 9CRL, 9DKY, 9DYN.

8BIL, Warren, Pa.

C.W.—1ADL, 1AJP, 1ARY, 7AZX, 1BDC, 1BEP, 1BGF, 1BKQ, 1BSD, 1BWJ, 1CA, 1COD, 1EZ, 1ON, 1PR, 1PT, 1QF, 1QP, 1RD, 1XM, 1YK, (2AAB), 2AJA, 2AJF, 2APQ, 2AQU, 2AWF, 2AWL, 2AYI, 2AYY, 2BDM, 2BEA, 2BGM, 2BJP, 2BML, (2BNZ), 2BQD, 2BQU, 2BRB, 2BSC, 2BTJ, 2BXP, 2BZU, 2CEC, 2CFI, 2CFT, 2CGO, 2EH, 2FP, 2FZ, 2KP, 2KU, 2KV, 2LH, 2NZ, 2OF, 2SQ, 2WT, 2ZK, 3AAG, 3AAO, (3AAY), 3AFU, 3AJD, 3ALN, 3ANO, 3ANS, 3ANY, 3AOD, 3APD, 3AQF, 3AQH, 3AQR, 3ATZ, 3AVY, 3BA, 3BAG, 3BEC, 3BFG, 3BHL, 3BLF, 3BNU, 3BOF, Can. 3BP, 3BUR, 3BZ, 3CA, 3CC, 3HG, 3HJ, 3IL, 3IZ, 3KM, 3LR, 3NH, 3QZ, RF, 3RP, 3RY, 3SM, (3SQ), 3VW, 3ZO, 3ZY, 3ZZ, 4BF, 4BQ, 4BY, (4DC), 4DQ, 4DZ, 4EH, 4EL, 4EH, 4GL, 4ID, 4JB, 4LP, 4YA, 4ZC, 5AAM, 5DA, 5FV, 5HO, 5LA, 5NZ, 6XA, 8ADG, 8ADP, 8AGO, 8AHZ, 8AIO, 8AIS, 8AIZ, 8AJV, 8ALD, 8ALV, 8AMQ, 8AOG, 8AOO, 8AQF, 8AQR, 8AQV, 8AQZ, 8ARD, 8AWM, 8AWP, 8AWY, 8AWZ (fone), 8AXC, 8BDB, 8BDU, 8BEX, 8BFX, 8BGF, 8BK, 8BLT, 8BNJ, 8BQQ, 8BUN, 8BVK, 8BYD, 8BZC, 8BZF, 8BZY, 8CAB, 8CKO, 8CG, 8GE, 8HJ, 8HM, 8IQ, 8NV, 8OW, 8PC, 8PT, 8SE, 8SP, 8VJ, 8VY, 8WY, 8ZAE, 9AAP, 9AAS, 9AAV, 9AAY, 9AIV, 9AJH, 9ARK, 9ASL.9AWM, 9AYH, 9BLO, 9BRL, 9BSG, 9CKD, 9DAX, 9DOF, 9DV, 9DYN, 9EI, 9FM, 9FZ, 9HW, 9IO, 9KP, 9LE, 9PF, 9UC, 9WA, 9ZL.
Spark—1AW, 1HO, 1RV, 2AER, 2AHU, 2BFX, 2BJO 2EL, 2FP, 2OM, 2RM, 2WB, 3AJD, 3AOV, 3APT, 3FB, 3HJ, Can. 3KG, 3QZ, 3YV, 4AG, 4BI, 4BQ, 4CX, 4DQ, 4EA, 4GN, 8AFD, 8AHH, 8AIZ, 8ARD, 8AXY, (8AYM), 8AYN, 8BAZ, 8BRL, 8BSY, 8CH, 8CHV, 8CP, 8EB, 8EW, 8FT, 8OD, 8OI, 8RQ, (8TY), 8YR, 9AAW, 9ACB, 9AIR, 9ASJ, 9DCX, 9OX, 9UH, 9VL.

Leonard Strobel, Akron, Ohio

Spark—1AW, 2DN, 2FP, 2WB, 2WC, 3AJD, 3BCM, 3BM, 3NY, 3TA, 4AG, 4AK, 4AS, 4CX, 4EA, 4GN, 5BA, 5JD, 8AAS, 8ABA, 8ADQ, 8AFD, 8ALD, 8AOH, 8APD, 8ASY, 8AU, 8AUG, 8AWY, 8BAZ, 8BHV, 8BMP, 8BRL, 8CJ, 8CO, 8CP, 8EF, 8ER, 8EW, 8HY, 8IN, 8LB, 8LY, 8MG, 8MT, 8NO, 8RX, 8SP, 8TU, 8VA, 8VY, 8WL, 8XE, 8YN, 9ACB, 9ACM, 9AEG, 9AIR, 9AKM, 9ALA, 9ALO, 9AOU, 9AVL, 9AX, 9AZA, 9AZK, 9BIM, 9CP, 9DB, 9DEV, 9DHZ, 9DIW, 9DKY, 9DQ, 9DRP, 9DSO, 9DUX, 9DYX, 9DZZ, 9GX, 9OX, 9VR, 9VW, 9WE, 9YA, 9ZB.
C.W.—1AJL, 1ALW, 1AOE, 1ASF, 1BAJ, 1BOL, 1BG, 1BGL, 1BKL, 1BKQ, 1CK, 1XAD fone, 1XM, 1YK, 1ZE, 2AAB, 2AWL, 2BB fone, 2BBB, 2BE, 2CA, 2CFT, 2CI, 2FP, 2HQ, 2OG, 2OP, 2SZ, 2UD, 2WT, 2WZ, 2ZK, 3AL, 3BD fone, 3BG, 3BHL, 3BVL, 3FW, 3GZ fone, 3AZ, 3ZY, 3ZZ, 4AAM, 4ADE, 4AX, 4BIY, 4BLF, 4BQ, 4BY, 4CM, 4CY, 4DF, 4DQ, 4EL, 4EU, 4FV, 4GL, 4GR, 4ID, 4XD, 4XQ, 4XY, 4XZ, 4YC, 4ZAB, 4ZC, 4ZZ, 5DA, 5DR, 5FV, 5GZ, 5MA, 5TU, 5ZL, 5ZW, 5ZZ, 8AB, 8ACF, 8AIM, 8AIV, 8AJ fone, 8ALV, 8AMU, 8ANX, 8AOG, 8APD, 8ARM, 8ARU, 8AW, 8AWY, 8AXK, 8BBK, 8BCM, 8BDO, 8BUM, 8BV, 8BYM fone, 8CP, 8DU, 8DV, 8OR, 8OW, 8QZ, 8RE, 8AZ, 8VY, 8WE, 8WR, 8XU, 8ZZ, 9AAP, 9AAU, 9AAV, 9ABA, 9ADB, 9AEZ, 9AKR, 9ALP, 9AMR, 9AMS, 9ARK, 9AW, 9AWB, 9AYU, 9BBF, 9BDP, 9BF, 9BP, 9BRL, 9BAX, 9DEW, 9DF, 9DJ, 9DP, 9DTA, 9DV, 9EI, 9FZ, 9IM, 9IO, 9KP fone, 9VL, 9VV, 9WK, 9WM, 9XW, 9YB, 9ZJ fone.

8AGO, Pittsburgh—All C.W.

(1II), 1QP, (1RD), 1XM, 1ZE, 1AZW, 1BUA, 1CAK, (1CMK), 2BG, 2FP, (2NZ), 2SQ, 2WI, 2WT, 2XQ, (2ZK), 2ZS, (2AAB), 2AJF, 2AMO, 2AQH, (2AYV), 2AWL, 2BAK, 2BEA, (2BEB), (2BEH), (2BFZ), 2BGT, 2BNC, (2BTJ), 2BYW, 2CCD, (3BA), 3BZ, 3CA, 3CC, 3CA, (3EM), (3FM), (3FS), 3GH, 3HG, 3HJ, (3IZ), 3JJ, 3KM, 3LR, (3QV), (3QZ), (3WW), 3XL, (3ZY), (3AAD), 3AAG, 3AAY, (3ADX), 3ANJ, (3ALN), 3APQ, (3AQH), (3AQR), 3ASO), 3ASW, (3BFS), (3BFU), 3BHL, (3BLF), 3BTK, 4AS, (4AZ), (4BF), 4BQ, 4BY, 4DQ, (4EU), 4FT, (4GL), 4II, 4KC, 4LP, 4XD, (4ZC), (4ZE), 4YA, 5DA, 5EK, 5FV, 5HO, 5JB, 5NZ, 5PM, 5UU, 5WO, 5ZA, 5AAM, (6BO), 6ZZ, 6XAD, (8BK), (8BO), 8BU, (8GE), 8GW, 8HJ, (8IH), 8IQ, (8KH), 8PC, 8QB, (8SE), 8VJ, (8VY), (8UK) 8WY 8ZG, 8ZZ, 8AAN, (8ADG), 8ADM, 8AGZ, 8AII, (8AIM), 8AIS, (8AMD), 8AMF, 8ANC, 8AQZ, (8ARI), 8ARK, 8ARW, 8AVD, 8AVO, (8AWM), (8AWP), 8AWY, 8AXK, 8BBD, 8BCA, 8BEI, 8BEY, 8BFX, 8BGV, 8BLT, 8BLW, 8BOX, (8BRM), 8BUN, 8UX, (8BXA), (8BZY), 8CJX, (8CLD), (9DY), 9EI, 9FM, 9FZ, 9HW, 9HY, 9IF, (9IL), (9IO), (9IZ), (9KI), (9KP), 9LE, 9LQ, 9PS, 9PW, 9QE, 9SL, 9SO, (9UC), 9WA, 9WK, 9XI, 9ZE, 9ZG, 9ZL, 9AAS, (9AAV), 9AAY, 9AEQ, 9AJA, (9AJH), (9AKD), 9AMD, 9AMU, 9ANE 9AOA, 9AQA, (9ARK), 9ARN, 9ASD, (9ATE) 9AYH, (9BED), 9BJB, 9BLC, 9BLO, (9BRL), 9DAM, (9DAX), 9DCF, 9DOF, 9DUN, (9DZQ), 9XAI, 9ZAE, Canadians (3BP), (3IZ), (3FO), 9AL.

8XE, State College, Pa.

(1ADL), (1AHL), 1APP, (1AW), 1AWB, 1AX, (1AZW), (1BKQ), 1BIR, (1BOP), 1BWJ, (1CZ), 1HO, 1MB, 1MX, (1RV), 1SN, (1XM), (1ZE), (2AGC), 2AJW), (2AQI), (2BB), 2BGM, 2BK, 2BJO, 2BPF, 2BML, (2BRC), (2BUM), 2CT, 2EH, (2EL), (2FP), 2OF, (2OM), 2PR, (2RM), 2VA, 2WB, (2ZL), (3ABB), 3AIE, 3AJD, 3AK, 3ARD, (3ARR), 3AUW, 3BAG, 3BHL, 3BJJ, 3BLF, 3BP, 3BZ, 3CN, 3EH, 3EI, (3FB), (3FM), 3HAY, 3HL, 3HQR, 3IP, 3MB, 3QF, (3QZ), (3TA), (3TJ), 3UD, 3UQ, 3XA, 3XW, 3ZAB, (8ZO), (4AS), 4DS, (4DZ), (4EA), (4EL), (4GL), (4GN), 4JB, 5AAB, (5FJ), (5FY), 5GI, 5NH, 5SM, 5XA, 5XB, 5YG, 5YH, 5ZAF, (8ACF), (8AIM), (8AIT), (8ARD), (8AUE), (8AUY), (8AXE), (8AYN), (8BEP), (8BEJ, (8BHV), (8BFS), (8CHO), (8DZ), (8IH), (8JJ), (8PI), (8QE), (8SP), (8UC), (8WM), (9AAP), 9AJ, 9AJA, (9AQV), (9ASJ), (9AXG), (9AZA), 9BRL, (9CP), 9DAX, (9DGX), (9DLX), 9DQQ, 9DRR, (9DWP), 9DY, (9FS), 9IO, 9KT, 9OF, 9MC, 9OX, (9UH), 9VL, 9VZ, (9YC), (9YE), (9XE), 9ZL.

9ZJ, Indianapolis—Every District

Spark—2EH, 2OM, (3BP Can.), (3FO), 3KG, (3ZO), (3ZS), (4YA), 5EK, 5JD, 5KC, 5SM, 5QA, 5XA, (5XB), (5XI), (5XU), (5YE), (5ZAF), (5ZE), 5ZR), (5XQ), 7ZM, (8AGO), 8ARS, (8AXY), (8BRL), (8IN), (8LQ), 8MZ, 8OD, 8WO, 8XE, (8YAE), (8ZA), (8ZN), (8ZP), (8YU), 9ACB, 9AEY, 9AIG, 9AIR, 9AMS, 9AQG, 9ASJ, (9AWU), (9AZE), (9BGP), (9BK), (9DXE), 9DZY, 9DMJ, 9GY, 9LF, 9OX, (9PB), 9RY, 9WU, 9WX, 9XAQ, (9XI), (9XM), (9YAE), (9YAJ), (9YAK), (9YB), (9YM), (9YQ), 9ZAF.
C.W.—1XM, 2BEA, 2BFX, 2BNZ, 2CCD, 2FP, 2FS, 2NZ, 3ALN, 3BG, 3BP Can., (3HJ), 3XW, (3ZO), (3ZY), 4CY, (4FT), 4GL, 5EK, 5ND, (5ZA), 6ZG, 6ZZ, 8AGO, 8AIO, 8ANJ, 8ARK, 8ARW, 8AVD, 8BBU, 8BCI, 8BDD, 8BK, 8BNJ, 8BO, 8XX, 8CBJ, 8CQS, 8DV, 8QZ, 8UK, 8UY, 8VV, 8WO, 8XE, 8YD, 8ZZ, 9AAS, 9AJA, 9AKR, 9AMO, 9BRL, 9DOF, 9FD, 9IL, (9RV), (9XM), 9ZAF, 9ZG.

9APK, Chicago—Every District

Spark—(1ARY), 1XM, (2BJO), (2BK), (2FP), 2JZ, (2OM), 2PV, (2ARB), (3AJD), (3ALN), 3XM, (3ZA), 4CG, (4DH), 5AQ, (5BY), (5HK), (5JD), 5LO, 5IR, 5IF, 5PE, 5PG, 5QQ, 5QS, 5SM, 5FO, 5FV, (5NS), 5XA, 5XU, 5ZE, 6LC, (6XAG), (7KG), (7MP), (7ZV), 7ZU, 8ABO, (8AFA), 8AFD, (8AID), 8AIO, (8AIT), 8AOI, 8APP, (8ARD), 8ARS, (8AVO), (8AVT), (8AWU), 8AVH, 8AXY, 8AYE, (8BBU), (8BBY), (8BCO), 8BDV, (8BDY),

8BEF, (8BEN), 8BEP, 8BFM, (8BFX), 8BFY, 8CAY, 8CGY, (8CP), 8EA, (8EB), 8FA, (8FT), 8FZ, 8GA, (8JJ), 8KY, 8LB, 8RM, 8RQ, (8UC), 8WD, 8WO, 8BBX, (8BXC), (8BXX), 8YR, 8BQC, 8BOI, 8XE, 8YN, 8ZAA, 8ZAC, (8ZF), 9ABV, 9ACB, (9ACL), (9ACP), (9ADI), 9AEG, 9AEF, 9AIF, 9AIG, 9AIP, 9ALP, (9ALU), 9ANO, 9ANP, 9AOJ, (9APS), (9AQZ), (8ARG), 9ARZ, (9ASJ), (9ASK), (9AUA), 9AVK, 9AVZ, 9AYH, 9AYW, 9AZE, (9BCF), (9BIJ), 9BDJ, 9BMN, 9BRT, 9BSA, (9DEH), 9DBY, (9DGW), (9DGW), 9DGX, (9DHZ), 9DKQ, (9DNC), (9DPB), 9DHH, 9DSW, 9DAG, 9FK, (9HR), 9JN, 9KA, (9MS), (9OA), (9OX), 9RY, (9UH), 9XT.

C.W.—1BKQ, 1COD, (2FP), 3ALN, 3ALR, 3AJD, 4CO, 4BQ, (6ZZ), 8AGO, (8AIO), 8AQV, 8AWM, 8AWP, 8AXK, 8BBK, (8BLW), 8IQ, 8BRL, 8BSS, 8BYR, 9AOG, 9BDV, (9DTA), 9ADI, 9QE, (9XI), 9ZAF, 9ZL, 8QB.

9BBE, LaSalle, Ill.

C.W.—1RU, 1XM, 1AFV, 1ARY, 1BCG, 1CAK, 2DN, 2EL, 2FD, 2FD, 2FP, 2FT, 2KP, 2UF, 2WF, 2WL, 2XB fone, 2ZL 2ZZ, 2AAX, 2AWL, 2BGM, 2BML, 3AM, 3DH, 3FB, 3FT, 3IW, 3LR, 3MO, 3QZ, 3XM, 3ZO, 3AAB, 3AEV, 3AHK, 3AQR, 3ARN, 3BLF, 4BA, 4BF, 4BK, 4BQ, 4CC, 4CO, 4CX, 4EL, 4FT 4GL, 4NX, 4SS, 4ZC, 4ZO, 5FV, 5HO, 5JD, 5LA, 5NK, 5NZ, 5RZ, 5UU, 5XB, 6ZZ, 8BK, 8CI, 8DX, 8GE, 8HM, 8HP, 8II, 8IQ, 8JQ, 8LF, 8LU, (8LX), 8NQ, 8NX, 8OH, 8QQ, 8RQ, 8SP, 8UJ, 8VJ, 8VY, 8WR, 8XE, 8XK, 8XV, 8ZG, 8ZZ, 8ABV, 8AEG, 8AGZ, 8AIO, 8AIM, 8ALE, 8AOA, 8AOD, 8AQF, 8AQV, 8AWP, 8AWZ, 8BCI, 8BDU, 8BEF, 8BFX, 8BNE, 8BOW, 8BOX, 8BRC, 8BRK, 8BXA, 8ZAE, 9EL, (9HK), (9IF), 9IO, (9JL), 9KP, 9LQ, 9PI, 9PS, (9QE), 9RM, 9WA, 9WT, 9XD, 9YB, 9ZG, (9ZL), 9AAP, 9AAS, 9AAV, 9AAY, 9ABU, 9ACB, 9AJA, (9AJH), 9AKD, 9AKR, 9AMB, 9ANE, 9AQR, 9ARK, 9ASL, (9AYS), 9BAC, 9BAP, 9BBF, (9BEO), (9BFH), 9BIZ MB, (9BUH), (9DBV), (9DCR), 9DDY, (9DKH), 9DTA, 9DYE, (9DYN), 9DZW, 9XAC, 9XAM, 9YAM, Can. 3BP. 9AW.

Spark—1AW, 1DJ, 1SN, 1TS, 1AKG, 1AWZ, 2BK, 2EL, 2OM, 2RU, 2WB, 2WL, 2AJW, 3AC, 3AM, 3DH, 3DM, 3EL, 3HJ, 3IW, 3MS, 3UC, 3ZO, 3AQR, 4BE, 4BQ, 4CX, 4DH, 4FD, 4GN, 4JB, 5AA, 5AF, 5AI, 5BY, 5DA, 5DU, 5ED, 5EG, 5EK 5ER, 5EW, 5FJ, 5FO, 5HK, 5IS, 5JD, 5MF, 5PY, 5QA, 5QS, 5SR, 5TD, 5TG, 5UU, 5XA, 5XB, 5XI, 5XJ, 5XM, 5XS, 5XU, 5YI, 5YL, 5ZA, 5ZL, 5ZS, 5ZW, 5ZX, 5ZZ, 5ZAB, 5ZAK, 8BP, 8CP, 8DW, 8EA, 8EB, 8ER, 8EW, 8FI, 8FK, 8FN, 8FT, 8GO, 8G, 8HG, 8HM, 8IN, 8JJ, 8KS, 8LH, 8LJ, 8MR, 8NZ, 8OI, 8PO, 8QA, 8QQ, 8RU, 8SP, 8TK, 8TT, 8UC, 8WI, 8XE, 8XS, 8YN, 8YT, 8ZD, 8ZN, 8ZP, 8ZR, 8ACF, 8ACN, 8ACR, 8AFB, 8AFD, 8AFF, 8AFK, 8AGK, 8AGO, 8AHH, 8AIB, 8AJX, 8AMD, 8AMZ, 8ANO, 8ARD, 8ARS, 8ATU, 8AWP, 8AYN, 8BBU, 8BEP, 8BNA, 8BRL, 8BUN, 8DBO, 8ZAA, 9AP, 9AU, 9BE, 9BF, 9BP, (9CA), 9CP, 9CS, 9EE, 9EL, 9ET, (9FK), 9FS, 9GC, 9GP, (9HK), 9HM, 9JN, 9JM, 9KO, (9KY), (9LF), 9LW, 9MC, 9ME, MF, 9MS, 9NQ, 9OX, 9PN, 9PS, 9RC, 9TL, 9UH, UU, VM, (9VW), 9XI, 9YA, 9YB, 9YC, 9YD, 9YO, 9ZJ, 9ZN, 9AAP, 9ABL, 9ACB, (9ACL), 9ACN, 9AEG, 9AEQ, 9AEY, 9AFF, 9AFK, 9AGN, 9AGR, 9AHE, 9AIC, 9AIG, 9AIR, (9AJH), 9AJZ, 9AMA, (9AMR), 9AMS, 9AMT, 9ANO, 9AOU, (9APB), 9APK, 9APQ, 9AQE, 9ARZ, 9ASH, 9ATV, 9AUA, 9AUH, 9AWX, 9AYW, (9AZA), 9AZF, 9BBU, 9BCX, (9BDF), 9BHE, 9BHM, 9BHO, 9BIC, (9BIJ), (9BJA), 9BJT, 9BSA, (9BSC), (9BSJ), 9BSO, (9BTA), (9BUO), (9BYF), 9BYM, 9DBU, 9DEH, 9DEU, (9DEV), (9DFX), (9DHD), (9DHZ), 9DIG, 9DKV, 9DLX, 9DMP, 9DMW, 9DPQ, (9DQR), 9DQQ, 9DRJ, (9DRN), 9DSD, 9DUG, 9DWP, 9DXI, 9DXM, 9DYU, 9DYY, 9DZQ, (9DZU), 9DZY, 9TTI, (QRA? PSE), 9YAK.

9AHC, Ellendale, N. D.

C.W.—1ARY, 1XM, 2FP, 4AZ, 4EH, 4XD, 4YA, 5DQ, 5EK, 5FV, 5HO, 5KP, 5LA, 5MT, 5OI, 5ZA, 5ZAC, 6KA, 6XAQ, 6ZZ, 7ZU, 8ABO, 8AGO, 8AJV, 8AM, 8APT, 8APV, 8AQF, 8AQV, 8ARD, 8ARW, 8AVO, 8AWM, 8BDU, 8BFX, 8BLW, 8BNJ, 8BO, 8BOX, 8BRL, 8BSS, 8BZC, 8BZY, 8CAZ, 8CFS, 8CJX, 8CX, 8HM, 8HZ, 8IQ, 8JL, 8LX, 8MP, 8OS, 8OW, 8OZ, 8QM, 8UK, 8VY, 9AAP, 9AAV, 9ACB, 9ADF, 9AEQ, 9AFB, 9AIF, 9AJA, 9AJH, 9AJP, 9AMB, 9AMU, 9ARK, 9ARZ, 9ASF, 9ASL, 9ATE, AWL, 9AWM, 9AXF, 9AYS, 8AZH, 9BAF, 9BBF, 9BED, 9BGH, 8BJB, 9BJI, 9BLO, 9BP, 9BRL, 9BSG, 9BTT, 9BUM, 9BCP, 9BYP, 9CAO, 9DCF, 9DCW, 9DGQ, 9DKY, 9DOF, 9DQM, 9DTH, 9DTM, 9DV, 9DVL, 9DX, 9DXN, 9DYI, 9DZQ, 9EW, 9FM, FZ, 9HT, 9IF, 9IL, 9JG, 9PC, 9PI, 9PS, 9QD, 9QE, 9SL, 9SO, 9VE, 9VK, 9WA, 9WK, 9XAQ, 9XI, 9YF, 9ZE, 9ZL, Canadian 3BP and 4CB.

Fone—9AG, 9AKX, 9ASF, 9BNO, 9PI, 9RZ, 9XAQ.

Spark—5EW, 5FO, 5HK, 5HZ, 5IF, 5LB, 5LO, 5NK, 5NS, 5PE, 5QI, 5SM, 5XB, 5XD, 5XU, 5YG, 7MP, 7XB, 7ZV, 8AY, 8AYN, 8BEP, 8BFH, 8LB, 9ABV, 9ACB, 9ACN, 9AEG, 9AEY, 9AFK, 9AFW, 9AGR, 9AHZ, 9AIG, 9AMI, 9ANF, 9ANP, 9ANQ, 9AOJ, 9AOU, 9APN, 9AQN, 9ASF, 9ASK, 9ASM, 9ASP, 9ATN, 9AUA, 9AUL, 9AVX, 9AVZ, 9AWZ, AXU, 9AYW, 9AZA, 9BGX, 9BHG, 9BMN, 9BOF, 9BRI, 9DEH, 9DEU, 9DJX, 9DKS, 9DPB, 9DSD, 9DUG, 9DUI, 9DXS, 9DXW, 9DZY, 9FX, 9GC, 9HI, 9IY, 9KI, 9LF, 9LW, 9MC, 9MS, 9OF, 9PI, 9RC, 9RY, 9SN, 9TI, 9UG, 9VL, 9WI, 9WY, 9XAI, 9XT, 9YAE, 9YAJ, 9YAK, 9YAL, 9YB, 9YQ, 9ZB, 9ZC, 9ZJ, Canadian 3GN.

Rev. 9AOR, Pequot, Minn.

C.W.—4FT, 5BQ, 5DD, 5EK, 5HO, 5KP, 6XO, 6XAD, 7HH, 7WE, 8AIM, 8AWG, 8AXK, 8BCA, 8BEX, 8BFX, 8BGA, 8BH, 8BO, 8BOX, 8BSS, 8CFS, 8II, 8LY, 8PN, 8RQ, 8UK, 8VY, 8WI, 8XAE, 8ZZ, 9AAI, 9AAP, 9AAU, 9AAV, (9ABB), 9ADF, 9AEQ, 9AFB, 9AFX, 9AGN, 9AJA, 9AJH, (9AJP), 9AJS, 9AKD, 9AKK, 9AKR, 9ALH, 9AOU, 9AQQ, 9ASF, 9ATE, 9ATX, (9AUA), 9AUM, 9AVM, 9AWM, 9AWP, 9AXK, 9AYR, 9AYU, (9BAF), (9BAV), 9BBF, 9BDO, 9BDU, (9BED), (9BFG), 9BGH, 9BIO, 9BJI, 9BJV, 9BLW, 9BOW, 9BRL, 9BSG, 9BUM, 9DB, 9DCS, 9DFA, 9DFX, 9DG, 9DGE, 9DGQ, 9DHA, 9DHC, 9DIG, 9DIM, 9DKY, 9DOF, 9DQM, 9DSG, 9DSW, 9DTH, 9DTM, 9DTS, 9DV, 9DXS, 9DYT, 9DZJ, 9DZQ, 9DZY, 9EI, 9EW, 9EX, 9FM, 9FW, 9FZ, 9HW, 9IL, 9IO, 9JL, 9KP, 9LJ, 9LL, 9LQ, 9NV, 9PI, 9PS, (9QE), 9SL, 9SW, 9UC, 9VK, 9VY, 9WQ, (9WU), 9WX, 9XI, 9XAQ, 9YAE, 9ZG, 9ZL.

Spark—5IS, 5JD, 9AAW, 9AEY, 9AIG, 9AIM, 9ANQ, 9ARZ, 9ARR, 9ASK, 9ATN, 9AUA, 9AVX, 9AVZ, 9AWZ, 9AXR, 9AYS, 9AZA, (9BAL), 9BIZ, 9BXC, 9DES, (9DGW), 9DIH, 9DKS, 9DNC, 9DSO, 9DZY, LW, 9MF, 9XT, 9YB, 9YM, 9YAC, 9YAJ, (9YAK), 9ZC.

9DPX, St. Paul, Minnesota

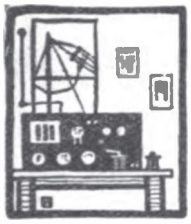
Spark—5AQ, 5EW, 5FO, 5HK, 5IF, 5JF, 5LB, 5NY, 5PU, 5SM, 8BBU, 8BXX, 9HG, 9HI, 9KI, 9LW, 9MC, 9MS, 9NQ, 9OA, 9OI, 9SN, 9VL, 9WI, 9WT, 9ABV, 9ACB, 9AEG, 9AFK, 9AGR, AHZ, 9AIF, 9AIG, 9AIK, 9ALO, 9AOJ, 9ASO, 9ATN, 9AUU, 9AVZ, 9AWZ, 9AXU, 9AYW, 9AZH, 9BRL, 9DCX, DEL, 9DFX, 9DJX, 9DKQ, 9DKS, 9DNC, 9DSD, 9DSO, 9DZI, 9DZJ, 9DZY.

C.W.—2XQ, 2BEA, 3BQ, 3AQR, 4BQ, 5EK, 5FV, 5HO, 5LA, 5NZ, 5OI, 8DV, 8GE, 8IO, 8MP, 8OS, 8OW, 8UK, 8WA, 8ABO, 8AIO, 8ALB, 8AMM, 8ANC, 8AOG 8APT, 8AWM, 8AXK, 8BBX, 8BCO, 8BDU, 8BEF, 8BNJ, 8BUM, 8BXA, 8BZC, 8CFS, 8CGM, 8ZAE, 9EW, 9FZ, 9HW, 9HY, 9IO, 9KP, 9LQ, 9PS, 9QE, 9WA, 9ZE, 9ZG, 9ZL, 9AAP, 9AAV, AAY, 9ABF, 9AIN, 9AJA, 9AKD, 9AOR, 9ARK, 9ATE, 9AWM, 9AYH, 9AYS, 9AZF, 9BAF, 9BBF, 9BED, 9BGH, 9BJB, 9BLO, 9BNO fone, 9BUM, 9DCR, 9DFL, 9DKY, 9DOF, 9DSM, 9DTS, 9DUN, 9DYN, 9DZQ, Canadian 3BP, 4CB.

9APW, St. Paul, Minnesota

C.W.—1ARY, 2FP, 3AQR, 3ZO, 3ZOV, 4BQ, 4FT, 4ZC, 4CY, 4BY, 5EK, 5ZA, 5LA, 5VR, 5UU, 5OI, 5ND, 6ZZ, 6XAD, 6ZF, 7HW, 8BE, 8DV, 8SP, 8VJ, 8VY, 8XV, 8ZZ, 8AGZ, 8AIM, 8AOG, 8APT, 8AQF, 8AWM, 8BDO, 8BLW 8BFX, 8BUM, 8CAZ, 8CFS, 8CGM, 8ZAE, 9BY, 9DB, 9DK, 9FM, 9HW, 9KP, 9IO, 9JL, 9PI, 9RY, 9WU, 9ZY, 9ZX, 9ZR, 9ZL, 9VK, 8YQ, 9YF, 9AX, 9AAP, 9AAV, 9AAO, 9AAY, 9AOU, 9AAS, 9AJA, 9AJS, 9ATN, 9AVM,

(Concluded on page 67)



Amateur Radio Stations

5HK, Oklahoma City, Okla.

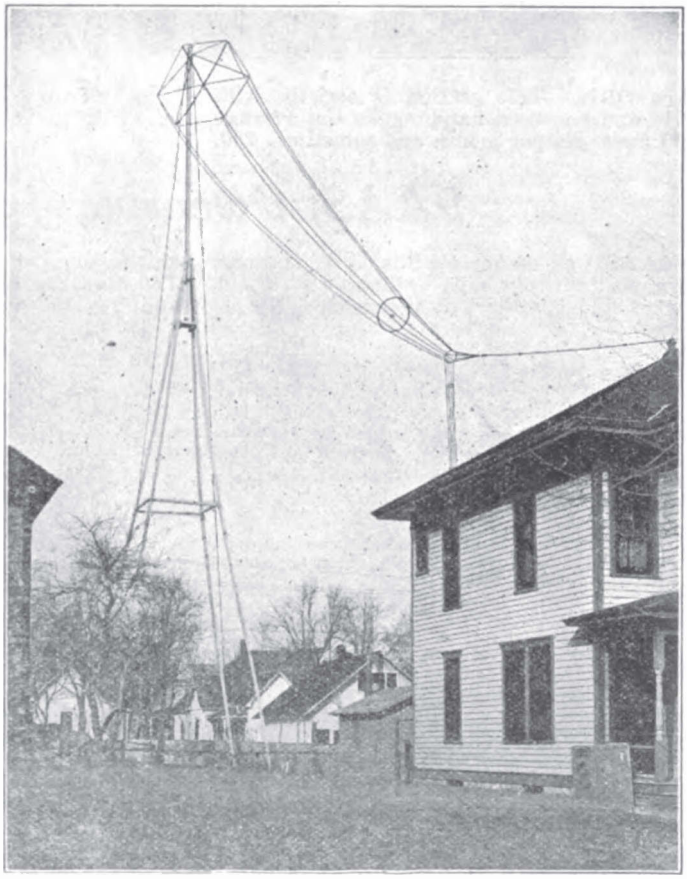
The spark set 5HK of Le Roy Moffett, Jr., at 312½ North Broadway, has been heard in nearly all states. The picture shows a selection from over 600 cards and letters he has received since September.

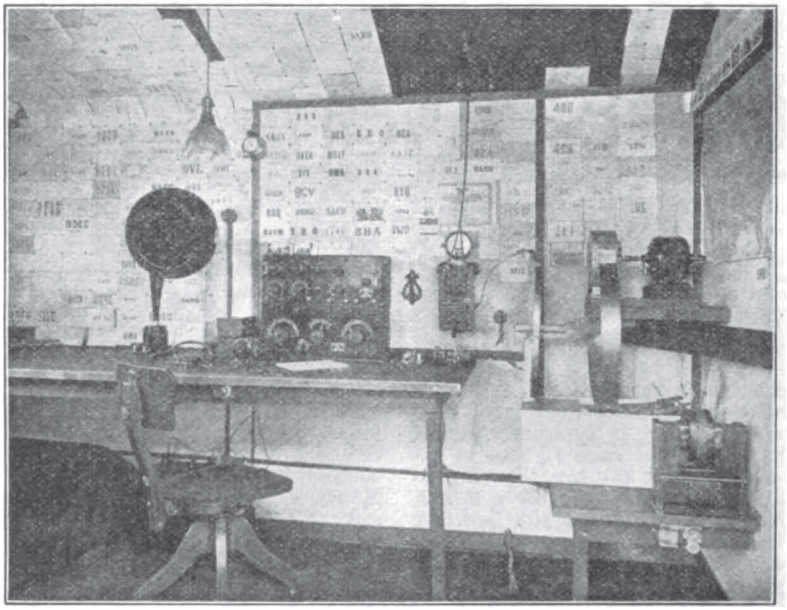
The antenna system is especially interesting. The aerial is a cage 12 feet in diameter, 93 feet high at the top, tapering to a bottom 3 feet in diameter with a 9-inch lead-in, the total length being 105 feet. A counterpoise is used, fanning out 80 degrees and covering all of the yard back of the shack and the yard to the left of the picture.

The transmitter has proven very efficient. The transformer is a 1 K.W. Acme. The condenser is a HE one and stands the gaff OK. It is an oil-immersed affair composed of 58 copper plates each separated by four 8-by-10 photo plates. The primary is a single turn of 2½ inch copper ribbon 22 inches in diameter and the secondary is made of 24 feet of ¾ inch strip. The gap is a Benwood eight-toothed driven by a variable speed motor, but as shown theoretically elsewhere in this issue the low tone is found to be best. We like this arrangement of the closed circuit, with the single-turn primary cut at the bottom for the condenser and at the top for the gap. Leads are minimized and the greatest efficiency secured thereby. With constant effort an antenna current of seven thermocouple amperes has been obtained.

The receiver is a Z-Nith regenerative with two steps of audio amplification, Baldy phones, Magnavox, W.E. and A.P. tubes.

5HK has been reported QSA from Boston, Mass., Seattle, Wash., Eugene, Oregon, Canada, and the Isle of Pines. He has worked 8RQ in Pennsylvania, 7ZU in Montana, and 6XAD in California. A 100 watt C.W. set will be going shortly to work

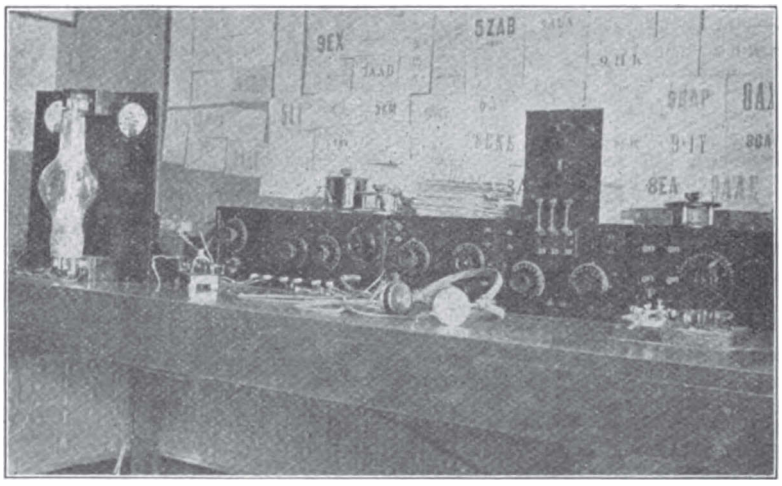




thru QRN. This station is strictly A.R. R.L. and has been handling on the average 100 messages per month and sometimes 200. If school work didn't cause so much QRM he would probably QSR more.

9AAS, Owensboro, Ky.

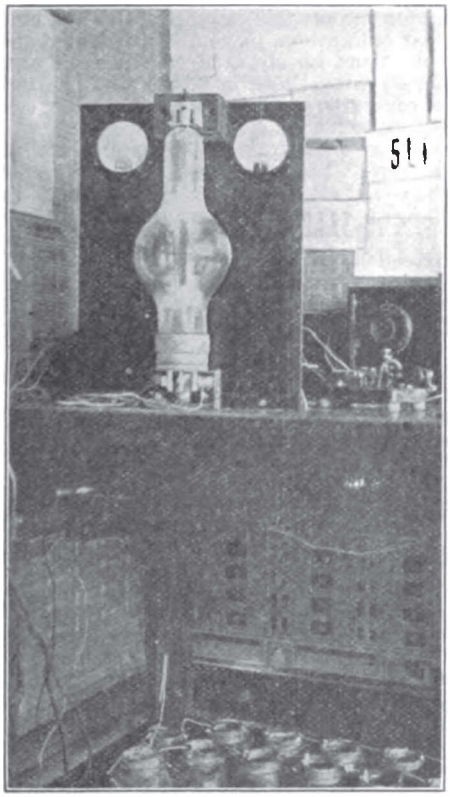
9AAS, one of our leading C.W. stations, is almost entirely built by Robert W. Field, owner and operator, at Owensboro, Ky.



The antenna is a nine wire inverted L supported 70 ft. high at one end by a persimmon tree and 60 ft. high by a pole on the house, the flat top being 90 ft. long. The counterpoise is 12 ft. from the ground and has the same length and number of wires as the antenna.

The transmitter has just been changed from a 50 watt tube to a 250 watt U.V.204

with the result that cards have been coming in faster than it is possible to answer. The circuit used is similar to number nine in the Radio Corp's C.W. catalogue except that only one tube is used. Except for the tube, grid leak, and condensers, nearly all the set is home-made. The power transformer has the low voltage filament winding directly over the primary. The high voltage winding is on the other leg and delivers 2200 volts on each side of the mid-tap. The rectifier consists of 36 quart fruit jars although 26 seems best as it



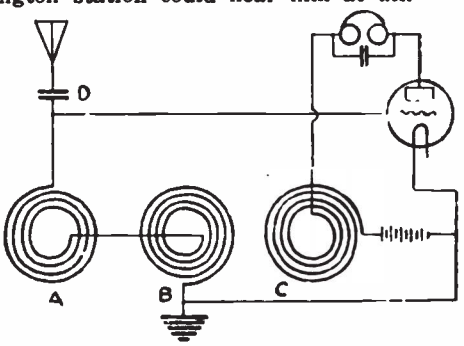
gives better radiation due to lower resistance. The elements are of aluminum and lead, aluminum wire has been found satisfactory in every way for the aluminum electrodes, used with a saturated solution of borax. With 9½ volts on the filament the antenna current is 3½ amperes. Some trouble was experienced at first in getting the tube to run without overheating but it now runs fairly cool.

The receiver is regenerative with detector and two-step, all home-made. For plate voltage an 80 volt lead plate test tube battery is used.

9AAS has been reported in every district but the sixth, including Canada, and is an example of an excellent station where most of it is home-made. The cost of such a station about equals the best one k.w. spark set and there is not a particle of doubt but that it is better.

A Two-Control Tuner

ONE of the entrants in the S.W. Smith Cup Contest described a novel short wave tuner proposed by Mr. J. E. Parker, 3XK, which was used at 3ABI in Washington with marked success. During the transcontinental relays the No. 1 westbound message was followed until it reached the Sixth District, 5ZA being copied solid at a time when no other Washington station could hear him at all.



It is equally applicable to spark and C.W., and its performance is said to be greatly superior to all the usual varieties of single-circuit tuners. It is simplicity itself, A, B, and C being the three coils of a Turney "Spider-Web" Tuner, mounted on swinging doors. There are but two controls. A and B serve as a hinged variometer, B being the fixed coil and all tuning being done by swinging A. C is a tickler coil and regeneration and oscillation are controlled by swinging the door carrying it.

At 3ABI, on an average amateur aerial, when fixed condenser D had a capacity of 0.001 mfd. the wave length range of this set was from 150 to 240 meters.

Try it.

Radio Communications by the Amateurs

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

Telegraphy's the Thing

Dayton, Ohio.

Editor, QST—

Your editorial in March 1922 QST was read with much interest.

In dealing with the subject "Phones and Amateur Radio" it seems that an important point has not been brought out. What is the chief use of radio communication, anyway. I think it is the transmission of intelligence from point to point in the least possible time. Right here, we of the "TELEGRAPHERS" group, have a powerful argument. The long years of successful commercial traffic carried on by the Western Union and Postal Companies has proven the superiority of the telegraph over the telephone for the ACCURATE transmission of intelligence. The A.R.R.L. is altogether for the RAPID transmission of messages, and that is the fundamental usefulness of radio telegraphy.

The radio telephonists, both the listening classes and the transmitting classes even including the commercial broadcasting stations have no claim to actual utility, they only have popular support. They cannot argue that it is necessary, for instance, to transmit music from Pittsburgh to some distant point instantaneously. Even the lectures which are transmitted have no urgency demanding their transmission in a short space of time. I do not think the radio telephone has any logical claim to the ether, and I think our government should be made to see this point.

Let's use this powerful argument in furthering our interests: That radio communication has its greatest value in the rapid transmission of intelligence. The amateur relay men and commercial telegraphs should have preference over the 'phones.

Yours for RADIO TELEGRAPHY,
Paul R. Fenner,
Director, Dayton Radio School,
Former Editor Pacific Radio News.

Arc-Light QRM

Philadelphia, Pa.

Editor, QST:—

I am a regular subscriber to QST. I have searched every month through it for some data on the elimination of arc light induction but so far I have been disappointed. I will give you the conditions under which I labor and if you in your next issue will print something which will enlighten me on this subject I shall be under great obligations to you. I live about three doors from an elevated car line and under this elevated there is a string of arc lights on each side with a space of about thirty feet between each arc. My aerial, which is a four wire flat top, is parallel with this arc line. I was using a crystal detector when I first heard this noise and then changed to a regenerator and tube detector thinking I could eliminate this noise. Instead it came in louder and at a friend's suggestion I shunted a variable condenser from the ground to the B Battery. This also did no good. I then erected an aerial at right angles to the arc line but this also was useless. I now started to get at my ground. I had been using buried chicken wire for a ground and I tried the radiator and then a tin roof but it did not make the slightest difference. I am at the end of my resources and look to you for help.

Thanking you in advance, I remain
A Very Disheartened Ham.

(We regret to say that we do not know an effective way of getting around this trouble—and it has kept many a good station quiet for a season at a time. Does anybody know any way around it? If so, please let us have the dope at once, for publication. Some hope is held in the balancing-out scheme, whereby a second aerial or perhaps preferably a loop would pick up additional arc-QRM and couple it into the tuner in the reverse direction from the regular aerial, thereby cancelling out the QRM and leaving the signals collected on the main aerial. Anybody tried this with success? Help!—Ed.)

Rotten Routing

90 Mountain Ave.,
Summit, N. J.

Editor, QST—

In reading a letter of Staff Sgt. Walkeen, published in January QST, I noticed that he says one should QSR a msg. to keep it going. That is very good as far as it goes but it seems to me that too many amateurs

QSR just to keep the msg. going and not to get it to its destination. The lack of judgment shown in relaying some msgs. is appalling. I have QSRed east and hrd the msg. come back from the south a week later to another station in the same town. It might better to delay a msg. a short time rather than QSR in the wrong direction just to get rid of it. Many a msg. never gets to its destination because it goes around in circles until someone gets wise to the fact that the information in it is too old to be any good and therefore throws it in the waste paper basket.

Most of this trouble could be remedied by a little thought and possibly the use of a map.

73, CUL.

Leonard Richards, 2AFR.

Keep Your Eyes Open

Lebanon, Ind.

Editor, QST—

List to my sad tale. Honest,—I've got a real kick coming this time. It isn't often that I get peeved enough to want to break into print, except of course, when something begins to interfere with the great old game, radio.

Now I honestly believe that the radio manufacturers are going to queer this kitty of ours unless we rise up wrath and get the wouff houng to working. The case in point is this—No long since a prominent radio man, sales manager of an eastern manufacturing concern of long standing, came to Indianapolis and indulged in a speech the substance of which may be summed up as follows—The people who are putting in expensive radio sets to receive wireless music do not want to hear this dah-de-dah stuff—they are not going to take the time to learn the code—and, if interfered with, are going to raise considerable protest.—Thus, unless the amateur lays off between the hours of 6 and 11 P.M., he will simply be legislated out of existence.

For the past ten years his firm, and all the rest of 'em, depended upon me and the hundred thousand other dah-de-dah amateurs to keep them going. The amateur made possible the development of the apparatus we have today, and some of our best designers come from that same gang. But, now that the manufacturers have a new and extremely gullible field for their operations, we are going to be "legislated out of existence very promptly".

Laying aside the fact that, this attitude makes us peevish, let's see if there isn't a solution to the problem:—

The amateur has a definite place in this scheme of affairs. Wouldn't the Signal Corps be in aheluvafix with this Radiola gang for ops? And everybody enjoys the concerts, for some really worth-while music is being sent out. I don't mean this Victrola stuff that we have to stand for most of the time, though.

Thus why can't the manufacturers build a set for the amateur that works from 100 to 300 meters, and another for the Radiola outfit that responds to the band of wave lengths between 600 and 1,000. The unused section between 600 and 1,000 meters would be very satisfactory for radio music, and any amateur can get it after about three minutes work connecting a honeycomb coil. There is plenty of room for both of us, so let's stop this impending fight right now before it is too late. Otherwise it will means the scrapping of a lot of apparatus.

Whenever an amateur game of any kind is commericalized, it is promptly relegated to the scrap heap. So let's get busy and start something.

Sincerely,
Bayard Shumate, 9KR.

Welcome Brother

326-18th St.,
Toledo, O.

Dear QST:—

I am a new reader or your magazine and get a devluvolot of amusement out of it. But I want to tell you how I feel about all this.

I first became interested in radio through radio music (?) and having been a professional musician for the past eighteen years I naturally became interested in the possibility of home folks enjoying good music at home. I purchased a number of radio magazines among which was QST and it goes without saying that I soon felt my lack of enlightenment on radio most keenly. Asking for some information at a local supply concern I was advised to cultivate the acquaintance of someone who knew and little by little I would pick it up! That is like that famous bit of advice: "Send your boy to college and the boys will educate him."

I bought books on the subject only to find that they were so mathematical that I could get little out of it, it having been some 20 years since I looked a quadratic in the face.

I had just begun to feel this was a cold, cold world and that you just had to know before you could understand what anyone was trying to tell you about radio and O joy, QST comes out with "Getting Started Listening" in the March issue. I read and understood every word of it. No, I know that it is not explanatory of the principles of wireless which I so much crave but it is *something*. Just give me time and I will get the principles. Just give me time and I will come to the point in this letter.

I started this thing interested in fone only, and was willing to listen to most anything so long as it came over the ether. But drivel is drivel and doubly so when it comes over the radiophone. Occasionally

some worth-while stuff comes over the wireless fone but 90% of it is worse than garbage from a musical festival. Being a musician, I detest jazz. When a person learns to appreciate—that is, listen to—music he no longer cares for jazz. Some folks prefer bologna to sirloin; folks with the same comparative musical tastes demand jazz, and *get it*, worse yet, *by way of radio*.

So I have lost interest in fones and want to learn all I can about telegraph receiving and transmission. Dear QST, couldn't you find space for a little information each month for us who want to know about radio and—there are thousands of us. Slip the mathematics to us gradually and we will assimilate in small doses.

Very truly yours,
Ben F. Boyer.

Back to Earth

Norfolk, Va.

Editor, QST—

In reading over the January number of your valued paper, "QST", I note the following under "Strays":—

"Recent news service pictures show a cow-person on horse-back with a portable radio set, overhead antenna, etc., all prepared to round up stray cattle. The thing that bothers us is what do they do for a ground—have a binding post in the horse's side?"

I imagine you have had many restless nights, pondering over this deep problem, and thinking that perhaps you might be relieved by any solution, good, bad or indifferent, may I suggest that the ground lead be attached to the horse's (g)irth? It is only a simple problem in mathematics to subtract the "*g*".

Being an ex-Signal Corps man, I once had the pleasure (?) of "spilling over" one of the brutes referred to, and while I found the transmitter was very efficient a highly-damped ground offered poor reception. I am for hooking the antenna to the bridle and the ground lead as suggested above.

With kind regards, I am,
Yours truly,
R. I.

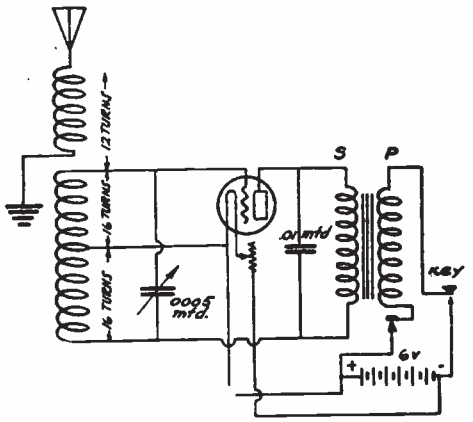
A Spark Coil C.W. Set

2065 Belmont Ave.,
Bronx, N. Y.

Editor, QST—

QST readers may be interested in my spark coil C.W. set. A diagram is here given.

I have found by experiment that inductive coupling will give better results than conductive coupling on a set of this type. By putting a 2 volt flash light bulb in the antenna circuit, the set can easily be adjusted to resonance. The apparatus needed is a Quaker Oats tube or any other 4 inch tube, a roll of insulated annunciator wire, a .0005 mfd. variable condenser (a small Murdock is just right), a U.V.201 amplifier tube or any other hard tube operating off 6 volts, a rheostat, a ½ or 1 inch spark coil, a .01 mfd. fixed mica condenser to lower secondary voltage and pass high frequency.



Twelve turns are wound at the top of the tube for the antenna inductance. A space of 2 inches is left and the grid-plate coil is wound. This consists of 32 turns with a tap at the center. The only tuning element is the variable condenser. If the set does not oscillate then reverse the connections to the primary of the spark coil. A toy step-down transformer can be used to light the filament.

With this set I have no trouble working 55 miles daylight. This set can be used to radio-phone 1 mile if a microfone is placed in primary of spark coil and the vibrator tightened.

Samuel Kopelson,
2BCF.

Rotten Msg.-Delivery

2111 So. Franklin St.,
Denver, Colo.

Editor, QST—

Being a very enthusiastic amateur and working for the success of amateur radio, I am taking the privilege of expressing my idea of the present day conditions of amateur relay stations.

First of all I wish to say that I, myself, have sent many relay messages to different points, mostly east of Denver, to localities that have many large relay stations, but I am sorry to say that *not a one* out of at least twenty messages has ever reached its final destination. Why? Why should a station accept a message if he does not intend to or cannot, deliver it?

I will name the destinations of a few recent messages sent from here (Denver) so you may see just why I have a good base for my argument. First we have Chicago, Ill. When you ask a relay man if he can

QSR Chicago, why he will always say "Sure, *that* will be easy", yet I have never succeeded in getting a message delivered there, even after hearing the message given to a Chicago relay station. Then comes La Crosse, Wis. This is a large radio center, yet I have never succeeded in getting a message there. Then we have Aurora, Ill., about thirty or forty miles from Chicago; Rockford, Ill. approximately eighty-two miles from Chicago, and again we have no success in getting messages to any of these points. Again, I ask, what is the trouble? It isn't the radio relay league proper, it's the stations representing them improperly.

Mr. Editor, if you look at this subject as serious as I do, I am sure you will give it a little thought. I would appreciate it very much if you would consider publishing this problem in an early edition of the QST as I would like to hear some one else's opinion on this difficulty.

R. C. Schryver, 9AWL.

CALLS HEARD

(Concluded from Page 60)

9AYS, 9AWM, 9QE, 9AOG, 9AFB, 9AZH, 9BJB, 9BOG, 9BVY, 9BRG, 9BRS, 9BSG, 9BLO, 9BAF, 9BFX, 9DHB, 9DDW, 9DSW, 9DJI, 9DYN, 9DVA, 9DZQ, 9DTH, 9ZG, 9ARK, 9ASF, 9DTS, 9DBG, Canadian 4CB, 3BP.

Spark—Canadian 3JI., 3FO, 3EI, 3GN, 3BP. U.S.—4BQ, 3XM, 5SM, 5DD, 5XB, 5XU, 5FO, 5HK, 5XA, 8YU, 8JJ, 8CP, 8YN, 8BEP, 8BEF, 8ZP, 9APA, 9HI, 9HT, 9HR, 9KI, 9IY, 9OF, 9JQ, 9MS, 9MC, 9LW, 9OA, 9WT, 9WI, 9TI, 9ZX, 9XM, 9ZO, 9RC, 9AAP, 9AIF, 9AIG, 9AZA, 9AVZ, 9AYW, 9ANF, 9AMQ, 9AEG, 9AFK, 9AVP, 9DEH, 9DMC, 9DMK, 9DUG, 9DSD, 9DSM, 9DSO, 9DIW, 9BKW, 9DFA, 9DZY, 9DZI, 9DZE, 9YAJ, 9YAE, 9YAK, 9YAC.

Reduce those QRN Atmospherics NOW with Burgess "B" Batteries

NOISELESS! That describes Burgess "B" Batteries. **Absolutely** noiseless! Weak and distant audio frequency signals can be received with multi-stage amplifiers and Burgess "B" Batteries because Burgess "B" Batteries **do not drown out signals.**

BURGESS "B" Batteries assure clear receiving. They will increase the efficiency of any receiving set. They are cheapest in hours of service. And they are sold by all reliable dealers in radio equipment. Look for the black and white stripes. If you can't get Burgess "B" from your dealer, just drop a line to us, care Dept. D.

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As indicated in the illustration. Burgess Batteries are supplied with both flexible wire terminals and binding post terminals. The binding post terminals are complete with hexagon nuts and brass nuts, making it possible to attach wires directly to the cells without the use of solder or bolts.

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radio necessities

No. 56 Phones

MURDOCK REAL RADIO RECEIVERS have delivered complete satisfaction, on a "money-back" basis for 14 years. Those years of experience have so simplified and perfected our production that there are today no receivers quite so good at so low a price.

The latest Murdock achievement, the No. 56 Receiver, is a highly sensitive instrument which retains all the rugged strength of previous types. Important features are, the improved comfortable headband, the "Murdock-Moulded" ear pieces shaped to exclude outside noises and the moulding of all parts into one durable unit.

All models of Murdock receivers are sold with free trial offer and money-back guarantee. Use them in direct comparison to any other phones for 14 days.

Make any test you wish. Then at the end of the two weeks, if the Murdock Phones are not entirely satisfactory, return them and your money will be refunded!

We strongly urge you to go to your dealer, and convince yourself of the quality of Murdock receivers, by actual examination, before you buy. Prices $5.00 to $6.00.

Murdock Phones are the standard bearer for a complete line of "Made-by-Murdock" radio parts and instruments. This includes the famous Murdock condensers, sockets and detectors, and the new Murdock Rheostat.

Buy Murdock apparatus from your dealer.

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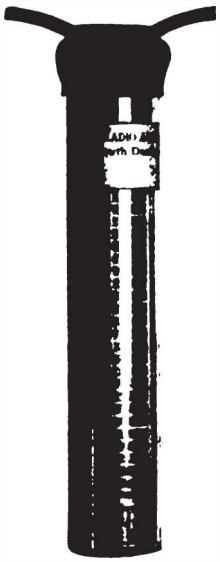

Price per cell $0.50
Add PP on ½ lb. per cell.

New Storage "B" Battery

A real storage "B" Battery for your Radio Set at a price every Amateur and Experimenter can afford to pay. Can be used on receiving apparatus as source of plate potential on both Detector and Amplifier tubes. Ideal as source of energy on small Radio Telephones or C.W. Transmitters.

Simple and easy to re-charge from your lamp socket and will last for years with ordinary use.

SPECIFICATIONS:

Cut shows cell one half natural size.
Voltage per cell 2 volts.
Pasted Plates—ready formed for initial charge.
High Ampere Hour capacity—will operate one detector tube 1000 hours with one charge.
Shipped dry with simple directions for preparing the electrolyte.

Mahogany Tray for holding ten cells $1.00 extra

Dealers:—Get our discounts on this new Battery—your customers will want them!

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About April 1st we will move to 415 South Dearborn Street where we will open a High-Grade Ground Floor Salesroom. With greatly increased space we will carry every make of good Radio Apparatus and will endeavor to have

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CHICAGO RADIO APPARATUS CO., Inc.

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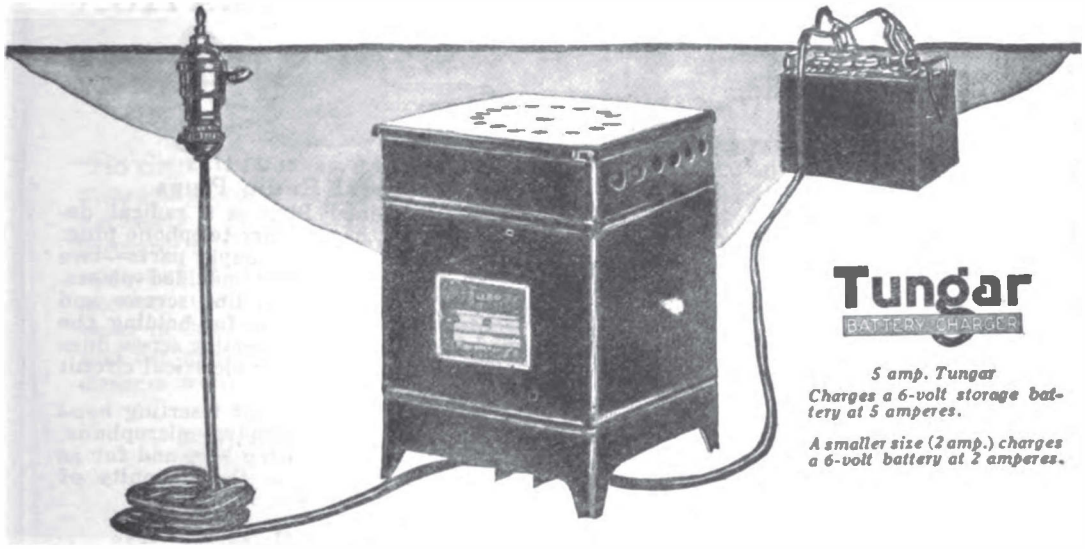
"There's No Place Like Home" To Charge Your Radio Battery



5 amp. Tungar
Charges a 6-volt storage battery at 5 amperes.

A smaller size (2 amp.) charges a 6-volt battery at 2 amperes.

If you use tubes in your radio receiver you use a storage battery.

If you use a storage battery it must be charged.

Charge Your Storage Battery at Home with a Tungar Battery Charger

Without taking the battery out of the house—in fact, without moving it at all—you can charge it easily and quickly at a minimum of expense, trouble and lost time.

Isn't this much better than taking the battery to a charging station, leaving it a day or two, paying from 75¢ to a couple of dollars and then carrying it back again?

The Tungar is a small, compact rectifier which connects to any a. c. lighting circuit wherever there is a socket or receptacle and requires no attention while operating. Its first cost is not high and it can be operated by anyone without the slightest danger of injuring the battery. Send for new radio booklet and prices.

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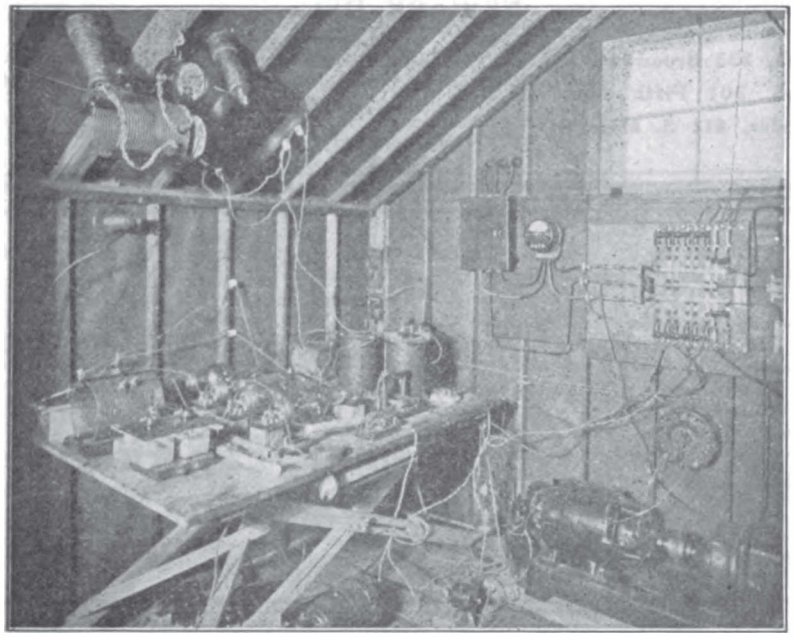
Dubilier Condensers Helped to Make Radio History

"No circuit is stronger than its weakest link." When 1BCG sent its now historical message across the Atlantic, a perfect co-relation of parts and apparatus was necessary. Everything from the commutator on the generator to the lead-in insulator in the roof had to function "just so". During the preliminary tests, the operators of 1BCG were constantly confronted with condenser trouble. One after another, the condensers would break down. It is always best to use the right thing in the right place, so two Dubilier Mica Condensers were placed in the circuit and the weakest link was immediately repaired. From that moment on, the condensers were forgotten because they could be trusted—they were reliable.



Are your condensers the weakest link in your circuit? There is a Dubilier Condenser to meet your every need. Dubilier Condensers are different because their construction is patented and they are manufactured by a controlled process. Send for literature describing them today.

The next time you visit your radio dealer, ask to see Pacent Radio Essentials. We sell apparatus plus service.

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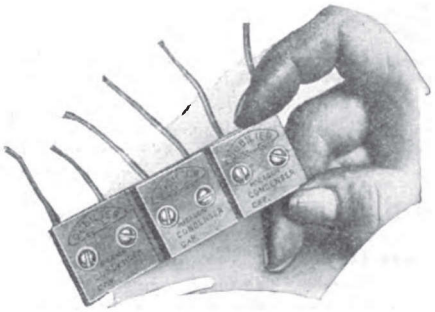
DUBILIER MICADONS For

Two remarkable mica condensers

Use Micadons Type 601 Like Building Blocks



Dubilier Micadon Type 601 is here shown one-third full size. It has the same perfect mica insulation, the same *permanent capacity* that has always characterized the famous, larger standard Dubilier mica condenser.

Dubilier Micadon Type 601 is only a little larger than a postage stamp. Micadons Type 601 can be used to build up capacity as if they were building blocks. Simply add one to the other with a few machine-screws, and you pile up any desired capacity. Connect them in series or multiple.

Buy Micadons Type 601 by the dozen, and keep them on hand.

The capacity ranges from .005 to .0001 mfd. Price 35 cents each. By the dozen $4.00.

Make Your Own Grid-Leak with a Lead Pencil

Sandpaper the surface of Dubilier Micadon Type 601 between the terminals. Next rub point of an ordinary black lead pencil over the roughened surface as here shown. To adjust the grid-leak thus made rub away as much of the graphite that has been deposited as may be necessary.

Every tube should have an *adjusted* grid-leak, and this is the way to make one simply and cheaply.

Why Tubes Howl

Faulty condenser construction terfere with the reception of broad The alternate layers of insulating contract with the oscillations of cur often as a million times a second. The tube responds with howling.

Micadons Have

Dubilier patented Micadons have experimenting to overcome this dif made like the famous, larger Dubi standard equipment by ninety-five radio companies of the world.

This means that in the Dubilier conducting layers have been pressed mass. The air has all been squeezed and contraction of the layers. The Tube noises, due to poor condenser

Dubilier Micadons last indefinitely. densers do.

Amazingly

Dubilier Micadons are amazingly est receiving condensers ever pro mand for inexpensive *mica* con with the cheapest or the most costly

Two types of Dubilier Micadons They are pictured and described on

Specify Dubilier condensers and Micadon is a trademark, adopted for these remarkable little mica con

Examine your set and see if it has are not receiving broadcasted news

Order Dubilier from your dealer or lier Condenser Co., 217 Center Street,

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Canadian General Electric Co., Toronto

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Dubilier Condenser Co., Ltd., London

DUBILIER CONDENSER

Perfect Broadcasting Reception

for 35 cents to $1.00 each

and Whistle

causes many of the noises that in-
casted music and entertainment.
and conducting material dilate and
rent in the antenna—sometimes as
The capacity varies correspondingly.
whistling and sputtering.

Permanent Capacity

been developed after long and costly
ficulty. They are *mica* condensers
lier mica condensers adopted as
per cent of the governments and

Micadons both the insulating and
together so as to constitute a single
out. Hence there can be no dilation
capacity is *absolutely permanent*.
construction, are impossible.
They will not burn out, as paper con-

Low in Price

low in price. Also they are the small-
duced. They meet the popular de-
densers which can be used either
receiving set.
are made—Type 600 and Type 601.
these pages.
follow the government's example.
your protection and applied only to
densers.
Dubilier Micadons. If it has not you
and music perfectly.
from the manufacturers, the Dubi-
New York.

LICENSEES FOR GERMANY
AND SOUTH AMERICA
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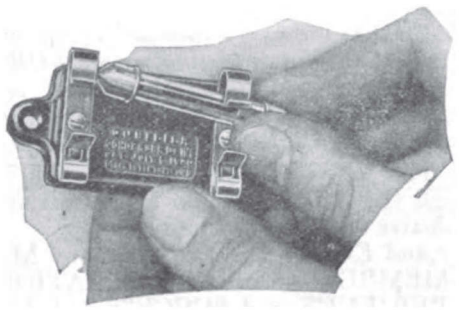
For the Price of a Single Grid-Leak Holder



Here we show Dubilier Micadon Type 600 one-half full size. It is a perfect Dubilier *mica* condenser, especially made to improve broadcasting reception. It costs no more than an ordinary grid-leak holder.

Dubilier Micadon Type 600 lasts indefinitely. Its capacity is *permanent*. There can be no variations and no leakage.

Dubilier Micadon Type 600 is provided with Fahnestock connectors and grid-leak clamps. The grid-leak can be easily removed and replaced with the fingers.

Everything is soldered. The container is of molded composition. Provision is made for holding screws.

Use a Crystal Detector Instead of the Grid-Leak

It is easy to substitute a crystal detector for the grid-leak if desired. Thus it becomes possible to use Dubilier Micadon Type 600 with crystal detector sets and obtain all the benefits that follow when a perfectly constructed *mica* condenser is used.

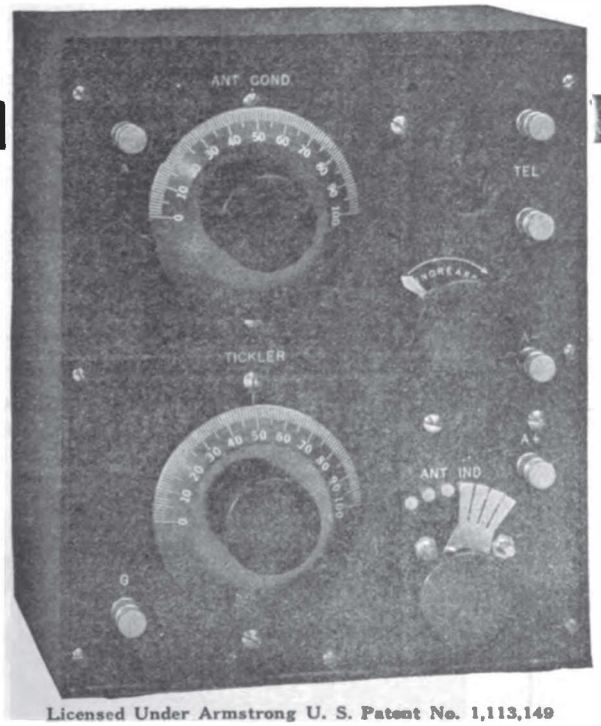
Price of Dubilier Micadon Type 600 in capacities ranging from .001 to .005 mfd. 75 cents each.

Price of Dubilier Micadon Type 600 in capacities ranging from .005 to .01 mfd. $1.00 each.

COMPANY, 217 Center St., New York

-you can't buy a better receiving set anywhere, at any price

$40.00



Licensed Under Armstrong U. S. Patent No. 1,113,149

- SPECIFICATIONS

PANEL—Condensite Handsomely finished.
CABINET—Solid Mahogany.
CONDENSER—Balanced type, 2 Rotary, 3 Stationary plates. Built as a Vernier
DIALS — Indestructible metal. White figures on black ground.
ANTENNA INDUCTANCE— Wound on Formica Tube
PLATE INDUCTANCE — Wound on molded ball.
BINDING POSTS—Black Rubber Covered.
SWITCH—Fan Blade.
RHEOSTAT—C. E. Type H 400.
CIRCUIT—Single circuit regenerative. Licensed under Armstrong U. S. Patent No. 1113149.
"B" BATTERY — Contained in compartment inside cabinet or external as desired.

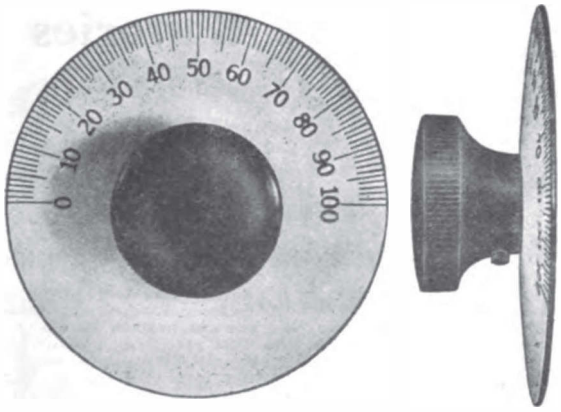
QUALITY—and at a reasonable price—is the appeal that the Clapp-Eastham Type H. R. Regenerative Receiver makes to men who know wireless equipment. The specifications and the Clapp-Eastham reputation tell them the story. To the novice, the appearance of the set, the clear, sharp tones, its wide range, and the perfect regeneration on all wave-lengths between 180 and 825 meters, is convincing evidence. The quality in the solid mahogany Cabinet is reflected all throughout the set. Ask your dealer to show it to you. If he's temporarily out—and he may be, because the demand has been phenomenal—write us. Send 6c. in stamps for the C-E Radio Catalog. If you're at all interested in wireless you ought to have it.

CLAPP-EASTHAM COMPANY

Radio Engineers and Manufacturers Since 1905

114 Main Street, Cambridge, Mass.

EXCLUSIVE FEATURE



J-RAY WHITE ENAMELED DIAL

VITREOUS WHITE PORCELAIN-ENAMEL ON COPPER

We herewith present our beautiful new white enameled metal dial, with heavy black engraved scale, fused into the enamel under heat treatment.

The smooth white watch-face enamel finish of this dial is unexcelled by any now offered. Besides its beautiful appearance against the conventional black Receiving Panels, our dial, due to its metallic construction, acts as a shield against body capacities. This feature alone is a most important reason why you should use the J-Ray Dial as those who are familiar with the annoying body-capacity effects will testify. Dial will not crack, warp, rust, change color, tarnish or grow dim with age. Lasts and maintains its new appearance forever.

Center of dial is raised or domed as per the conventional type.

Knurled Black Compostion Knob completes the dial's beauty and finish.

Diameter of Dial 3 in. Diameter of Knob 1 7/16 in. Center Bushing for 3/16 or 1/4 in. shaftings.

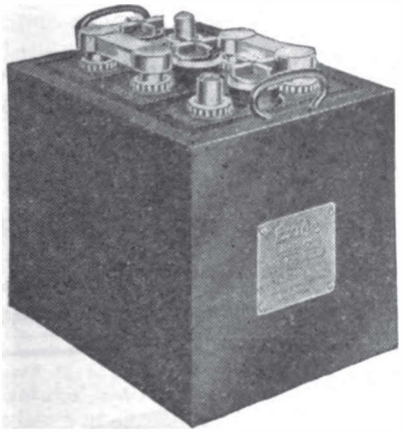
Price, complete with knob $1.00. Without knob $0.80.

Send for Bulletin 3 describing the above Dial and our Receiving Apparatus.

Dealers—We can make prompt shipments on Dials in any quantity. Write for attractive proposition

THE NEW EXIDE RADIO BATTERY

IS NOW READY!



When the evening meal in countless homes is finished, the family settles itself comfortably in the living room for an evening's entertainment by wireless telephony.

The instrument is set up, a dial is turned, and from a distant city the voice of an operatic star fills the room. Or, at another turn of the dial, bed-time stories for the children are heard. Again, the strains of a church organ, the voices of the choir as well as the sermon, are heard from some church many miles away.

But to insure maximum enjoyment from any radio outfit, an absolutely dependable storage battery is essential—a battery designed to provide steady current—a battery whose voltage will not drop after a few minutes' use and necessitate frequent adjustments of the apparatus.

To meet these demands the Exide Radio Battery has been built.

From its practically unbreakable jars to its bolt connector terminals, every detail of this battery reflects the intimate knowledge of storage bateries which its builders possess.

The splendid results obtained with the Exide Radio Battery can be definitely attributed to the long experience behind it. For in the thirty-four years that Exide Batteries have been built for every purpose, much has been learned that was applied in designing a battery specifically for radio work.

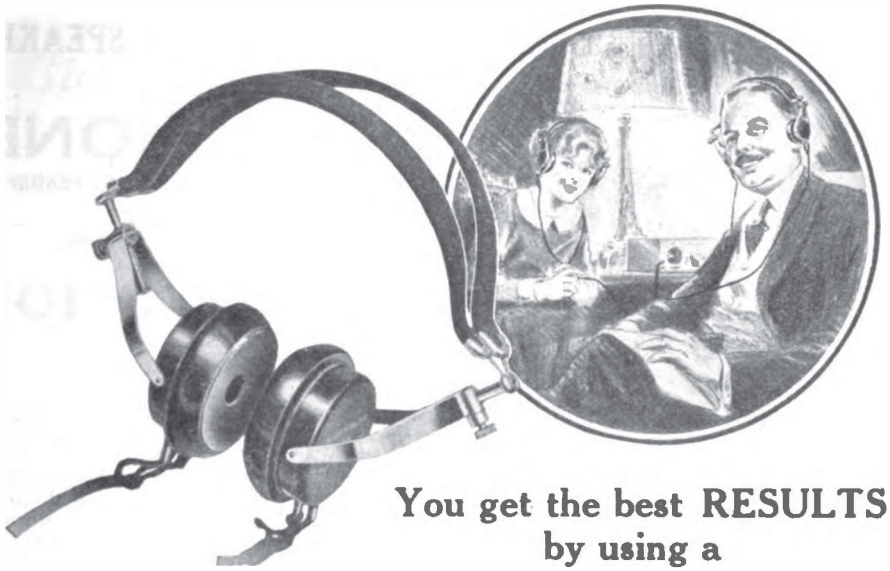
Plates that insure long life without reducing their activity; wood separators of the type that have proved so successful in the famous Exide automobile batteries; jars that will withstand an unusual amount of hard usage; and terminals that insure perfect contact through the simple tightening of a nut—these are briefly, some of the features of the Exide Radio Battery.

The following table shows the four sizes in which this battery is made, with ampere-hour capacities ranging from 20 to 120, according to the number of plates. The over-all height of the battery is approximately 9 5/8 inches; the width, 7 1/8; while the length, varying with the number of plates used, is given in the following table:

Type	Cat. No.	Length	Weight	Capacity	Price F.O.B. St. Louis, Mo.
3-LXL-3	13735	4 3/16	15 1/2 lbs.	20 amp. hrs.	$13.75
3-LXL-5	13736	5 11/16	24 1/2 lbs.	40 amp. hrs.	17.85
3-LXL-9	13737	9 3/16	42 1/2 lbs.	80 amp. hrs.	23.46
3-LXL-13	13750	12 3/16	59 1/2 lbs.	120 amp. hrs.	30.60

Distributed By

J-RAY MFG. CO., 1618 Chestnut St., St. Louis, Mo.



You get the best RESULTS
by using a

Stromberg-Carlson
Radio Headset

These fine instruments, made by a Company engaged in the manufacture of telephone apparatus for 28 years, bring in the long distance tones with accuracy and distinctness.

They give the fullest measure of enjoyment because of the quality of the tones. Convenient and comfortable. The construction of the Stromberg-Carlson Head Set allows simultaneous use by two observers.

Head Set Receivers

Receivers are equipped with a one-piece bipolar permanent magnet, of high grade magnet steel; provided with phenol fiber spool heads, slotted soft iron pole pieces, corrosion proof diaphragm, enameled copper wire coils. All parts are encased in a receiver shell of cast non-magnetic insulating material, that is unaffected by either moisture or temperature changes. Each coil is wound to 500 ohms. The coils are connected in series. This gives a combined resistance of 2000 ohms.

The Head Band

A head band is furnished of the spring wire type, covered with heavy brown webbing, correctly shaped, light in weight and comfortable to the operator. Knurled thumb screws are provided on both ends to permit locking the adjustment after it is once fitted to the head. There is also provision for separating the receivers which permits two observers listening in on a circuit simultaneously.

The Cords

Each No. 2-A Radio Head Set is equipped with a 5-ft. brown silk moisture proofed, receiver cord which is forked in two branches, one branch for each receiver.

Price $7.50 each f.o.b. Rochester, including two head set receivers, head band and forked 5-foot cord.

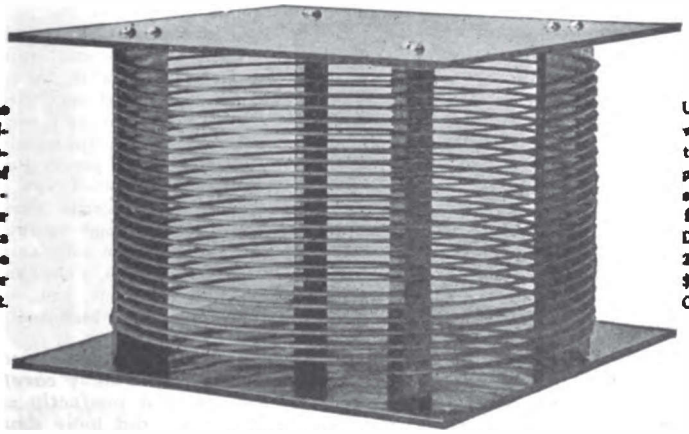
Send for our Free Bulletin No. 1030-Q, describing the No. 2-A Radio Head Set and other superior apparatus of our manufacture.

STROMBERG-CARLSON TELEPHONE MFG. CO.
ROCHESTER, N. Y.

Branches: Chicago, Kansas City, Toronto. Address nearest office.

We can't make ALL of the radio apparatus — so we just make the BEST of it

The use of the WIMCO INDUCTANCE assures you of maximum results from your CW outfit. Its low resistance means greater antenna output.



Used everywhere where the best apparatus is desired. Order from your Dealer. Price 25 turn size $10.00, Grid Coil $2.00 extra.

WIMCO CW 100 INDUCTANCE

The following data on the resistance of the WIMCO C.W. INDUCTANCE was furnished by the Washington Radio Laboratories, Washington, D. C. It was measured for ten turns, this being the average number of turns in use on most amateur aerials at 200 meters wave length;

Wave length	H. F. Resistance
150	.71 ohms
200	.85 ohms
250	.95 ohms

(effective inductance 80.5 microhenries at 200 meters)

Full description of this inductance, and circuit diagram is contained in the WIMCO catalog, mailed anywhere on receipt of 15 cents in stamps.

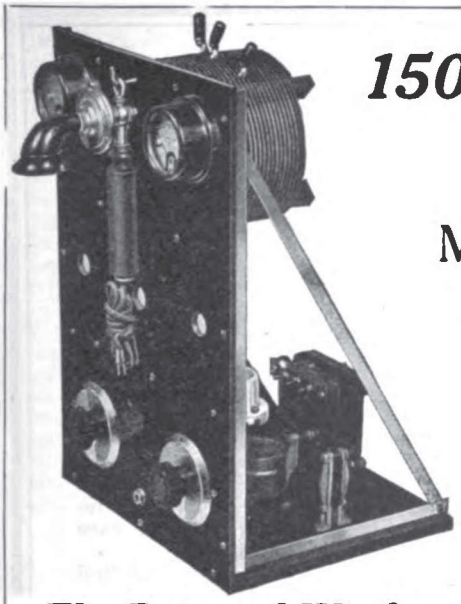
ANNOUNCING THE "STANDARD" AUDIO FREQUENCY AMPLIFYING TRANSFORMER. We are distributors for the new Standard amplifying transformer designed for Cunningham and Radiotron tubes, 9 to 1 ratio, equal to any transformer on the market, and are in position to make immediate deliveries. Price $5.00 fully mounted and thoroughly guaranteed. DEALERS—JOBBERS WRITE.

REMLER APPARATUS—CUNNINGHAM TUBES—FROST REGENERATIVE RECEIVING SETS—CLAPP-EASTHAM AND FEDERAL PRODUCTS—HIPCO PLATE BATTERIES—WORKRITE VARIOMETERS AND COUPLERS—KLOSNER VERNIER RHEOSTATS–FADA APPARATUS–BRANDES AND BALDWIN HEADSETS

8ZV WIRELESS MANUFACTURING CO. 8ZV

CANTON, OHIO

JOBBERS—MANUFACTURERS



1500 Miles With CW!
1100 Miles Voice!

Music Heard 40 feet from Phones by Stations in 300 to 400 Miles Radius

These are actual results obtained by our testing station 9ZB, using this set, You can get just as good work out of it.

The Benwood Wireless Telephone

For CW, ICW, Modulated Buzzer and Voice Transmission

This high class set is just the thing for your broadcasting and DX work. An ideal set for the local radio club or the more progressive amateur. Think of the range this set will give you! If centrally located, you will be heard in almost every state in the Union.

It is manufactured exclusively by and for the Benwood Co. and combines the best in material, workmanship and design.

Radiates 1 1-2 to 3 Amps.

We guarantee that this outfit will radiate 1½ amperes on the average amateur antennae when assembled in accordance with our instructions. It will radiate 2 to 3 amperes when used with an antenna whose fundamental wave length is 225 to 275 meters. That is why you can get such wonderful results.

Specifications

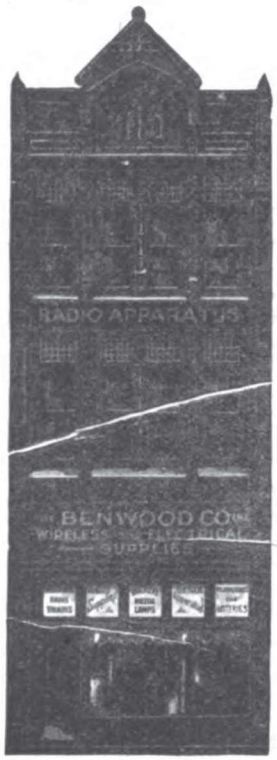
The set comes to you completely assembled with all parts mounted on panel, as shown, but not wired. Full instructions and wiring diagrams are furnished. You can wire it and start sending in less than an hour after you receive it.

The outfit is complete with motor generator, minus tubes, and consists of the following:—

Panel 12x18x¼, angle brass supports, hardwood base, 3 tube sockets, 1 power rheostat, 1 80 watt filament trans., 1 modulation trans., 1 CW inductance, 1 hand transmitter, 1 0-3 Radiation meter, 1 0-500 milliammeter, 1 21 plate condenser, 1 43 plate condenser, 1 tapped condenser, 1 L-300 choke coil, 1 2000 volt filter condenser, 1 10,000 ohm grid leak, plug and jack connection for microphone buzzer and CW, 1 600 volt 220 watt motor generator. Boxed for shipment, $200.00 f.o.b. St. Louis, Mo.

Send for Catalog

Send 10c in stamps for the new Benwood Radio Catalog comprising the latest Price Directory.



The above photo shows our new 3 story building in the heart of the St. Louis business district. Our mail order department is complete in itself and we give you immediate service on all mail orders.

THE BENWOOD CO., INC., 1114 OLIVE STREET, ST. LOUIS, MISSOURI

"WORLD WIDE MAIL ORDER SERVICE"

Above All

Quality is the wave length to which the wise consumer tunes today, in his purchase of radio equipment. He buys quality apparatus because he knows it produces quality results—constant, unvarying efficiency under ordinary conditions, anywhere.

It has been the privilege of the Marshall-Gerken Company not only to manufacture quality wireless apparatus, but to show users the value of quality in radio instruments. They have expressed their ideal of quality in the precision required of their engineers in the making of the smallest as well as the largest part; quality construction is the key to the facility of operation of Marshall-Gerken apparatus; the factor of quality again predominates in the simplicity of the instructions by which the amateur as well as the professional obtains the highest utility from Marshall-Gerken equipment.

In the establishment of their nation-wide reputation for making and selling only thoroughbred apparatus, the Marshall-Gerken Company have set a high standard by which to test superior endurance and unusually satisfactory service of radio equipment.

Progressive Distributors and Dealers: Write for our illustrated Booklet, you will find it exceedingly interesting.

The Marshall-Gerken Co.
Quality RADIO Products
MANUFACTURERS—DISTRIBUTORS
Toledo, Ohio, U.S.A.

T & H Radio Company

Largest Radio Stock In Mid-West **Immediate Deliveries**

All items listed are in stock in large quantities.

CW APPARATUS		RECEIVING APPARATUS	
UV202 5 watt Radiotron	$8.00	UV200 Radiotron, detector	$5.00
UV 203 50 watt Radiotron	30.00	UV201 Radiotron, amplifier	6.50
UV216 Kenotron Tubes	7.50	Electron Relay, detector	5.00
UV217 Kenotron Tubes	26.50	A. P. Amplifier tube	6.50
UR542 Porcelain Socket	1.00	Grebe CR9 witb amplifier	130.00
UR541 Porcelain Socket	2.50	Grebe CR8 150-1000 meters	80.00
PR535 Filament Rheostat	3.00	Grebe CR5 150-3000 meters	80.00
PR537 Filament Rheostat	10.00	Magnavox, 14" horn	45.00
UP1719 Grid Leak	1.10	Burgess #2156 "B" Battery	3.00
UP1718 Grid Leak	1.65	Burgess Tapped "B" Battery	2.75
Acme CW Inductance	8.00	Baldwin Receivers type C	12.00
Acme 200 Watt CW transformer	20.00	Baldwin Receivers type E	13.00
Acme 500 Watt Power Trans.	25.00	Baldwin Receivers type F	14.00
Acme Choke Coils, single	6.00	Brandes "Superior" receivers	8.00
Acme Choke Coils, double	8.00	Acme Amplifying transformers	5.00
Acme Modulation Transformer	5.00	Honey Comb Coils, all sizes	

Inquire for monthly stock sheet, shows our complete stock each month. CW and radiophone catalog sent any address when four cents in stamps accompanies inquiry.

5th District Distributors for Ideal Apparatus Co.

T & H Radio Company

ANTHONY, **9ZAC** **KANSAS**

HI-GEE
PLUGS and JACKS

Now ready for delivery—

Jacks .....80c each
Plugs .....70c each **$1.35**

Combination set of one plug and one jack. This is a special limited offer for short time only. We positively guarantee to ship these one hour from receipt of your order. The most efficient and serviceable plug on the market. Both units are attractive in appearance and are sturdily constructed.

HI-GEE AUDIO FREQUENCY AMPLIFYING TRANSFORMERS

Fully assembled and mounted. Made of the best materials. Correct ratio of primary and secondary turns. Silicon steel core. The best Audio Frequency transformer on the market, selling at a popular price

Special 30 day offer. **$3.30**

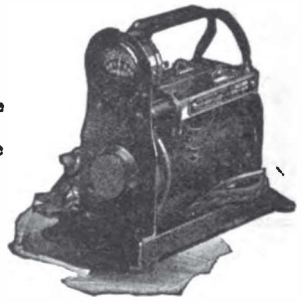
We offer for immediate delivery the following: Parkin Dial Rheostats, Vacuum Tubes, Klosner Vernier Rheostats, Head Sets, HI-GEE Variable Condensers, Grid Leaks, HI-GEE Variometers & Couplers, Grid Condensers.

12 page loose leaf catalogue now ready
Write for your copy NOW
HI-GEE Pays the Postage

HI-GEE RADIO MANUFACTURING COMPANY
Marion, Illinois

INDIVIDUAL BATTERY CHARGING AT LAST
PRACTICAL AND EFFICIENT

For Charging Radiophone and Automobile Batteries from Lamp Socket



Initial charging Rate 6 volt Battery, 10 amperes

THE Sterling
Portable Rectifier

THE Sterling charges a nearly exhausted battery over-night for a few cents. Improved vibrating reed type, simple, effective and durable. One thumb-screw does all the adjusting. Automatically tapering charge safeguards against overcharging.

Price Complete - - - $16.00
West of Rocky Mts. - - 17.00

Write for Bulletin giving full information.

THE STERLING MFG. CO.
2834 Prospect Ave., Cleveland, Ohio.
Over two million Sterling Instruments in use today.

Meeting the Demand for Radio Sets

IT is natural that broadcasting, *carrying news, music, lectures, concerts and even grand opera* into the homes of the American people, should have created a concerted and impatient demand for radio sets and apparatus—especially the popular radio receiving sets.

If the demand for radio sets and apparatus had grown normally, the well-equipped and highly-organized factories supplying the Radio Corporation of America would now be producing an excess over the market requirements.

Under the present expansion program of the Radio Corporation of America it is quite possible that there will be a surplus production within six months.

A Greatly Expanded Program

The factories manufacturing for the Radio Corporation of America are operating on a greatly expanded production program. ***They are straining every nerve and muscle to meet the demand.***

It is not merely a question of men and raw materials. There are limiting factors in some of the delicate equipment parts, and even when all production is running evenly, new jigs, dies and tools must be especially designed, manufactured and installed before the production forces can be increased.

As a result of the efforts that are being made, it is expected that within the next few weeks considerable quantities of material will be shipped on orders already placed. This applies to all classes of radio sets and apparatus, and especially Radiotrons, Vacuum Tubes, etc., which are employed for reception.

The assurance can be given that every scientific, manufacturing, organizing and financial resource of the Radio Corporation of America is being used to meet the demand for radio devices.

We are working to the utmost, not merely to supply the demand, but to put into every set and every piece of equipment complete quality, and as much permanent satisfaction as a rapidly developing art will permit.

We are asking the aid of our distributors and dealers in explaining the capabilities and limitations of radio sets and apparatus, and we welcome their co-operation and indulgence, as well as that of the public itself, until the present expansion program is carried out.

A new R. C. A. Catalog, covering all the radio devices being manufactured for the Radio Corporation of America, will be ready for distribution within thirty or forty days. This catalog will contain timely and helpful information of great value to the wholesale distributor, the retail dealer, and the user of radio apparatus.

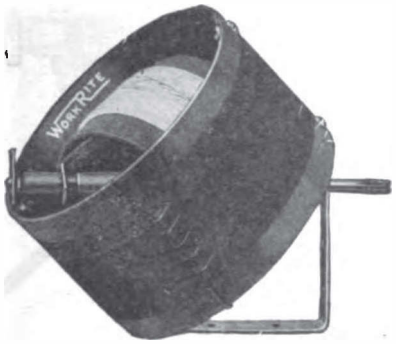
Radio Corporation of America

WORLD WIDE WIRELESS

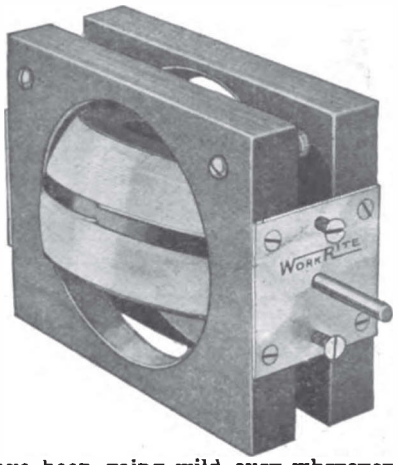
233 BROADWAY ~ NEW YORK CITY

Sales Department Suite 1803

"WORKRITE PRODUCTS WORKRITE"



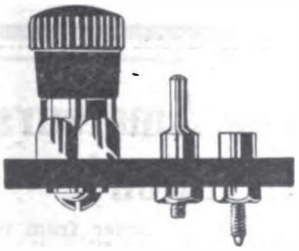
Finest Material Finest Workmanship Finest Finish



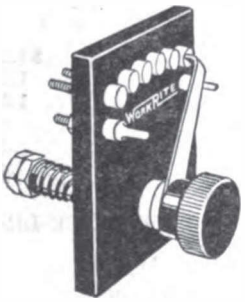
Here is the "Tuner Team" that radio fans have been going wild over wherever shown. Most dealers have their entire allotment sold before shipment is received. "They certainly do WorkRite" is the verdict of all users.

One WorkRite Variocoupler and two WorkRite Variometers are guaranteed to give you a tuner that cannot be excelled by anything on the market.

WORKRITE VARIOCOUPLER OR VARIOMETER IN ATTRACTIVE BOXES $6.00 EACH



WorkRite Binding Posts	$0.12
WorkRite Switch Points	.04
WorkRite Switch Stops	.06



Just what you want. Remove the parts and use the block as a template for drilling your panel. Put up in neat individual boxes. Complete WorkRite Switch Sets, $1.00. Switch arm only, with bushing, 50c.

TYPE "A" WORKRITE HYDROMETER

Double the life of your battery by giving it proper care. Fill and test it regularly with a WorkRite Hydrometer. Never let it become discharged below 1150, or it will soon be ruined. Full instructions for testing and care of battery with each "WORKRITE." Get one now! Price, $1.00

Insist that your dealer furnish a "WORKRITE." Accept no substitute. If he cannot supply you, we will ship direct by mail prepaid.

JOBBERS AND DEALERS—Write or Wire for Discounts

The WORKRITE Mfg. Co., 5603 Euclid Ave. Cleveland, Ohio.

New "Read 'Em" Binding Posts

16 Styles

Antenna

Ground

Condenser

Tickler

Variable Condenser

A—Battery—

A—Battery+

B—Battery—

B—Battery+

Plate

Detector

Phones

Secondary

Primary

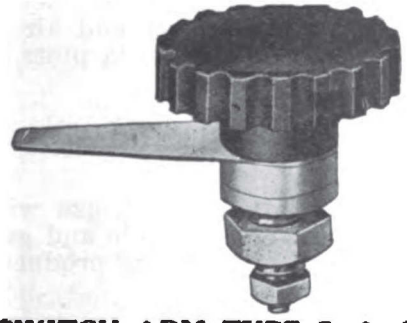
Grid

Filament

Complete Post and Knob 15c each

The enormous demand for these "read 'Em" binding posts, prompted us to put in a large stock to take care of our friends. Our stock is complete.

We are in equally fine position to fill orders promptly for binding posts made up of exactly the same high grade material and workmanship—the same in every way, without the knob engraved @ 12c. each.



SWITCH ARM TYPE S. A. 3

Price .....$ .50 Each
Knob—1¼" Knurled Bakelite
Lever—1½" Phosphor Bronze Nickeled
Bushing—to fit up to ⅜" panel.
Type S. A. 1—Price.....$ .40 Each
Same as above with 1" radius knob.

SWITCH ARM TYPE S. A. 4

Price .....$ .50 Each
Knob—1¼" Fluted Bakelite
Lever—1½" Phosphor Bronze Nickeled
Bushing—to fit up to ⅜" panel.
Type S. A. 2—Price.....$ .40 Each
Same as above with 1" radius knob.

Send Us Your Orders Now

Orders will be shipped the day they are received. Send in your order early.

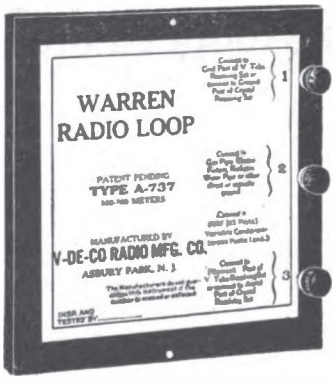
THE KUEBLER RADIO COMPANY

125 Boody Bldg.

Toledo, Ohio

Warren Radio Loop

NO AERIAL

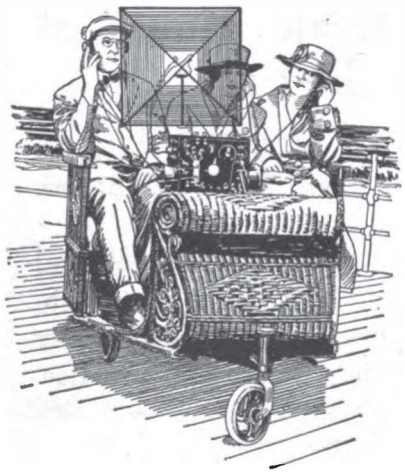


LESS STATIC

If Dad says—
"NO AERIAL ON THIS HOUSE"
don't allow his QRM to worry you but purchase a

WARREN RADIO LOOP

The LOOP that made the Radio Roller Chair famous on the Boardwalk at Ashury Park, N. J.
Is just the thing for an apartment or den.
Is light in weight and easily portable.
Is produced under a new principle of winding.
Is wholly enclosed, thereby protecting the winding.
Is used in place of an outside aerial.
Is adapted for receiving in moving vehicles.
Takes the "tic" from static.
Eliminates all danger from lightning.
Can be used with any receiving instrument.
Can be used without tuner.



This picture of the Radio Roller Chair showing the Warren Radio LOOP was used as cover designs on "Wireless Age" and "Radio News" and featured in many other magazine and newspapers in the United States.

Send your order through your dealer or direct to us with his name.

Type-A-737 (300-700 meters) $10.00
Type-A-7236 (175-1000 meters) 12.00

V-DE-CO RADIO MFG. CO.

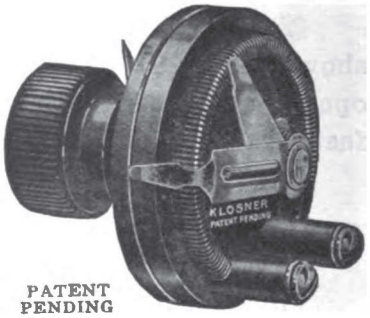
DEPT. R, ASBURY PARK, N. J.

Send for bulletin—No. AIOI

MAKE NO MISTAKE

THE

KLOSNER VERNIER RHEOSTAT



PATENT PENDING

is the only Vernier Rheostat made having the exclusive feature of using but

ONE SINGLE KNOB

for both rough and fine adjustments. This feature allows the symmetrical appearance of the single knob to be retained when mounted on a panel with other instruments, and, at the same time adds to the simplicity and ease of operation in obtaining the necessary fine adjustments for best results from the modern critical vacuum tubes, especially when receiving phone and C.W. signals.

We invite comparison with any other filament rheostat now made. Look for the name KLOSNER moulded on the base.

Your dealer has them or send direct to us.

PRICE $1.50

Shipping weight, One pound.

A two cent stamp brings interesting literature.

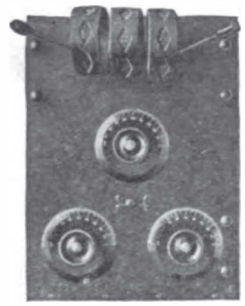
Made only by the Originators.

The Klosner Improved Apparatus Company

Dept. Q4

2024 Boston Road, New York City N. Y.

Type "Q" Receiver



AN IDEAL RECEIVING SET FOR LONG AND SHORT WAVE AND RADIO TELEPHONE RECEPTION

This set is the most flexible receiving set on the market. With the use of the various sizes of Honeycomb Coils everything in the range of radio telegraph and telephone reception from 200 to 25,000 meters is brought into your home. Consists of a three coil mounting, and three Variable Condensers of proper capacity. Tuning extremely sharp. Remler dials.

Price without Detector.....$35.00

Duck's New Radio Catalog No. 16

Send 25c in coin carefully wrapped today for copy of the greatest radio catalog ever put between the pages of two covers.

275 Pages--A Catalog DeLuxe

Never in the history of radio was such a catalog printed. The radio data and diagrams embracing upwards of fifty pages, gives the experimenter more valuable and up-to-date information than will be found in many books selling for $2.00, and $1.00 could be spent for a dozen different radio catalogs before you could gather together the comprehensive listing of worth while radio goods found in this great catalog.

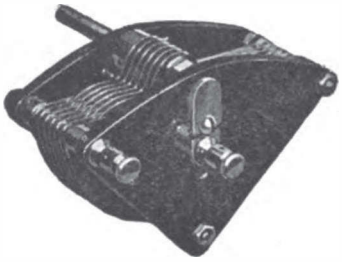
A brief summary of the radio goods listed in this catalog:

The entire radio catalog of the Radio Corporation, with a wealth of scientific and technical data on C.W. transmitting sets, and all the diagrams for the assembling of these sets; the complete Remler catalog, which embraces 25 pages, the Westinghouse, Firth, Murdock, Federal, DeForest, Clapp-Eastham, Brandes, Connecticut Company, Thordarson, Turney, Magnavox Company catalogs, the best products of Adams-Morgan, Signal and countless other manufacturers, including our own complete line of radio apparatus, and many individual items and parts used in radio work today.

Send 25c in coin, (carefully wrapped) for new catalog. The great cost of this elaborate catalog prohibits distribution on any other basis.

The William B. Duck Company

243-245 Superior Street **Toledo, Ohio**



HORNE VARIABLE CONDENSERS

The Variable Air Condenser with the "straight line" capacity variation. A large area substantial plate is used in the construction of this condenser, so that the multiplicity of plates used in the cheaper types is avoided.

Horne Variable Condensers are assembled with solid Bakelite end supports and turned brass spacers made to Micrometer gauge, and are provided with handsome nickel plated binding posts.

The laboratory type is enclosed in a polished nickel plated brass tube and can be used as an oil condenser at all leading Jobbers.

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Horne Manufacturing Co.

243 Mercer St., Jersey City, N. J.

Manufacturers of Radio Products

CRYSTAL DETECTOR STAND

Nickel plated or brass finish

No. 1201—$1.50

Tested Galena in Wood's metal 20c.

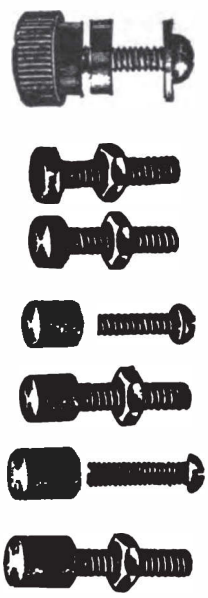
Get prices for other instruments and parts

With Screws and Washers for Bottom

No. 33 6c. ea.

No. 30 4c ea.

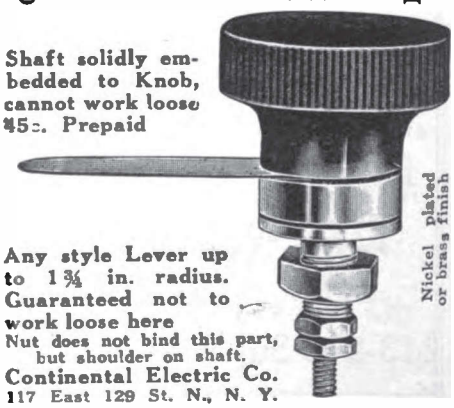
Cuts of Contacts & Binding Posts represent original size



No.	7160	7127	7512	7594	7138	6647	71	72 larger 8c.
	For 100— $1.80	$1.70	$1.40	$1.20	$1.30	$1.20	7c ea.	

If nickel finish is desired add 50c. for 100
More than 50 styles of Binding Posts and other parts made by us and carried in stock.

Shaft solidly embedded to Knob, cannot work loose 45c. Prepaid



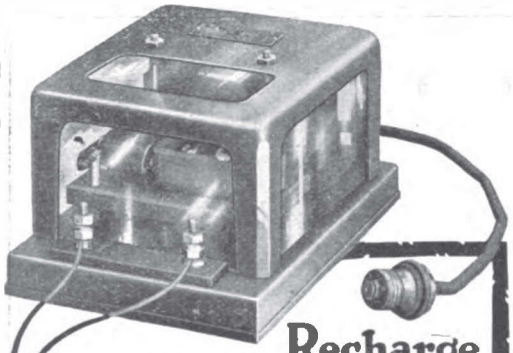
Nickel plated or brass finish

Any style Lever up to 1¾ in. radius. Guaranteed not to work loose here

Nut does not bind this part, but shoulder on shaft.

Continental Electric Co.

117 East 129 St. N., N. Y.



Recharge Your Battery at Home

Don't be without the use of your Radio Receiving Set while your battery is being charged by some Service Station. Get a *Valley Charger* and charge your battery right at home at one-tenth the usual cost.

Attach the Charger to your home lamp socket—attach the clips to the battery terminals and you will get a quick tapering charge which just exactly charges your battery, but cannot over-charge or harm it in any way. This *Valley Charger* has no troublesome bulb and will charge your automobile battery as well as radio battery.

Satisfaction Guaranteed. If your local distributor cannot supply you, write direct to

VALLEY ELECTRIC COMPANY

Department Q, St. Louis, Mo.

- - - Mail the Coupon - - -

Valley Electric Co., Dept. Q, St. Louis, Mo.

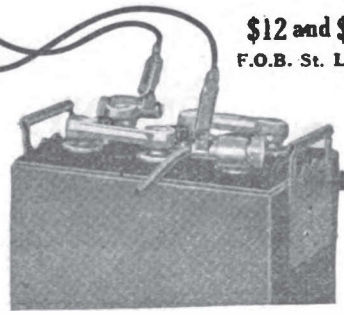
Gentlemen: I am enclosing money order (or check) for $12.00 for which send me a Valley Battery Charger with black metal case. $15.00 for which send me a Valley Battery Charger with five-panel glass display case and indicator. If not satisfactory, will return it and get money.

_____ Name

_____ Address

_____ Town

$12 and $15
F.O.B. St. Louis

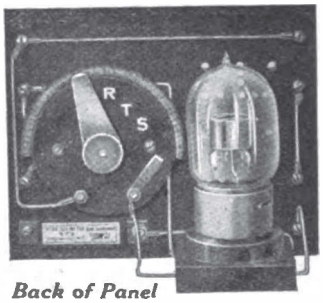


Install this RTS Standard Detector Panel

Front of Panel

ONLY $5.95 Assembled
(Without tube)
Prepaid by Insured Parcel Post

RTS



Back of Panel

Here is a correctly designed panel made of best grade Formica. Its signal strength is unequalled by any other tested in our laboratory. The exclusive use of silver plated wire greatly increases its efficiency.

We guarantee the RTS Detector panel to be exactly as represented and will refund your money if you are not satisfied.

Order TODAY before the price goes up.

RTS BUSHING LEVER

This Bushing Lever is well designed and beautifully finished. The knob is the well known Marconi type. Spring lever is 1¼" long with ground ends insuring smooth adjustment. A guide bushing raises the lever to proper height for all switch points. **PRICE 60c.**

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EDISON B BATTERY ELEMENTS. Make your own. Can be recharged and lasts for years. 200 ampere hour A batteries, guaranteed, $35.00. Harry Morrell, 52 Goffe St., New Haven, Conn.

1-0 to 10 GENERAL RADIO hot wire meter $6.00, 1KW Packard transformer 16500 volt, 1 General Radio Type 45 wave meter (new) $32.00, 1 Amrad wave meter $6.00. A. L. Walser, Chesaning, Mich.

SELL—New Westinghouse R. A. Tuner $62.00. Detector, three step amplifier, oak cabinet 7x18, a real bargain, $55.00. Three Western Electric J Tubes $9.00 each. R. Ireton, Saginaw, Mich.

A REAL STORAGE BATTERY BARGAIN. Edison six cell 10 volt 225 ampere hour battery in first class condition $45.00. P. Harwood, 657 54th St., Milwaukee, Wis.

LIBERTY C.W. TRANSFORMERS, chokes, condensers, other Liberty products. Guaranteed. Write. Dealers wanted. Snyder Radio Mfg. Co., Ashland, Ohio. Southern Representative, M. F. Harrod, Orlando, Florida.

MY COMBINATION long and Short Wave Hook-Up Diagram will bring in the concerts. 150 to 20,000 meters. Pittsburgh and others too numerous to mention heard here in Lansdale. 50c brings it to you with instructions. Guaranteed. G. W. Calvert, Lansdale, Pa.

WIRELESS THEORY course, eighteen lessons, first money order for ten dollars takes it. Edw. D. Seitz, Pauline, Kansas.

WANTED: 500 Volt, 100 Watt Generator. State all particulars. R. H. Beaumont, jr., Radnor, Pa.

STOP! LOOK! AND ACT! VT's Accessories! With each of the listed tubes Radiotron U.V.200, $5.00, and A.P. Moorhead detectors, $5.00; Radiotron U.V.201 $6.50, and A.P. Amplifiers, $8.50; we will supply free of charge your choice of either of these 5 premiums—Latest FADA rheostat, Paragon VT socket. Murdock socket, DeForest socket, Remler rheostat, $1.00 each. Either of the Federal single, closed or double circuit jacks listed respectively at $0.70, $0.85, and $1.00 will be given as premiums with each Federal 226W or R. C. of A. U.V 712 amplifying transformers, $7.00 each. U.R.1714 Radio Frequency amplifying transformer. FADA 5 ampere Nichrome Thermoplax power rheostat $1.35 or R. C .of A. U.R.542 porcelain V.T. socket will be given as premiums with each $8.00 U.V.202 power tube or A.P. Moorhead 5-watt Type C power tube, $7.50 each for C.W. or Radiophone transmission or power amplification. We absolutely guarantee the foregoing apparatus. Only new and high grade equipment carried in stock. Unsatisfactory goods subject to return within five days. 12 hour service or your remittance returned. Postage and insurance prepaid by us, thereby saving time and money. Remember us. The Kohler Radio Laboratories, Dept. Q, Abilene, Kansas.

NEW ½KW AMRAD QUENCHED GAP $10. Transformer, four sections, condenser and oscillation transformer $37. All for $45. Meade Williams, Lynchburg, Va.

SELL: My ½KW Spark Set, $25.00. Write D. Brown, Convoy, Ohio.

CLOSING STATION—SELL: 1KW United Coffin 35,000 volt, $36.00; ½KW Winger $20.00, 8 Point Hyrad rotor with 4500 rpm motor, 1-6 hp. motor, $18; O.T. for Coffin, $4. Arthur Johnson, 1703 West 103rd St., Chicago.

FOR SALE: Thordarson 1KW Transformer, $9.00; 1KW O.T., $3.50; Dubilier Protective Device, $2.50; 1KW Condenser with tank, $4.00. All guaranteed. L. B. Wilcox, Angola, Indiana.

SELL: 1KW 25000V. Transformer, new, $22.50. Ultra Benwood Gap, 8 point rotor $30.00. Heavy O.T. 3 inch ribbon $8.00. Plate glass oil immersed condenser .001 $8.00, Grebe CR3 Relay special, excellent condition, $35.00. Tresco NAA Tuner, new, $7.00. D C. ammeter 0-5 amps, new, $4.00. Galax Bottling Co., Galax, Va. 3HL.

FOR SALE: Spark Set ½KW Meteor transformer, oil immersed Condenser, Universal Gap O.T. and key $35.00 Dave Shelley, Grove City, Pa.

FOR 50c we will send you plans of a super variocoupler. Materials cost 65c, easily sell for $1.50. Hi-Bro Radio Engineering Company, North Abington, Mass.

TWO SPOOLS of #36 D.C.C. Magnet Wire, 3 lbs. Two telegraph sounders, two relays, one key. Other articles. Prices on request. C. R. Gerst, 2974 West 25th Street, Cleveland, Ohio.

FOR SALE: Excellent cabinet Tuner 200 to 5000 meters range $15.00. DeForest Audion control cabinet no bulb $10.00. Floyd Correll, Clay City, Ind.

CASH TALKS: One Radio Corp. of America C.W. transformer model UP1368 with plate, filament and kenotron windings, $20.00; One Clapp-Eastham ½KW, $8.00. Both 60 cycle, guaranteed A-1 condition. Elmer Scharbach, Hobart, Ind.

FOR SALE: New type "C" Baldwin fone, $9 00; Arlington coupler and Audiotron with adapter, $8.00. Marion Graham, Angola, Ind.

FOR SALE: Single tuned regenerative, detector and one step amp, $40.00. Two step amplifier $28 00. Sets are in cabinets, photo on request. A. L. Walser, Chesaning, Mich.

LIBERTY Amplifying transformers wonderful. Ask for Liberty literature. Snyder Radio Mfg. Co., Ashland, Ohio.

FOR SALE: Packard ½ Kilowatt Transformer, $15.00; Clapp-Eastham ½ Kilowatt Condenser. $15.00; Clapp-Eastham one Kilowatt Tesla Coil, $15.00; Two inch spark coil with adjustable gap mounted on coil $7.50; All good as new. P. Harwood, 657 54th St., Milwaukee, Wis.

FOR SALE: Complete ¼KW spark set. Write for particulars. Also Clapp-Eastham Regenerative $20, Tresco Long Wave Tuner $8, Wilcox Rotary $5. Paul Eisenbrown, 919 N. Third St., Reading, Pa.

FORTY DOLLARS for spark transmitter. Write W. D. Myers, Vandergrift, Pa.

WHY USE a storage battery? Sell the nuisance and use 110 on your filament. Blueprint and complete dope for 50c. Marcus, 3725 N. 18 th, Phila., Pa.

PRACTICALLY GIVEN AWAY—New Rotary Bakelite enclosed Gap with Motor. Oil Condenser, Aerial Change over Switch and Key—$28.00. Complete Omnigraph outfit $12.00. Bauernfeind & Heid Electric Co. Menasha, Wis.

BARGAINS: ¼KW Spark Set, Winger ¼KW Transformer, Amrad Gap, oil Condenser, large O.T., heavy key, 3 pole switch, and 4 point Benwood Disc, $25.00; Burnt out Audiotron $0.75. L. Sharp, Greenwood, Ind.

FOR SALE: ¼KW spark transmitter with magnetic aerial switch $40.00. All letters answered. Charles Vaughan, 88 Lakeview Ave., Cambridge, Mass.

CROSS SAGK OFF UR CALL BOOK. NEW CALL SUE, LANCASTER, N. Y.—C.W.

FOR SALE: 1KW RS type Thordarson Transformer, Thordarson oil condenser, large hinged O.T., Benwood Gap. Mounted on large Bakelite pan l and base. Wired complete, Price $60.00. A-1 condition. L. N. Bell, 213 Seminary Dormitory, Lancaster, Pa.

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the Continental Code will do it. On highly glazed cardboard 7x16½ inches. 50c brings it to you with International abbreviations free. G. W. Calvert, Lansdale, Pa.

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IMMEDIATE SHIPMENT on Westinghouse and Clapp-Eastham receivers, tubes, B batteries ,etc. My service and prices will please. R. M. Ireton, Saginaw, Mich.

NAVY TRANSMITTER in Hudson Radio Club booth at Second District Radio Show, Bargain. Geo. Wiss, 328 W 84 St., New York.

A—B BATTERY that can be recharged and will last indefinitely can be made from Edison nickel-iron elements. .Eighteen 1.25 amp.-hour pairs, enough for a 22.5 volt battery, $2.50. A. J. Gilbert, 426 New Britain Ave., Hartford, Conn.

1KW ACME TRANSFORMER, $25; 1KW Oil immersed condenser .015, $18.00; Brawood Removable point disc $8; O.T. with 4 inch ribbon throughout. $8.00; ⅓ hp. Sink motor, $25.00. Every thing good as new, used 2 months. Edward Avery, Dunmore, Penna.

STAHL EIGHT HP Sink Motor 110 volt 60 cycle with 8 point Bell gap $55.00. 1KW United Wireless Coffin $40.00. W. Johnson, 4216 North Paulina, Chicago.

SELL: Acme 200 watt C W. Transformer, $15.00; Somerville A.C. filament voltmeter. $4.00; ¼KW type R Thordarson, $8.00; Amrad wavemeter, $2.50. Geo. Thomas, Iowa Falls, Iowa.

8SP SPARK SET 1KW Acme transformer 220 volt $28.00. .01 Dubilier condenser new type $28. Brawood spark gap complete $28. Complete set $75. Terms cash. A. G. Kisner, Fairmont, W. Va.

FOR SALE: Tungar Rectifier Construction Print, $1.25; Variometer Reg., $25.00: Detector and 2 step, $25.00; Holtzer Cabot Phones. $6.00; Test Tube BB Rack 80 cell capacity, $1.00; 3 Leyden Jars, $3.50 each .0025 MF. Audiotron Bulb, $5.00; Magnetic Battery Chargers, $14.00 complete. I. A. Nerber, 41 Beattie Ave., Lockport, N. Y

EXCHANGE ¾KW Transmitter complete. Want Banjo Mandolin. Inquiries answered. Allen Vickery, Bellevue, Ohio.

ROTARY QUENCHED GAP fourteen inches diameter with ½ hp. motor $45. ½KW Transformer $6.00. 1KW Old type Thordarson transformer and O T. $20. R. Kinney. 8AVT, 1803 Middlehurst Rd., Cleveland Heights, Ohio.

DEFOREST Radiophone type "O" $175—New $300. R. Hird, Plainville, Conn.

FESSENDEN 500 cycle ½KW set complete $85.00. Telefunken New $250. Kienzle, 501 E. 84 St., New York.

K. C. HOME RECEIVING set $16 50. Complete with head phones and antenna wire, sent express collect. A new book, "How to Make Home Wireless Receiving Set" 25c copy, money order or stamps accepted, postage paid by us. Archway Book Store, Seattle, Wash.

PATENTS ON RADIO—My special experience and compilation of patents and literature enables me to advise inventors and manufacturers on radio inventions and patents. John B. Brady, Ouray Building, Washington, D. C., formerly with Radio Division, Navy Department, and Secretary, Government Radio Board, investigating radio patent situation.

PREPARING FOR COLLEGE. Must sell following new, guaranteed apparatus: Packard one kilowatt oil immersed transformer $20.00, oil immersed condenser, $15.00; Karlowa enclosed rotary gap $10.00; Cootie key, $2.50. Entire set for $40.00. Also General Electric 6-volt 16-ampere motor-generator set complete, $25.00; Emerson 1-10 horsepower motor $8.00. Sayville gap motor $8.00. First come first served. Write today. James Work, Washington, Iowa.

WANTED: Omnigraph for Club. State price and condition, etc. Arthur Johnson, 1703 West 103rd St., Chicago.

360METER LOOPS $1.75; Regenerative receiver, using tickler, with detector control, minus bulb, oak cabinet & panel, $19.50. Improved Reinartz tuner with detector control minus bulb, oak cabinet formica panel, $25.00; 3-step choke coil amplifier with RAC 3's. oak cabinet, formica panel, real amplifier, $35.00; 2 Chi-Rad Variometers, $2.75 each. Robert Lewis, Church St., Princeton, Illinois.

OAK CABINETS, Beautiful French polish, hinged covers, complete with ⅞" formica panel. Sizes 6"x10" and 6"x14", depth 7 inches. Prices $8.30 and $10.00. For other sizes write for estimates. The L. & B. Radio Shops, Dept. Q, 6195 McMillan Ave., Detroit, Michigan.

NAVY ½KW 500 cycle Panel Transmitter complete with voltmeter, wattmeter, Thermo-couple Ammeter, new quenched gap and automatic starter. Tunes 200-952 M. Good Motor Generator, runs on 110v D.C. $235.00; Marconi ½KW 500 cycle "Cargo" synchronous gap Transmitter with motor generator complete, $125; French ½KW field Transmitter, $47.50; Marconi 2KW 500 cycle Transformer, $22.00; Dubilier .004 MF 12,500 Volt. $18.00; ½KW 500 cycle Exciter Generator for engine drive, $85.00. Rubber jars suitable for rectifier, $0.25. If picture is desired send 10c. Eaton, 1915 S. 12th Phila. Pa.

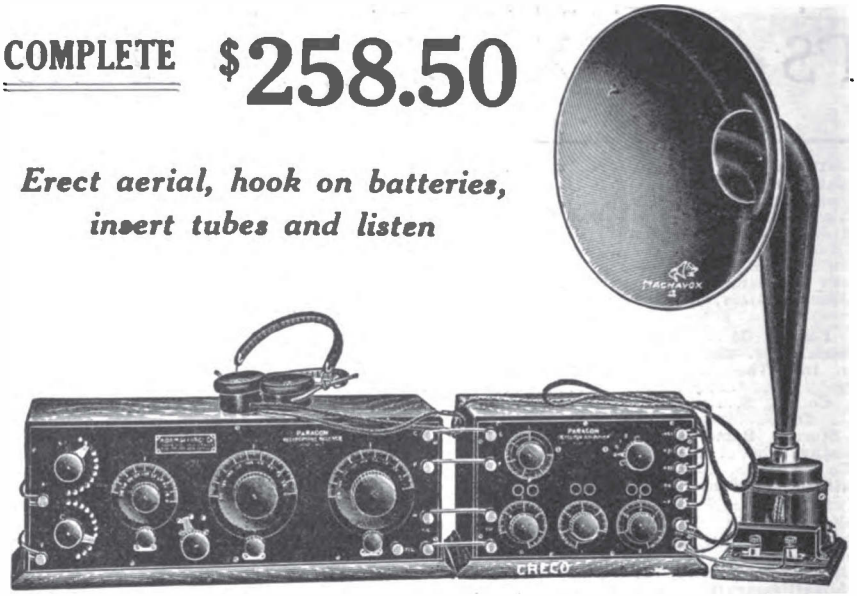
—FOR YOUR CONVENIENCE—

QST'S INDEX OF ADVERTISERS

IN THIS ISSUE

COMPLETE **$258.50**

Erect aerial, hook on batteries, insert tubes and listen



Unexcelled for C. W. reception

TESTED, proven units are combined in this outfit to make a complete set without a weak link. The tuner is the famous Paragon R.A., Ten regenerative receiver,—the worlds leading short wave tuner. To this is added its companion instrument, Paragon DA-2 Vacuum Tube Detector and two-step amplifier. Then comes the Radio Magnavox, which sends wireless telephone concerts as well as code, clearly all over a room or hall without detracting from the original tonal qualities. For sharp tuning head phones are provided—Baldwin type "C" standard of the world. Every item of accessory equipment is supplied —of a quality consistent with the Paragon instruments that form the heart of this set. This includes 3 Radiotron vacuum tubes, 3 Eveready "B" Batteries, 1 60-80 Ampere-hour storage battery, specially built for radio work, and our Number 3 antenna equipment, with wire and insulators for a 4 wire 100 ft. aerial, lead-in wire, ground clamp, etc.

Not a single item is omitted for a complete installation. The actual work of installation is reduced to a minimum. Simply put up your aerial, insert tubes, hook-on batteries, make an easy ground connection—and you are ready to listen.

The price complete is $258.50. Quality considered, we confidently recommend this outfit as today's best buy in radio. If you live in New York examine this equipment at the Continental store. If you live farther away, order by mail. Shipment immediately, by express, accompanied by the Continental guarantee of satisfaction.

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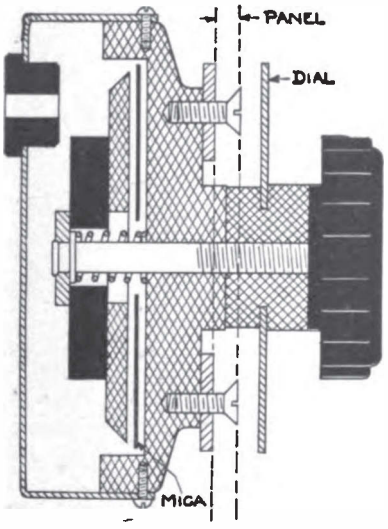
CONNECTICUT RADIO

A NEW PANEL TYPE VARIABLE CONDENSER

Easy to mount, since it requires the drilling of only four holes, this new type is an improvement in mounting design. Only the dial shows on the panel. Otherwise it is the same instrument which users everywhere tell us is the best they ever had. Scores of enthusiastic letters have come to us, unsought.



Cross section view of panel type condenser

COMPACT: The simple two-plate design, with the mica insulation, gives in small space a capacity equal to ordinary condensers of many times the size.

STABLE: The novel design insures permanence to your adjustment, regardless of the position of your instrument, a decided advantage for panel use.

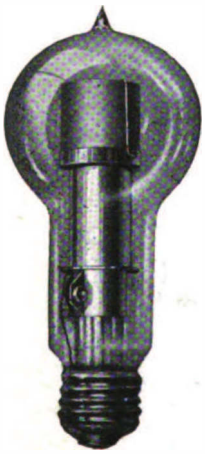
SELECTIVE: Low effective resistance in the CONNECTICUT Variable Condenser increases selectivity, and the long scale, practically 360°, permits finer work than the 180° scale of other condensers.

The price should be compared with the performance. The new panel type sells for only $5.50. Ask your dealer to get it for you. This and other CONNECTICUT radio apparatus are shown in our new bulletin A9, which we shall be glad to mail on request.

CONNECTICUT TELEPHONE & ELECTRIC COMPANY
Meriden Connecticut

AMRAD

The Recognized Symbol of Superior Performance



"S" TUBE
RECTIFIER No. 3000
RATING—20 watts
VOLTAGE 300-750
CAPACITY 50 Mil. Amp.
PRICE — $8.00

Announcing the New "S" Tube- the rectifier Tube

THE new Amrad "S" Tube—The Tube Without a Filament—has already aroused widespread interest in the scientific world. It it now offered commercially as a rectifier of alternating current of any frequency, and finds instant application to small radio telephone and telegraph transmitting sets.

Amrad "S" Tube 3000 is used in the same manner as the familiar Kenotron, except that no filament heating current is required. Two "S" Tubes will pass sufficient plate current to operate two five-watt power tubes. "S" Tubes may be operated in series, parallel or series-parallel to accommodate higher currents and potentials.

The average life of the Amrad "S" Tube Rectifier is not known. As it has no filament to burn out, continued operation simply depends on the ability of its internal elements to stand up against the effects of heating and cooling. Its life is conservatively estimated at 3000 hours. The Tube in its present form is not applicable to receiving purposes.

Operation of radio telephone transmitters on AC current supply has been retarded by the lack of an effective filter—one that would eliminate AC "hum." The Amrad Mershon Electrolytic Condenser 38 mfd. solves the filter problem. It DOES eliminate that AC "growl." If punctured by excessive voltage, it heals automatically. Its first cost is the last cost. Included with each condenser is one charge of chemically pure Electrolyte.

Bulletin J describes both the Amrad "S" Tube Rectifier, and the Amrad Mershon Electrolytic Condenser—two vital accessories in CW transmission. Write for your copy. Complete Amrad Catalog, 10 cents.

ELECTROLYTIC
CONDENSER
No. 2747
PRICE $8.00

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