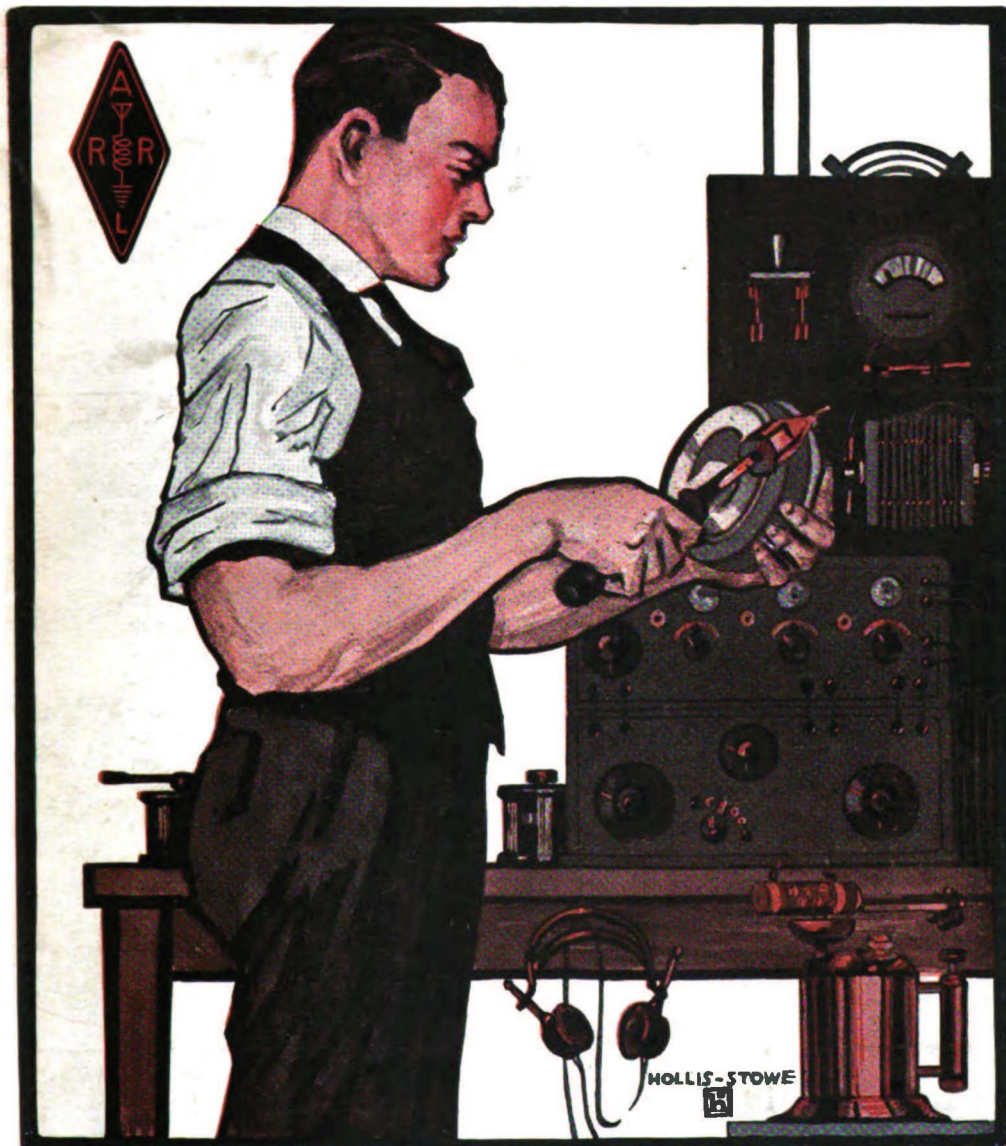


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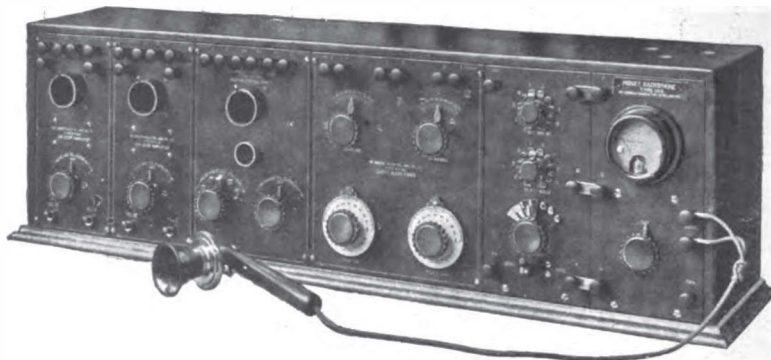
QST

A Magazine Devoted Exclusively to the
WIRELESS AMATEUR



Published by the American Radio Relay League

JUNE 1921



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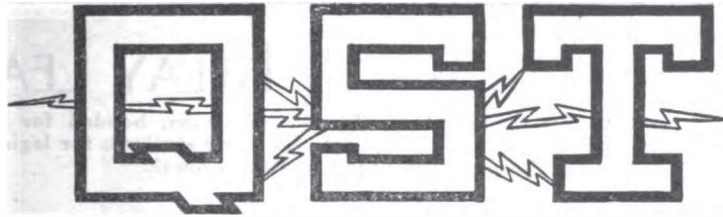
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ATLANTIC RADIO COMPANY

INCORPORATED

**88 Broad Street
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**Branch:—15 Temple Street
Portland, Maine**



The Official Organ of the A.R.R.L.

VOLUME IV

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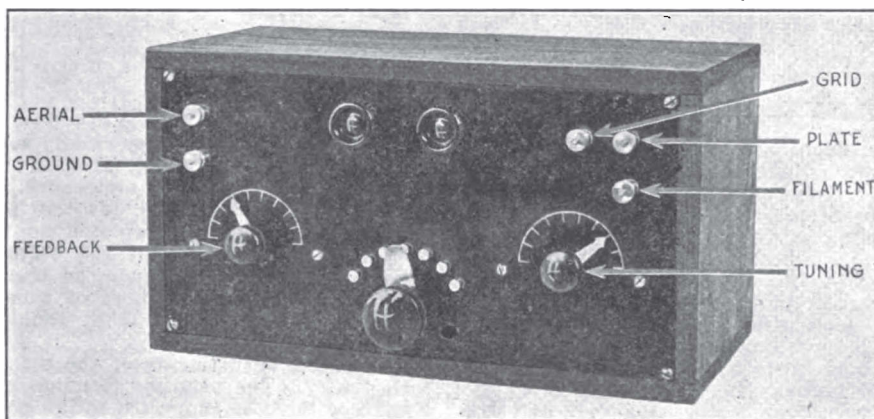
A Magazine Devoted Exclusively to the Radio Amateur

A Receiving Tuner for C.W.

DO you believe it possible that C.W. can be tuned in much easier than spark? Accustomed as you are to the modern regenerator with its multi-controls, where the plate circuit has to be carefully tuned to the grid circuit and then retuned each time the grid circuit is varied, to say nothing of critical adjustments of antenna circuit and coupling, no doubt it sounds improbable, and indeed it is a hard job on our regenerators. But can you imagine a tuner that

has been devised by Mr. John L. Reinartz, 1QP, of South Manchester, Conn., and forms the basis for this article.

C.W. transmitters have been progressing faster in recent months than C.W. receivers, and the difficulty of tuning it in has been holding back development. Our regenerative tuners, expressly designed to work almost but not quite up to the oscillating point, are being found unsuited to C.W. reception because of the length of time required to perfect the various ad-



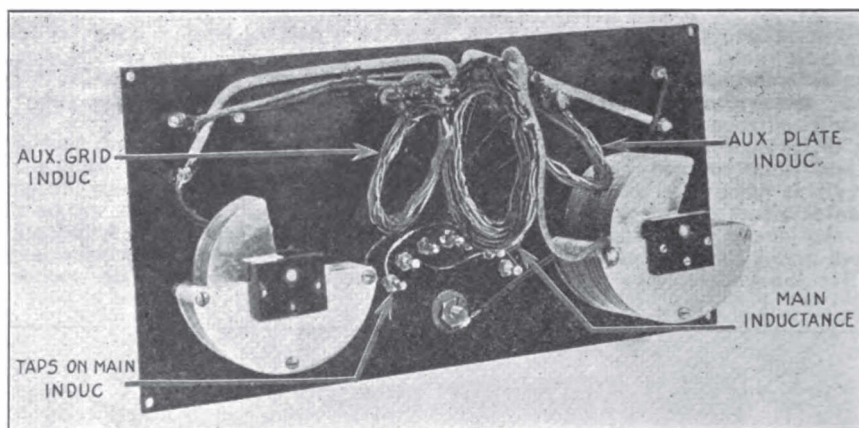
would oscillate nicely at whatever wave length the grid circuit was tuned to, and in which the aerial circuit and coupling didn't have to be adjusted at all, so that all that would be necessary would be to start it oscillating and vary the secondary and then be able to hear the C.W. stations as you pass their waves, be able to stop without effort on any of them or to switch almost instantly back and forth from one to the other and find them always in the same spot, and all totally free from capacity effects? A set that does these things

justments on a given signal. Most of the circuits finding favor for receiving C.W. employ a capacity feedback in one form or another, rather than the tuned plate circuit, which former gives stable oscillation over a wide range of secondary-circuit wave lengths. The new Westinghouse tuner with its tickler feedback and with variometer and condenser on the same shaft, is also very convenient for C.W. The tuner described below can be built by any amateur at a trifling cost, and altho C.W. is its *piece de resistance* it is almost as

good as the tuned-plate-circuit regenerators for spark work.

The photographs show the outside and interior of Mr. Reinartz' tuner, and the hook-up (with an extra switch, to be mentioned later) is shown in the schematic diagram. The main inductance TL is a home-made "spider-web" type with a 2-inch center hole, wound with No. 22 cotton-covered wire with turns and taps as shown in detail under the hook-up, the taps being made by making long loops at the proper turn, baring the wire and soldering close to the winding, and continuing. Now this main inductance is the only one entering into the actual tuning of the set, and the feedback is primarily by means of a condenser, but difficulty is experienced in

the photographs has no taps on the secondary and this condenser is therefore the sole means for tuning it. However, Mr. Reinartz finds that somewhat better results are obtained by having a few taps on the winding so that more inductance can be used and less capacity be necessary for reaching the longer waves. Accordingly a switch TS is shown in the hook-up, and is the right-hand switch in the detail drawing of the main inductance. GC is a 43-plate variable grid condenser, which is often an advantage over the fixed grid condenser altho very good results are obtained with the latter. RC is a 43-plate variable to control regeneration. The 7-point switch AS varies the aerial circuit inductance, which is part of the main in-



making such a circuit oscillate at very short wave lengths and for this reason two auxiliary inductances are introduced into the circuit to give a greater measure of coupling between grid and plate circuits. These are indicated at T₁ and T₂ and consist of 25-turn coils of construction similar to the main inductance but without taps. If the constructor desires, these coils can be made by "jumble-winding" the proper number of turns on a 2-inch tube, taking off, and taping. In the set illustrated the spider-web form was followed, and the shape of the coil preserved by applying a little sealing-wax at various points to stiffen it. The auxiliary inductances are mounted on each side of the main one, by fastening them with sealing wax to short shafts actuated by the two small knobs at the top of the panel. Their coupling, therefore, is via the main inductance. There is one adjustment of these couplings that will be found best for a given aerial and tube adjustment, and when once secured the coupling need never be disturbed.

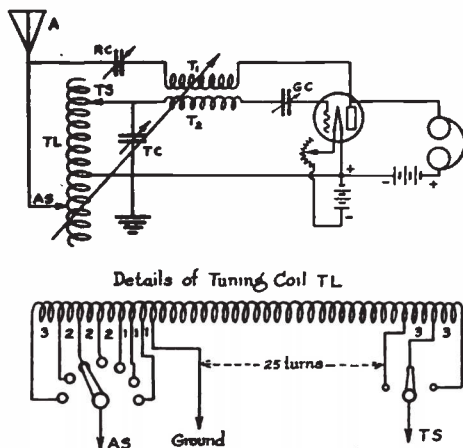
TC is a 23-plate condenser for tuning the secondary circuit. The set shown in

ductance and therefore very closely coupled to the secondary winding, from 1 to 12 turns. This is the switch appearing in the lower center of the panel. If the 3-point switch TS is added, the two switches could be placed side by side at the bottom of the panel. The detail drawing of the main inductance shows the number of turns between each switch-point and should be carefully followed.

The initial adjustments of the set are a little tricky. The negative terminal of the B battery *must* be connected to the positive terminal of the A battery, and this point grounded. When an amplifier is used the grid circuits of same should connect with the negative side of the A battery. The polarity of the two tickler coils must be right—they will work in one direction and not in the other.

On an average amateur aerial the set will tune from 150 to 450 meters and will regenerate or oscillate over the entire range. It requires a somewhat greater detector filament current than is necessary for the same tube in a tuned-plate-circuit regenerator, and if results are not at first obtained, the filament should be crowded

a little. Tune with condenser TC and regenerate with condenser RC. Turning RC a little past the regenerative point, the bulb will oscillate, independent of the aerial circuit adjustment, and its frequency will depend substantially on the secondary cir-



cuit adjustment, so that the latter may be varied thruout its range with the bulb oscillating nicely at every wave length. The primary circuit acts as if it were aperiodic and probably functions purely

thru shock excitation, as its adjustment has very little effect on wave length. On the first tap the set tunes very sharply, there being but one turn in the aerial circuit, and will accurately measure incoming waves if calibrated, while on the seventh tap the tuning is quite broad for C.W. In general the first tap should be used for very short waves and the third for the higher waves. With the bulb oscillating, C.W. signals will be heard when the local frequency differs from that of the incoming signal by an audible beat note. It is fairly easy to stop on any desired signal, and the condenser RC provides a fine adjustment for varying the note to any pitch desired. The movable plates of condenser TC are connected to earth, while the aerial connection to condenser RC is made to the movable plates, with the result that no capacity effects from the operator's hands are noticeable.

This circuit is equally adaptable to long wave receivers by making TC of the proper size, and is a very fair transmitter. With the detector bulb oscillating a key or microphone may be placed in the ground lead and local communication had without difficulty.

Mr. Reinartz kindly volunteers to answer any questions concerning the set. A stamped addressed return envelope should be enclosed with communications.

Rotten Nerves

By The Old Man

'Salmost too good to be true, fellows, but after many months of silence we have again heard from our mysterious friend, T. O. M., and just as we suspected he has been fooling with this C.W. stuff. Read it and weep.—Editor.

WELL, son, it is some moons since I have taken this pen in hand to write you about things that are rotten. I reckon there have been a plenty of rotten things to write about, what with the income tax and trying to get a C.W. set to work, but it has not seemed safe to venture. Lord Helpus, but I could tell some things that are so rotten they would bring tears to the eyes of a cigar store Indian but, to be honest, I don't dare. I've lost two of the best friends a man ever had, darned near got divorced twice, burned myself with the high voltage D.C. stuff until my hands hurt all over, and set fire to the house twice, trying to get one measley ampere of C.W. into the antenna. When our nerves get steadied and it is safe to make a few comments without starting a fight maybe I will dare tell about it. It might be funny

six months from now, but at date it would probably incite somebody to murder.

You know, son, I have it figured out that this radio business gets your nerves after a while. We radio bugs are rapidly becoming temperamental, like a lot of opera singers. I never saw such a hair-trigger lot of folks as a class. I am going to organize the N.W.C. (Nervous Wreck Club) and make myself president of it and get cheap rates at some sanatorium where there is a chance to put up a wire in the air. Then maybe we can kill or cure ourselves and get along with less wrangling over small points. Why I have seen the time when nerves got so on edge that close friends have had to be separated in an argument whether Beeman's Pepsin was or was not better than Wrigley's Spearmint. We work so blamed hard and we want what we want when we want it

so passionately, and we sit up to such deadly hours at night and take so little sleep that we just naturally get edgy and jumpy. It takes less to start a row among radio bugs than in any other class of people on earth, I reckon. Sometimes it gets downright funny, if you have a sufficiently sensitive bulb in your sense of humor, but during the heat of the argument it is far from funny. The funniest case of nerves yet recorded happened here



...organize the N. W. Club...and get cheap rates at some sanatorium.

the other night, and I think the parties involved may stand for a recital of it. I have carried a smile around on my face for a week thinking about it and by Heck I believe I will break my long silence and tell it to the gang.

It was one of the many by-products of our C.W. experiments. C.W. has a good many by-products, as some of the fellows well know by this time. You all remember our Radio Club, and Final Authority with his glasses, Radical with the eternal chip on his shoulder and the direct way of going at things, and our husky President with the determined manner and the strong right arm. Well, as per usual, Final was the goat. Final always was considerably touchy as to nerves. It never took much to scare him. He was always strong on theory and weak on the practical things of life. When anything got to turning over faster than 2500 r.p.m. Final was for stepping one pace to the rear and wrinkling up his finely chiseled brow in expectation of the worst happening. He belongs at a receiving set and not where the machinery is noisy and moving fast. Radical, on the contrary, has no nerves. They ran out of nerves when they built him. He fears neither man, devil, nor the Radio Inspector and has an insatiable desire to feel of everything with his bare hands. The more noise it makes and the more fire it vomits the better he likes it. He keeps your heart in your mouth most

of the time, when he is loose in the vicinity of a transmitter. With C.W., where it is an easy thing to get a jolt that will kill you, he makes me nervous and jumpy. It was Radical who taught me you could grab hold of the lead in when you were transmitting, provided you grabbed in real man fashion. He gave me palpitation once when he grabbed my lead-in one night when I was working my one k.w. Thor on full power. He says if you grab hold good and solid it only prickles, but if you dally with it any it bites a piece out of you. Old Kruse down at the Bureau of Standards ought to make some researches into this.

Final, Radical, the President, Yours Truly and Final's Dad were all assembled in Final's cellar not many nights ago, trying to find where the daggone C.W. juice was going to that ought to have been going up the antenna via the hot wire ammeter. There was a bunch of stuff laid out on a table, and a mad tangle of wires and instruments and things lying around all over the place. Final knew where things went, but I had not the remotest notion and I am blessed if I believe either Radical or the President were much better off. On the floor directly back of them was an A.C. motor coupled to a D.C. generator, both of which had seen better days. The coupling was a huge monstrosity of cast iron, leather disks, bolts, nuts and rubber tape. The rubber tape was depended upon to hold the business together. A couple of big U tubes were mounted upon the table among the maze of wires and if you were an acrobat you could stand between the table and the motor-generator set and make readings of a milli-ammeter, and not get the seat of your pants chewed up by the couplings. The plates in the U tubes were white hot most of the time and threatening to burn out and bring financial ruin upon their owner and the D.C. commutator on the poor miserable generator was screeching bloody murder and spitting blue fire, and the evil coupling between the motor and the generator was snarling and snapping something dreadful. Under the circumstances it may readily be imagined that there was an air of nervous tension pervading that cellar.

Final's Dad had been attracted to the cellar by the racket and the smell of brimstone, as he put it, and was an interested observer. He carried around with him a sly little twinkle in his eye and I had a hunch in the beginning that he might be up to something. Dad is a real dyed-in-the-wool sport. He is not a whole lot older than I am, and drinks home brew and plays poker Saturday nights with a gang of his age. He made you wonder how such a real he-man ever could have such a nervous young lady for a son as Final. I think he has wondered at it several times

himself. Final's Dad regards radio from the same slant that he regards hunting, fishing, base ball and prize fighting. If it is a case of sitting silently at a receiving set for a few hours he gets sleepy and loses interest. But if there is something red hot and making lots of noise and offering chances of busting up, he is Johnnie-on-the-spot. So Dad stuck around on this evening, watching the D.C. fireworks and listening to the snapping coupling with admiration. The coupling blew up several times during the tests and scattered cast iron and bolts and nuts and leather disks over the face of Nature, and Dad thought it fine business. Final tried to explain to him the formula governing centrifugal force, and how unhealthy it might be to stand in the plane of rotation of the coupling when it busted, but Dad could not take it in. Once or twice he slyly kicked the generator bearing with his foot, hoping, I honestly believe, to make it bust again.

It was getting late and we had been there some time working hard making adjustments of inductance and capacity and cursing Colpitts for ever getting up such a circuit, and getting just exactly nowhere, when Dad passed me a wink and we drew apart from the young men and went up stairs and took a couple of bottles out of the ice box. After emptying them and lighting two fresh stogies and hearing about how he mixed his hops and his malt extract, and when to add the yeast, we returned to the cellar to see how the coupling was getting on. Radical sniffed frankly and asked us how we got that way in these dry days, but went on rowing with Final about the effect of large capacity and small inductance, the latest article in QST by Warner to the contrary notwithstanding. This was more or less tiresome to Dad and he strolled around the cellar blowing great clouds of smoke from his free burning stogie. There was a big piece of about number twenty gauge sheet iron on a bench and Dad felt of this and reflected. Standing over against the other end of the bench was a big brute of a crow bar. Dad looked at the crow bar and at the sheet iron and seemed to be sunk in thought. I caught him steal a glance at the three young fellows bending over the instruments on the bench, but I looked away in time not to be caught watching. I guessed the old boy with the twinkle in his blue eyes was up to something, but I never dreamed what it turned out to be. I smile now as I reflect upon how skillfully he hatched his plot.

Final and Radical and the President had decided to try an entirely new kink and Dad came back to look on. He stood eyeing the crazy coupling for a while and whether he did something to it or not, I don't know, but anyway she gave a savage slap and

with a terrible roar busted again. Final as usual nearly jumped out of his skin and everybody dodged the flying hardware. I put in a bid to stop long enough to fix the blamed thing up right, but the younger fellows vetoed my motion. Just like young fellows, they did not want to stop long enough to fix anything. Their nerves were on edge and they wanted results. Dad butted in here and took my side. He pointed out the obvious fact that rubber tape was not the best thing in the world with which to fix a coupling which had to revolve at the tremendous speed of 7000 r.p.m., the point where Final said the generator must run in order to get the plate voltage which theory demanded. Dad also pointed out the effect of getting hit in the bean with one of the half-inch nuts. He seemed to think it was taking chances. He said the darned coupling shook and rumbled too much to suit his taste and that he considered it an altogether grossly disreputable piece of machinery. It might go off any minute and kill them all right there in their tracks and muss up the cellar. He said it always made a fizzy sound before it busted and he did not believe in a machine that made fizzy sounds. He considered that a very bad sign. He had heard of a fly wheel that had busted once and had killed most of the inhabitants



Dad let loose the most blood-curdling yell in him.

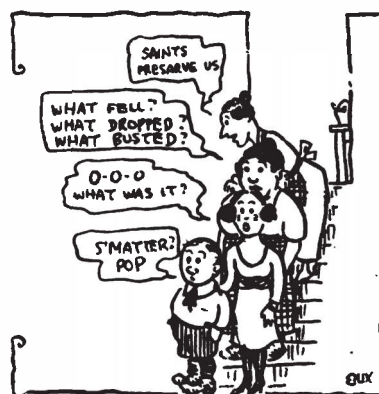
of the town, cutting off arms and legs and heads regardless of consequences. This crazy coupling was likely to explode the same way and send them all to Kingdom Come. He grew eloquent, and I could not help wondering why he was laying it on so thick. I found out later he was engaged in setting his stage for the big show he proposed to pull off in a few minutes.

Final and Radical and the President took his words partly to heart. They spent fifteen minutes putting back the bolts and nuts and leather things, and got some new tape and wrapped it around good and

thick and then wired it down so it would not come unstuck. Then they cleaned and adjusted the business end of the D.C. generator and started in once more to take readings with the new circuit. I got interested and watched them closely. I took note that Dad was over by the sheet iron and the crow bar, but I did not pay much attention to what he was doing. While we were at our busiest he came over and let out a holler right back of us to look out. The coupling was fizzing again. Final thought something had let go somewhere and nearly jumped through the ceiling. Radical himself gave a jerk. He was getting screwed up himself after all the trouble and the talk by Dad. I confess the yell brought me up all standing too. My nerves were as edgy as anybody's. They decided the fizzy sound did not portend anything serious and we went back to changing the capacity and the inductance and taking readings. We were right in the middle of the last combination when there came the most blood-curdling gawdawful yell I ever heard from a white man. Following it immediately came a perfect whale of an explosion and crash. It was right back of us, and of course all hands thought of the coupling and what Dad had said. Well sir, you never heard such a goldarned ripping and roaring nor saw such a mix up in all your born days. I went clean over the motor-generator set and landed out in the cellar floor. Every nerve in my body was taut as a fiddle string. Gasping for air, I glared around wildly to see whatinhel had got adrift and where the heavy parts were likely to come down. I remember being surprised when I looked up and saw that the roof was still on. I expected to see the stars above me. My mouth tasted of copper. It always does when I get a real sockdolager of a fright. I suppose my eyes blazed and my hair stood up. I acknowledge I had the fright of my life. What between the hoarse yell and the terrific explosion, and the state of my nerves, I thought the biggest bust-up America had ever figured in was right here in town.

Final happened to be leaning over the instruments and he projected himself half way over the table and lit in among the bulbs and wires and odds and ends. He had jerked so when the bust-up happened he had bumped Radical in the jaw with the milliammeter. Radical said later he thought one of the hunks of cast iron had lit on him. He knew he was mortally wounded because he could feel the hot life-blood flowing down his chin. He was convinced his jugular vein had been severed and that he was bleeding to death. He had recoiled sideways and had caromed off the President and was heading in the general direction of the coupling. He said he had

visions of sitting down hard upon the rapidly rotating remains. To save himself and the seat of his pants he had made a frantic grab at the President in passing, and had hooked into him somewhere. The two of them got mixed, the wires connecting the instruments they were holding pulled taut and snapped, and these two agile young men went into a tail spin. They spiralled and side slipped and executed the darndest hootchie-cootchie you



By this time Final's family had poured down the stairs.

ever beheld trying to make a landing elsewhere than on top of the coupling, which they both knew was directly behind them. Goshamighty, I never imagined such a whirling around of things and people!

When Final got himself unsnarled from the tangle of wires and instruments and settled down out in the middle of the floor, all he could do was to jitter. He held tight hold of a miserable bit of insulated wire. What he thought he was going to do with it I give up. After gazing wildly around and muttering incoherently he looked hard at his Dad. By this time I had caught on. My nerves were unstrung, but I could understand things. Not so Final. He was in a beastly state of funk. Radical was looking at the coupling which was running still and entirely normal, or as near normal as it ever was. I saw at once that Dad was standing over by the big piece of sheet iron, and was having an awful time trying to control himself. His blue eyes were twinkling away like stars. The big crow-bar rested upon the sheet iron and a big welt showed across the full width of the latter. Dad had taken the crow-bar, lifted it high over his head, let loose the most blood curdling yell in him, and had brought the crow-bar down on the sheet iron with the huskiest wallop he could command. The whole thing was as plain as the nose on your face.

Final could not grasp anything. His nerves were shattered. He could see and

also hear the coupling running, but he was so sure of his theory that it had busted that he did not take into account what his eyes and his ears showed. The noise and the yell told him something big and dangerous had let go and as the coupling was on his mind it must be the coupling that had busted. His face was pale green. You could see that every nerve in him was raw. He jittered something and staggered over toward his Dad. The two of them looked hard at each other at close range for what seemed five minutes, and then the following edifying conversation ensued, each one yelling at the other in order to be heard above the racket of the coupling. (As yet not a one of us had the brains to shut off the motor-generator.)

Final jittered, "What hap—you—did some—where—?"; to which Dad replied, "Sure." Final glared around to see if anything heavy was coming his way, and still clinging fast to the bit of wire, said, "What was—where—I—Gosh!" Dad thought this over and came back with "Yes, that's right." It seemed like a perfectly good answer to Final. He asked then something like, "What was it—why is—you—yell—where—my head aches." I don't know how long they would have kept this drool up. Radical saw they were getting nowhere, and as customary with him he came right to the point. He walked up to Dad, and looking at the sheet iron and the welt across it and the crow-bar said, "What for gawdsake happened?"

By this time Final's younger brother and his pretty sister and the hired girl and his mother had poured down the stairs into the cellar. Mother was trying to make up her mind whether to be frightened or mad. She demanded to know what had fallen down and broke. You could see she was in doubt between some wireless bust-up or some home brew bust-up. Pretty sister

was frightened and expected to see blood and gurry scattered around. Young brother thought it great stuff and searched for some sign of the explosion. The hired girl was all of a tremble and eyed me with open suspicion. She had seen Dad and me with the bottles earlier in the evening. Radical had the brains to shut off the motor-generator at this point and as the thing dawned upon him he began to laugh. Dad explained to the assembled multitude that they were conducting some new wireless experiments and once in a while it made some noise. No one had been chewed up and the family would please go back upstairs. The experiments were over and they would all be stopping pretty soon now.

Final looked around vacantly after the crowd went, and no one seemed to want to fool with C.W. any more that night. Everybody's nerves were pretty well frazzled and so we went home. On the way home with Radical the latter chuckled to himself every minute or so and when I dropped him at his house he grinned and allowed as how a rattling good time was had by all, and that Final's Dad was some radio bird. I don't know when we will pick up the Colpitts matter again. I am going to lay off a while until my nerves get straightened out and my fingers get well. Somebody says to cut out the motor-generator idea and use the sixty cycle juice on the plates. But if it can't be made to drum and grunt less than what I have heard in the air coming from those hooligans with the five watt tubes, I shall stick to the motor-generator. But when it comes to coupling up an A.C. motor to a D.C. high voltage generator, I shall fix me up something that does not have to turn up to 7000 r.p.m. and make a noise like a drunken pneumatic hammer badly out of repair. But by Heck it will not be until I have taken a week to rest up my nerves.

The Ideal Relay Spark Station

By R. C. Denny, 6CS

In two parts: Part I.

This is the Second Prize article in QST's contest for practical material on spark sets. As we stated in our mention of the subject in April QST, we cannot fully subscribe to some of Mr. Denny's views, and attention is asked to the notes at the end of the article. We frankly admit that many of these questions are matters of opinion and we do not wish to disparage Mr. Denny's article, which is excellent and in the constructional data it contains in particular will be welcome information to many of our readers.—Editor.

The Mast

It is generally conceded that the high vertical aerial is the most successful for transmitting the greatest distance with a given amount of power. Then, since the ideal relay transmitter should cover the

greatest possible distance with the rather limited power of 1KW, a vertical aerial system should be the choice for such a station. Inasmuch as the natural wavelength required in an aerial for 200 meter transmission should be 160 meters, or an

electrically equivalent actual length of 100 feet, a mast or tower of that height would be required for a truly vertical aerial. The construction of a single mast or tower and vertical aerial of the same height would be impractical, as it would be difficult to insulate the aerial from the mast and from the guys. To build two or three masts to get sufficient clearance for a vertical aerial of the same height would prove costly, and require considerable space. However, by sacrificing say 25% of vertical height (and it is doubtful if this would

reduce the transmitting range appreciably) it is perfectly feasible to suspend a 100 foot aerial from a 75 foot mast or tower, and get plenty of clearance. A minimum of space is required for erecting and guying a mast or tower of this sort, and that is the principal restriction at most locations.

The following description of a triangular section, latticed tower is taken from an actual amateur installation, shown in the accompanying photograph entitled "95 Foot Amateur Aerial". In this particular case the tower sits on the roof of a building 20 feet high, but this fact does not alter or in anyway affect the design. It will be seen from the accompanying triangular section drawings that the tower is 50 feet high, and that it rests on a square structure 20 feet high. The triangular tower is built entirely of 1" x 2" material, which may be clear soft pine or spruce. It is made in three sections which are bolted together as shown. (Fig. 1.) The strut members should be fastened to the vertical members with round head wood screws, as they hold much better than nails and are not so likely to split the wood. The braces should be sawed to fit and screwed in place to the vertical members. The pole at the top is a 3" x 3" seven feet long, which projects from the top 5 feet. Through the top of this pole is fastened the eye bolt, which holds the single sheave galvanized iron pulley. The square tower is a 2" x 4" structure 20 feet high, braced as shown with 1" x 4" pieces. The legs are spaced 10 feet at the bottom and taper to 4 feet at the top. There is ample space within this square structure for the radio station if such be the desire of the builder.

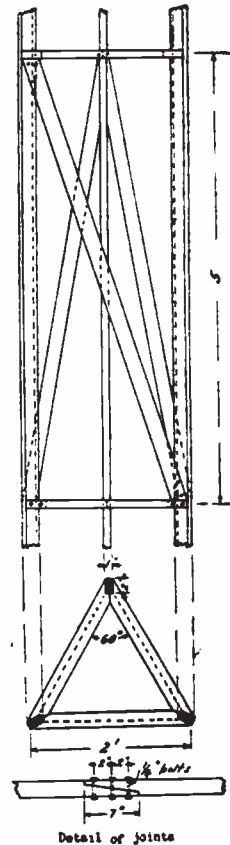


FIG. 1 (B)

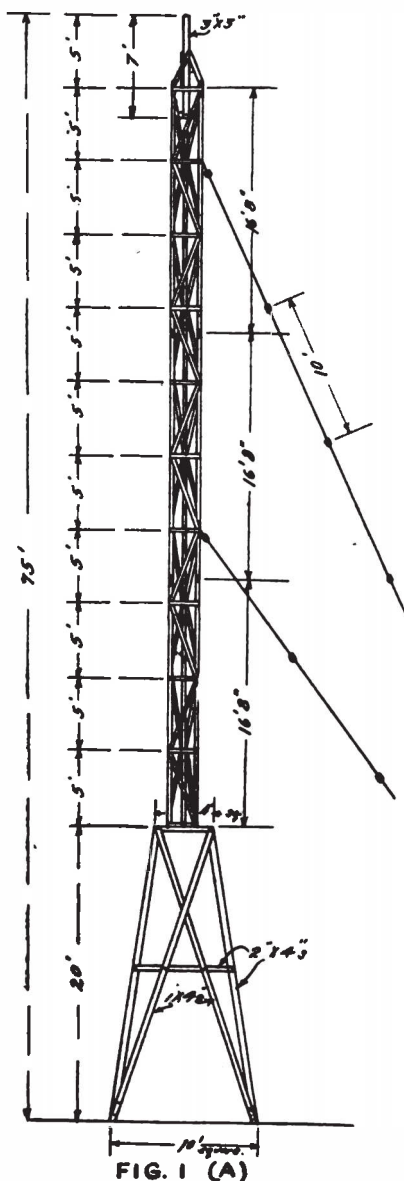
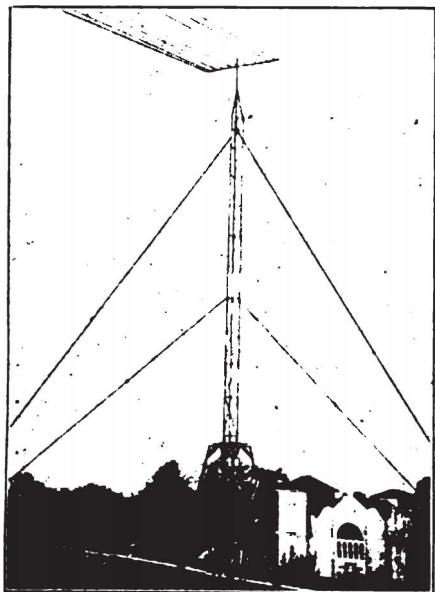


FIG. 1 (A)

There are two sets of guys, three wires each; i.e. guyed in three directions out 35 feet from the foot of the tower. It is not

absolutely necessary to guy out that far, but in general the farther out the better, depending somewhat upon the character of the anchors. They should be in the ground very firmly, as heavy winds exert a con-



95 Ft. Amateur Aerial

siderable pressure on such a tower. The guy wires are of No. 12 galvanized iron, and are insulated every ten feet by a heavy porcelain knob. The idea of this insulation is to break up the lengths so that they will not absorb energy from the aerial and set up oscillations at anywhere near the normal wave length. It is a good idea to paint the tower, and this should be done with the three sections apart, so that the joints get a coat also. Probably the easiest way to erect this tower is to stand the three sections on end inside the square structure, and having run a 150 ft. length of heavy sash cord through the pulley, boost a section up through the top. Fasten on the top set of guys and bolt to the second section; then boost again, and bolt on the third section. Fasten on the second set of guys and give the final boost, allowing the tower to rest on top of the square structure. The tower shown in the before mentioned photograph was erected in this manner, requiring three men to handle the guys, and four to boost and lift on the tower. The photograph entitled "75 Foot Commercial Aerial" illustrates another application of this same style of triangular section. tower of the same general dimensions, one of two supporting an inverted L aerial.

The Aerial

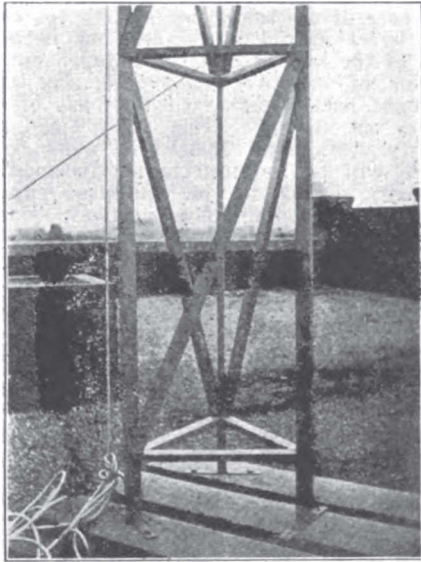
The arrangement of an aerial on such a tower as described depends somewhat upon the location of the operating room. If at the base of the tower, as is often the case, the wires should be fanned out between two of the sets of guys, and guyed out by means of marlin twine. They are then brought back together at the base of the tower as shown. (Fig. 2.) The more nearly vertical an aerial, the more wires there will be required to obtain a given capacity, owing to the decreased capacitance to ground in a vertical system. However, by using more wires than are ordinarily used in a flat horizontal aerial, and spreading them out over a great area, sufficient capacity may always be obtained. Stranded or braided copper wire may be used with very beneficial results; however, solid copper wire of the larger sizes, No. 12 or 14, is generally very satisfactory. All connections should of course be soldered, and it is very good practice to lay out each wire of sufficient length to reach the apparatus, so that the lead-in may be formed by simply twisting all the wires into a cable. A single wire might be brought in on the opposite side of the tower from the multiple aerial, and used for receiving. A single wire so nearly



75 Ft. Commercial Aerial

vertical would have very little capacity, and the tendency for static charges to collect would be nil. Very little if any induction should be noticed on an aerial such as described. Neither will such a

system interfere with telephone lines in the vicinity to any extent, when trans-



Detail construction of wooden triangular section tower.

mitting. A glazed porcelain tube or corrugated composition bushing of some sort should be used for the entrance of the lead-in. It is a wise precaution to provide a ground switch especially in localities where electrical storms are prevalent. This should be a single pole double throw knife switch, of 60 to 100 amperes capacity, mounted outside the operating room, and on some other material than slate, which absorb moisture. The switch should be of such dimensions that there is no leakage or brush discharge from the center stud to the ground clip while transmitting.

The Change-Over Switch

This may be either a single-pole double-throw or a double-pole double-throw switch; in either case it is generally provided with an extra blade to start the spark gap motor operating when thrown to the transmitting position. It should be a quick operating device, and conveniently located, preferably just back of or at one side of the sending key. This switch also should be of sufficient dimensions to prevent sparking or brushing across from aerial to ground connections, and should have large surfaces in the clips. A good simple design of such a switch is shown in the accompanying drawing, Fig. 4, which is self explanatory.

The Ground

The best ground connection that most amateurs have available is the water pipe. This is not a bad ground at all, if a clean tight contact of considerable area can be made close to where the pipe enters the ground. Ground clamps should be used for this purpose, making sure that the pipe is absolutely clean. A heavy copper wire or cable should be soldered to the clamp, and led by the shortest possible route to the apparatus. Precaution should be taken to ground gas pipes, by bonding them to the water pipes at several points, so that no difference of potential exists to cause sparking and possibility of fire in event of a gas leak. Very good grounds have been made by burying several lengths of galvanized chicken-wire fencing a few inches underground, and then keeping the ground wet down quite well. (Note 1.)

Transmitting Apparatus

It has probably been the experience of a great many amateur radio operators that the consistent operation of the transmitting set is a matter in which a great many factors are involved. Blinking the neighbors' lights results in the power company getting "ruffled up", and buzzing the neighborhood phones rouses the ire of the telephone company. Often one's own family objects to being kept awake by the spark, to say nothing of the neighbors' views on this breach of etiquette. Those difficulties obviated, troubles develop elsewhere. Condensers shoot out or the rotary motor gets a kick-back and burns a field open, or maybe the key gets all "het" up and sticks, or the contact points get loose. These troubles can pretty nearly always be remedied or obviated entirely by the proper choice and layout of apparatus, and the use of protective equipment.

The Transformer

If a man builds a transformer because it seems cheaper than to buy one, he is quite likely to skimp on materials to make it still cheaper. Very few amateurs are competent to design and build transformers. Usually due to poor design they draw excessive current, and frequently they have poor or insufficient insulation between the primary and secondary windings, leading

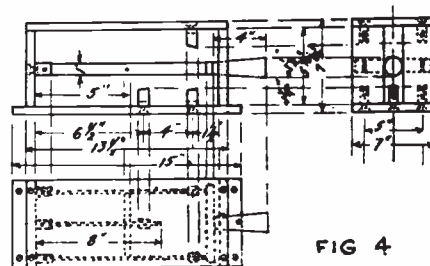


FIG 4

eventually to leakage and breakdown. Home made transformers very often cause the power and telephone companies considerable trouble, and incidentally the owner also.

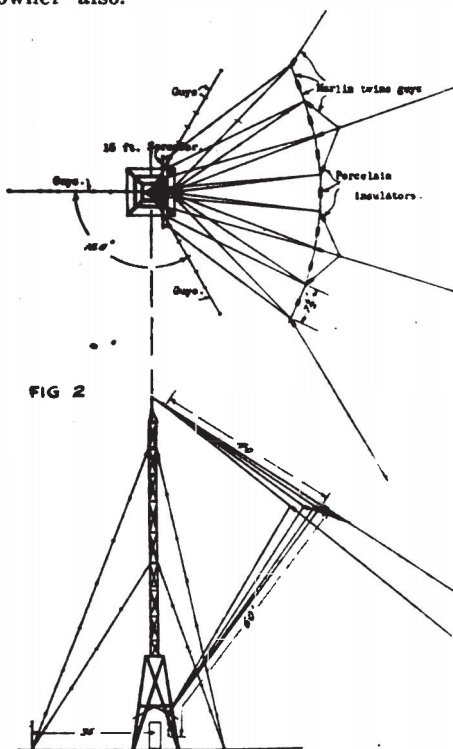


FIG 2

The better idea is to buy one of the reliable make of transformers on the market. It would be commendable of the manufacturers if they made these transformers with two-coil primaries, so that they could be used in multiple on 110 volts or in series on 220 volts. In the case of a 1KW installation, the power companies would very likely be more consentient to running in a third wire, and changing the meter for three wire 220/110 service, than to hang a separate transformer for a special 110 volt circuit, which would require a separate meter also. Naturally a given transformer working on 220 volts draws only half the current that it would on 110 volts; consequently the lights would be affected only slightly, and the duty on the sending key would not be nearly so severe.

A closed core transformer of the non-resonant type is undoubtedly the best, as this type of transformer will hold up their voltage under load, and consequently work very satisfactorily over quite a range of spark frequencies. The high voltages of 20000 and thereabout are not at all essential. They only inflict a punishment

on the best condenser, to say nothing of what they do to a poor condenser. Such voltage further necessitates exceptionally good insulation of the spark gap, and all conductors of the oscillatory circuits. They also result in abnormally high voltage on the aerial, causing it to brush and lose a great amount of energy. Secondary voltages of 5000 to 10000 have been found entirely satisfactory in the case of the non-resonant type of transformer. (Note 2.)

Protective Apparatus

In the leads from the transformer secondary to the condenser there should be reactance or choke coils, to prevent high frequency currents getting back into the transformer. Across the primary terminals of the transformer there should be connected two 1 MFD. telephone condensers in series, with the center or common connection grounded. In addition to this there should be spark gaps from each side of the circuit to ground. This protection is to bleed off to ground any high frequency current caused by induced potentials of high frequency in the transformer. Such protection has generally been found very effective.

The Condenser

This piece of apparatus is probably the most troublesome of all to contemplate. It is no doubt less understood by the average amateur than any other part of the apparatus. Dielectric strength of a material should not be confused with its insulating property. Many good insulating materials are poor dielectrics. The property of a material of being able to store an electro-static charge is probably by reason of its peculiar molecular make-up. The charge, no doubt, disarranges the molecules, which are held in a state of strain or tension, and the discharge is caused by the reaction, when they resume their original arrangement. A great many insulating materials simply do not have the proper physical make-up.

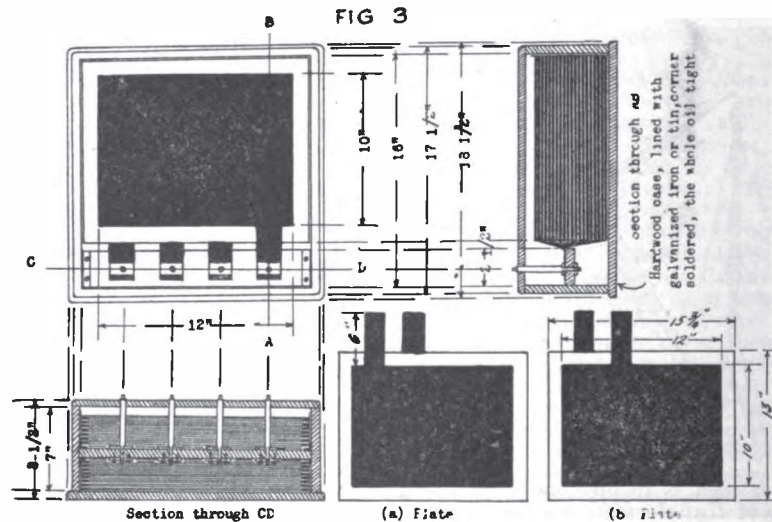
Of all dielectrics, glass and mica are the best. Good glass is easier to obtain than good mica, and is much cheaper. A condenser develops a certain amount of heat, the same as any power consuming device; therefore provision should be made for properly cooling it. For this reason, regardless of the dielectric material, the plates should not be stacked together in a solid pack, but rather separated appreciably to allow for the circulation of the cooling medium. This is not done in the moulded condenser, and is probably the reason why so many of those units fail.

The accompanying drawing (Fig. 3) gives data and dimensions of a very reliable glass plate condenser to work under oil. It is of sufficient capacity, about .01 MFD., for a 1 KW installation, and good

for voltages up to 20,000 or more. First a galvanized iron or tin tank should be made, to fit snugly into a stout wooden box, of inside dimensions 16" x 16" x 7". Twenty one pieces of clear double strength window glass, which is about $\frac{1}{8}$ " thick, should be selected and cut to size, 13" x 15 $\frac{1}{4}$ ". Cut also 40 strips 1" x 13" to serve as separators. The plates should be thoroughly cleaned and dried. Forty pieces of tinfoil should then be cut to size, 10" x 12". Cut also forty strips 1 $\frac{1}{4}$ " x 10", these to serve as leads to the terminals.

Give one plate at a time a coat of white shellac, and allow this to very nearly dry, when the strips should be placed as shown, one on each side, with the 6 inches projecting over the edge. Then immediately

the side opposite the terminal board. Then place two of the glass strips on this, along each end of the plate. Upon these strips place one of the (a) plates, bringing the leads up on top of the terminal block. Then place two more of the glass strips as before and add a (b) plate. Proceed thus alternating (a) and (b) plates, until ten plates are in position. The last plate will be a (b), with separating strips along the ends of it. Now reverse a (b) plate end for end and place it in position next to the other (b) plate. Now add an (a) plate reversed, and proceed thus, alternating (b) and (a) plates, reversed as mentioned, until the ten are in place. The terminals may now be screwed in place, clamping the leads together tightly against



apply a sheet of tinfoil to each side, placing them centrally on the plate, and brushing all air bubbles out along the edge as applied. Now apply a coat of shellac all over, excepting on the leads, and place in a warm oven till the shellac is thoroughly dry. Twenty plates should be thus prepared, being exceedingly careful not to tear any of the leads.

Attention is called to the fact that the leads are not placed the same on all plates, for the reason that when assembled, the adjacent metallic surfaces must be of the same potential. The oil is used merely as an insulating and cooling agent, and not as a dielectric. Ten plates are made up with leads as shown in (a) and ten as in (b), in Fig. 3. Before assembling the condenser, a terminal block should be made of wood and fastened firmly in the position shown, by soldering metal angles to the side of the tank. To assemble the condenser, place the extra glass plate directly on the bottom of the tank, against

the block. The terminals may be of $\frac{1}{4}$ " brass rod turned down on both ends and threaded 8/32, and insulated with a piece of rubber tubing slipped down over them. The metal plate under the terminal board should be threaded and fastened to the terminal board so that it will always be held in place properly, with no chance of working loose and falling into the tank.

The condenser should now be filled with oil, which should be done slowly, first tilting the terminal side up considerably to allow the air to issue out from between the plates as the oil rises, thus preventing any air being trapped between plates. The condenser should not be filled with oil until it is placed in its permanent resting place, as it is very heavy and awkward to handle after being filled. A cover should be provided, as well as binding posts for the terminals. It will be evident that on connecting the two adjacent terminals together and the others across the transformer, we are working the two sections in series, and

that as all adjacent metallic surfaces are of the same potential at a given instant, there will be no tendency for sparking across through the oil. Such a condenser as this has been in service for a number of years, and used in that time on several transformers, with entire satisfaction, having a very great safety factor. (Note 3.)

(Concluded next issue)

Comment

Note 1. We must say, as we did regarding Mr. Mathews' article, that we cannot agree with the author that he describes an ideal ground, and again we would recommend a "Round's round ground" or, failing that, a symmetrical

arrangement of buried radial wires or a radial counterpoise.

Note 2. We feel that the ideal transmitter should have the greatest possible range for 1 k.w. input, and of course the higher the voltage the more the power that can be stored in a given condenser. In our opinion, then, higher voltages than Mr. Denny recommends are desirable for average amateur operation.

Note 3. The 1/4" brass rod terminals shown in the design do not impress us as ideal. We think there should be more surface. It will be apparent that the design will permit the use of 1 1/4" ribbon for terminals, instead of the small rod, and this former we certainly recommend.

—Editor.

A Radiophone Employing A.C. and a Chemical Rectifier

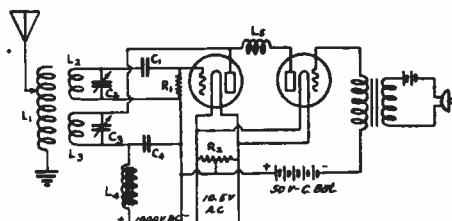
By H. E. Bussey, 4AI

THE owner of the apparatus to be described had for several years experimented with spark radio transmission but, realizing the many advantages of tube transmission and being in possession of a few 50 watt tubes, decided to try out this phase of radio.

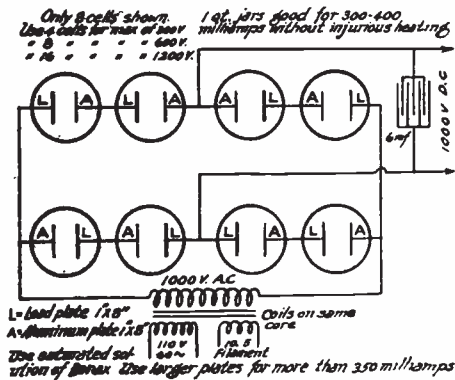
At the time experiments were started, little information of value could be obtained on circuits and circuit constants for best results, and a large amount of, what was to me, original work had to be done. This description is not offered as a model, or a theoretically correct solution of the problem, but sets forth the practical work done.

I had the tubes but no inductance or source of plate voltage. A generator was out of the question as a 1000 volt 100 watt generator was too expensive. I had a fair aerial and had done in excess of

1000 miles on 700 watts input with 60 cycle non-synchronous spark transmission. The aerial was poorly located and its capacity to surrounding objects too high and its dimensions not all that could be desired. It consisted of 4 wire flat top 63 feet long, about 35 feet high, its natural period



L₁ - 15 turns 1/8" Litz on 2 3/4" O.D. tube, 5 single-turn taps
 L₂ - L₃ - 20 turns 1/4" O.D. tube, no taps
 L₄ - 2 henry iron core choke
 L₅ - 400 turn honey comb coil
 C₁ - .002 M.F. cond. - C₂ - C₃ - .001 variables C₄ - .002 cond.
 All inductances in radio circuits closely coupled. Set L₁ for proper wave length then tune grid and plate circuit with C₂ + C₃.



Only 8 cells shown. Use 6 cells for max. of 100V. 100V jars good for 300-400 milliamps without injurious heating.
 L = lead plate 1 1/2" A = aluminum plate 1 1/2" Coils on same core
 Use autotransf. set. 110V 50W Filament
 Use autotransf. set. Use larger plates for more than 350 milliamps

being 162 meters. A counterpoise ground was used consisting of wire netting of an area about twice as great as the aerial flat-top. The counterpoise was used because the ground resistance in this section is unusually high, the city water pipes giving a resistance of 125 ohms at 110 volts 60 cycle A.C. by three-ground elimination method.

The first problem of plate supply was solved by the use of a 24-jar chemical rectifier. I foresaw plenty of trouble with this, but over a years' operation has not developed any. 110 volt 60 cycle power supply is used and, to smooth out, a condenser bank of 6 mfd. is used. The A.C.

hum is very slight, and while it can be heard when not speaking into transmitter, it does not in the least interfere with speech.

The rectifier is made up of 24 quart jars. The electrodes are of lead and aluminum, each electrode 1" wide by 8" long, supported 1" apart. The electrolyte is a saturated solution of borax.

Filaments are lighted by A.C. from a winding on same core as used to step up 110 volts to 1000 for the rectifier.

Many circuits were tried and the choice narrowed down to the one indicated as

being the best under my conditions.

With one 50 watt tube, the antenna current is 3.3 amperes, and CW telegraphy has been reported at 700 miles—readable 6 feet from phones—with 2 stages. Phone and buzzer-modulated have been heard QSA at 350 miles, but modulation is not as large a percentage as it will be later with an improved modulation scheme.

The accompanying sketches illustrate rectifier arrangement, also oscillation and modulation circuits, and with their legends will convey the necessary details of construction.

The Radio Work of the Dept. of Commerce

By J. H. Dellinger, Ph. D.

Chief of Radio Laboratory, Bureau of Standards.

All of us should be informed on the activities of those departments of our government charged with the development and administration of civilian radio. In this article, written especially for QST, Dr. Dellinger tells in interesting fashion of the work of the Inspection Service and the Bureau of Standards. The Editor particularly asks the attention of A.R.R.L. members to the extent to which these branches of our government are shown to be handicapped by lack of funds, and after reading this article you are requested to read the Editorial in this issue entitled "Friends of Ours."
—Editor.

SINCE 1911, when regulation of radio communication was begun by the Department of Commerce, radio has undergone a wonderful development.

The apparatus used has been changed, the methods have been greatly improved, and radio methods have become indispensable in marine and aerial navigation, in commerce, transportation, and the dissemination of information. The Atlantic has been spanned by the human voice, not only in a high power demonstration specially prepared by the joint efforts of the most powerful naval and commercial communication organizations of the world, but such a feat has also been reported in the ordinary working of the private amateur.

The technical progress and increasing scope of radio has required increasing activity in the Department of Commerce. Indeed the resources of the Department are at present inadequate to do justice to the work which it is called upon to perform. The two Bureaus principally concerned are the Bureau of Navigation and the Bureau of Standards. Because radio, in its beginning, was principally used to insure safety of vessels at sea, the administration of the radio laws was placed under the Bureau of Navigation, which supervises safety and other matters pertaining to ships.

The Bureau of Navigation inspects ship radio installations, issues station and operator licenses, and enforces the provisions of the radio laws, international conventions, and Department regulations. The Bureau of Standards is the technical

branch of the Department in radio, and assists the Bureau of Navigation in its inspection and other work with technical information, instruments and methods for measurements, and conducts special investigations on problems that arise in the course of law enforcement.

Most of the radio and other work of the Bureau of Standards is directly for the public. A considerable part of the work of the radio laboratory is of interest to the amateur. Broadly, the work includes radio research, engineering, standardization of apparatus, a certain incidental amount of operating, and the preparation of technical information.

The radio laboratory is housed in a two-story laboratory building, adjacent to the electrical building of the Bureau. This building is devoted exclusively to radio work. The Bureau laboratory occupies the upper floor, the lower floor being the location of research laboratories of the Navy Department and the Signal Corps.

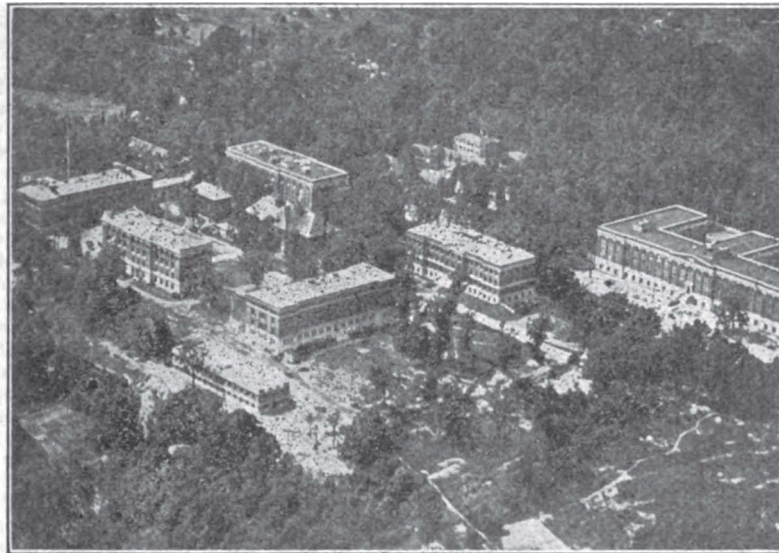
Standards are established and improvements made in the accuracy of standardization of frequency (wave length), capacity, inductance, and resistance, all at radio frequencies. The radio laboratory assists in the standardization of definitions for radio terms, symbols for radio instruments and apparatus, and endeavors to keep an up-to-date file of standard definitions, abbreviations, etc. A comprehensive reference list (now containing about 10,000 references) is maintained and kept up to date by the examination of current periodical and other radio literature. A detailed

radio subject classification has been devised and is used in the filing of references and other information. In these ways and by reports, publications, etc., the laboratory serves as a clearing-house for radio information.

The Bureau's research work is largely on fundamental principles and methods of measurement in such fields as radio waves, antennas, electron tubes and amplifiers, high-frequency telephony, radio instruments, and properties of materials. The work on antennas includes studies of coil antennas, condenser antennas, and other types, to determine the basis of correct design of an antenna for any particular purpose. One object of such work is to secure enough data about antennas so that

proved wire telephony, has been one of the principal objects of research in the Bureau radio laboratory. The work on this includes the measurement of properties of various types of tubes and the relation of these properties to performance as generators, detectors, and amplifiers of alternating currents. Special methods of measurement are developed for this work, and standard tubes prepared. Among the principal applications of electron tubes are radio telephony and high-frequency wire telephony. The various circuits and methods are studied, including novel methods.

The Bureau co-operates in radio research and does radio engineering work for a considerable number of other



AIRPLANE VIEW OF THE BUREAU OF STANDARDS

it will be possible to predetermine received current when transmitting current and distance are known. This is closely related with the research work on radio waves.

A good example of research on radio wave phenomena is the study of fading, made jointly by the American Radio Relay League and the Bureau. The nature of the subject studied made large-scale tests of this kind very much more valuable than any work which the Bureau could do unaided. The data secured are most valuable, and supplement satisfactorily theoretical studies made by the Bureau. The understanding of fading and also of strays and other radio transmission phenomena is materially advanced as a result of these tests.

The electron tube, which has revolutionized radio communication and greatly im-

proved wire telephony, has been one of the principal objects of research in the Bureau radio laboratory. The work on this includes the measurement of properties of various types of tubes and the relation of these properties to performance as generators, detectors, and amplifiers of alternating currents. Special methods of measurement are developed for this work, and standard tubes prepared. Among the principal applications of electron tubes are radio telephony and high-frequency wire telephony. The various circuits and methods are studied, including novel methods.

The Bureau co-operates in radio research and does radio engineering work for a considerable number of other

our coasts when the Bureau of Lighthouses secures funds for the purpose.

The work of the Bureau of Navigation is carried on mainly through the radio inspectors, there being one in each radio district with assistant inspectors in some districts. The offices of the inspectors are at Boston, New York, Baltimore, New Orleans, San Francisco, Seattle, Detroit, and Chicago. One of their first duties is the inspection of radio apparatus on ships. During the last fiscal year they made 5400 inspections of ship radio apparatus, resulting in the discovery of over 800 defects in apparatus. In many cases they assisted and instructed operators in the proper care and use of the radio equipment.

The inspectors' duties are by no means limited to ship inspections. They examine prospective operators and issue licenses. In the year preceding July 1, 1920, about 5000 commercial operators' licenses were issued, three times as many as during any previous year. This was not the total number of applicants examined; over 3000 applicants failed to pass the examinations, showing that a high standard of skill was maintained in the granting of licenses. During the same period over 6000 amateur first and second grade licenses were issued. This kind of work continues to increase; thus over 1000 amateur licenses were issued in February, 1921, and still more in March. The examination and licensing of stations also keeps pace with the increasing task of licensing operators.

The radio laws require the Department of Commerce to enforce all laws, regulations, and international conventions ratified by the U. S. relating to radio. Outside of the licensing and ship inspection work mentioned, the Department has been able to do relatively little with the small force at its disposal. There are many provisions of the laws, notably the requirements as to wave length and decrement, which the Department should be able to enforce more actively. To be sure, the Department has received excellent co-operation from the radio fraternity generally, but the radio inspection force should be adequate to assist people to comply with the law and cope with such offenders as do exist.

As far as the amateurs are concerned, particularly whole-hearted co-operation has been the rule. The amateurs seem to appreciate that the Department has always had their interests in mind. They have even come forward with plans for policing themselves. Such a plan has had particular success in the Chicago area, and it may well be extended widely.

The necessary provisions to insure adequate administration of the radio laws include increases in the number and in the qualifications of inspectors and in the

equipment at their disposal. In one district one inspector, single handed, has jurisdiction over one quarter of the United States; he has more than he can do to keep up with the routine of licensing and certainly can not undertake inspection of existing stations. Not only must more inspectors be provided but the Department must be able to hold good men when they are obtained. The low salary paid the inspectors is notorious among radio men and most of the experienced inspectors have naturally left the service.

The inspectors must have a certain amount of modern equipment if they are even to attempt to enforce the laws. Each inspector should have a well designed direction finder and receiving outfit to assist in locating offenders. To make the examination of operators more practical, and for other purposes, the inspector should have a radio transmitting set. For the inspection work now being done, it is imperative that the inspectors' measuring instruments be extended to cover the long wave lengths and very small decrements now used.

In the technical laboratory work done at the Bureau of Standards as well as in the field and inspection work done by the Bureau of Navigation, the Department needs increased support for its radio work. The work of the radio laboratory has been in part carried on by allotments of funds from other departments. Such allotments cannot be continued because of reductions in the other departments' appropriations and the result is that the money available for carrying on the Bureau of Standards' radio work this year is half of what it was two years ago, and the sum appropriated for the next fiscal year is only a third. This is especially regrettable at a time when the Bureau is receiving more calls for service along radio lines than ever before, and when the use and importance of radio generally is so rapidly advancing.

The increased appropriation necessary to perform the radio inspection and licensing work more adequately has been requested by the chief of the Bureau of Navigation in his annual report. Additional funds have also been asked for the Bureau of Standards. The general necessity of economy, however, by which Congress is confronted may result in refusal of these requests. Unless the appropriations are adequate it is obvious that the Department's radio work can not be performed properly.

The progress in radio communication has rendered many provisions of the radio laws and of the 1912 London Radiotelegraphic Convention unsuitable to modern radio practice. The Department of Commerce is working actively with a

view to changes in the fundamental laws and agreements, both national and international, to accord with the latest developments. The Department had a representative in Paris last year, attending a preliminary international conference, which prepared a protocol or report that is already influencing practice in the choice of wave lengths, in the classification of modern types of radio systems, etc. The Department subsequently appointed a com-

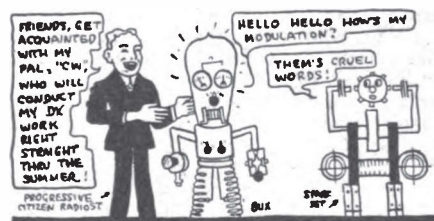
mittee representing American radio interests, which prepared valuable modifications of the protocol. Legislation is also being prepared which eliminates obsolete features in the present radio law and provides for keeping the radio administration up to date. In all of its work, the continued interest of the radio men of the country, including the amateurs, will be of the greatest assistance to the Department.

Coming---The Static-Puncturing Contest!

COME on, you fellows who have packed your sets away for the summer. Come on and get in line with the rest of the gang and take part in our big summer QRN puncturing contest. We are going to try to knock this old buzzard QRN into a cocked hat, and to do that successfully we need all the help we can get. We want every A.R.R.L. member and every other amateur who is interested in citizen wireless to get in on the fun. It will take quite a bit of hearty co-operation to put Old Man Static under the quilts, but by the Ever-Leaking Grid, we can and will do it! It makes no difference whether you operate a steen-step radio frequency amplifier or have a set consisting of a hunka coal with a safety pin for a holder and a bed spring for an aerial. Come on, everybody, and let's hit Old Man Static with a crash that will jar him loose from his nipperdrink.

The idea, in the main, is to settle once and for all the question whether or not C.W. will come thru when the spark falls down. You all remember the argument that makes every man wish he had never heard of spark gaps. Just you mention the high note vs. low note to some gap fanatic and then make your preparations for a hurried retreat if you don't care to hear what drove so many amateurs to sea, where the rotary spark gap is as free from mention as our straight C.W. is from decrement. The scheme, tentatively, is this: In each division of our organization we will have pairs of stations, consisting of the most powerful spark and C.W. transmitters in their respective classes, transmit a message for you to copy. At a specified time and on given wave lengths each station in turn will test for a few minutes so that you may tune your receivers to the respective waves of each transmitter. The preliminary test will take place on July 16th, and on July 19th the final messages will be broadcasted, a different message from each station transmitting. Now your part will be to copy every message from

every station, if you can. At any rate copy as much from each station as possible, which will be to your advantage. While you are copying, you must have at least two witnesses to your reception and their signatures must be affixed to your copy of each message. You may select your witnesses from the following list: mother, father, sister, brother, uncle, aunt, grandmother, grandfather, a blacksmith, clergyman, policeman, doctor, or lawyer. After the entire transmission is completed, determine in air-line miles the distance of each transmitter from your station. Then add



all the distances of the spark stations and C.W. stations together, which will give you a grand total of air-line miles. The man having the greatest number of miles to his credit wins the contest. The winner will be asked to furnish a photograph of himself and a description of the receiving equipment with which he won the contest. Other men with big scores will be given honorable mention in QST. Mail your records to A.R.R.L. Headquarters, 1045 Main Street, Hartford, Conn.

We are going to have two nights of real fun and you should not miss it. Watch July QST for the whole story and how you can join the gang in this contest of good receivers. We will find out who is the best receiver thru Old Man QRN. This will be the first time that we have attempted anything like it right when Old Man Static is at his peak, and we are going to "get" that peak.

Results of Washington's Birthday Relay

By W. H. Kirwan, *Contest Manager*

ON the night of Feb. 21st the biggest free-for-all relay was run thruout the United States and Canada. An actual count of the answers received showed that over 7240 amateurs sent in reports. The message was one from Mr. Harding, now President Harding. It consisted of 30 words and 14 of them came thru from the Atlantic Coast in great shape, 14 from the Pacific Coast in better shape, and the other two words were easily copied from the middle west.

Complete correct message: "May the spirit of Washington be our guide in all our national aspirations and may the current year mark the return of tranquility, stability, confidence and progress thruout entire world."

Fourteen of these words, representing the first, third, fifth, etc., were sent from the Atlantic Coast; fourteen representing the second, fourth sixth, etc., came from the Pacific Coast, and the remaining two from the Mississippi Valley. Some perfectly wonderful receiving was done and some real records made and as a whole it was a very creditable performance of the real amateur body. If this magazine were large enough it would publish names of all those who participated, but we don't believe that it would be interesting. As far as getting the message across the country was concerned, no trouble was experienced; but the fact remains that without, say, about six stations, the relay would have been a failure, particularly in the east where there was the most noticeable QRM, QRN, QSS. These stations are NSF, 8XK, 9ZN, 9LR, 5YH, and a few others. Nearly all the reports show that sigs. were hard to read and the boys waited until either one or the other of these stations sent in order to check up the msg. A slip-up occurred somewhere between 9LR and 8XK of one word only and even NSF, who could not do otherwise, sent the word as they received it. This caused a lot of stations to get one word incorrectly and naturally marked for the error, as there was no other way to do it.

Incidents of the Relay

Hertz of Washington State, who was to send the relay east, got into trouble at the last minute, but we had him covered by 7YS, St. Martin's College, Lacey, Wash., who sert in his stead. Bessey of Sunnyvale, Calif., who was to start the MSG. east from Calif., went fishing and forgot it, but was located thru our frantic efforts

and put the southbound MSG. thru in great shape.

Personally I want to thank each and every one that helped in this relay for their most wonderful assistance and cooperation. I do not believe that there is in this world a body of men or boys that works closer together for the common cause, than our amateur radio workers.

H. P. Maxim's station in Hartford, Conn., started the west-bound MSG. and was considerably handicapped by local QRM but his sigs were clearly read in the middle west as the report shows.

No attempt was made by the writer to notify anybody to keep real quiet as the conditions were wanted real bad so that only the real hard workers would get the msg. and those without the real experience would have lots of trouble. This was just as it turned out, as some seem to think that all you have to do now is to stick a piece of wire in the air and tie a phone to it and listen in. This relay started some few thinking, you may be sure, and took some of the swelling out of others who can receive real well under good conditions. The reason that the relay results were not printed sooner, boys, is on account of the magazines wanting the story about two months before you get your magazine and after crawling thru about two tons of letters and sorting them, reading, checking, tabulating, marking, etc., I found that two months were gone.

Results of Relay

Fourteen governors of as many states received this message from the amateurs, several of them being called out of bed to sign for it. A certain Catholic priest got the Governor of his state out of bed to sign for the message, and this governor, who lives in the south, thought it was a MSG. from the Night Riders. Our friend the priest told him, "No, it's the Night Radioers".

Two hundred and forty seven mayors of as many cities were disturbed at all hours to sign for the MSG. and did so like real fellows.

One enterprising amateur had the nerve to give to the then president Wilson at Washington a copy of Mr. Harding's msg. Thought that this was carrying out orders in great shape. Twenty-two U. S. senators, 35 state senators, over 500 Chiefs of Police, Selectmen, City Councilmen, Sheriffs, Postmasters and News Editors, received the msg. This was a most wonderful showing and some of the reports sent in were really masterpieces. Some made errors in time of sending stations, call letters, etc., and

will have a whole year to improve their receiving in order to get the next national msg. correctly. Some amateurs worked in pairs, but the results were only put in the name of the one to whom the receipt was given. Everyone in the U. S. engaged in the wireless business was solicited for prizes and willingly gave to the limit allowed, which was one prize only from each one. All the sending stations that helped in the relay have been sent a complete report of it by the writer and can tell easily who received their sigs and just how far they went under the bad conditions prevalent. The tabulated reports on the relay were submitted to the Prize Committee:—Dr. A. N. Goldsmith Institute of Radio Engineers; Mr. E. H. Armstrong, of Yonkers, New York, whom you all know; and Mr. Hiram Percy Maxim, President of the American Radio Relay League of Hartford, Conn. All three of them agreed on awarding the prizes on the basis of **SPEEDY AND CORRECT RECEPTION**, together with the marks for the perfect wireless report about the conditions. All of this figured down to miles per minute in receiving and delivering.

Very few of you will be able to comprehend the great amount of work in connection with this relay and I hope that the awards will meet with your approval and that you all will thank the many dealers who made the distribution of prizes possible. The first prize winners were consulted as to their pick of the prizes and the others awarded on the basis of their report marks and the relative value of the prizes. The prize winners are listed below without their addresses, which the writer has here, and to get your prize merely send a letter to W. H. Kirwan, Box 148, Davenport, Iowa, stating what prize you get and the writer will approve it and send it on to the donor of that prize. If anyone has any trouble getting their prize, merely drop another line and we will get you straightened out. All the possible advertising you can do with your prize please do, as it will show the real world who the co-operative dealer is that takes enough interest in the game to make the relays worth while. Do not judge the prizes by their value but from the fact that they are prizes.

As stated before the only lady in the United States who received the message correctly and made good time and turned in a good report was Miss Winnie Dow of Tacoma, Wash. I have not written to anyone yet about the prizes, as the magazine they read is the place to find out all about it. Lots of ladies sent in reports but a great many considered the report as a joke and their marks were likewise.

A certain man in the middle west sent in a report as a lady and used a lady's name, but a little wireless detecting soon found him out and we sent his report back to him to frame and show his children when he grew up, how he nearly won a prize—almost. The first prize is won by Leander L. Hoyt, of Hayward, Calif., whose report decided all the judges. Hoyt worked with Mr. S. D. Brown in his city and says that he also deserves credit. Mr. Hoyt also won in 1917 the Long Wave Chambers Coupler as fifth prize. Mr. Hoyt says nothing will satisfy his craving but the Clapp-Eastham ZRF Regenerative Receiver and when he complies with the request in the story we will see that he gets it and tells us all later how it works.

A Testimonial

R. E. BRIGHAM

Jeweler

Oneonta, New York

April 30th, 1921.

Mr. K. B. Warner, Sec.,
Hartford, Conn.

Dear Mr. Warner:

Cheek received in payment of the A.R.R.L. Certificate of Indebtedness which I held.

I wish to commend the management of QST which has made it possible to pay off the Bonds. I would have been satisfied if the money had not ever been paid back as the QST has grown so much better that I was sure the money was being well spent.

Yours very truly,

(Signed) R. E. BRIGHAM.

Prize Winners

- 1—Leander L. Hoyt, & friend, Hayward, Calif., Clapp Eastman ZRF Reg. Receiver.
- 2—Miss Winnie Dow, Tacoma, Wash., the Navy Type Tuner donated by Sears-Roebuck Co.
- 3—M. S. Andelin, Richfield, Utah—gets the Chicago Radio Lab. Zenith Regenerator.
- 4—N. Hood, Casper, Wyoming—gets the Grebe CR3A regenerative receiver.
- 5—D. I. Bailey, Clinton, Iowa—gets the Electric Specialty Co. ESCO Receiver.
- 6—H. Berringer, Burlingame, Calif., gets the 2-step Amplifier from Montgomery-Ward Co. This will help him to get even better signals from the east.
- 7—J. R. Hall, Washington, Penn.—gets the one-step Amplifier donated by the General Radio Co., Cambridge, Mass.
- 8—E. Statts, Sacramento, Cal.—1 Illinois watch—donated by the Illinois Watch Co., of Springfield, Ill.
- 9—V. McIlwaine, Auburn, Ala.—1 NSR-300 or 600 Rotary Gap—donated by Wireless Mfg. Co., Canton, Ohio.
- 10—R. McCommon, East Palestine, Ohio—1 Storage Battery—donated by Klaus Radio Co., Eureka, Ill.
- 11—Xenia Radio Club, Xenia, Ohio—1 \$50 Coupon for goods from catalog of the AMRAD, New York.
- 12—E. W. Wilson, Olympia, Wash.—1 Spider Web Inductance tuner—donated by E. Turney, Radio Hill, Holmes, N. Y.

- 13—D. A. Wheelow, Pierre, S. Dak.—1 Pair Lattice Variometers—donated by A. Hallbauer, Chicago, Ill.
- 14—G. Robinson, Richmond Va.—1 Antenna Switch—donated by Atlantic Radio Co., Boston, Mass.
- 15—J. E. Cain, Nashville, Tenn.—1 20,000 Meter Tuner—donated by TRESKO, Davenport, Ia.
- 16—S. Ruth, Lacey, Wash.—1 pair 50,000 ohm phones—donated by C. Brandes, Inc., New York.
- 17—Lowell Radio Club, Lowell, Mass.—1 CW 20B. Enclosed Gap—donated by Karlowa Radio Corporation, Rock Island, Ill.
- 18—J. Bickel, Whittier, Cal.—1 No. 14A Rotary Gap—donated by The Wilcox Laboratories, Lansing, Mich.
- 19—W. Arnold, Southbridge, Mass.—1 Pair Phones—donated by John Firth, Inc., New York.
- 20—W. Shoop, Vandergrift, Penna.—1 Pair of Brownlie Phones—donated by John Firth & Co., New York.
- 21—R. Parker, Augusta, Maine—1 Pair No. 55 Phones—donated by W. J. Murdock Co., Chelsea, Mass.
- 22—E. Thatcher, Oberlin, Ohio—1 Acme 200 Watt. C.W. Transformer—donated by Acme Apparatus Co., Cambridge, Mass.
- 23—J. Coleman, Pittsburgh, Pa.—1 New Type Microphone for Radiophone—donated by Federal Tel. & Tel. Co., Buffalo, N. Y.
- 24—R. Willison, Portland, Ore.—1 No. 8 condenser with dial—donated by Chelsea Radio Co., Chelsea, Mass.
- 25—S. Ayer, Waterville, Maine—1 Radisco Coupler—donated by Radio Distributing Co., Newark, N. J.
- 26—B. Benning, Atlanta, Ga.—One quarter KVA Transformer—donated by Thordarson Elec. Mfg. Co., Chicago, Ill.
- 27—A. Kisner, Fairmount, West, Va.—1 Oscillation Transformer with clips—donated by Shotton Radio Mfg. Co., Scranton, Pa.
- 28—A. Selby, Boise, Idaho—1 R37 Tuner Set—donated by Signal Elec. Mfg. Co., Menominee, Mich.
- 29—G. Barnes, Stanbridge East, Quebec, Canada—1 No. 181 Inductance—donated by the C. D. Tuska Co., Hartford, Conn.
- 30—Major H. Stethen, St. John's, Canada—1 Pair of Brownlie Phones.
- 31—Rev. Father Burns, Marshall, Texas—1 Pair of Brownlie Phones.
- 32—B. Phelps, Minneapolis, Minn.—1 O-5 Eldredge H.W. Meter—donated by J. Firth & Co.
- 33—J. Gjelhaug, Baudette, Minn.—1 O-5 Eldredge H.W. Meter—donated by J. Firth & Co.
- 34—F. Mahr, San Francisco, Calif.—1 O-1 Eldredge H.W. Meter—donated by J. Firth & Co.
- 35—J. Martin, Amarillo, Texas—1 O-1 Eldredge H.W. Meter—donated by J. Firth & Co.
- 36—Benzeer, Buffalo, N. Y.—1 O-3 Midget Advance Meter—donated by J. Firth & Co. N. Y.
- 37—J. Dewitt, Nashville, Tenn.—1 Pair Brownlie Phones—donated by J. Firth & Co.
- 38—A. Lorimer, Montreal, Can.—1 Set honey-comb coils—donated by Coto-Coil Co., Providence, R. I.
- 39—C. Jones, Northfield, Vt.—1 No. 21 Variable grid Leak—donated by Chelsea Radio Co., Chelsea, Mass.
- 40—F. Fallain, Flint, Mich.—1 No. 182 Inductance—donated by C. D. Tuska Co.
- 41—E. Brack, Midville, Ga.—1 No. 41 Bakelite dial—donated by Chelsea Radio Co., Chelsea, Mass.
- Two following get one Connecticut Variable Condenser—donated by Conn. Tel. and Elec. Co., Meriden, Conn.:
- 42—O. Bowers, Marietta, Ohio.
- 43—J. Miller, Hammond, Ind.
- Each of following get a UV-200 bulb donated by the Radio Corp. of America. These bulbs may be had by writing direct to QST, Hartford, Conn., and explaining your wish:
- 44—M. Powell, Warren, Arizona.
- 45—D. Culbert, Warren, Arizona.
- 46—L. Runey, Belmont, Mass.
- 47—R. Taggart, Pasadena, Calif.
- 48—F. Weyerhauser, Pasadena, Calif.
- 49—K. Lloyd, Erie, Penna.
- Each of following gets a UV-201 bulb donated by Radio Corp. of America by writing to QST., Hartford, Conn.:
- 50—T. Banks, Williamstown, Mass.
- 51—H. Brewer, Emeryville, Calif.
- 52—A. E. Bessey, Sunnyvale, Calif.
- 53—T. House, Dublin, Texas.
- 54—M. Apple, McKinney, Texas.
- 55—R. Stott, Douglas, Arizona.
- Following get a bulb from the Audiotron Mfg. Co., through E. T. Cunningham, San Francisco:
- 56—L. Peine, Houston, Texas, 1 C-301. The writer has these bulbs at Davenport, Ia.
- 57—G. Riddell, Sheboygan, Wis.
- The following get a yearly subscription to the "Pacific Radio News" of Frisco.:
- 58—C. Lundquist, Winfield, Iowa.
- 59—H. Dunn, Oxford, Ohio.
- 60—R. Brigham, Oneonta, N. Y.
- 61—J. Kolb, Louisville, Ky.
- 62—H. Sairs, Ambridge, Penna.
- 63—J. Copeland, Ashland, Ohio.
- 64—R. Winchester, Syracuse, N. Y.
- 65—P. Harmegnies, Rapid City, S. D.
- 66—L. Mathias, Antigo, Wis.
- 67—W. C. Bridges, Superior, Wis.
- The following get a one years' subscription to "Radio News", of New York:
- 68—F. Breene, Iowa City, Iowa.
- 69—E. Beardmon, Glasco, Kansas.
- 70—J. Inasahl, Pitt, Minn.
- 71—D. L. Caston, Gainesville, Ga.
- 72—M. Koupal, Eugene, Oregon.
- The following get a one years' subscription to "QST," of Hartford, Conn.:
- 73—A. Welch, Gardiner, Maine.
- 74—G. Turner, Independence, Mo.
- 75—M. Flynt, Madison, Maine.
- 76—F. Miller, Emporia, Kas.
- 77—W. Harris, Marshfield, Oregon.
- 78—E. Anderson, Marshfield, Ore.—2-year subscription to "Radio Topics" of Chicago.

Notes on Relay

Everybody interested in this relay claimed that it was real sport, instructive and very interesting, and gave the boys a chance to do some real long distance work at least once a year. It also brings to the attention of the public the wonderful strides made in citizen radio, thereby helping the game.

For a prize to repay the writer for all the hard work and money spent on this relay the Prize Committee were unanimous in stating that the prize would be given in RADIO HEAVEN, wherever that may be. Hope the static is not bad, at least.

Hundreds of amateurs thruout the U. S. and Canada have requested that Washington's Birthday be set aside as a National Relay for the amateurs and that all the amateurs would stand by for one big relay once each year. Have been appointed chief of these relays by at least 500 who probably mean well but don't know that the writer is getting old and each relay has added another handful of grey hair on the back and removed the same amount from the front of my head. Let's have some opinions, anyway, about this National Relay so that irrespective of color, creed, or previous servitude, all may join in once a year at least in a free-for-all contest.

Amateurs Wanted to Join Signal Reserve Corps

IT will be of interest to amateur radio operators throughout the United States to know that the War Department, thru the Chief Signal Officer of the Army, is now making arrangements for the training of amateur radio operators and devising plans for their service should the Nation need them in an emergency.

The proposed plans provide for the recognition of organizations of amateurs within each Army Corps Area. The headquarters of these various Army Corps Areas are as follows:

- Headquarters 1st Corps Area—
99 Chauncey St., Boston, Massachusetts
- Headquarters 2nd Corps Area—
39 Whitehall St., New York City
- Headquarters 3rd Corps Area—
Fort Howard, Md. (Near Baltimore)
- Headquarters 4th Corps Area—
Fort McPherson, Ga. (Near Atlanta)
- Headquarters 5th Corps Area—
Fort Benjamin Harrison, Indiana
(Near Indianapolis)
- Headquarters 6th Corps Area—
Fort Sheridan, Ill. (Near Chicago)
- Headquarters 7th Corps Area—
Fort Crook, Nebr. (Near Omaha)
- Headquarters 8th Corps Area—
Fort Sam Houston, San Antonio, Texas
- Headquarters 9th Corps Area—
Presidio, San Francisco, California

At each of the headquarters there is to be established a transmitting radio station with a range sufficiently great to cover the entire Corps Area, and also a receiving set.

Courses of instruction will be prepared and sent out by radio and by mail. Questions will be received and answered.

The amateur radio personnel will be formally inducted into the Signal Reserve Corps and called to active service where practicable for approximately two weeks' camp during the summer.

We believe this plan will produce results of far-reaching importance. Interested amateurs are requested to communicate at once with their proper Corps Area headquarters.

A Suggestion

THE following communication has been received at A.R.R.L. Headquarters and is published for comment:

Say Son, may I make a suggestion? I've been chewing it over for some months.

Some of us would like to listen to the Sixth and Seventh Districts once in a while. Maybe we can get across to them in one hop some night. It cannot be done now on account of the DX QRM. Most of the latter comes pouring out of the Second and Third Districts. What ails those ginks over East anyway? The way they roar and beller is something scandalous. Have they found a way to push more energy into a watt or what is it? But anyway, what I want to suggest is that we have some quiet hours. What's the harm of having some quiet once in a while? It wouldn't hurt anybody. If we who live in the eastern half of the country would all QRX for an hour or so twice a week and if those who live in the western half would do the same a couple of other nights there would be some new and interesting records established. Your Uncle thinks it would not be long before some of the wise ones would arrange schedules and you would soon see traffic going across from coast to coast in one hop.

What's the matter with making it Tuesday and Thursday nights in the eastern half of the country, say between eleven and one Central Time? And then make it Wednesday and Friday nights in the western half between eight and ten Pacific Time. Every Hooligan who broke the rule and did any transmitting during the quiet hours, to be taken out at sunrise and boiled in transformer oil until he is rendered pliable.

The Old Man.

What does the Gang say, fellows? Shall we have them or not? Is it worth the effort? Is the majority willing to stand by for the general good so that some records may be established? We want to hear from A.R.R.L. members on this, and if the decision is in favor of having listening hours our Operating Department will dope out a plan and launch it this summer so that it will be in full operation and a recognized thing by fall weather.

We Are Paying Our Bonds

THE A.R.R.L. Certificates of Indebtedness were called for payment as of May 1st. Not all of them have been turned in. Notice is hereby given to all parties holding such bonds to return them at once for payment. If not turned in within ninety days from their maturity the A.R.R.L. cannot accept responsibility for their payment, nor can payment be made in any case unless the original certificate is surrendered.

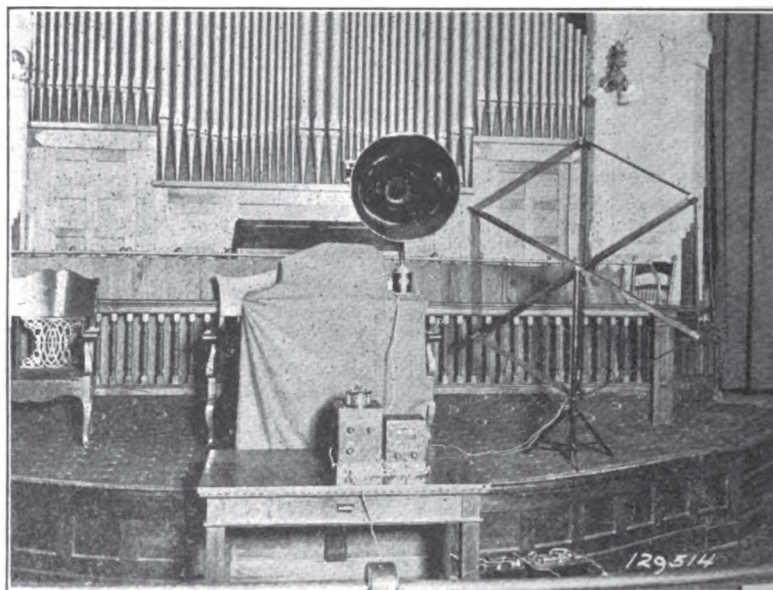
K. B. WARNER, *Secretary.*

The Invisible Minister

FOR the first time, as far as known, wireless telephony has been used to transmit services from one church to another in order that a congregation without a regular pastor could have the benefits of Sunday evening worship. The churches involved are the Calvary Episcopal and the Herron Avenue Presbyterian, both of Pittsburgh, Pennsylvania.

former throughout. Even during the offertory hymn, contributions were accepted. During the sermon of the Calvary rector, intense interest was maintained at the Herron Avenue church so clearly and distinctly was the message received.

It is hard to say just what demonstrations like this will lead to, but certainly it proves the great flexibility of wireless telephony. There may be in the future a central pastor who will talk to thousands



During a period of months the Sunday evening services of the Calvary Episcopal Church have been broadcasted from KDKA in East Pittsburgh, Pennsylvania. These services have been eagerly awaited by radio amateurs all over the United States.

The Herron Avenue congregation has been without the services of a regular pastor for some time, being forced by circumstances to use any substitute available. One or two of the congregation being wireless enthusiasts got in touch with the Westinghouse Company, requesting it to install a small receiving outfit in the church in order that the members could hear the Calvary services. This was done and a compact set consisting of a loop antenna, amplifier and condenser was placed upon the rostrum in front of the pulpit, as shown in our photograph. The loudspeaking horn rested directly on the pulpit.

An expectant throng filled the church and were not disappointed for the voices and music of the Calvary choir, rector and organ were received clearly and distinctly. In spite of the difference between Episcopal and Presbyterian services, the latter congregation followed the pastor in the

of congregations situated in all parts of the world, but this may take time. The idea is not far-fetched by any means, as the transmitting of the Calvary services proves.

Tubes Without Filaments

WONDERS never cease—in radio! A new and startling idea has been developed by two prominent radio engineers, Mr. C. G. Smith and Dr. V. Bush, of the Amrad research staff at Medford Hillside, Mass., in the shape of a new type of audion that will rectify, oscillate, amplify, and otherwise perform the work of modern three-electrode vacuum tubes, all without a filament. The tube was displayed and explained at a recent meeting of the Boston Section of the I. R. E. and we presume the paper delivered there will soon be available to the radio public in the Institute's Proceedings. As yet QST has only bare details of the "S-tube", as it is called, but we are asked to imagine a couple of metallic salt-shakers as used in any household, separated by a distance equal

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EDITORIALS

de AMERICAN RADIO RELAY LEAGUE



Friends of Ours

IF we are good Americans and love our radio we ought to rise up on our hind legs and do something about the Department of Commerce appropriations. It is something we have worried about for a long time. When we read Dr. Dellinger's fine article in this issue and realize that the Bureau of Standards and the Bureau of Navigation are among the most important bureaus of our Government, it rouses us to action. It is a shame that they should be limited so pitifully as to money that they are unable to properly carry out the duties imposed upon them by law. They are both good friends of ours and what hurts them hurts us. The conditions in the Radio Inspection service are notorious and have been so for a long time. With the money that has been doled out it has been absolutely impossible to carry out the inspection work either of ships or amateurs. This ought not to be and it spells trouble later on. The service will lose its splendid *esprit de corps*, and the first thing we know it will degenerate into something which will not be pleasant to have around. It seems hard to understand why Congress will go on wasting money on some branches of the Government and allow such fine things as the Radio Inspection Service and the Bureau of Standards to go hang. In one breath we hear about the grand things the Government is going to do and in the next we see the most vital bureaus cut down in their money allotments until there is not enough to pay for stenographers to write necessary letters let alone perform the duties specified in the law.

It is a public disgrace in the case of the Bureau of Standards. Here is the one truly efficient and disinterested place in America where a citizen can go for technical assistance. It is the one place also where business concerns may go for disinterested help in technical matters. And the appropriations have been so cut that they can no longer keep their organizations together. The word has gone forth to prune expenditures and instead of applying the knife to places using thirty and forty percent of the public funds the knife is taken to the Department of Commerce which uses only a very few percent. If the whole blooming Department were

thrown overboard it would not save an appreciable amount. The Government spends on silly partisan investigation as much as would run ten Inspection Services and Bureaus of Standards. It spends on printing and distributing hog-wash which no one even pretends to read all that would be needed to enable the Inspection Service and the Bureau of Standards to properly function to the benefit of millions of citizens. It spends upon tours of inspection of certain committees all the money needed to maintain ten times the *esprit de corps* of the Inspection Service and to maintain several of the organizations at the Bureau of Standards. It may be argued that we are a great nation and we can afford to enjoy ourselves with petty partisan investigations, and the printing and distribution of congressional hot air and the sending of committees on tours of inspection. Maybe we can, but it seems to us that if we afford these things then by the gods we can also afford to have a Radio Inspection Service and a Bureau of Standards. Our Board of Direction will be asked to take this matter up at its next meeting if we live.

The Aurora

IN middle May this little old globe of ours was the victim of a magnetic storm which for many hours and in some cases days completely tied up wire and cable communication and put a great big crimp in radio operation.

We hereby call upon A.R.R.L. members who made any careful observations during the disturbance to send in copies of their logs to Headquarters, as we would like to find out something about how this business affects our amateur radio. A lot of information has already come out. It seems there was another solar disturbance, a huge sun spot, which caused a violent magnetic storm on our earth and ionized our upper atmosphere with the resulting display of Northern Lights. The magnetic storm resulted in the establishment of earth currents which greatly disturbed the values of voltages being used on telegraph lines, in some cases the values of these potential differences between two points in the earth's crust being sufficient to reverse the current thru the lines. Con-

stantly shifting in value, it was impossible to correct the voltages on the lines to overcome the disturbances of the earth currents.

A totally different action of the sun spot seems to have been the cause of our radio troubles, for it is doubtful if the earth currents have much effect on our operation. The thing that has bothered us is the ionization of our upper atmosphere, resulting in the high absorption of our radiated energy, so that signals do not get thru. It has been very interesting to note that signals from stations within the daylight range were not affected in any way. This is a strong confirmation of the theory now rapidly spreading that radio transmission has to be considered in two classes: direct propagation over the surface of the earth, the limit of which transmission marks the reliable non-fading (and incidentally, daylight) range of the station; and transmission which depends upon the traveling of the radiated energy along the so-called Heaviside layer, a medium normally of very low absorption but subject to disturbance which may be either local, resulting in fading or poor reception in one or more directions, or general, as in the case of ionization evidenced by aurora display, where the absorption is so great as to prevent the signals getting thru. As a side point it is to be noted that in this theory there probably would be an intermediate zone just outside the daylight radius of a given station where conditions would not permit the reflection of signals, accounting for the difficulty of maintaining communication over distances that are too great to work in daytime but which should be ridiculously easy at night—a phenomenon with which every amateur is familiar. Incidentally, all the increase in range that we amateurs experience at night over our daylight range is due to the easy passage of our signals over or thru some medium of much less absorption than the earth's crust, and unfortunately it seems such transmission will always be subject to irregularities. We should bear in mind that absolutely dependable communication at night cannot be expected over distances materially exceeding the daylight range.

Getting back to the aurora, what did you observe and what effect did it have on signals? Did any real DX come thru? Did you hear any weird noises? Let's find out something about Miss Aurora.

The Legislative Situation

IT never rains but it pours. There are seven bills relating to radio in the present Congress! Two of these are minor and have no bearing on us amateurs. Another is Senator Poindexter's infamous S. 31, on which it is expected further hearings will be held. This is the autocratic

bill that was before the previous Congress under the number S.4038, and which would result in giving the Navy control over radio. To offset this bill Congressman White of Maine has introduced a bill, H.R.4132, now before the House Committee on Merchant Marine & Fisheries, which instead of forming a radio commission would empower the Secretary of Commerce to regulate radio, with an advisory committee to examine problems and report for his guidance. Another bill, H.R.5889, identical in important points but improved in many details, has since been introduced by Mr. White and referred to the same House committee; and both bills have been introduced in the Senate by Senator Kellogg, given numbers S.1627 and S.1628 respectively, and referred to the Committee on Interstate Commerce. It is our understanding that the second bill has the active approval of the Department of Commerce.

Our Legislative Committee and our secretary spent several days of this month in Washington investigating conditions. Mr. White is a friend of the amateur, and as chairman of the Merchant Marine's sub-committee on radio he has invited our A.R.R.L. to present its views on his bills and promised us every consideration. Hearings on his bills will be held soon. They are not half bad, but we do not feel that we can actively support either of them. They provide that the Secretary of Commerce shall classify stations and assign wave lengths, decrements, power, working hours, etc., for each class. No regulations are contained in the bills, as in our present law, the idea being rather to create a framework that will provide for the administration of radio regulations and let the actual regulations be subject to change as the art progresses so that it will not be necessary to frame new laws in years to come. With this principle we agree in the main, but because we amateurs are in such a peculiar condition we think that the law ought definitely to specify our domain. We think we can consistently ask this because our wave length band is at one end of the radio scale and if definitely specified in the law it would stabilize the use of wave lengths immediately adjacent to ours; furthermore, we amateurs are not like the vast commercial companies who have the means to constantly guard their interests: we do not believe our future would be safe unless it was written into the law so that no amount of political pressure, change in officials, etc., could result in the unceremonious change in our wave length or other drastic action which would make junk out of our millions of dollars' worth of equipment.

Therefore we are going to ask that any new legislation shall specifically state that

one of the classes of stations shall be citizen or amateur stations, and just what our wave length, decrement and power shall be. Every radio interest in the country admits the value of the amateur, and most of them are friendly towards us. We are sure they will see the reasonableness of our request that our future be written into the new law.

Our National Convention

HERE is news: from August 30th to September 3d, inclusive, the A.R.R.L. will hold its First National Convention at Chicago. There will be five Big Days as chock full of amateur radio as anyone can think of. Other amateur meetings have been heralded as the biggest thing that ever happened in amateur doings, and all of them were fine, but here is one that will outstrip them all, because it will be the first national convention of radio men ever held in this home of the ether-hound. We are telling you right now that you want by all means to get there, and come prepared to see the thing thru, for real amateur radio history is going to be made and you must be in on it. Never before has so pretentious an affair been attempted and if you miss it it will be the outstanding regret of your radio life. So take a tip from us, save up your money—make your vacation be at the Chicago convention!

Details of the program have not been completed but it is hard to imagine a schedule more enthralling to an amateur than is now in preparation. There will be business meetings at which we will discuss our co-operative problems of interference control, time division, traffic regulation, legislation, etc.; technical meetings to hear nationally-known authorities speak on spark and C.W. apparatus, both transmitting and receiving; educational lectures bearing on the fundamentals of electricity and radio; meetings to discuss club organization and activity; a meeting of the entire huge personnel of the A.R.R.L. Operating Department; a meeting of our Board of Direction; and the president of these United States and the secretaries of the departments of Commerce and Navy are to be invited to address us on our opening night. Not all of the convention will be brain food, tho, for automobile and motor bus tours, yacht and motor boat and hydro-aeroplane trips, swimming, tennis and golf, will all be available; a Liar's Contest will be held, with a big prize for the owl that can tell the worst yarn; a get-together absolutely without speeches or business will be held at one of Chicago's best cabarets; stunt parties; an indoor baseball game between the A.R.R.L. Board of Direction and the Chicago Executive Council; a whopping big banquet and dance on the

famous beach walk of the beautiful Edgewater Beach Hotel on the last night; and thruout the convention a radio exhibit, open to the general public, that it is expected will surpass anything ever held. Arrangements are being made for the accommodation of the ladies, these plans including shopping tours thru the various stores, automobile and lake trips, etc. Everyone knows that Chicago is a most delightful place at that time of the year, and a radio man's vacation could not be spent with so much fun and keen interest as he will get at the coming meeting.

So start planning and saving, O.M., for we're looking for about five thousand like you to show up, and we can assure you that it's going to be so good that you simply can't afford to miss it.

Summer Arrives

IT has been the custom for some time for warm weather to come upon us about this time of the year. Personally we can't see why the air doesn't stay crisp and clear and shy of strays all the year around, but somehow things just started going this way and now it seems too late to correct them. We're confidently expecting, therefore, that it's going to get hot and that the air is going to have quite a lot of static in it before long.

But let's not let a little thing like that bother our radio work. The A.R.R.L. proved conclusively last summer that there isn't any such word as "season" in the bright lexicon of the amateur, or the lexicon of the bright amateur, whichever it is. Static gets rotten at times, it's true, and the long DX of winter isn't always possible, but it isn't half bad. Every so often in the worst summer weather there are nights as clear as winter and DX is fine. The fellows that locked up their sets last summer won't do it again for they have been told what they missed—how things rocked along just as merrily as of old. Don't *you* make that mistake.

It's time to revive the Home-to-Lunch Club. All you have to do to be an H.T.L. is to sit in when you are home at noon and get in on the fun. There will be lots of fellows within your range and you will find QRN practically nil during daylight. Daylight work is a thing that needs our serious consideration right now, fellows. Our Operating Department is looking for stations to form daylight routes, because traffic is surely going thru this summer.

Do you ever get up early? Of course not, when you operate all night, but on these hot nights when static is bothersome, try getting up about daylight in the freshness of the early morn, and notice how Old Man QRN seems to belong only with the night

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The Operating Department

F. H. SCHNELL, Traffic Manager
1045 Main St., Hartford, Conn.



WOULDNT it be wonderful if Old Man Static (QRN) had lost his combination and could not tune his set to resonance this summer! Regardless of how we hate to have him and his twin brother QRM breaking up our lines of communication, he will be here just the same. Wonder if he will devise a new means of breaking up our CW operation? QRN has started his ruthlessness already and is almost back to summer normalcy. Can you imagine



QRM, who has been chopping away all winter, being greeted by his twin brother QRN who comes from under cover and looks fit as a fiddle, telling QRM to take care of the Northern stations while he (QRN) handles the Southern stations? Old Man QRN goes to work with such renewed effort that it seems as tho he did not need the assistance of QRM.

However, we have gone "over the top" with our traffic for the past month, our records showing a total of 10352 messages having been handled. 1921 is rewarding the fighters. Let us keep up the good work all thru the summer months.

For the second time in succession "Amateur Number One" leads the gang in messages handled and upholds the reputation of the New England Division, altho 2RK gave him a hot race, showing a total of 450 for the month.

MR. I. VERMILYA, 1HAA
Marion, Mass.
457 Messages
New England Division

Thru to Florida !!!!

The Division Manager and the Operating Department personnel of the East Gulf Division are to be congratulated for the successful opening of a route to Florida

over which traffic has moved during the month. The splendid spirit of co-operation combined with determination has made this possible under adverse atmospheric conditions.

Traffic has increased in the Roanoke Division thru the QRN, while the Delta Division stations are unable even to hear stations that can be communicated with under fair conditions.

Our Northern Route thru the Rocky Mountain Division is maintaining its right of way with all traffic and will continue to do so until the above mentioned "crepe hanger" (QRN) gets his set in resonance.

Your attention is invited to the report of the Atlantic Division. Every possible bit of information is contained therein and it ill becomes anyone to offer alibis for failure to move traffic into this division. A midwinter report in midsummer. F. B. Reports are missing from the following divisions: Central, Pacific, and St. Lawrence. Reports of the Division Managers follow:

CENTRAL DIVISION R. H. G. Mathews, Mgr.

No detailed report received.
Total messages 2102. Busiest station, 8ZL—183 messages.

NEW ENGLAND DIVISION G. R. Entwistle, Mgr.

C-W stations of all kinds are increasing in New England. Most of us are preparing to keep in this summer with C-W. It seems to be the only solution, or, at least, a partial solution to the QRN problem.

Let's award a prize to 1HAA's synchronous gap. It went a year without stopping (long) and it takes a pretty good piece of apparatus to do that. But at last it has succumbed. Its starting windings and one bearing went on strike a few days ago and now VN uses a straight gap. In spite of the disaster to the rotary, 1HAA handled 457 messages during the past month.

A.D.M. Robinson, (1CK), reports counterpoises all the rage, but that they only seem to work well in the hands of experienced CQers. 1CK handled a total of 167 messages during the past month.

1EAV hopes to shake the jinx and be

with us again soon. He has a new thirty wire aerial of his own design with a 60 foot spread. Maine is heard from occasionally, 1FV and 1KAY being the ones best heard. D.S. Johnson, (1DY), reports that his detectives found that the strange QRN in Lynn was the street-car company's electric rail welder and it has stopped now. Johnson also says that he is having good success getting traffic thru to 1HAA and New York before midnight lately. The CQers in Lynn must be decreasing. 1DY handled a total of 238 messages during the past month.

A.D.M. Mix, (1TS), reports noticeable decrease in activity probably due to increasing QRN and also the Bureau of Standards' fading tests. Also that work is progressing fine on the C-W. 1TS has a 100 watt set now and is working 1RD in Brookline every night. Traffic is also handled with 1XX in Providence. The following C-W stations are now in actual operation in this section and covering good distances: 1NAQ, 1MO, 1FQ, 1GAI and 1TS. 1BM handled 20 messages, 1HO 86, and 1TS 94.

A.D.M. Castner, (1UQ), reports the advancement of this section as most encouraging. A reliable route to Bangor is in operation from Portland: 1UQ, 1FV, 1KAY, to 1CAO, 1UL, 1PAT to 1MBS to 1LAX, 1DAQ to 1OT, 1GQ. The route from Portland to Bar Harbor is: 1UQ, 1FV, 1KAY to 1CAO, 1UL, 1PAT to 1MBS to 1LAX, 1DAQ to 1MBZ. Portland has succeeded in connecting with southern QSR via 1DAC. 1MBZ and 1VT are making tests in an effort to hook up Bar Harbor with Calais. Many of the stations in Maine are planning to renew activity after school closes. 1FB will be right on the job after July 1st and will be able to clear all traffic for Maine. Stations in Portland broadcast every night at 7:15 p.m. Any stations hearing same, please send card to A.D.M. Castner at 15 Temple St., Portland, Maine.

Total msg's. 1062. Busiest station 1HAA, 457 msg's.

ATLANTIC DIVISION

C. H. Stewart, Mgr.

The Division Manager has at last realized his ambition to present a fairly complete report from all sections, and one which he believes shows steady progress is being made in the right direction.

Mr. Clifford J. Goette (2JU), A.D.M. Northern Section, reports that there have been quite extensive changes made in his section, resulting in the creation of one new district to be known as the Capitol District with headquarters at Albany. New York State outside of New York City and Long Island is now split into three districts, and

the territory distributed in such a manner that each Superintendent is closely in touch with stations handling volume of traffic in each district. Each Superintendent has given the A.D.M. assurance that everything will be done to place the Northern Section on top where it rightfully belongs.

Numerous complaints have been received in reference to traffic between New York and Philadelphia not coming through in view of the fact that a day light route between these two cities exists. All stations in New York City, including Brooklyn, should clear through any of the following stations: 2FD, 2RB, 2ZD, 2RK and 2JU who will relay to 2ZL, 2EL, 2AJW, 2BGR, 2RL or 2FS. All of the latter stations are clear of the local QRM of New York City and work 3FB, Atlantic City, with ease. From 3FB the route is as follows:—3AS Ocean City, N. J., 3NB Vineland, N. J., and 3EH Collingswood, N. J., who has no trouble in clearing Philadelphia. If this route is utilized both ways we should have no further complaints. The Northern route via 3XM Princeton, N. J., which appears to be open is not being used to any extent, but efforts will be made to get our stations along this line in action again. 3EH Collingswood, N. J., as well as several other stations in the Philadelphia District are in daylight QSO range with Princeton, and inasmuch as the latter station is always in communication with New York, quicker service can be performed over this route than over the southern route, and some of the traffic should be diverted to this route to insure more prompt action.

The Hudson Valley route to Albany, Troy and cities to Buffalo will soon be in operation. So far New York City to Troy is open via the following stations: 2BK, 2DN, 2BB, 2DA, 2AR, 2BM, 2FG, 2XQ and 2SZ. The Superintendents of the Capitol and Western New York Districts are both working on a daylight Albany to Buffalo schedule. All stations in and around New York City should take advantage of this route, as in using same it will cut down delays and eliminate QRM.

The following gives in some detail the activities is each of the Districts under the jurisdiction of the Northern Section, as taken from the local reports of Superintendents.

WESTERN NEW YORK—Benzee Bros., Dist. Supt., 196 Keystone Street, Buffalo, N. Y. (District includes counties of Niagara, Orleans, Wayne, Cayuga, Oswego, Onondaga, Seneca, Ontario, Monroe, Livingston, Erie, Genesee, Wyoming, Yates, Cortland, Broome, Tioga, Chemung, Tompkins, Steuben, Schuyler, Alleghany, Cattaraugus, Chataqua and Jefferson.) The Supt. reports that Buffalo has recently called upon the amateur to help solve the

stolen automobile problem. Nightly bulletins pertaining to autos stolen are transmitted via radiophone from station 8PJ, Buffalo. The first bulletin broadcasted on April 4th brought about the recovery of machine the following day in Scranton, Pa. The Buffalo police are so pleased over results that they are planning to install a station of their own as in New York City.



Mr. R. W. Bissell, 8TY, has been appointed official station for Jamestown. During a visit to Jamestown, a hamfest was enjoyed with 8TY and 8AYM, who are wide awake and very much interested in our cause. The number of stations handling bulk of traffic during the past month are as follows: 8IL Lockport 138 messages, 8AMB Lancaster 42, 8AGK Niagara Falls 53, 8GI Rochester 128, 8AMM 51, 8AFA 17, 8AMZ Oakfield 200, 8AYM Jamestown 10, 8TY Jamestown 24 and 8HJ Elmira 10. The total number of messages handled by all official stations numbers 836. 8AMZ certainly has been clearing traffic in fine shape and his work is being greatly appreciated. 8ANJ has a working schedule with Canadian 3AB Toronto and traffic for Ontario Division points should be routed through Buffalo to 8ANJ.

CAPITOL DISTRICT (comprising counties of Lewis, St. Lawrence, Franklin, Clinton, Herkimer, Oneida, Hamilton, Essex, Warren, Fulton, Saratoga, Washington, Rensselaer, Schenectady, Montgomery, Madison, Chenango, Otsego, Schoharie, Albany and Delaware) Mr. F. H. Myers, Dist. Supt., 540 Providence St., Albany, N. Y. This is the newly created District and includes some of our best stations such as 2XQ, 2FG and 2SZ. Owing to the short time that this District has been organized nothing of much importance has yet been accomplished, but as soon as the New York City to Buffalo route gets into operation more will be heard from this District. All stations capable of doing good relay work and located in any of the above named counties are requested to send their names and addresses to Mr. Myers, so that he will be in a position to line them up.

HUDSON VALLEY DISTRICT (comprising the counties of Greene, Sullivan, Ulster, Columbia, Dutchess, Orange, Putnam, Rockland and Westchester) Mr. Carl E. Trube, Dist. Supt., 6 Livingston St., Yonkers, N. Y. This District has a num-

ber of excellent stations and is clearing a great deal of traffic. 2DN and 2BK both clear New York City and all traffic for cities along the New York to Buffalo route should be handed to them for relaying to 2BB, 2DA, 2BM and 2FG. These stations, in addition to 2OA, are a fine outlet for traffic destined to the New England States, and in the absence of a consistent route to New England points from New York City, messages should be routed via 2DN, 2BK or 2OA. Total number of messages handled by 2DA for past month was 177. Detailed reports from other stations are lacking. Mr. Trube has just recently taken hold of this District and it will take him a short while to get his stations lined up.

LONG ISLAND DISTRICT (All of Long Island east of Jamaica) Mr. Harry S. Collins, D.S., Babylon, L. I., N. Y. Although there is a comparatively small number of stations in this District each and every one of them are doing their share. Being far enough from the bulk of QRM from New York City, no difficulty is experienced in working distance. 2ZL Valley Stream has CW schedules with 1AE and 8th District stations and considerable traffic is cleared consistently. The same applies with 2BGR (spark) Bayshore, who maintains schedules with 1HO, 1BAB, 1BAZ, 1FW and 1BM. 2EL and 2AJW are also doing very good work. All of the above named stations are in communication with the Jersey resorts, and traffic for these points should be routed via them. 2AJW has recently installed a CW transmitter.

NEW YORK CITY DISTRICT (Manhattan and the Bronx) Dr. E. A. Cyriax, D.S., 219 East 71st St., New York City. The stations doing the bulk of the work in this District are 2DI, 2CT, 2IF and 2YM. In addition to these there are a number of others who are capable of doing distance work, but are handicapped by the terrible local interference. During the past month 2DI handled 94 messages.

BROOKLYN DISTRICT (All of Brooklyn and Long Island west of Jamaica), Mr. Frank A. Maher, Dist. Supt., 828 55th St., Brooklyn, N. Y. This District has quite a number of stations doing good work in face of the bad interference from local stations and ships entering the port of New York. 2RK cleared 450 messages working stations in all directions. Others that have been doing good work are 2OW, 2RM, 2BO, 2DR and 2WB.

SOUTHERN NEW JERSEY DISTRICT. Mr. Marcus Frye, Jr., D.S., Vine-land, N. J. Traffic conditions have been very good during the past month, a number of the smaller stations coming into the limelight. At the present time the entire district is covered with daylight route, which has been brought about only through

plugging on the part of Mr. Frye. The main stations handling traffic are as follows: 3BA 15 messages, 3AAN 23, 3EH 31, 3FB 43 and 3NB 184. The following are newly appointed official stations: 3EH, W. G. Phillips and H. Densahm, Collingswood, N. J.; 3LS, C. L. Rork, Penns Grove, N. J.; 3FB, Wm. Jordon, Atlantic City, N. J.

NORTHERN NEW JERSEY DISTRICT: Mr. Lester Spangenberg, 2ZM, has resigned as Dist. Supt. and Mr. Fredk. B. Ostman (2OM), 180 Broad St., Ridgewood, N. J., has been appointed in his place. Traffic in this district is being handled in very good shape. Business for Northern New York is now being temporarily diverted to other routes than through 8XU (Cornell Univ.) which station is experiencing induction trouble. The following stations are all handling distance in wonderful shape and clearing lots of traffic: 2TK, 2JJ, 2VA, 2AST, 2CL and 2JN. 2PE is now getting out with his CW, as well as 2ZM and 2AJF, who are also using CW.

Mr. Goette requests that station owners wishing to become official relay stations get in touch with their respective District Superintendents.

Mr. E. B. Duvall, Assistant Manager in charge of Southern Section, reports considerable progress during the month and a steady improvement in conditions.

WESTERN PENNSYLVANIA DISTRICT: Mr. R. C. Devinney, D.S., 1224 Boyle St., Pittsburgh, Pa. The stations in this District have again failed to make a report of messages handled, with the exception of 8ZD, who handled 165 messages. It is to be regretted that message reports are not received, as the failure to forward these reports prevents proper credit being received by this Division for messages handled. 8RU owned and operated by Allan McChesney and Charles Rankin, Pittsburgh, has been appointed as an official relay station. They have a fine station, and they will take care of the morning trick on Trunk Line B from 3 a.m. to 7 a.m. daily.

The following stations in this District have installed phone or CW for relay work: 8DV, 8ACF, 8JQ, 8FB, 8HA and 8WY. The station of the Traffic Assistant 8ZD is also being equipped with straight CW. 8DV and 8HA are doing the most consistent work, handling relay traffic regularly on their CW sets. 8FB has the best telephone set of the lot.

This District has again hooked up with the headquarters of the Central Penna. District at Milton through 8ZD and 8BQ. As fading signals from 8BQ almost always prevented us from working last season, we are quite elated to note that 8BQ comes through perfectly now.

The Doubleday-Hill Electric Co. of

Pittsburgh are installing a high powered CW and phone set to be used largely for the purpose of handling business with their Washington, D.C., store. This station will be in working order in the near future and may be depended upon to handle A.E.R.L. traffic. Our official relay station at Uniontown, Pa., radio 8MT, is again on the job. 8VQ at Freeport is out of commission for a few weeks. 8JQ has given up his excellent spark set and is now working on a CW set. To sum up would say that, while relay traffic can be expected to decrease with the coming of heavy static and warm weather, from the number of CW and phone sets going into commission among our official stations, it seems likely that there will be more on the job this summer than ever.

CENTRAL PENNSYLVANIA DISTRICT: Mr. Herbert M. Walleze, 234 Vine St., Milton, Pa., states that traffic has passed through Pennsylvania during the last month much better than at any time since the reopening. The fact that 8BQ is again on the job and working a regular schedule (10 p.m. to 1 a.m.) is helping the situation. Mr. Walleze and his Traffic Assistant Cawley have consolidated their efforts on one station each using his own call (8BQ and 8HR respectively). Since reopening this station on March 15 they have handled 38 messages and are reaching out fairly well, having exchanged traffic with 1HAA, 8NB, 3EN, 8AMM and 9UU, and have worked Scranton (8ABQ) about 90 miles in daylight. Daylight tests with 8XE were very successful, both stations QSA and no fading, but at night both weaken considerably and fade badly. Daylight tests with 3AIC, 3GX and 3LP, Reading, Pa., are so far unsuccessful due to excessive QRM and induction at Reading. 3AQR at Hershey, Pa., a short distance east of Harrisburg came to life and QSR'd. This, however, opened a long closed branch into Harrisburg. This station (3AQR) should be able to pass traffic on down to York, Pa., and possibly direct to Baltimore. The ball is rolling now and with stations slowly coming to light there is no reason why we should not come up to standard with this District within a short time. Our great need now is a duplicate for 8XE for this summer.

EASTERN PENNSYLVANIA DISTRICT: Mr. S. W. Place, D.S., 622 Stanbridge St., Norristown, Pa., reports the following official relay stations appointed during the month: 3AIC Reading High School for Boys (Practical Arts Dept.), Chief Operator Fred. G. DeLong, in reliable communication with 3FR Allentown, 3HJ Haverford, 3WX Lancaster and 3ACS Whitford, 3AVG Yeates School, Lancaster, Pa., Operator Fred. B. Westervelt.

Traffic Assistant 8ZQ, N. E. section,

reports that conditions in the Scranton district are very dull, and that the stations seem to take very little interest in handling traffic. He has, however, located and appointed a new station in Wilkes Barre, Pa., on Branch Line No. 1.

DISTRICT OF COLUMBIA, Mr. Francis M. Baer, D.S., 1744 Corcoran St., Washington, reports a great increase of activity in his District since his last report, and the following messages were handled: 3ALM 37; 3KM 13; 3ABI 9; 3XF 48. 3IW has also handled quite a volume of traffic, but no figures were received from him.

3KM is arranging a regular schedule with 1QR who will use CW. The CW set at WWV also has some good DX work to its credit.

Trouble is still experienced in clearing traffic to the south of Washington, principally on account of NAM's QRM with the Virginia stations and also due to static conditions. It is usually necessary to forward the southern traffic by mail. Local conditions in the city of Washington are still as good as can be expected in view of the numerous transmitting stations, and practically no friction is evident between the local and DX stations. This is almost entirely due to the influence of the Washington Radio Club.

EASTERN MARYLAND DISTRICT, Mr. E. B. Duvall, A.D.M., acting Dist. Supt., 3909 Cottage Ave., Baltimore, Md. reports that a change has been made in the traffic control station schedule for Baltimore, and although the schedule given in the last monthly report was not completely carried out as announced, the traffic control in the city was found to take care of itself to a certain degree. Until further notice the following stations will control and clear traffic through Baltimore:

3IB—Monday	3UC—Thursday
3AN—Tuesday	3HG—Friday
3GU—Wednesday	3EM—Saturday
3AC—Sunday	

Station 3AN is again in operation. 3IB, 3GU, 3AC and 3EM have been getting their signals out of late and are placed on the Control in order that their stations may have a chance to handle some of the traffic through the District.

3HG seems to have the lead on the DX stations in Baltimore, but no report as to the number of messages handled has been received; in fact none of the stations have furnished this information, and they are asked to co-operate with Mr. Duvall in the future and have this information in his hands before the 20th of each month. 3HG has a daylight schedule with 3ALN in Washington, and the two cities may be considered to be reliably bridged at present.

Mr. Duvall still holds the appointment open for District Superintendent for East-

ern Maryland, and wishes to make it known that he will consider anyone who can satisfy him that they can handle the work efficiently in the full interest of the League, and possesses and operates an efficient DX station and who is a member of the A.R.R.L.

Many CW stations have sprung up in Baltimore. The leaders as far as DX work is concerned are 3CT, Hogan, who has been in touch with Pittsburgh and Cleveland on several occasions, and 3EQ, Holloway, who has been temporarily out of commission due to a habit he has formed of burning out tubes. Among the promising CW stations which are working and improving their sets for future DX work are 3IB, 3UC, 3ER, 3EM, and a set is being installed at the local store of R. Selway Collmus Co. operated by Mr. Winters Jones, who will no doubt come up with some fine DX work.

WESTERN MARYLAND DISTRICT (Comprising the counties of Frederick, Washington, Allegany and Garrett), Mr. Roger W. Clipp, Dist. Supt., Hagerstown, Md., has made no report.

Total messages 2226. Busiest station 2RK—450 msgs.

ROANOKE DIVISION

W. T. Gravely, Mgr.

Reported by A. S. Clarke, Div. Traffic Mgr.

Excessive static has made good work next to impossible during the past month. Despite this the number of messages handled has shown quite a jump. There is an awakening of interest in radio throughout the division, many new stations being reported. No lagging of interest during the summer months is expected but rather more interest is being taken in developing day light communication.

District Supt. Wohlford of S.W. Virginia is making strenuous efforts to develop his section. Salem promises 3 good stations. Daylight communication one way with Salem has been established from Danville. The following appointments have been made, each man to assist Wohlford in his vicinity, Higgins at Oldtown to cover from Radford to Bristol; Gundry at Stonega for the Clinch Valley; and Fleenor at Bluefield for the territory lying between Bluefield and Williamson, W. Va.

City Manager White of Norfolk says that between NAM and busted condensers, relay men are having their troubles but msgs are going through. Both 3VV and 3FG, normally busy stations, have been out with busted condensers. 3EN takes second place for number of msgs. handled 53. XF-1 has done fine relay work handling 51 msgs.

Increasing interest in radio throughout W. Va. is evident. D.S. Heck, 8EF, reports

daylight lines open from Mannington to Washington and Uniontown, Pa., and Cambridge and Marietta, Ohio. Liller at Keyser, and Rector of Bellington, W. Va., are counted on for good work before long. 8SP continues to be the star in this division.

Reports have not been received from Blair at Richmond and Bunker at Charlotte. Blair at 3ZL is beginning to be heard. Daylight communication has been regularly established between 3BZ Danville and 4CK Winston-Salem.

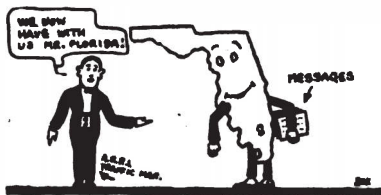
The following stations handled the majority of our messages: 8SP, 3EN, XF-1, 3GO, 8JE, 8EF, 3ACT, 3VV, 3ACE.

Total msg. 300. Busiest station 8SP—67 msg.

EAST GULF DIVISION

E. H. Merritt, Mgr.

We made a record this month, fellows!! Over 25 msg. to FLORIDA passed thru 4YA, all to 4FD and 4GN. The route is at last working successfully and often thru very heavy QRM and QRN. No report from Florida D.S. Gullidge, but 4DL, 4AM, 4BI and 4CS seem to do the work for the whole state. They need help too, so let's hear from other Florida stations.



4XC is now D.S. for Georgia and all Georgia men please report to him each month. He is B. W. Benning, 50 Whiteford Ave., Atlanta, Ga. Dr. Hodge, Savannah City Manager, reports that 4GL, Mr. F. A. Hill, recently of the Roanoke Division, is operating on CW and doing good work. 4BY and 4GL are taking all the traffic thru there now. 4FD, 4BK, 4AG and 4GN are all doing fine work now. 4DV (Columbus, Ga.), 4BW and 4DT are heard occasionally trying to break thru the din. In Atlanta many of the stations are trying CW and fone work.

The best report comes from Dist. Supt. McIlvaine of 5XA. Alabama is coming to life. He has appointed Mr. H. L. Crane, 5JO, City Mgr. of Birmingham. 5EQ, 5JO and 5BQ are trying to get out. In Montgomery, 5NL and several others are working hard, and in Mobile 5KB and 5JZ have opened up. A radio club has just been organized in Mobile and promises some good DX stations next fall. 5XA is now on 375 meters with spark and ICW. A club has been organized there to back up and boost 5XA and is called "I Tappa Key". Mr. McIlvaine would like to hear

from all stations in north Alabama at once.

QRN most of the time makes operation impossible now or at least very difficult but most of the stations are sticking to it and hammering thru. The D.M. earnestly requests that we keep the good work up and not close down for the summer as per usual. This QRN lets up occasionally, even in the summer months.

Total messages reported this month are 455 with only six stations reporting. Busiest station 4YA 125 msg. Let's hear from you all next month.

DELTA DIVISION

J. M. Clayton, Mgr.

Owing to the approach of summer weather and summer QRN relay work thruout the Division has been very spasmodic. The good relay nights have about ceased to be, and when traffic is received it is a case of clearing it the same night, or waiting two or three weeks for a good night.

The fact that relay work is so slack possibly accounts for the fact that NO reports have been received from the Delta Division personnel. Again let me emphasize the importance of getting in some kind of a report MONTHLY to the Division Manager, or the A.D.M., if we are to have any representation in QST at all. Especially is this important during the summer months, as we all are more or less away from the stations during the summer months and the A.D.M. is unable to keep up with the various stations unless he gets a report from them.

It is hoped that we can put over a little relay work thru the whole summer, if we can build up two or three good C.W. stations in the division. Spark relay work is about impossible except on occasional good nights. And while on that subject the Division Manager would like to cast a few remarks on relay conditions down here during the summer, as compared with conditions in the north. Last September the Division Manager had the pleasure of being out at 9ZN one night, and noted Matty's exclamations and profanity over the "terrible QRN" then raging in the north. Despite this "bad QRN" the 2's and 3's were coming thru to 9ZN in fine shape and even a five station or two. Possibly the night that I happened to be at 9ZN was a particularly good night but nevertheless relay work CAN'T BE done here from May to October except on very rare occasions. We can't even HEAR the stations in the south during that time, much less work with them.

5YH has closed down his spark station for the season but is talking of putting in a semi-high power CW station. 5JD is still plugging along every fair night and

clearing some traffic thru it all. 5ZAB (Pullen of Houma, La.—ex 5JE) hasn't been heard on the air for several weeks. 5EA hasn't been heard for a month or more. The surprise of the month was created when the Division Manager heard 5ZS the other night and gave him a msg. or two for Shreveport. Anthony came back with the news that he was at some fair or something. Guess Friend Willie was putting on an exhibition for the natives. 5ZK, Greenlaw, hasn't been heard on radio for some time either. DeBen, 5ZP, has been sick. We are expecting him on the air at any time. 5ZL has started up again, but this time the station is out at Camp Pike College at Camp Pike, Arkansas, where the D.M. is holding down a job as instructor in radio to men in Sam's Army. Incidentally Sam furnished the Grebe synchronous gap which is signing 5ZL now. The rest of the station except the oscillation transformer is 5ZL.

We hope to be able to run successful daylight tests thruout the division. Heretofore in past seasons these tests have been successful for maybe a week at a time and then it's absolutely impossible to get signals thru the QRN. Possibly this age of two steps and GOOD regeneratives will make some sort of relay work possible all the season around.

The Division Manager has had the pleasure of handling some traffic with Friend Merritt of the East Gulf Division. 4YA's signals certainly do come thru in fine shape over this way, and the D.M. is certainly pleased to have "connected" with the East Gulf Division Manager once during this season.

Again let me urge that you all get in some kind of a report each month to the Assistant D.M. If not at your stations let us know what you are doing and where you are. Also it is very important STILL that Greenlaw have a traffic report from you. Now that relay work has let up in this division ANY messages gotten thru will be of interest and we should get credit for any relay work done. Please let's have these reports.

Total messages, 180.

DAKOTA DIVISION Boyd Phelps, Mgr.

Due to the early coming of the static season the good radio weather has been shortened considerably but we are not hanging up the phones on the peg and quitting. On the contrary we are making every effort to keep traffic moving over the Northern Route in some kind of shape all summer. As no stations have appeared in the western or central part of North Dakota the jump from Ellendale to the 7th district will have to be made when static conditions permit.

Station owners are encouraged to listen in every night all summer at least half an hour per night as there are frequently nights when static is so slight that distances of several hundred miles may be covered and the few stations that happen to be on the job clear many messages with little QRM. Last summer it was found that daylight working was very satisfactory where stations were within daylight range of each other. Some stations report better working conditions at noon while others think sunrise or sunset to be the best. This perhaps varies in different localities. Stations should test with their neighboring stations in nearby towns to determine the best hours. The Division Manager would appreciate a detailed report from each station on this subject and a list of the nearby stations that can be heard and communicated with regularly.

All routes in the eastern part of North Dakota are working and traffic is handled in daylight from 9LW at Wahpeton up to 9YAF at Pembina thru 9AEJ and 9AGN, and from 9YAF to Winnipeg, Canada. 9ZC at Baudette, Minn., clears daily with 9YAF at 11:00 A.M. and with 9AGN. Good stations are needed between Aberdeen, S. D., and Sioux Falls to complete a perfect summer route from the Midwest Division to Canada. The summer route from North Dakota to the Twin Cities is complete except for the last 60 miles from St. Cloud. Working north from the Twin Cities was always very difficult and communication was never established with the best stations in St. Cloud but the Division Manager is building a station at his summer home 18 miles from Minneapolis which will be somewhat nearer St. Cloud and equipped with every anti-QRM device now known. Summer station appointments will be made on the various routes when it is seen that traffic can be handled. Stations are still scarce in the southern and northern part of Minnesota and in the central part of South Dakota. Stations of any size whatever in these parts should write to their District Superintendents whose addresses were given last month.

Mr. Bridges of NUX, A.D.S., wishes to announce that his station 9DBT (ex "BQ") now has the call 9YAC. 9HM went out of commission April 2nd.

9WU and 9EE have combined their stations and are now operating under a special license—9ZX. It is to the untiring efforts of these two men that we owe thanks for the successful maintenance of our Northern Route. We can be assured right now of a perfect route via the North with these two men on the job. (Tfc. Mgr.'s. note: Goddard and Leavenworth have the chance of being to the Northern route what 5ZA is to our Southern route, and every indication is that they will give 5ZA a hard tussle

for the honors. However, 9ZX will have a slight advantage in not having the QRN that 5ZA is used to, and in addition having two operators who are trying to prove that sleep is less desirable than moving traffic. More power to you, fellows.)

Individual station reports have been coming in better of late but there is still room for much improvement. Stations should get their reports to their District Superintendent by the 20th, especially their message totals so that we can prove we are handling summer traffic.

Total messages 332.

MID-WEST DIVISION

L. A. Benson, Mgr.

9JA, Dist. Supt. for Iowa, reports that even though QRM has been very bad and many dead nights, the traffic through the state has been heavy. Several additional stations have sent in their reports this month. Severe lightning and storms delayed somewhat, but with 9JN on again and 9AEQ coming in strong as ever, quite a bit of traffic was cleared through these stations and remarkable lot of west coast traffic is going through the state by way of 9JN and 9LW. 9MS and 9AWX are making DX records every night and 9YA has been heard several times on the west coast. 9CS is having no trouble in working the east coast regularly. 9DBS reports a route to Sioux city through 9ZU, as this station is opened again and has four operators. This station fills a link which has long been missing in the state of Iowa. Station 9MS works regularly at noon with 9CA, clearing traffic. 9YA has regular operators on every night working C.W., phone and spark. They have 1KW spark transmitter on 260 meters and 2KW on 425 meters.

9DU reports that traffic is moving over short jumps and in day time in his district due to QRN at night. 9AVK at Holden is doing good day-light work, working Columbia and Kansas City. It is sometimes impossible to work direct with 9YN but the best route so far is by way of 9AVK. Routes to the north, although still open, are not handling much traffic. Mr. Turner reports that C.W. is coming to the front in his district. 9KAB of Kansas City has a six tube set in operation. 9EL, Council Grove, Kansas, announces 9AEG Ira Graham, Eldorado, Kansas, has been appointed A.D.S. and 9OE of Wichita, Kansas, second A.D.S. These two men are working on day-light routes throughout Kansas to handle traffic during the summer months. 9EL is installing C.W.

Among some of the stations doing good work in Wichita are 9EUO, 9LAG and 9LV. 9PS and 9OE are the two most consistent stations at present. 9ZB has been

handling all traffic lately using C.W. Several messages were handled direct to New York through 2ZL on evenings when QRN was so bad that spark stations were inaudible, using two 5 watt tubes. 9ZB has been reported QSA at Hartford, Conn. All stations in the Mid-West division using C.W. outfits at present are requested to kindly communicate with the Division Manager so that C.W. routes throughout the division can be maintained. 9LC of St. Louis has been doing excellent work with his C.W.

Total messages handled, 2124. Busiest station 9OE, 267 messages.

WEST GULF DIVISION

Raymond L. White, Asst. Div. Mgr.

Northern Texas District

Eastern Territory: John Dorsa, A.D.S., no report; however, Greenville reports direct that station 5HV handled total of 137 messages which makes him star station of that Territory.

Central Territory: Guy Neel, A.D.S., reports a club started in Dublin and activities increasing. Star station 5XJ.

Western Territory: J. L. Martin, A.D.S., reports conditions favorable; 5IF of Amarillo is doing some splendid relay work.

H. P. Heafer, D.S. of the Northern Texas District, has had prepared a special map of which he sent a copy to the Divn. Mgr., A.D.M., and all A.D.S.'s., which is indeed very up-to-date and if used will be of great benefit to all concerned.

A very interesting report from D.S. Tilley, of the Southern Texas District advises that Austin stations are now confined to only one, that being 5ZU, as 5EJ had his ninety (90) foot tower blown over and has gone to Colorado for the summer. 5JA's antenna rope broke so the whole system has to come down to get the rope through the pulley again. 5BO had two 70 foot poles blown down and the station has been closed for the summer. The University of Texas has an appropriation of \$2,000 to equip their radio station; the antenna will consist of two 100 foot poles 200 feet apart with the latest Grebe receiving instruments installed, all of which are on the ground. A three (3) K.W., 240 cycle synchronous set is already installed and waiting for the antenna system to be finished. The station will be manned by seven licensed operators recruited from the ranks of the Austin amateurs, with District Superintendent W. H. Tilley as Chief Operator.

5XI at Kelly Field, San Antonio, has been heard from, but there still remains for a real DX station to open up in that important city. All the small towns around Austin are regularly heard from, but the

service is poor as most of the boys are beginners and cannot receive over 5 words per minute, with the wave length anywhere from 250 to 500 meters. (Note: Let's stop that 250 to 500 stuff; Wesley de White).

QRN is getting bad for summer work at night so the day-light routes are being lined up to keep the District on the map until O.M. Crimp puts in his appearance again.

Report from A.D.S. Daniels of the Houston Texas Territory, states that his office must of necessity report a very quiet district this month, unfavorable atmospheric conditions existing in that territory. Almost constant squalls and electrical disturbances have been prevailing since the last report was forwarded, this being the equinox period. On many nights it was impossible to copy 5XB who has been our most reliable short relay station.

Dist. Supt. Louis Falconi, of The New Mexico District, reports conditions exceedingly quiet, complaining of no monthly reports from his assistants, etc.

Traffic is still going west on good nights and when CW is installed at 5ZA operation may be carried on later in summer. 5XB comes through there with CW when spark is helpless.

Total msg's. 599. Busiest station 5ZA, 242 msg's.

ROCKY MOUNTAIN DIVISION

M. S. Andelin, Mgr.

During the month of March a great deal of the trans-continental traffic went via the Southern Route. The southern stations found very little difficulty working, and constant communication was maintained. The northern stations of this division have less static and consequently bear the burden of extra heavy traffic. Messages are passing over the trunk lines with the same regularity as the winter months and showing no signs of decreasing. It is possible that all-summer communication will be maintained; most of the DX stations are very enthusiastic over the probability of keeping the trunk lines open this summer. Never before has this been done in the Rocky Mountains.

The stations handling the bulk of traffic in April were 6ZH, 6ZA, 6ZM, 6WV, 9AMB, 7KX, 6JT, 6AEZ.

Total msg's., 587.

ONTARIO DIVISION

K. Russell, Mgr.

The past month marks both the height and approaching end of the relay work for the season 1920-21. Conditions in Toronto are such now that it is apparent that there are a number of amateurs shutting up their stations for the summer months.

In the east, the Ottawa Valley District of the Ontario Division has been formed with Major W. A. Steel, of Ottawa, as the District Supt. Under his efficient management, the Ottawa Amateur Radio Association has been formed and affiliated with the A.R.R.L. In the near future this district will form a most valuable link in the chain from Montreal to Toronto and Windsor. The most likely chain at present thru eastern Ontario is from Montreal to Ottawa, Perth, Napanee, Belleville and Kingston, Port Hope and Cobourg, and then to Toronto, with a branch line north to Peterboro, or perhaps the straight jump between Toronto and Ottawa may be managed through Peterboro, where a city Manager, Mr. F. H. N. Sherwood, has been appointed.

Reports from south-eastern Ontario are promising but things are still pretty much futurist there, with a tendency towards the development of C.W. Quite a bit of traffic is being handled between Napanee, Kingston, and Belleville, though this has been much curtailed owing to the 50 meter rule.

In Toronto, the usual amount of work is being carried on. The Manager's station has received a special license from Ottawa, new call 9AL, with allowance of 200 meters at all times, and communication with Pittsburgh and Salem, Ohio, has been established. Station 3FO reports having closed down. 3BP has dismantled his spark set also, owing to the opening of navigation, and is now using C.W. only. Communication has been had with 3B in Brantford.

There is talk of holding a convention in Toronto in the Fall, at the time of the National Exhibition, to try and get the Ontario amateur interested in relay work in the Province.

The Manager had a visit from D.S. Lloyd of Sault Ste Marie, Ontario, who reports that relay work is rather difficult in his locality, owing to the peculiar soil conditions, and metallic deposits along the north shore.

ALASKA DIVISION

Roy Anderson, Mgr.

Whew, what's that noise? Tuned to six hundred meters the operator at 7IT, Ketchikan, had a surprise, for suddenly a sound, not unlike induction, only of a much higher frequency was heard. It was unbearably loud on one or two points of the secondary condenser. But, thru it all, came the sound of a "spark". It proved to be NVH, Ketchikan, calling KDFB, Hyder. But, the mystery remained unsolved. Suddenly the noise stopped and did not start again so it was passed up as a freak. Later, however, on POZ's tune,

some queer noise, not unlike that of a few hours previous, was heard. A little tuning on the arc set solved the mystery. It was Ketchikan's new arc. Unless on the proper tune it sounds like a sixty cycle spark, with a continuous induction-like-rumbling but when tuned properly, she delivers the goods in fine style. It marks the opening of the new thirty kilowatt arc station which has been installed by Mr. Hubbard, of Bremerton.

The installation of this arc set at Ketchikan marks a development in commercial radio, but for amateur radio, in and around Ketchikan, it hurts. One thing, they don't keep their arc burning when they're not sending. Let's hope they keep this policy up.

Ketchikan seems thus far to foster long distance receiving, regardless of QRM and QRN. Using a single bulb detector and 225 foot single wire aerial, elevated about thirty feet, POZ, NPM, NPN, NPO, NSS, WII, WSO, NPA and other high powered arcs are heard with a great regularity; most of them are heard every night or evening. On some occasions, others of less importance, commercially, are heard. Ships are heard all over the Pacific. NIO, the U. S. Navy Vessel KANSAS sent a TR report to Ketchikan naval station, and it was also heard by an amateur using a bulb detector and a makeshift tuner. At this time the NIO was using 4.2 kilowatt and was, I think, 3200 miles from Ketchikan. Anyway, it established a new record for naval 5 KW sets. Let's keep it up.

NORTHWESTERN DIVISION
John D. Hertz, Mgr.

Summer is nearly here but still only a slightly increasing difficulty is experienced in handling traffic, and the CW sets now on the air seem to be having even less difficulty. It is getting to be more and more difficult to work 7CC, while on the other hand more luck is had between Portland and Seattle. Work north and south is as regular as ever.

In Montana, Asst. D.M. Cutting is very optimistic over the outlook for keeping the Northern Route open all summer. And he is doing his part well, by tearing up the air with his station 7LY, which works 9's on the east, gets south well, and tears in at Seattle and Tacoma, tho is not as loud in Portland.

Mr. E. L. Wharton, 7EX takes the "cake" this month for amount of traffic handled with a total of 384. Do any of the other transcontinental routes handle as much traffic?

7ZG being a "tiller of the soil", does not find as much time for radio work at present due to spring farm work. As a result he will not be with us as often.

7ZM (Ex-7CC) is apparently suffering the worst due to QSS. Still he is on quite regular and is trying hard to keep his end of the line open.

7YA at Boise offers a good alternative route for "east and west" business, and he gets his share, most of which goes via the Montana stations 7EX, 7ZG and 7LY and some direct to the ninth district. He seems to be taking the bulk of the eastern business from Central and Northern California.



7FI and 7BQ at Pullman are also coming to the front in the relay game, and make good alternates for 7ZM. They are handling considerable traffic with 7BK and 7AD to the west, also 7CN and 7BD in Portland; but, with 7ZM, find it hard going east.

7FQ at Tekoa, Washington is beginning to get out, and works Spokane stations.

In Seattle 7BK, 7AD and 7CA are the principal stations this month, 7BK taking the bulk of the business, as 7AD is conducting research work along the radio-phone end of the game.

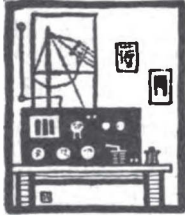
Mr. Hunter Onstine, 7LS, of Ferndale, Wash., is a new arrival in the relay game. He is in communication with 7IY at Vashon Island who in turn works both east and south. This opens up a new district which has heretofore been dead to the world. This station together with 7FO in Everett, Wash., makes up the long lost route to Canada, where 5BA and others await.

In Tacoma 7CE does the best work with 7BC a close second. 7CB and 7BA also get out and are doing their part to make Tacoma the second largest relay center in the Pacific Northwest.

A new station appears at Hoquiam, Wash. on Gray's Harbor; 7NN, who works 7BK, 7BQ, 7BC and others. This opens a district that has been dead since before the war.

In Eugene a new D.S. is due for appointment. Therefore, no report has been had from there. Portland, while still the largest relay center of the Pacific Northwest, is losing many of its men. 7BP has dismantled for the summer, and is commercial operating in Alaska. The D.M. is leaving at the time of this writing for another point in Alaska. 7DS has been out of commission for some time. 7ZI has dismantled his spark set and is now con-

(Concluded on page 42)



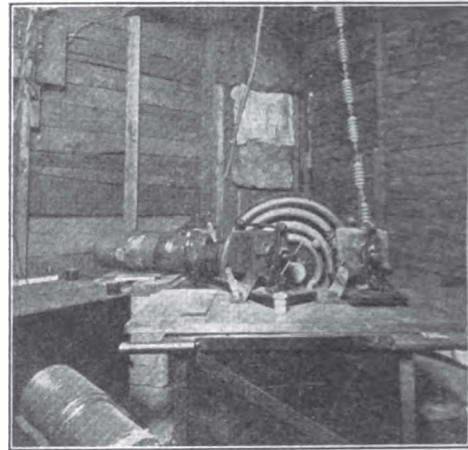
Amateur Radio Stations



8ML, CLEVELAND, OHIO

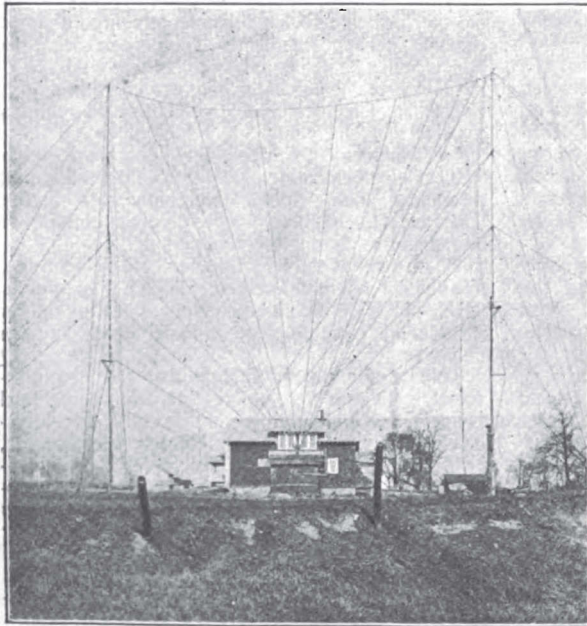
Here's a station that, like 8ZR, has a real set of masts. 8ML is the station of Mr. Frank M. J. Murphy in Cleveland, and is one of those stations that have helped to make the Amrad gap famous.

To jump right into a description, the front mast (left) is 112 ft. high, 68 ft. being of timber and the balance of 2" and 1½" pipe, while the rear mast is two feet shorter, of similar construction, with 100 ft. separating the two. In this space is hung a ten-wire fan aerial, the wires being of uneven spacing so as to provide the same length of current path for every wire and its neighbor, regardless of their distance from the center of the system. A top cable of 7-strand No. 20 bronze, insulated with two 10" Electro-seal insulators at each end, carries the fan, which is made of Jupiter 7-strand No. 22 copper. Mr. Murphy estimates that he put up these masts 50% with the help of Mrs. 8ML, 40% alone and 10% with the help of interested neighbors. He threatens to put



up another so as to have a triangular inverted cone, from which we see that a few more 112-footers are nothing in his young life.

The transmitter shack, under the center of the aerial is 10' x 12', made of scrap lumber left from the construction of the house. The transformer is a 1 k.w. open-core United Wireless with a home-made primary winding, while the condenser is made of 22 sheets of 8 x 10 copper and 44 sheets of 11 x 14 photographic glass immersed in coil, capacity not known to us. Two ½-k.w. Amrads form the gap equipment, while the O.T. is a "he", home-made with one-inch copper tubing for the primary and 2½" ribbon for the secondary. Either 8ML's aerial is a bit too ambitious or his wave meter lies, for he finds it impossible to get down to 200 meters without a series condenser, and two .002 mfd. Marconi jars are used in series in the ground lead for this purpose. Notwithstanding the inevitable loss in such an arrangement, 8ML is QSA everywhere

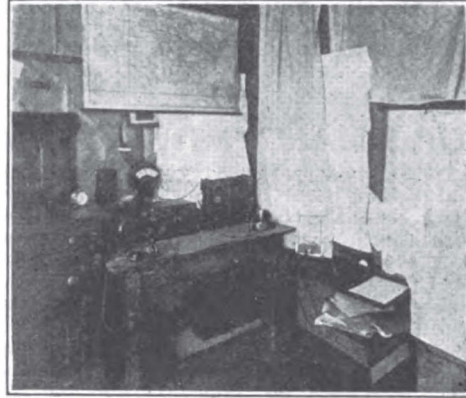


within a respectable range, and has been reported from 7ZJ, Vancouver, Wash.

8ML also uses one of "Round's round grounds", made of 8 sheets of 3 ft. x 8 ft. Armco galvanized iron, set edgewise in a trench 5 ft. deep and 21 ft. diameter, surrounding the shack. Two leads of No. 10 R.C. wire run to each plate.

The transmitter is mechanically controlled from the operating room, 40 ft. distant. The receiver comprises a Grebe CR-3, audiotron detector, home-made 2-step amplifier using Acme transformers and Radiotrons, Baldwin phones, and Edison A batteries.

The details of the arrangement, we believe, will speak for themselves.



6XAD, AVALON, CATALINA ISLAND, CALIF.

Not a vast amount of explanation is needed, in order to grasp the details of 6XAD, ex-6BX, the very efficient station at the residence of U.S. Deputy Fish and Game Warden Lawrence Mott, on Catalina Island, thirty miles off the coast of California. Mr. Mott is the well known author, and his hobbies are fishing (note

VT-2's. Mr. Mott is now experimenting with the new U.V. 202's, finding them most satisfactory. The transmitter is so built that any of several wave lengths is instantly available.

6XAD has been reported QSA as far north as Vancouver, down in New Mexico, and as far east as Pittsburgh. The an-



the photograph—courtesy P. V. Reyes, Avalon), big game shooting, and radio. His receiving apparatus consists of a Kennedy long-wave and a Grebe short-wave CR3 regenerative receiver. He employs a two-step Grebe amplifier for both, in conjunction with an audion detector and Baldwin phones. The transmitter is a C.W. set, operated on city current, and using from three to five

tenna is an inverted "L", max. height 70', 4 wire, No. 14 soft-drawn copper. Grounds are water pipes and a 7' x 12' sheet of ¼" copper, buried beneath the antenna.

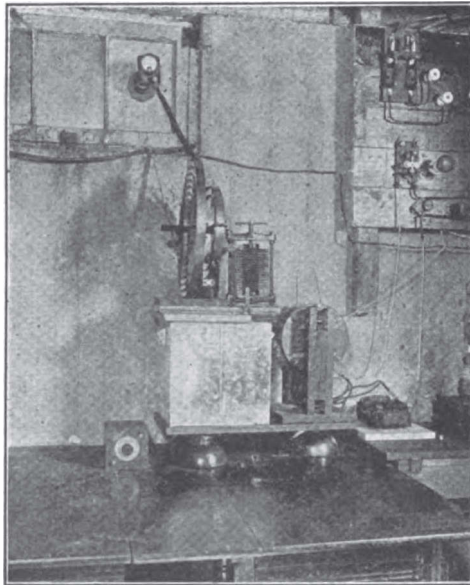
For reception on his Kennedy he uses a single wire, 300' long, and he claims he hears *all* the power stations of the world. His antenna current, transmitting, is from 1.5-3 amps.

Warden Mott is extremely anxious to

make up a schedule for serious long distance work with C.W., with interested amateurs, and asks that he be reported by postal card. He uses 200 and 225 meters.

1QP, S. MANCHESTER, CONN.

1QP, owned by John L. Reinartz at South Manchester, Conn., is another of the stations that are doing splendid DX work with Amrad gaps. Our photographs show that his equipment is neat and business-like, the receiver being mounted in an upstairs room from where operation of the transmitter in the cellar is remotely controlled. The aerial is a slanting flat-top of large gauge aluminum wire with one end on a mast on the house and the far



end high up in a tree. Each flat-top wire and its corresponding vertical wire are in one piece, doing away with the almost hopeless proposition of soldering joints in aluminum wire.

The receiving tuner is of the type described elsewhere in this issue, so nothing more will be said of it here except to state that it works fine. The tube equipment is a detector-three-step and is quiet. 1-Kewpie's mascot adorns the top of the tube cabinet.

The transmitter consists of a home-made transformer with a secondary wound in pies and giving a potential of about 40,000 volts; a home-made glass plate and

foil condenser immersed in oil, a Thor-darson oscillation transformer, and an Amrad quenched gap remodeled to handle a greater voltage per gap than customary. In the power line is placed a large constant-duty rheostat of commercial make capable of giving a gradual and even control. By the adjustment of this resistance 1QP can vary his note from 30 cycles to 500 cycles. The antenna current is highest at the high frequency but 1QP is wise and knows that it is the power in each wave train that counts and that his condenser voltage builds up highest at the lowest frequency. Consequently he is at present using a 30 cycle note which, while not particularly pleasant to hear and sometimes sounding like static, certainly has the punch behind it and reaches out. During the Amrad transcontinental relays 1QP gave a fine performance and was regularly QSO 9PV on 200 meters and with a note of 30 in Chicago. The normal antenna current cycles is about 3 amperes.

OPERATING DEPARTMENT

Report of Northwestern Div.

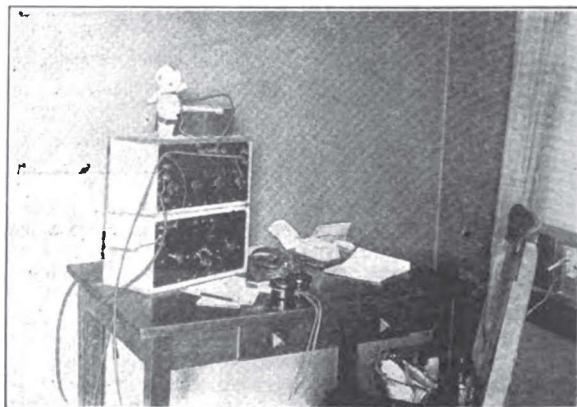
(Concluded from page 39)

fining his activities entirely to the development of C.W. 7JW, 7ED, and 7DA are the principal sparks handling traffic.

In Vancouver 7ZK and 7CM continue steady. 7BS is off for the summer, having also gone to Alaska commercial operating.

A.R.R.L. work of the Division has been turned over to Mr. R. T. Galyean, 460 Miller Street, Portland who will discharge the duties of the office from the present date.

Busiest station 7EX, 384 msgs.



Who's Who in AMATEUR WIRELESS



CLIFFORD J. GOETTE

Mr. Goette, Assistant Manager of our Atlantic Division, is the well known operator of Station 2JU at Woodhaven, Long Island and accordingly needs no introduction to our readers altho we are all glad to see what he looks like.

Goette is one of the old-timers, having become interested in radio in 1908 while employed at a local railroad telegraph office on a 12-hours-per-day job. Between clearing "19's" and "31's" he managed to find time to read up on the subject, which was then decidedly in its infancy, and erected a small spark-coil transmitter. Being unable to connect up with FV, now 2ZV, A. H. Grebe, Jamaica, L. I., but little over a mile away, he decided he needed more kilowatts and so installed a transformer and eventually had a range of 25 miles.

At the outbreak of war Goette joined the Signal Corps and was assigned to Radio Tractor Units in the Military Intelligence Branch, serving along the Mexi-

(Concluded on page 57)



S. KRUSE

Hurray! We finally got a photograph out of Kruse, but it was like pulling eye-teeth!

It gives us a great deal of pleasure to present this likeness of "LQ" to our readers, for we are proud of him and his ability. He was born in Halstead, Kansas, (doesn't say when) but insists he is proud of the place. The scheduled interest in radio was born upon reading an article in McClure's, describing Marconi's first transatlantic tests, and he started playing with a coherer set in 1907, eventually hearing Fort Leavenworth's 2 k.w. fixed gap set twenty-seven miles away, an accomplishment which was fittingly celebrated. He went thru engineering school at Kansas State University at Lawrence and while there operated old 9LQ (whence the present personal sine "LQ"), also old 9XP. 9LQ was a part of the old 9JW-9EP-9LO-9DM-9ABD-9MQ gang that relayed thru Kansas and Missouri in the good old days, and was a good station without question, as it

(Concluded on page 57)

Strays



More Transcon Dope

The following additions to the story of the Transcons as reported in the March QST have been received:

Transcon 14 msg. nr. 2 was originally reported stalled at 6ZH. 6ZH gave it to 6ZA, but received no QSL. 6ZA passed it to 6ZO, while 6ZH continued his endeavor to pass it on. Unfortunately he developed condenser trouble but gave it on low power to 6JD who was unable to work west until 3:30 A.M. mountain time, when he passed it on to 6KA. So it finally got to Los Angeles after all.

Transcon 15 reply nr. 3 was reported stalled at 6JT. 6JT is now reported as having given it to 6KA and QSL received, but no time reported.

Transcon 16 reply nr. 1, reported stalled near 1FU, actually got through as it was copied direct at 1FV in Portland when 1AW gave it to 2RK, although no QSL could be given.

According to "QTC", published in Rochester, the reason C.W. is so popular is that it means "Caressing-Women".

An amateur entered our cell the other day and talked so much about a telephone station whose carrier wave he could constantly hear but who never talked, that we were prompted to investigate, and so we went out to his shack and asked him to tune in this fellow. With a certain adjustment on his regenerator, his bulb howls beautifully. We didn't have the heart to tell him what it was.

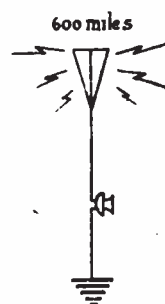
We are proud of the city of Lafayette, Indiana. Professor R. V. Achatz of Purdue University, City Manager, reports he has his city tuned down to 200 meters, and has personally checked up every station under his jurisdiction, with several of the smaller stations operating on 160 and 180 meters. Let's have more cities like Lafayette.

We have felt obliged to discontinue the two pages in QST known as "Directory of Calls" because calls are being issued at such a rate as to make it hopeless for us to keep up with them in the limited space available.

From the New York American:

"Minister's sermon carried 600 miles by wireless.... In delivering his sermon he simply spoke into the mouthpiece of an ordinary telephone transmitter which was connected with the aerial."

And all the while we have been wasting our time arguing about grid modulation versus Heising modulation and what not!



Station 2RK has been indefinitely closed for an alleged interference with the U.S.N. compass station at Sandy Hook on 800 meters. While that charge in itself is subject to considerable question, it is reported that 2RK continued operation after having his license suspended, and is now charged with that, with operating on an illegal wave length, with operating CW equipment not covered by his license, and with signing the letters "KH" for a call. If the charges against Hewitt are substantiated, it is probable that 2RK will be no more.

We again point out to our members that the radio laws must be obeyed.

In the catalogue of the Charles William Stores we find a nice picture of the well-known Arlington receiving transformer, price \$9.98, and under it these illuminating words: "Same as used at Arlington wireless station. Wave length 4,000 miles."

Things we want to know:

Where a ground lead ends, and the real ground begins.

The truth about power factor in an oscillating circuit.

The why of a resonance transformer.

When 1TS sleeps.

Why 8ZL reaches out.

How to eliminate induction in the nearby wiring.

In the first item in "Strays" in March QST, we requested data from A.R.R.L. men who served in radio during the war. Do you mean to say that no more of you

chaps who haven't dropped us a postal giving us the desired information were in the radio service? Shake a leg, fellows, and send in the dope as we want to have a complete roster of what we did during the war.

We certainly like the action of The Benwood Co., Inc., in stimulating summer interest by their offer of monthly prizes for the best operation during the hot months. If all the manufacturers would get behind the gang in this manner, things



The Benwood Store, St. Louis.

would certainly hum during the dog-days. We thank the Benwood Co. for this and hope that other manufacturers will evolve ideas of special interest during the summer months, as we know they will surely rebound to the benefit of all concerned.

Have you tried the Turney Spider-Webs? With a couple of variables they certainly make a neat and serviceable little regenerative tuner. They work fine and they are great for a portable set too.

If you have your transmitter in a dog-house or bird-house in the back yard, put a padlock on it. According to "QTC" a Buffalo amateur had his entire transmitter stolen recently. It was set on a pole in his yard and operated by remote control.

The "Richmond (Indiana) Palladium" announces the installation of radio apparatus as part of its regular news gathering machinery, with call letters 9SS.

Station 8AYM is owned and operated by C. M. Nichols of 8ACM and if heard please forward cards to address of 8ACM. The station formerly had another operator, R. W. Bissell, but he has dropped out of 8AYM in order to have time to operate his own station 8TY.

Hints for QRM Makers:

Don't sit on your key. It is tiresome and a brick is much more convenient.

Never use a Helix or O.T. They are too expensive.

Never copy a message, memorize it. Paper is too expensive.

Don't answer the fellow who calls you. He likes to call because it lets the other fellows know that he is on the job.

A correspondent wants to know, now that we have synchronous gaps, how to set the rotor so as not to blow all the condensers in the country. That's just it, OM, the idea is to adjust it so as to get that maximum voltage that punctures every ordinary condenser and then build a he-condenser that will hold it and thereby get some real juice out of the old set. But it surely does take a condenser.

Speaking of records: 2BK is reported heard by 6KA in Los Angeles about 4:38 A.M. E.S.T., April 19th. About the same time next day 9OE and 9PS both called 2BK saying "QSQ 6KA", so it would seem that 6KA heard 2BK on two occasions. But that isn't all; we have a postal from 8AGK, Lancaster, N. Y., advising that at

4:30 A.M. April 20th, he heard 6KA calling 2BK.

8ZA was copied by 6EJ, Walnut Grove, Calif. on January 19th.

3HJ has been heard 200 miles west of the Azores, a distance of 2300 miles.

9LC, Bill Woods, St. Louis, has now been heard in Portland, Maine; Los Angeles; Ontario; Telos, Cuba; and most places in between, all on $\frac{1}{2}$ KW.

"A. Novice" recently complained about the straps on his honeycomb coils "perspiring". 2ATV discovers that celluloid makes a wonderful substitute that stands the hot weather OK.

1AW is now broadcasting reports of automobiles stolen in Hartford and other important police news daily at 9:30 P.M., E.S.T.

Not that we care, but dijanotice that Sears-Roebuck's artist found out what a radio station looks like from Hoffman's drawing on our October cover? See the circular illustration on the rear cover of their catalogue.

Calls Heard



HEARD DURING APRIL Unless Otherwise Specified

Instructions to reporters:

(1) Typewrite or neatly print the calls, "double-spaced," on a separate sheet of paper, running them across the sheet, not down a column, and writing on but one side of the paper.

(2) Arrange alphabetically thru each district, from 1 to 9, with no break between districts, using commas to separate items and putting parentheses around calls of stations also worked—all as per the lists below.

(3) The period covered by the report shall be from the first of one month to the first of the following month. All lists must be received by us by the 10th of the second month, for publication in the next following QST.

HEARD AT SEA.

J. C. Taylor and L. S. Butler, aboard U. S. S. "Buffalo", at San Diego, Calif.:
5ES, 5ZA, 5ZZ, 6XZ, 6EA, 6ED, 6EJ, 6FI, 6GK, 6HR, 6HP, 6IC, 6IF, 6IM, 6JQ, 6OC, 6PR, 6XC, 6AIV, 7BX, 7ZI, 7ZJ, 8ZC, 8ZU, 8ZV, 9UU, 9TI, 9ACD, 9ZN, 9ZL, 9DIN.

T. W. Braidwood, Opr. KOSM, Mar. 11, 350 miles east Portland, Me.: 1CY, 1XM, 1GBC, 3HG, 8ZB, NSF. Mar. 12, 645 miles east, 1AE, 1ARY, 1EAV, 2YM, 3DH, 3DN, 3HJ, 3RK, 3SK, 3ML, 3AMZ. Mar. 14, 1250 miles, 3DH.

CAN. 9AL, TORONTO, ONT.

1RD, 2ABR, 2BML, 2XQ, 3AAE, 3CC, 3AGZ, 8BO, 8IV, 8JM, 8JW, (8LF), (8PJ), 8XB, (8ZG), 8ZN, 8ZZ, 9AZX, 9AJA, 9XI, 9XM.

CAN. 3KU, NIAGARA FALLS, ONT.

1AW, 1CK, 1DV, 1FW, 1GB, 1IA, 1JA, 1LZ, 1QP, 1RZ, 1TS, 1VV, 1XK C.W., 2BG, 2BM C.W., 2DA, 2DR, 2EL, 2EN, 2JJ, 2RK, 2RM, 2VA, 2UK, 2XX C.W., 2VE, 2ZL C.W., 2ZM C.W., 2LR, 3AAO, 3DS, 3EN, 3KM, 3PU, 3XM, 4XB C.W., 8AAX, 8ABT C.W., 8DR, 8AGK, 8AGZ C.W., 8AJR, 8AKX, 8AMQ, 8ANK C.W., 8ANR, 8ANT, 8AOA, 8APB, 8ARS, 8AXQ, 8AXQ, 8AYJ, 8BB C.W., 8BU, 8DR, 8DS, 8FO, 8GI, 8HR, 8IK C.W., 8JW fone & C.W., 8LQ, 8MB C.W., 8NB, 8OZ, 8QM, 8SB, 8SP, 8WE, 8WV, C.W., 8WY, 8XU, 8LB, 8LN C.W., 8LR, 9AEQ, 9AO, 9BY, 9IP, 9LQ, 9MC, 9XI C.W., 9XM C.W., 9ZN. CANADIAN—8BA, 8BP, 8CA, 8CO, 8DS, 8EP, 8FK, 8LE C.W. & fone, 8AQ, 9AL C.W. & fone, 9AJ fone.

1TS, BRISTOL, CONN., One Tube

Spark stations: (1ACZ), (1AW), (1BBL), 1CBJ, 1CBT, 1CCL, 1CK, 1CM, 1CY, 1DAL, (1DAP), 1DR, 1DY, 1EBW, 1EP, 1FBE, (1GAI), 1GAN, 1GAS, 1GBC, 1GM, (1GY), 1HAA, 1HBT, 1IA, 1JAP, (1JAU), (1JBF), 1JQ, (1JX), 1KAC, (1LAP), 1LBR, 1MAD, 1MBS, 1NAQ, (1NAT), 1NEJ, 1NBP, (1OAA), 1OAD, 1OBE, 1OBH, 1OE, 1OJ, 1OT, 1PG, (1QP), (1QT), 1RAD, 1RAK, (1RAY), 1SBS, 1SN, (1SZ), 1TBJ, 1TL, (1UJ), 1UN, 1UQ, 1WR, 1XM, 1YB, 2ACD, 2AFP, 2ALY, 2AR, 2BEH, 2BGH, 2BGR, 2BK, 2BLP, 2BM, 2CL,

2CO, 2CT, 2DA, 2DI, 2DN, 2DX, 2EL, 2FG, 2JJ, 2JU, 2MG, 2MX, 2OA, 2OM, 2OW, 2PL, 2RK, 2RM, 2SS, 2SZ, 2UA, 2ZM; 3AAN, 3ACE, 3ACM, 3ACT, 3ALN, 3BG, 3BZ, 3CC, 3CK, 3DH, 3DS, 3EN, 3FJ, 3FR, 3GO, 3HG, 3HJ, 3HX, 3IB, 3IM, 3KM, 3LP, 3NB, 3OU, 3PU, (3RW), 3UF, 3VV, 3XF, 3XM, 3ZA; 4FD; 8ADK, 8ADQ, 8AGD, 8AGK, 8AIO, 8AL, (8AMM), (8ANT), 8AOT, 8AP, 8AFB, 8ARD, 8AVD, 8AWP, 8AXO, 8BB, 8BC, 8BQ, 8CG, 8CH, 8DR, 8DY, 8FE, 8FK, 8FQ, 8GI, 8HA, 8HF, 8HR, 8HY, 8ID, 8IL, 8IN, 8KZ, 8LQ, 8ML, 8MM, 8MZ, 8NI, (8PT), 8QC, 8QE, 8RQ, 8SP, 8TN, (8VW), 8WY, 8XE, 8XU, 8ZA, 8ZD, 8ZR, 8ZW, 8ZX, 8ZY; 9HJ, 9HR, 9K, 9IQ, 9UH, 9YB, 9ZJ, 9ZN; Canadian 2DD.

C.W. stations: (1AB), (1AE), 1BAY, 1CK, 1DBZ, (1DH), 1DR, (1DT), (1FBK), (1GAI), 1HBA, 1HBP fone, (1IBF), 1IL (1JBF), (1KAZ), (1KBL), (1MO), (1NAQ fone), 1NBA fone, 1NBS, (1RD), 1RZ, 1UD, 1XD fone, 1XE fone, 1XV fone, (1XX fone); (2ADL), 2AJF, 2AJW, 2AKO, 2AZP, 2BDU, (2BML fone), 2FD, 2HI, 2HZ, 2PE, 2UD, 2ZA, 2ZQ, 2XX, 2XL fone, 2ZM; 3AAE, (3AAO), 3ABL, 3CC, 3JC, 3LE; (3AGZ), 3AJ, 3AKE, (3APH), 3ASM, 3BO, 3DR, 3GA, 3HL, 3IB, 3IV, (3JM), 3JU, 3KM, (3LF), 3LV, 3OH, (3PJ), 3UJ, 3UK, (3VS), 3XK fone, 3XN, (3YG fone), (3ZG), 3ZN fone; 9AJA, 9AZX, 9XI, (9ZB); Canadian 3AB, 9AL; (NMW), NSF, WWV.

1OBK, SOMERVILLE, MASS.

1HAA, 1NAQ, 1SBZ, 1TS, 2AX, 2AFP, 2AJF, 2AOF, 2BM, 2DN, 2DY, 2EL, 2FG, 2JJ, 2JN, 2JU, 2MME, 2MZ, 2OM, 2OU, 2RK, 2RM, 2UA, 2UC, 2UK, 2VD, 2XM, 2XP, 2ZC, 2ZL, 2ZM, 3AAE, (C.W.), 3CC, 3EN, 3EV, 3GO, 3HG, 3HJ, 3HX, 3IB, 3IW, 3KM, 3NB, 3OU, 3PU, 3RW, 3XM, 3YK, 3YV, 3AG, 3AGK, 3AMQ, 3AMZ, 3AVD, 3AWP, 3AXC, 3BC, 3CG, 3DZ, 3FK, 3GL, 3HR, 3KZ, 3RQ, 3SP, 3UE, 3WY, 3XB, 3XK, 3YG, 3ZD, 3ZG, 3ZW, 3KF, 3ZJ, NSF, WWV.

1MO, F. H. Schnell, 134 Oakland Terrace, Hartford, Conn.—All C.W.

1AE, 1BV, (1FQ), 1GAL, (1KBW), (1NAQ), 1NBA, 1NO, 1RD, 1SZ, (1TS), 1UN, (1VAD), 1XM, 1XV, 2ACZ, 2ADL, 2AJF, 2AJW, 2AKO, 2BB, 2HI, 2XA, 2XAC, 2XX, 2ZL, 2ZM, 3AAE, 3AAO, 3CC, 4GL, 8DE, 8DZ, 8IB, 8IV, 8YG, 8ZN, 8ZV, 9XI, NMW, NSF, NHT, WWV, XBI, XFI.

1XM, CAMBRIDGE, MASS.

1AW, 1HAA, 1MAD, 1OE, 1RAY, (1's too numerous), 2AC, 2ADE, 2ADM, 2ALD, (2BK), 2DI, (2DN), 2DR, 2EL, 2FG, (2JU), 2OA, (2OM), (2OW), (2RK), 2SZ, (2UK), 3AAD, 3AAE, 3AAN, 3AAO, 3ACM, (3ACT), 3AFE, (3AHK), 3AJD, 3ALN, 3ABC, (3BG), 3BP, 3BZ, (3CC), 3CCM, 3DY, (3DS), (3EN), (3EV), (3GO), (3HG), (3HX), 3IB, (3IW), 3KK, (3KM), 3MF, (3NB), 2ND, 3OS, (3OU), 3PF, (3PU), 3QF, 3UU, 3VJ, 3VM, (3VV), (3XF), (3XM), (4BY), 4YA, 5ZA (Confirmed), 8AR, 8ABZ, 8AW, 8AEE, 8ACM, 8AEF, (8AGK), 8AIO, (8ANT), 8ARD, 8AWP, 8AWX, (8BC), 8BO, (8DR), 8FU, (8ID), 8JE, 8KZ, 8LD, 8MC, 8MG, 8ML, 8MM, 8MR, 8MZ, 8NZ, 8OZ, 8PX, 8QE, (8RQ), (8SP), 8WV, 8WY, 8XE, 8XK, 8XU, 8YN, 9AR, 9AW, 9AAQ, 9AAW, 9AWZ, (9CA), (9DLX), 9GJ, 9GP, 9HJ, 9JN, 9KF, 9MS, 9NQ, 9NW, 9OE, 9UH, (9UU), 9XU, 9ZJ, 9ZN, (NSF), (WWV), (WZAA), XFI.

1OBE, NORWICH UNIVERSITY, NORTHFIELD, VERMONT

1AE, 1AW, 1BAY, 1BB, 1CAO, 1CCY, 1CF, (1CK).

1CM, 1CY, 1DAC, 1DAL, 1DY, 1EAV, 1FV, 1GBC, 1GBT, 1GM, 1GY, 1GP, (1HAA), 1HAF, 1HBZ, 1HO, 1IA, 1JZ, 1MAD, 1MBA, 1MBS, 1OE, 1OJ, 1PAO, 1PAZ, 1PG, 1QR, 1RAD, (1RAY), 1RV, 1SBZ, 1SW, 1SY, 1SZ, 1TS, 1XM, 1XF, 1YB, 1YP, 2AH, 2AJ, 2AJF, 2AR, 2ARA, 2AS, 2AWF, 2AWO, 2BG, 2BGR, 2BK, 2BM, (2BML), 2CC, 2CT, 2CM, 2DA, 2DD, 2DI, 2DM, 2DN, 2DX, 2EI, 2FM, 2GR, 2IM, (2JJ), 2JU, 2OA, 2OW, 2Q, 2RB, 2RK, 2RL, 2TK, 2TS, 2UA, 2UK, (2VA), 2XA, 2XK, 2XQ, 2ZM, 2AHK, 2ABG, 2AGR, 2BZ, 2CC, 2DM, 2DS, 2EN, 2EV, 2FR, 2GO, (2HJ), 2HX, 2KM, (2NB), 2OBD, 2OU, (2PU), 2UC, 2VV, 2XI, (2XM), 2ZE, (2ZL), 2ACE, 2ADQ, 2AGD, 2AIO, 2AGK, 2AGO, 2AMM, 2AVD, 2AWP, 2AXC, 2BC, 2BV, 2CD, 2FE, 2GI, 2HR, 2IN, 2IL, 2JM, 2KZ, 2LQ, 2ML, 2NI, 2MI, 2OW, 2PO, 2QM, 2RQ, 2SP, 2SWY, 2XE, 2XU, 2XK, 2ZA, (2ZD), 2ZN, 2ZR, 2HJ, 2ME, 2ZN, 2ZJ.

2BML RIVERHEAD, LONG ISLAND, N. Y.
 1AEE C.W., (1BAB), (1BBL), (1CBT), 1CK, 1CP, 1CY, 1EBV, (1FBV), (1FV), (1FW), (1GAI), (1GAV), (1GM), (1HAA), (1HO), (1JAP), (1KBM), (1LBR), 1MAD, (1MX), (1NAZ), (1NBP), (1OAL) C.W., (1OBE), (1OE), (1QP), 1QW, 1RAK, 1RAS, 1RAY, (1UQ), 1XM, 1YB, 2ADL C.W., 2AHK, 2AJW, (2BGR), 2CT, 2FG, (2HI) C.W. & fone, 2OM, 2RK, 2SZ, 2UK, 2ZL, 2ZM, 2AAE, 2AAO, 2ACK, 2AHD, 2BZ, (2CC), 2DM, (2EN), 2FG, 2GO, 2HB, 2NB, 2OA, 2PU, 2UC, 2UQ, 2XM, 2YK, (2BI), 2AC, 2ACC, (2ACF), 2AGD, 2AGK, 2AHD, 2AOT, 2ARU, (2AXC), 2BC, 2BO, 2BV, 2FQ, (2HR), 2HY, 2IL, 2IN, 2KP, 2NI, 2PJ, 2PM, 2PU, 2RQ, 2SP, (2SH), 2TT, (2XE), 2XK, 2XM, 2XU, 2XW, 2ZG, 2ZQ C.W., 2ZR, 2ZV, 2ZW, 2HI, 2KP, 2MC, 2ZJ, NSF.

2AVE, JAMAICA, N. Y.
 1AE, 1AW, 1CK, 1CM, 1DY, 1JQ, 1OE, 1XM, 1GAX, 1HAA, 1JAP, 1MAD, 1CJ, 1GBC, 1GBT, 2's too numerous, 3At, 3BC, 3CG, 3CC, 3EN, 3EV, 3GO, 3GL, 3HJ, 3IW, 3KM, 3NB, 3OW, 3VV, 3XF, 3XM, 3ABL, 3ACT, 3ALT, 3APT, 4BY, 4FD, 8BC, 8CG, 8DP, 8DZ, 8FE, 8FQ, 8GI, 8HG, 8HR, 8HY, 8KZ, 8LF, 8LQ, 8NI, 8NZ, 8OI, 8OS, 8OZ, 8QE, 8RQ, 8SP, 8TN, 8TT, 8TY, 8XE, 8XK, 8YN, 8ZD, 8ZV, 8ZW, 8ZY, 8AAZ, 8ACF, 8AKE, 8AFB, 8AGK, 8AGO, 8AIB, 8AIO, 8AMM, 8AMQ, 8AOA, 8ACT, 8APB, 8ASF, 8AUQ, 8AXC, 8AYN, 8BP, 8GP, 8LQ, 8MC, 8ME, 8OY, 8QH, 8UH, 8UK, 8UU, 8ZJ, NSF, WWV.

2KV, BRONXVILLE, N. Y.
 1AW, 1BBL, 1CK, 1DY, 1GM, 1JAP, 1JQ, 1MAD, 1OE, 1QP, 1YB, 2FG, 2SZ, 2ABC, 2ACM, 2AHK, 2ALN, 2ATA, 2BG, 2CC, 2EH, 2EN, 2FG, 2GO, 2HJ, 2HX, 2IB, 2IQ, 2KM, 2NE, 2OU, 2PU, 2RW, 2TA, 2UC, 2UQ, 2XF, 2XM, 2YK, 2ZO, 2CK, 2SL, 2IM, 2AAZ, 2ABZ, 2ACF, 2ACS, 2APG, 2AGK, 2AHG, 2AHZ, 2AIO, 2AXC, 2BC, 2BO, 2BQ, 2BZ, 2DB, 2FK, 2FQ, 2FT, 2GI, 2HG, 2HR, 2HY, 2ID, 2IN, 2JO, 2KE, 2KZ, 2ML, 2QE, 2RQ, 2SA, 2SK, 2SP, 2TT, 2WY, 2XE, 2XU, 2ZD, 2ZN, 2ZW, 2AWX, 2JQ, 2LQ, 2MC, 2ME, 2UH, 2UU, 2ZJ C.W., 1NBA, 1QR, 1XM, 1XX, 2ACT, 2AJF, 2AJT, 2AJW, 2AKO, 2AWK, 2BDU, 2BH, 2BML, 2DF, 2FD, 2FZ, 2HZ, 2PM, 2RB, 2UD, 2XAC, 2XK, 2XQ, 2XX, 2ZL, 2ZM, 2AAO, 2CC, NSF, WWV, 4GL, 8DR, 8IV, 8JM, 8XK, 8ZG.

2OM, RIDGEWOOD, N. J.
 (1AE), 1AW, 1BY, (1CK), (1CY), (1CZ), 1DY, (1GM), 1GBC, (1GBS), (1HAA), (1MAD), (1MAU), 1CE, 1RAY, (1SN), (1UL), 1WQ, (1XM), (1YB), (2AAG), (2ABG), 2ACT, 2AIC, (2CV), 2FJ, 2HG, (2HJ), 2HX, 2IT, 2IW, (2KM), (2NB), 2UF, (2VV), 2XF, (2XM), 4YA, (2ACF), 2AGK, 2AIO, (2BC), 2DR, (2GX), (2ID), 2NI, (2RQ), 2SH, 2SP, 2TT, 2WL, 2XE, (2XU), 2ZW, 2AAF, 2AAW, (2AWZ), 2CP, 2DLX, 2FF, 2LQ, 2UU, 2ZJ, 2ZN, NSF, WWV.

2DK, SCARSDALE, N. Y.
 1AW, 1BBL, 1CJ, 1CK, (1CY), 1DY, 1FV, (1GBC), 1GBT, 1HAA, 1JAP, 1LAX, 1OE, 1QP, 1RAS, 1RV, 1RZ, 1UN, (1XM), 1YB, 2AIF, (2BB), fone, 2BM, 2DA, 2FG, 2SZ, 2ALX, 2CC, 2CC, 2CV,

2DR, 2EN, 23FJ, 2FR, 2GO, 2GU, 2HG, 2HJ, Daylight, (2IW), 2OU, 2PU, 2UF, 2UQ, 2XM, 2YO, 2ABZ, 2AGD, 2AJT, 2AMQ, 2ARW, 2BC, 2DC, 2DP, 2DY, 2DZ, 2EF, 2GB, 2GX, 2ML, 2MM, 2NI, 2OJ, 2PT, 2RQ, 2SP, 2TT, 2WY, 2XE, (2XU), 2AAW, (2ACJ), 2AJH, 2AWZ, 2CP, 2JLX, 2FF, 2KL.

3AGI, READING, PA., on silicon
 1BBL, 1JQ, 1GBT, 1HAA, 1MAD, 1OBE, 1RAY, 1AW, 1BZ, 1CK, 1CZ, 1IA, 1JQ, 1QP, 1KB, 2BM, 2EL, 2FG, 2JU, 2OA, 2OW, 2RK, 2SZ, 2TK, 2ZM, 2AVV, 2BZ, 2EV, 2GO, 2HG, 2NB, 2VV, 2XF, 2XM, 2YK, NSF-Fone, 2AEE, 2AGK, 2AGO, 2APB, 2AXC, 2AYN, 2BC, 2BO, 2FK, 2GI, 2IL, 2KZ, 2ML, 2NI, 2QE, 2RQ, 2SP, 2VQ, 2XE, 2XU, 2YN, 2ZN, 2ZR, 2ZW, 2ZY, 2ABL, 2HJ, 2MC, 2QH, 2WE, 2ZJ, 2ZN.

3CA, ROANOKE, VIRGINIA
 1AW, 1GBC, 1OE, 1TS (C.W.), 2BK, 2BML (C.W.), 2DA, 2FG, 2JJ, 2RK, 2ZL (C.W.), 2ZM (spk and C.W.), 2AAO (C.W.), 2ABC, 2AHK, 2BBE, 2CC, 2DH, 2EN, 2GO, 2HJ, 2HX, 2KN, 2OV, 2PU, 2UM, 2VV, 2XF, 2XM, 2YK, 2YU, 2ZA, 2ZJ, 4AU, 4BY, 4DY, 4EY, 4FD, 4GN, 4YA, 5DA, 5EK, 5XA, 2ABZ, 2ACF, 2AIB, 2AMR, 2ANK, 2AOV, 2ARW, 2BC, 2CE, 2CF (C.W.), 2DC, 2FT, 2JE, 2JM (C.W.), 2ML, 2OW, 2RG, 2RQ, 2RY, 2SP, 2TN, 2WY, 2XE, 2YM, 2YN, 2ZY, 2AAF, 2AEG, 2ANV, 2ATW, 2AZX, 2FS, 2LQ, 2MC, 2OL, 2PS, 2SP, 2UH, 2UK, 2US, 2YA, 2YB, 2ZB, 2ZJ, 2ZL, 2ZN.

BLACKSTONE MILITARY ACADEMY, BLACKSTONE, VA.—March
 1NA, 1XX, 2NF, 2QR, 2XE, 2XX, 2YC, 2AA, 2CK, 2CY, 2DH, 2DN, 2ER, 2GO, 2GX, 2HG, 2NB, 2RQ, 2PU, 2XM, 2XJ, 2YO, 4AW, 4AG, 4BA, 4BY, 4CA, 4CK, 4FD, 4YA, 4XB, 5AM, 5DA, 5ER, 5JE, 2AH, 2BV, 2FM, 2IK, 2IN, 2IV, 2JV, 2JY, 2KZ, 2OY, 2RX, 2RY, 2TM, 2WE, 2XE, 2XJ, 2XK, 2XM, 2YA, 2YR, 2ZD, 2ZG, 2ZI, 2ZJ, 2ZR, 2ZS, 2AAH, 2AGK, 2AGD, 2ARS, 2ARW, 2AF, 2AV, 2BD, 2CD, 2GJ, 2GN, 2MF, 2SX, 2TS, 2VX, 2YB, 2YD, 2YN, 2ZA, 2ZD, 2ZN.

4CK, WINSTON-SALEM, N. C.
 1QP, 1GBC, 1AW, 1CK, 1MAB, 2BK, 2JN, 2BGH, 2EL, 2UA, 2DA, 2RK, 2JJ, 2DN, 2BGR, 2JU, 2ZL (C.W.), 2BP, 2XM, 2AHK, 2CC, 2FG, 2FX, (2GO), 2HJ, (2EN), 2ACT, 2AB (C.W.), 2PU, 2AN, 2FV, 2AWV, 2UG, (2VV), (2XF), 2OU, (2ACE), 2KM, 2YE, (2BZ), (2AEV), 4YA, (2XC), (2BK), (2BY), (2FD), 4AU, (2GN), 4AM, 4CP, 4GL (C.W.), 4DV, 4DT, 5XA, 5YE, 5DA, 2QE, 2ZN, 2ZL, 2AMJ, 2YK, 2ZW, 2AFB, 2LV, 2SP, 2HG, 2ADE, 2ACF, 2YN, 2LY, 2RU, 2AYN, 2ARW, 2DY, 2GX, 2AOU, (2RQ), 2WY, 2ZA, 2CF (C.W.), 2MM, (2AGD), 2NI, 2OM, 2IN, 2ZD, 2FG, 2DC, 2AEE, 2XI, (2AXC), 2XE, (2AKH), 2DI, 2AIC, 2DJ, 2ZR, 2AIE, 2GW, 2AKV, 2WE, 2FN, 2ZB, 2AAW, 2LQ, 2YC, 2LP, 2AIR, 2APS, 2FD, 2MC, 2FS, 2NJ, 2ZN, 2LF, 2AWU, 2UH.

5LO, MIAMI, OKLA, March
 5YA, 5BI, 5BM, 5CL, 5EA, 5ER, 5EU, 5EW, 5FB, 5GW, (5HJ), (5HL), 5IB, 5JD, 5JM, 5JR, 5JS, 5LR, 5SL, 5XS, 5YE, (5YH), 5ZA, 5ZB, 5ZS, 5ZV, 5ZW, 5ZX, 5IK, 5ZL, 2AGD, 2AF, 2DF, 2DY, 2EL, 2EQ, 2GS, (2HI), 2IZ, 2JA, 2JG, 2JN, 2JQ, 2KF, 2LQ, 2LR, 2MS, (2OE), 2OO, 2PS, 2QO, 2RC, 2RE, 2SI, 2TK, 2WQ, 2WS, 2WU, 2XI, 2XM, 2YA, 2YI, 2YY, 2ZA, (2ZB), 2ZG, 2ZJ, 2ZL, 2ZR, 2ZZ, 2ACL, 2ACN, 2ACX, 2AEG, 2AEY, 2AEB, 2AFX, (2AIZ), 2ANF, 2AOJ, 2AQE, 2ATN, 2ATO, 2AWG, 2AXU, 2HB, 2XAE fone.

5JY, DALLAS, TEX.
 (5AI), 5AL, 5BM, (5CE), 5OW, 5ER, (5EW), 5ES, 5EL, 5FA, 5FB, 5FE, 5GU, (5HF), 5HL, (5HV), (5IB), (5IE), 5IF, (5IS), (5IU), (5IX), 5JA, 5JD, 5JE, (5JG), (5JL), (5JU), (5KG), (5KK), 5KQ, (5LC), 5MC, 5ME, (5MK), (5ML), (5MM), (5MR), (5NC), 5NG, (5NY), 5XA, 5XB, C.W., (5XG), 5XJ, 5YE, 5YH, 5ZA, 5ZB, 5ZC, 5ZF, 5ZG, spk-fone-mod. C.W., 2ZL, 2HG, 2AKV, 2KK, 2MR, 2AAC, 2AAZ, 2AEG, 2AEQ, 2AEY, 2ACL, 2ANP, 2AWO, 2AON, 2AUO, 2CA, 2DKP, 2EL,

9FF, 9FU, 9HI, 9HT, 9JA, 9JN, 9JQ, 9LA, 9LC, 9LW, 9MC, 9MM, 9NQ, 9OE, 9OR, 9PS, 9QO, 9UQ, 9UT, 9WN, 9WU, 9WW, 9XI C.W., 9XM C.W., 9YA, 9ZA, 9ZL, 9ZQ, 9ZY C.W.

50D, QUINLAN, TEXAS

5AL, 5CE, (5DW), 5ER, 5EW, 5FB, (5HF), (5HV), 5IB, 5IF, 5IS, 5IU, 5IX, 5JG, 5JU, 5Y, 5KK, 5LC, 5MM, 5NC, 5ZA, 5ZB, 5ZC, 5ZF, 5ZG C.W., music and phone, 5ZL, 5ZS, 5XB, spk. C.W., fone. 5YH, 5HG, 8YG C.W., 8YJ, 9BW C.W., 9HI, 9JA, 9JY, 9LY, 9OE, 9OR, 9PS, 9ZC, 9ZN, 9ACN, 9AEG, 9UG, 9ALG, 9YO.

6EN, LOS ANGELES

5HL, 5IF, (5ZA), 5ZI, 5XD, (6AE), 6AF, 6AG, (6AJ), (6AK), (6AFN), (6AH), spk.-C.W., (6AV), (6AN), (6AFY), (6AAW), (6AAT), 6AFU, (6AAZ), (6BN spk.-C.W.), 6BU, (6CC), 6CE, 6CH, 6CL, (6CO), (6CP), (6CA), 6CS, (6CV), 6CW, 6CY, (6DP), (6DY), 6ET, 6EV, (6EP), (6EX), (6FE), (6FI), (6FS), (6FM-C.W.), (6FH), 6GA, 6GK, (6GQ), (6GV), 6GO, (6GR), (6GF), (6EH), (6HO), (6IC), 6IM, 6II, (6IY-C.W.), (6IZ), 6GX, (6JI), (6JK), (6JN), (6JA), 6JO, 6JQ, (6JI), 6KL, (6KM), 6KZ, 6LD, (6MZ), (6OC), (6OW), (6OH), 6OT, 6PM, (6PR), (6PJ), (6VL), 6VS, 6VK, 6LT, 6QU, 6QM, (6QR), (6SK), (6UM), (6TC), (6TV), (6HP), (6WV), 6AID, (6AEA), (6BX-C.W.), (6BAB-C.W.), (6ZA), (6ZB), 6ZE, (6ZH), (6ZK), 6ZM, (6ZO), (6ZR), (6ZU), (6ZX), (6ZY), (6ZZ), (6XZ), (6WN), 6ADA, 7AD, 7CC, 7CW, 7CR, 7BP, 7BQ, 7GQ, 7DA, 7DK, 7EC, 7GH, 7ZI, 7ZJ, 7ZG, 7ZB, 7IN, 7IM, 7GY, 7GO, 7YA, 7YS, 9WU, 9JE, (9OE), (9PS), 9LR, 9ZN, 9ZJ, (9XM-C.W.).

6ABA, ALTADENA, CALIFORNIA, March

6BX, 6DD, 6DS, 6EF, 6EN C.W., 6EX, 6FX, 6GF, 6IC, (6IQ), 6IX, 6KL, 6KP fone 6KY, 6LLC, 6LU, 6MH, (6MW), 6ND, 6NQ, 6PQ, 6QS, 6SK, 6UB, 6VH, 6VZ, 6ZH, 6ZU, 6ZX, 6AAG, 6ACR, 6ADN, 6AGF, 6AGN, (6AHA), 6AID, 6AIW, 6AKE, (6ALD), 6ALL, 6ALU, 7BQ (865 mt.), 7YA.

6ZX, ex 6EJ, WALNUT GROVE, CAL., March

(6ZA), (6AAK), (6ABP), (6ADX), (6AGF), (6AIK), 6AJX, (6DP), (6ED), (6EF), 6EN, (6ER), 6FT, (6GP), 6ID, (6IF), 6IV, 6JT, (6KP), 6KS, 6MH, (6MZ), (6LC), 6OH, (6PG), (6RN), (6SK), (6XZ), 6ZB, (6ZH), 6ZM, (6ZN), 6ZY, (6ZZ), 7AD, 7AX (7BC), (7BK), 7BP, (7BQ), (7BR), (7CU), (7CW), 7DS, 7ED, 7FI, 7FG, 7FL, (7GG), (7IN), 7JW, 7BY, (7ZI), (7GM), (7GJ), 9YW.

IRVING PINKERTON, NOGALES, ARIZ.

5BW, 5IF, 5ZA, 5ZJ, 6AC, 6CV, 6EN, 6ER, 6JI, 6MZ, 6SK, 6WV, 6XW, 6XY, 6XZ, 6ZA, 6ZH, 6ZM, 6ZB, 6ZT, 6AJH, 6AFP, 7CC, 7EX, 7JE, 7YA, 7YW, 7ZG, 7ZO, 9AR, 9EE, 9KG, 9OE, 9PS, 9SQ, 9ABX, 9AEG.

7YA, BOISE, IDAHO

2RK, (5BA Can.), 5IF, (5XD), (5ZA), 6AD, (6AE), (6AH), (6AK), (6AN), (6AT), (6BJ), (6BQ), 6BW, 6BX C.W., 6CH, 6CO, (6CV), 6DD, (6DP), (6EA), (6EB), (6ED), 6EF C.W., 6EJ C.W. & Spk., (6EN), (6ER), 6EW, 6EX, 6FI, 6FS, 6GE, 6GP, 6GY, 6HK, 6IC, 6IF, 6IG, 6IS, 6IV, 6IY C.W., 6JD, 6JJ, (6JR), (6JT), (6KA), 6KH, 6KM, 6KO, 6KP, 6LC, 6LE, 6LT, (6LW), 6MK C.W., (6NQ), (6OC), (6OH), (6OT), 6OW, 6PO, (6PR), (6QR), 6QS, 6SK (6TC), (6TV), 6UV C.W., 6VL, 6VM, 6WO, (6WV C.W. & fone), 6WZ, 6XAD C.W., (6XW C.W. & fone), 6XZ, (6XA), (6ZE), 6ZE C.W., (6ZH), (6ZK), (6ZM), (6ZN), (6ZO), (6ZR), 6ZU, 6ZX, 6ZY, 6ZZ, 6ZAA, (6AAG), 6AAT, spk. & C.W., 6AAV, 6AAW, 6ABM, 6ACM, 6AEW, 6AFN, 6AGF, (6AID), (6AIW), 6AJE, 6AJH, (6AJT), 6AJX, 6AOM, (6APH), (7AD), 7BA, (7BC), (7BH), (7BJ), 7BK, (7BF), (7BQ), 7BX, (7CE), 7CN, (7CU), (7CW), (7DA), (7DS), 7ED, (7EX), 7FD, 7FI, 7FL, (7FM), 7FO, 7FQ, (7FT), (7FY), 7GA, (7GQ), 7GY, 7HF, (7HJ), 7HN, (7HU), 7IM, 7IV, 7IY, (7JD), 7JF, (7JW), 7KA, 7KM C.W., 7KX, (7LE), (7LN), (7LO), 7LS, 7LV, (7LY), 7MB, 7MY, (7NL), (7NN), (7OF), (7OT), (7OK),

(7PS), 7YG, (7LS), (7ZB), (7ZG), (7ZH), (7ZI C.W.), (7ZJ), (7ZK), (7ZM), 7ZO, (7XD), 9BW, 9FG, (9EE), 9HI, (9HT), (9JN), 9KA, 9LR, (9LW), 9NR, (9OE), 9PS, 9QB, 9RG, 9WA, (9WU), 9XI C.W., 9XM C.W. & Spk., 9YI, (9YW), 9YY, 9AEG, 9AEY, 9AGN, 9ALG, 9ASF, 9AWD, 9AYU, 9XAE, 9ZAC, 9ZAB.

7BQ, PULLMAN, WASH., March

5IF, (6AE), (6AJT), (6AT), (6AAT), (6AID), (6AGF), (6DD), (6EA), (6ED), (6EJ), (6FI), (6FH), (6IC), (6JJ), (6JP), (6KA), (6MK), (6OT), 6PR, (6QR), 6ZA, (6ZB), (6ZU), (7AD), (7BE), (7BJ), (7BK), (7BF), (7BR), (7CB), (7CE), (7CN), (7CU), (7EX), (7ED), (7GA), (7GQ), (7IN), (7LU), (7NL), (7NN), (7YA), (7YS), (7ZG), (7ZJ), 9AM, 9AEY, 9AFX, (9AGN), 9ATO, 9DKS, 9CC, 9EE, 9IF, 9JN, 9LR, 9LW, 9MC, 9OK, 9RL, 9UT, (9WU), 9YO, 9YW, 9XLL, 9ZC,

8SP, FAIRMONT, W. VA.

(1AW), 1CK, (1CZ), (1DY), 1OE, (1XM), (1GBC), (1HAA), 1JAP, (1MAD), (1RAY), 2BB, 2BG, (2DA), 2DN, 2DR, (2EL), (2JU), (2OA), 2OM, (2OO), (2RM), (2RK), (2UA), (2UK), 2VA, 2ZL, 2ZN, 2AID, 2GBL, (2BZ), (2CC), (2EN), 3FG, (3GO), (3HG), (3HJ), 3HX, 3IW, (3KM), (3NB), 3NC, 3OU, (3PU), (3QF), (3UC), (3UQ), (3VV), (3XF), (3XM), 3ZA, 3ZL, (3ACT), (3AHK), 3AWV, (4AG), (4CK), (4YA), (4YK), 5ER, (5XA), (5BC), (5BO), 5CF, (5DI), 5DJ, 5DR, 5FL, (5FK), 5FQ, 5FT, (5GI), (5GB), 5HG, 5HY, (5HR), (5ID), (5IN), 5IV, 5JJ, 5JM, 5LV, 5ML, (5MM), (5MT), (5OI), 5PX, (5QE), (5RQ), 5SH, (5WR), (5WY), 5ACF, 5ACY, (5ADE), (5AEE), (5AFB), (5AGD), (5AGK), 5AGO, (5AIB), 5AIO, (5AJT), 5AKJ, (5AKV), (5AMM), 5AND, (5ANT), 5ARS, 5AVF, 5AWA, 5AWP, (5AYF), (5XE), 5XM, 5XU, (5YN), (5ZA), 5ZD, 5ZN, 5ZW, (5ZY), (9AP), 9ET, (9FS), (9GP), (9HR), 9KF, 9KO, 9LF, (9LQ), (9MC), 9OE, (9OX), 9QH, (9UH), (9UK), (9UU), (9WE), 9ZJ, (9ZN), 9AAF, (9AAW), 9ABJ, 9ABL, 9AEG, 9AGH, 9ANV, 9AWG, (9AWX), WLI, XFI, NSF, Canadian (3BP) 3DH.

8ANA, DETROIT, MICHIGAN

1AW, 1XA, 2AWL, 2DN, 2EL, 2FG, 2GO, 2RK, 2UR, 3CC, 3EFX, 3EL, 3EN, 3GO, 3HG, 3NO, 3PU, 3XM, 3ZF, 4FD, 4XC, 5ADG, 5AFS, 5AGK, 5AGO, 5AGW, 5AIO, 5AMW, 5AOG, 5ASP, 5AXC, 5BC, 5BK, 5BDU, 5DG, 5DI, 5FA, 5GI, 5GO, 5HG, 5HI, 5HP, 5HR, 5HY, 5IL, 5IN, 5IRS, 5JN, 5KA, 5KO, 5LD, 5LV, 5MM, 5NC, 5RL, 5RQ, 5RT, 5ST, 5TN, 5XC, 5XE, 5XU, 5ZD, 5ZI, 9AAW, 9ACN, 9AEO, 9AJ, 9DR, 9ANV, 9AP, 9AV, 9AXU, 9CA, 9EL, 9EQ, 9FG, 9GO, 9GL, 9HN, 9JA, 9JN, 9JY, 9KO, 9LL, 9LQ, 9NJ, 9NR, 9NW, 9OE, 9PS, 9QH, 9QN, 9QO, 9SP, 9TW, 9UH, 9UU, 9WW, 9WI, 9XI, 9ZC, 9ZJ, 9ZK, 9ZN.

8AOY, LANCASTER, N. Y.

1AW, 1CK, 1CY, 1CZ, 1DY, 1GAV, 1GBC, 1HAA, 1MAD, 1OE, 1QS, 1TS, 2AR, 2BB, 2BM, 2CT, 2EL, 2JJ, 2JU, 2KM, 2OM, 2RK, 2VA, 2UK, 2XQ, 2ZL, 2ZM, 3AB, 3AAE, 3ACT, 3ALN, 3CC, 3DS, 3HJ, 3IW, 3KM, 3MO, 3NE, 3PU, 3SC, 3VA, 3XM, 3YE, 3YK, 3ZA, 3XA, 3AAK, 3ADQ, 3ADR, 3AGK, 3AHS, 3AHQ, 3AJR, 3AMB, 3AMJ, 3AMZ, 3ANS, 3ANJ, 3ANT, 3AOF, 3APJ, 3ARS, 3AVE, 3AXC, 3AXQ, 3AYE, 3AYN, 3BC, 3BV, 3CF, 3CG, 3CZ, 3DR, 3FE, 3GI, 3HF, 3HR, 3IL, 3IN, 3KR, 3KU, 3KW, 3KZ, 3LA, 3LB, 3MF, 3MH, 3MZ, 3NU, 3NZ, 3OI, 3PJ, 3QB, 3RQ, 3SP, 3TN, 3UF, 3XE, 3XK, 3XU, 3YG, 3ZA, 3ZD, 3ZL, 3ZN, 3ZR, 3ZW, 3ZY, 9AAW, 9AMK, 9FG, 9FS, 9HJ, 9IP, 9KF, 9LQ, 9UF, 9UU, 9XM, 9YB, 9ZB, 9ZC, 9ZJ, 9ZN, 9ZT, 9ZU, NSF, XFI.

8AXC, MARIETTA OHIO

1AW, 1BZ, 1CZ, 1DR C.W., 1OE, 1QR C.W., 1JAP, 1MAD, 1RAS, (1GBC), 1XM C.W., 2BK, 2DA, 2EI, 2FG, 2JJ, (2QE), 2OW, (2RK), (2SZ), 2UK, 2VA, 2AWL, 2BGH, (2BML C.W.), 2XQ Spk. & fone, I.C.W., 2ZL C.W., I.C.W., 3BZ, 3CC Spk. & C.W., 3EN, (3FM), (3GO), 3HJ, 3IW, (3KM), (3NB), 3OU, (3PU), (3QF), (3VV), 3AAE C.W., 3AAG, (3ABC), 3ACM, (3ACT), 3AHK, (3ALN), (3WV), 3XA, (3XF), 3XI fone, (3XM), 3XN, 3YK,

8ZL, 8ZN, 8ZP, 8ZZ, 4AG, 4AU, 4BK, 4BY, (4CK), (4CX), (4DT), (4FD), (4XC), 4YA, 4YB, 5CC, 5DA, 5JD, 5XA, 5YH, 5ZL, 5ZAB, 5ZAC, 8AL, (8BC), 8BO C.W., 8BQ, (8OJ), 8DP, 8DR, 8DZ, (8EF), 8FE, 8FG, 8FI, (8FT), (8GI), 8GS, 8GX, 8HA C.W., 8HG, (8HR), 8IB C.W., 8ID, 8IK, (8IN) 8JE, 8JU C.W., (8KK), 8KZ, 8MI, 8ML, (8MM), 8MT, (8MZ), 8NZ, 8OI, 8OJ, 8PU, 8PW, 8QU, 8RE, (8RQ), (8SF), 8TJ, (8TY), 8WY, 8AAZ, 8ACF, 8ACY, 8ADE, 8AEE, 8AFB, (8AFD), 8AFO, (8AGD), 8AGK, 8AGO, 8AKH, 8AMM, 8AMW, 8AMZ, 8ANJ, 8ANK, 8AOA, 8AOP, 8AQP, 8ARD, 8ARS, (8AVD), 8AVF, 8XE, 8XK I.C.W., 8YG C.W., (8YN), 8ZA, 8ZD, 8ZN, 8ZR, 8ZV, 8ZW, 8ZX, 8ZY, 9AP, (9AR), 9BP, 9CP, 9FS, (9FU), 9GN, 9GP, 9HM, 9HR, 9JA, 9JN, 9JQ, 9KF, 9KL, 9LQ, 9MC, 9ME, 9NQ, 9NW, 9OE, 9QH, 9QR, 9JW, 9UH, 9UK, 9UU, 9AAC, 9AAG, (9AAW), 9ABL, 9ACN, 9AEG, 9AEP, 9AGH, 9ALG, 9ALS, 9AMK, 9ANV, 9ANW, 9AWW, 9AWX, 9ASL, 9DLX, 9YB, 9ZB Spk. & C.W., 9ZJ, 9ZN, KDKA fone, (NIFX), (NSF fone), WWV.

8LF, CRAFTON, PA.—All C.W.

1AE, (1TS), 1XF, 1XK, 1XM, (2AJF), 2BML, 2ZL, 2ZM, 3AAE, (3AAO), 3BM, (3CC), (3WS), 3XM, 4AAE, 4XB, 8BO, 8DP, 8IB, (8IV), 8KM, 8OZ, 8QY, 8VS, 8YG, 8YZ, (8ZG), 9AJA, 9LC, 9XI, 9XM, 9YA, 9ZB.

8ZA, NEW PHILADELPHIA, OHIO

(1AW), (1BZ), 1BBL, 1CK, 1MAD, 1HAA, 1XM C.W., (2BML C.W. & fone), 2CC, 2DN, 2BGH, 2EL, (2FG), 2JU, 2RK Spk. & C.W., 2SZ, 2VA, 2XQ fone, 2ZL C.W., (2ZM C.W.), 3AAO C.W., 3ACM, 3ALN, (3AHK), 3BZ, 3CC C.W., 3EH, (3EN), 3AWW, (3GO), 3HG, 3HJ, 3HX, 3KM, 3KO, (3NB), 3MME C.W., 3OU, 3PU, 3XF, (3XM), 3YK, 3YV, 4AG, 4AL, 4AU, 4CK, 4XB C.D., 5DA, 5HL, 5YE, 5YH, 8AL, 8AA, 8AAV, 8ABZ, (8ACF), 8AEE, 8ACY, 8AFD, (8AGD), (8AGK), (8AGO), 8AHR, 8AKH, 8ALY C.W., (8ANJ, 8AMF C.W., 8ANT, 8AOA, 8AQP, 8ARK, 8ARW, 8AXC, 8BC, 8BCO, 8BK, 8BO, 8BO, 8CD, 8CH, 8CP, 8DC, (8DJ), 8DR, 8DV, 9FA, 8FQ, 8FE, 8FK, 8FL, 8FT, 8GE, (8GH), 8GI, (8GW), 8HA, 8HG, 8HR, 8HS, 8IB C.W., 8ID, 8IN, 8JL, 8JM C.W., (8JU C.W. & fone (8KM C.W. & fone), 8KP, 8LF C.W., (8LQ), 8LV, 8LW, 8ML, (8MM), 8NI C.W., 8NZ, (8OI), (8OP), 8OM, 8OW, 8OZ C.W., 8PE, 8PN, 8PU, 8QM, 8QY C.W., 8RQ, 8RW, 8SH, 8SP, 8TN, 8TT, 8UR, 8VS C.W., 8WY, 8WZ, (8XE), 8XK, 8XU, 8YG C.W., 8YN, 8YV, 8ZD, 8ZG C.W., 8ZL, (8ZN), 8ZP, (8ZR), 8ZT, (8ZV), 8ZW, (8ZX), 8ZY, 9AAV, (9AAW), 9ACJ, (9AP), (9AWX), 9AWV, 9AXJ, 9AMC, 9AMV, 9ABL, 9ANV, 9AV, 9CC, 9DV, 9EQ, 9ET, 9EZ, (9FG), 9FN, (9FS), 9DLX, (9GF), 9HJ, (9HN), (9HR), (9KF), 9IL, (9LQ), 9JA, 9JQ, (9JT), 9LW, 9MC, 9MS, 9NQ, (9PC), 9PV, 9QO, (9UU), 9QH, 9XI, 9XM, 8XAE, 9YAC, 9YAD, (9ZC), 9ZJ, (9ZN), (9ZV), (NSF), (NIFY) XF1, XK1.

9NQ, GALESBURG, ILL., Every District.

1AW, 1XM mod C.W., 2RK Spk. & mod C.W., 2ZM, 3CC, 3EN, (3GO), 3NB, 3QF, 3XM, 3YK, 4AG, 4BY, 4XB, 4XC, (5EK), (5HL), 5IB, 5NK, 5XA, 5XP (5YH), (5ZA), (5ZL), 5ZU, 5ZAA, 5ZAB, (6WV), 6ZZ, 7EX, 7YA, 7ZM, 7ZO, (8AL), 8CF mod C.W., (8ID), (8MM), 8ZN, 8ZY, 8ACF, 8ACY, (8ADE), 8AM C.W., 8BBO, (9AR), (9CP), (9EL), (9HM), (9KO), (9LC), (9LQ), (9LW), (9OE), (9PV), (9TI), (9UU), (9XI), 9XM Spk. C.W., mode & fone, 9YM, (9YAD), 9ZB C.W., 9ZJ, 9ZN, (9ZT), (9ZV), 9ZY C.W., 9ZAC, NSF, WWV.

9AIF, SIOUX FALLS, S. D.

2RK I.C.W., 5EU, 5HL, 5HV, 5IF, 5JD, 5YH, 5XB C.W. & Spk., 5ZA C.W. & Spk., 5ZE, 5ZL, 5ZR, 5ZU, 7YA, (7ZG), (7ZO), (8AFS), 8AIB, 8KP, 8LF C.W., 8LQ, 8PJ C.W., 8QJ, 8QY I.C.W., 8XK fone & I.C.W., 8YN, 8ZR, 8ZW, Y, 9AAC, 9AAW, 9ACB, 9ACN, 9AEG, 9AEH, 9AEN, 9AEY, (9AGN), 9AIZ, 9ALG, 9ALK, 9ALS, 9AMX, 9ANF, 9ANP, 9ANQ, 9ANV, 9AOK, 9AON, 9AOU, 9AOU, 9AOU, 9AOU, 9AV, 9AVP, 9AWX, 9AWZ, 9AXU, 9AYE, 9AYS, 9AYW, 9BM, 9BP, 9BQ, 9CP, 9DAE, 9DAT, 9DBO, 9DD, 9DE, 9DIW, 9DJX, 9DKS, 9DLS, 9DLX, 9DMB, 9DML, 9DNN, 9DO, 9DV, 9EK, 9EL, 9EQ, 9EW, 9FF, 9FS, 9FX, 9GC, 9GP, 9HI, 9HM, 9HT, 9IF, 9II, 9IY, 9JA, 9JE C.W., 9JN, 9JQ, 9JV, 9KD, 9KL, 9KO, 9LF, 9LQ, 9LW, 9MC, 9ME, 9MS, 9NQ, 9NR, 9NW, 9OA, 9OE, 9OC, 9PC, 9PL, 9PL, 9PN, 9PS, 9QH, 9QO, 9RY, 9SZ, 9TI, 9TO, 9TW, 9UF, 9UG, 9UH, 9UK, 9UU, 9VB, 9VC, 9VE, 9WE, 9WI, 9WO, 9WS, 9XAE, 9XI, 9YAC, 9ZAA, 9ZAC, 9ZB, 9ZC, 9ZJ, 9ZN, 9ZY C.W., NSF.

9HI, 9HN, 9HR, 9IY, 9JA, 9JN, 9JQ, 9KF, 9KL, 9LF, 9LQ, (9LW), 9MC, 9MS, 9NQ, 9OA, 9OE, 9OO, 9PL, 9PN, 9PS, 9QO, 9RG, 9SC, 9SZ, (9TI), 9TW, 9TZ I.C.W., 9UF, 9UK, 9UU, 9VE, 9WI, 9XAE, 9XI C.W. & Spk., 9XM C.W. & fone, (9YAE), 9YAF, 9YB, 9YO, 9YT, 9YW, 9ZAC, 9ZB, C.W. & Spk., 9ZC, 9ZJ, 9ZU, 9ZY C.W., 9ZV.

9FS, GOSHEN, IND.

1AW, 1JA, 1XM C.W., 2EL, 2RK, 2SZ, 2ZL, (3AAO C.W.), (3AHK), (3CC), 3DH, 3DS, 3EN, 3GO, 3KM, (3XF), 3XM, 3YK, 4AG, 4CG, 4GL (5XA), 5XB, 5YE, (5YH), 5ZD, 5ZT, 5ZL, 5ZW, 5ZX, 9ACF, (8AFB), 8AFS, 8AGD, (8AXC), 8CD, (8CP), (8DZ Spk. C.W.), (8FI) (8HG), 8HR, 8IN, 8JE, 8JL, 8JN, (8MM), (8NZ), (8OM), (8PN), (8PU), (8RQ), (8SP), (8TK), (8TN), (8YN), (8ZA), 8ZD, (8ZY), (8ZL), (8ZN), (8ZR), 8ZV, 8ZW, 9AAG, (9AAW), 9ABC, 9AEG, 9AFX, (9AGH), (9AGN), 9AGX, (9AKC), (9AKH), 9AKZ, (9ANV), (9AON), 9ARG, 9AXU, (9AZX C.W.), (9DAX), (9DLX), (9DKT), 9YAC, 9YAD, 9ZAC, (9DV), 9FJ, 9FN, (9FQ), 9GP, 9GX, 9HM, (9JL), 9JN, 9KF, 9LC, (9LQ), (9LW), (9ME), 9NQ, 9BP C.W., (9PC), 9ZJ, 9PS, (9UK), 9WE, (9WO), (9WZ), (9VZ), 9QH, (9QO), (9TO), 9XI C.W., 9XM C.W. Spk and fone, 9YA, (9YB), (9YC), (9YM), (9YQ), (9ZC), (9ZN).

9AE, BOONE, IA, C.W. Stations.

2ZL, 2ZM, 5XB, 5ZA, 8ALY, 8AMZ, 8IK, 8JM, 8OH, 8VS, 8XK, 8XY, 8YG, 8ZL, 8ZN, 8ZG, 8ZR, 8ZW, 8ZY, 9AG, 9AK, 9AL, 9AMU, 9LC, 9RQ, 9XI, 9XM, 8ZB, 8ZC, 9ZY, 9AZX, NMW, NSF, XF1.

9ACJ, CHICAGO

1HAA, (2CS), 2DK, (2DN), (2RK Spk. & I.C.W. Can 3BP, 3CC, 3GO, 3HG, (3HJ), 3KM, 3NB, (3XF), 3XM, 4AG, 4FD, 4XC, 4YA, (5HL), 5IF, (5YH), 5XA, 5ZA, (5ZAB), 5ZL, 5ZX, 6KA, 7ZG, 8ACF, (8ACY), (8ADE), 8AEE, 8AFS, (8AGK), (9AGO), 8AIB, (8AKV), 8AXC, (8AL), 8BBW, 8BO, 8BI, 8CD, (8EB), 8EF, 8FK, (8FQ), 8GX, (8HG), (8ID), (8IN), 8JE, (8JL), 8ML, 8MM, 8NL, 8OI, (8OJ), (8RQ), (8RU), 8SP, 8TN, (8TY), 8WY, 8XE, 8XK C.W. & fone, 8ZL, 8ZN, (8ZW), 8ZY, (9AAC), (9ABI), 9ACB, 9AEG, 9AEY, 9AKA, 9ALG, 9ALO, 9ANK, (9ANP), (9AOK), 9AOJ, (9ARG), 9ARJ, 9ATO, 9AXU, (9AYE), 9DV, (9EE), 9EK, 9EL, 9EZ, (9FU), 9HK, (9HN), 9HT, 9IY, 9JA, (9JL), (9JN), 9JQ, (9KO), 9LQ, (9MS), (9NQ), 9OE, (9OO), 9PS, 9QO, (9TI), 9UH, 9UG, 9UT, 9WE, (9XI), 9ZAC, 9ZB, 9ZT, (CW3).

9AHC, ELLENDALE, N. DAK.

5CE, 5EK, 5HK, 5HL, 5HV, 5IB, 5IF, 5JI, 5JR, 5LB, 5LC, 5MM, 5NK, 5YH, 5ZA, 5ZB, 6LC, 6WV, I.C.W., 6ZA, 6ZH, 6ZZ, 7DH, 7EX, 7HS, 7IM, 7LU, 7LY, 7MO, 7ZG, 7ZM, 7ZO, 8BO, 8BP, 8CF I.C.W. C.W., 8FT, 8ML, 8JM C.W., 8OZ C.W., 8SP, 8XK C.W., 8ZR, 8ZY, 8AEE, 8AGK, 8AIO, 8ANW, 8AOU, 8AXC C.W., 9AAV, 9ABH, 9ACD, 9ACJ, 9ACL, 9AGN, 9AEG, 9AEJ, 9AEY, 9AFK, 9AFX, 9AG C.W., 9AGN, 9AHF, 9AHO, 9AHZ, 9AIF, 9AIS, 9AJH, 9AJP C.W., 9AKA, 9AKC, 9AKM, 9AKX, 9ALG, 9ALH, 9ALK, 9ALO, 9ALU, 9AMH, 9AMK, 9AMV, 9ANF, 9ANP, 9ANV, 9AOA, 9AOH, 9AOJ, 9AOK, 9AON, 9AOU, 9AP, 9AQA, 9AR, 9ARJ, 9ARP, 9ARS, 9ASF, 9ASL, 9ASN, 9ATG, 9ATN, 9ATO, 9ATV, 9AUH, 9AOU, 9AUS, 9AUV, 9AV, 9AVP, 9AWX, 9AWZ, 9AXU, 9AYE, 9AYS, 9AYW, 9BM, 9BP, 9BQ, 9CP, 9DAE, 9DAT, 9DBO, 9DD, 9DE, 9DIW, 9DJX, 9DKS, 9DLS, 9DLX, 9DMB, 9DML, 9DNN, 9DO, 9DV, 9EK, 9EL, 9EQ, 9EW, 9FF, 9FS, 9FX, 9GC, 9GP, 9HI, 9HM, 9HT, 9IF, 9II, 9IY, 9JA, 9JE C.W., 9JN, 9JQ, 9JV, 9KD, 9KL, 9KO, 9LF, 9LQ, 9LW, 9MC, 9ME, 9MS, 9NQ, 9NR, 9NW, 9OA, 9OE, 9OC, 9PC, 9PL, 9PL, 9PN, 9PS, 9QH, 9QO, 9RY, 9SZ, 9TI, 9TO, 9TW, 9UF, 9UG, 9UH, 9UK, 9UU, 9VB, 9VC, 9VE, 9WE, 9WI, 9WO, 9WS, 9XAE, 9XI, 9YAC, 9ZAA, 9ZAC, 9ZB, 9ZC, 9ZJ, 9ZN, 9ZY C.W., NSF.

(Concluded on page 57)

April Station Reports

1NAQ, Hartford, Conn.
 Steadiest 1HAA—1RAY—1MBS
 2RK—2BML—2ZL
 3XM—3GO—3KM
 8RQ—8BC—8ZR
 9ZJ—9ZL—9ZN
 Loudest 1RAY—1HAA—1MBS
 2RK—2EL—2ZL
 3XM—3ABC—3GO
 4FD—4AL
 8KP—8BC—8RQ
 9ZJ—9ZL—9ZN

1DY, Lynn, Mass.
 Steadiest 1HAA—1SBZ—1YB
 2EL—2RK—2JU
 3XM—3NB—3GO
 8SP—8XE—8ZA
 Loudest 1HAA—1YB—1MAD
 2EL—2RK—2JJ
 3XM—3NB—3HX
 8XE—8DR—8BC

1CK, Braintree, Mass.
 Steadiest 1OE—1HAA—1SBZ
 2RK—2EL—2JU
 3XM—3CC—3GO
 None consistent
 8XE—8XU—8BC
 9ZJ—9LQ—9ZN
 Loudest 1SBZ—1HAA—1OE
 2RK—2EL—2OM
 3XM—3CC—3GO
 4YA—4EY—4CK
 8XE—8XU—8VQ
 9ZJ—9ZN—9LQ

4XC, Atlanta, Ga.
 Steadiest 1AW
 2RK—2EL—2BK
 3GO—3HJ—3NB
 4GN—4FD—4BY
 5XA—5YH—4ZAB
 8ID—8DC—8RQ
 8ZY—8ZW—8XE
 9MC—9LQ—9UU
 9ZJ—9XM—9YI
 Loudest 1AW
 2EL—2RK—2BK
 3GO—3HJ—3NB
 4GN—4BY—4FD
 5YH—5XA—5YE
 8DC—8AXC—8HG
 8XE—8ZW—8ZR
 9OX—9EL—9MC
 9YI—9XM—9ZJ

4AM, De Land, Fla.
 Steadiest 2RK—2JU—2EL
 3BZ—3GO
 4DL—4XC—4FD
 5XA—5YA
 8SP
 9ZJ—9MC
 Loudest 2RK—2JU
 3BZ—3GO—3EN
 4DL—4XC—4YA
 5XA—5YA—5ER
 8HG—8XE—8SP
 9ZJ—9MC

5XA, Auburn, Ala.
 Steadiest 1XB—1XF—1AW
 2RK—2ZL—2EL
 3GO—3BZ—3IW
 4BY—4YB—4YA
 5ZAB—5YH—5HL
 8ZL—8KP—8RQ
 9AAC—9ZN—9FU
 Loudest 1XB—1UBC—1RW
 2RK—2EN—2EL
 3GO—3EN—3HG
 4BY—4GL—4YA
 5HL—5HV—5ZL
 9XK—9TN—9RQ
 9ZN—9YC—9CA

5ZL, Little Rock, Ark.
 Steadiest 2RK—2ZL—2PL
 3GO—3AAG—3DH
 4XC—4YA—4AG
 5HV—5EW—5NK
 6WV
 8MR—8ZY—8BA
 9AEG—9ZAC—9OE
 Loudest 2RK—2ZL—2PL
 3GO—3AAG—3DH
 4YA—4XC—4AG
 5HV—5EW—5NK
 6WV
 8ZY—8MR—8BA
 9OE—9ZV—9AEG

8SP, Fairmont, W. Va.
 Steadiest 1MAD—1AW—1DY
 2EL—2RK—2JU
 3XF—3CC—3EN
 4CP—4YK—4YA
 5ER—5XA
 8AXC—8AGK—8RQ
 9LQ—9UU—9MC
 Loudest 1MAD—1AW—1DY
 2JU—2EL—2RK
 3XF—3XM—3NB
 4YK—4YA—4CP
 5ER—5XA
 8OI—8YN—8AGK
 9LQ—9MC—9ZN

8ZA, New Philadelphia, O.
 Steadiest 1BBL—1AW—1HAA
 (C.W.) 1XM—1RZ
 2ZM—2RK—2SZ
 2ZM—2ZL—2BML
 (C.W.)
 3XM—3GO—3XF
 Loudest 1AW—1RAY—1BBL
 (C.W.) 1XM—1RZ
 2RK—2SZ—2DN
 2RK—2BML—2ZM
 (C.W.)
 3XM—3GO—3EN

8AOA—3CC—3MME
 (C.W.)
 4AG—4XC—4AU
 (C.W.) 4XB only
 5YE—5YH—5DA
 8ANJ—8AGK—8ZW
 8ZV—8JU—8KM
 (C.W.)
 9UU—9ZN—9LQ
 (C.W.) 9XI only
3AOA—3CC—3MME
 (C.W.)
 4XC—4AG—4AU
 (C.W.) 4XB only
 5YH—5DA—5YE
 8BO—8LV—8ZW
 8ZV—8ZG—8LF
 (C.W.)
 9JT—9ZN—9PC
 (C.W.) 9XI only

9ME, Ft. Wayne, Ind.
 Steadiest 1AW—1BBL
 2RK—2EL
 3XM—3EN—3AWV
 4AG—4BK
 5ZAB—5JD—5DA
 8ZY—8DX—8ZL
 Loudest 1BBL—1AW
 2RK—2EL
 3XM—3EN—3AWV
 4AG—4BK—4XM
 5ZAB—5JD—5DA
 8ZY—8DX—8ZL

9FS, Goshen, Ind.
 Steadiest 1AW—1HAA—1XM
 2ZL—2RK—2SZ
 3DH—3EN—3AHK
 4XC—4AG
 5XA—5YH—5YE
 8ZA—8XE—8RQ
 9ZN—9AEG—9ZN
 Loudest 1XM—1AW—1HAA
 2ZL—2RK—2SZ
 3EN—3GO—3DH
 4XC—4AG
 5YE—5XA—5ZL
 8ZR—8XE—8RQ
 9EQ—9HN—9ZN

9YB, Purdue University, Lafayette, Ind.
 Steadiest
 3XM—3EN—3KM
 4GN
 5YH—5XA—5DA
 8XE—8ZR—8ZA
 9ZJ—9LQ—9OE
 Loudest 1AW
 2RK
 3XM—3EN—3YK
 4XC—4AU—4GN
 5DA—5YH—5XA
 8XE—8DI—8ZA
 9ZJ—9QO—9OE

Remarks:
 First District. 1AW comes in well at times on fading tests but not heard often otherwise.
 Second District. Usual lack of good signals from Second District.
 Third District. 3XM, following in the footsteps of 3DH, has been best although gap used lately changes tone and does not come through so well. 3EN seems to be going well.
 Fourth District. Not much doing; few stations heard occasionally.
 Fifth District. No change except that 5XA is coming through more often.
 Sixth and Seventh District. No stations heard.
 Eighth District. Based on steadiness of signals and the number of times heard 8XE takes the lead this month with 8ZR next and 8ZA following. 8DI comes in very loud at times.
 Ninth District. 9ZL still holding the lead, 9LQ next best, although 9QO and 9OE come in more loudly at times.

SUMMER ARRIVES.
 (Continued from page 29)
 force. Make schedules with the fellows you hear and watch how the gang grows. Summer operation in the early morning is so incomparably better than at night that we would be wise to change our bed-time hour so we could join Mr. Hebert's "Early Birds" of bygone years. As announced elsewhere in this issue, we're going to have a contest, right in the middle of summer with all its static, and see who can do the best receiving. Reading thru QRN is an art in itself but with only a little practice musical tone signals can be read as long as
 (Concluded on page 58)



Central Illinois Get-Together

The Central Illinois Amateur Banquet will be held in Peoria at the Jefferson Hotel in June. This meeting will not be a Convention but will be a regular get-together and ham-fest with a banquet in the evening. This affair will be held under the auspices of the Peoria Radio Club and it is hoped that a good attendance of Illinois men will be present.

New Club Papers

QST is in receipt of copies of several new club organs, among which are "The Hamville Star", published by the Central Michigan Wireless Assn., of Lansing; "The Radio Digest", of the Springfield (Mass.) Radio Assn.; and "The Radio Radiator", published by the Jefferson City (Mo.) Radio Club; all affiliated with the A.R.R.L.

As we have said before, we think the idea of local sheets is a fine one, and every amateur will find that the pleasure of having a home radio paper makes it worth his most enthusiastic support.

M. V. R. A.

The Monongahela Valley Radio Association with headquarters at Fairmont, W. Va., has recently affiliated with the A.R.R.L. Its present officers are:

President: A. G. Heck, 8EF
 Vice-Pres.: Edw. C. Jones, Jr., 8JE
 Sec'y-Treas.: Albert G. Kisner, 8SP

The membership is now about twenty, composed of station-owners within forty miles of Fairmont, although mostly confined to Marion County. The membership include several former Signal Corps men, and other eligible amateurs are expected to join.

One purpose of the organization is to combat the QRM evil, which is not only from local spark coils, but from hams on high power poorly tuned sets in a city 25 miles away, who use full power to work a few city blocks, and have no regard for hours, QSS tests or other amateurs.

The meetings of the M.V.R.A. are not limited to the usual gab, but often experiments are made. Recently, in order to tell how much the human element enters into making the QSS charts, artificial fading was made with a buzzer and a loose coupler, with every member's phones con-

nected in Results showed that everyone interpreted the general characteristics the same.

Lectures on practical and theoretical subjects are regular features. Meetings are held semi-monthly.

An inter-city checker tournament is being arranged, and will take place as soon as the champions can be located at hours that will cause the least interference.

All communications to the club should be addressed to Edward C. Jones, Jr., 8JE, 522 Fairmont Ave., Fairmont, W. Va.

Northwestern Radio Assn.

The Northwestern Radio Association of Portland, Oregon, has recently purchased a General Radio wavemeter to be used in tuning the members' stations. The meter was found to be unsuitable for use in tuning a transmitter to 200 meters, so is being rebuilt for this purpose.

The organization is growing rapidly, and now includes over sixty active members from several counties in two states. Meetings are held every Friday night at 8 P.M. in the Journal Bldg., Portland. It has been found advisable to devote certain meetings each month exclusively to discussions on radio subjects, all business being set aside. This has met with marked approval.

Lowell's Radio Dance

Another successful radio exhibit and dancing party was held on March 29th by the Lowell (Mass.) Radio Club, with a huge attendance. The music was transmitted by radio from the club rooms to the dance floor at Associate Hall. In addition to the dancing another novelty was presented in the form of a miniature railroad system completely controlled by wireless.

Columbus Radio Club

Columbus, Ohio, has a live radio club of about 65 members. On April 1st the club held its annual election of officers, resulting in the choice for president of M. Fay McDowell, A.R.R.L. City Manager; vice pres., John Martin; secretary, F. S. Harmer, 74 N. Monroe Ave., and treasurer, Leo Hirsch.

The club recently entertained the convention of Ohio amateurs as mentioned in

last QST. A club room is being sought atop a high office building, where it is planned to maintain a good DX relay station.

Dallas Radio Club

Citizen radio in the vicinity of Dallas is booming, and is showing its value to the community.

The Dallas Daily Times Herald recently had a full page story of the achievements of the local men, illustrated with photographs of the operators and equipment of stations 5ZC, 5ML, 5ZG, and the club's able secretary, Brother Porter T. Bennett. This article has done much to open the eyes of the general public to the fact that we amateurs are more than a bunch of kids.

The big news from Dallas, however, is the story of the reporting of recent municipal elections by radio, in co-operation with the Dallas Dispatch. Election returns were phoned by the Dispatch to Ben Emerson, 5ZG, who broadcasted them by radiophone, and were picked up at a half dozen points over the city where the club members had installed temporary sets equipped with Magnavoxes. Large crowds in auditoriums and before bulletin boards, as well as hundreds in outlying districts, were accordingly kept instantly posted on the progress of the count. The new mayor's first message to his people was likewise sent out by radiophone and was conveyed to a dozen large gatherings, two-score private radio parties, and the election watchers in downtown streets.

Dallas now has a time schedule calling for free air 8 a.m. to 7 p.m., with blanks for time signals and daylite QRK tests; 7 to 7:30 p.m. reserved for broadcasts; 7:30 to 8:30 p.m. free air but no testing; 8:30 to 9:30 p.m. short relays and collection of local traffic; 9:30 p.m. to 8 a.m. long distance relaying.

Phila. A. R. A.

The Philadelphia Amateur Radio Assn. announces a contest for the best reception accomplished with loops, closing Sept. 19th, with suitable prizes for the winners. Particulars can be obtained from the president, J. E. Delp, Jr., 1526 No. Hollywood St.

During the past month some very interesting and valuable papers were presented before the association. Meetings are held on the first and third Monday nights of each month and all amateurs of the Third District are cordially invited to attend and partake in the discussions.

West Allis Radio Club

The West Allis (Wisc.) Radio Club was organized about May 1st, 1920, and after going thru some rather strenuous times became a recognized organization in West Allis. The club now numbers 20 members

and is steadily on the increase. Just recently the club joined the Milwaukee Radio Executive Council to co-operate with the other clubs in Milwaukee County in the reduction of QRM which hinders traffic.

Address all communications to West Allis Radio Club, 602 64th Ave., West Allis, Wisc.

Lehigh Valley Radio Association

A very enthusiastic meeting of the wireless men in Bethlehem, Allentown, Easton, and vicinity was held March 10th, at Bethlehem, Pa. This was the largest and most interesting meeting of wireless men ever held in this vicinity. Mr. F. Clifford Estey, President of the Essex County (Mass.) Radio Association, gave a talk on club organization and the experiences of his recent trip throughout the west and south in the interest of wireless.

After Mr. Estey's talk a business meeting was held at which it was voted to form a new association to be known as the Lehigh Valley Radio Association, with a section or club in each of the cities and towns in the valley, all running as separate clubs yet bonded together in the larger association and meeting in one of the cities once each month and the separate sections holding meetings once each week or as often as desirable. Each section will elect its own officers and the president of each section will be a vice president of the Lehigh Valley Radio Association. Besides these vice presidents the association will have a president and chairman of the Advisory Board and these officers will be the governing body of the entire association.

Mr. K. F. Gray of Easton was elected president of the Association and Mr. Arthur F. Breisch of Bethlehem was chosen chairman of the Advisory Board. A committee of three was appointed by the president from each city to call the wireless men together in their towns and conduct the local elections.

TUBES WITHOUT FILAMENTS

(Concluded from page 26)

to the thickness of a sheet of paper and enclosed in a cylindrical glass tube containing Neon or Helium gas. The field of a powerful permanent magnet is directed across the gaseous space between the two electrodes and apparently causes the liberation of electrons thru ionization due to atomic bombardment. Just how the action is controlled to produce oscillations we do not know and chief interest in the Amrad company is now centering on the use of the new device as a rectifier.

Tubes without filaments would certainly be a blessing and we will await developments with interest.

Radio Communications by the Amateurs

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



GENIUS, OR THE P.O.D. RADIO ENGINEERS

Omaha, Nebr.

Editor, QST—

Since the beginning of time man has been bothered with genius. Some geniuses do something and others undo something. This is a story of geniuses that undid something. Just how they accomplished this undoing is narrated below.

As is the case with every burg, city or village, Omaha has its representative body of radio men. If you think I'm kidding just mooch the phones off the the operator at 9HT some evening about eight o'clock. Here you will find Genius in the form of mother's little lambkins permeating the air with ungodly squeaks and groans. But I'm getting slightly off the subject for it's a higher type of genius I wish to tell about, the type who wishes to place before the eyes of the layman, Wireless; Wireless in the form of some mysterious super-natural phenomena.

Coming from lunch Thursday noon, March 10th last, Mr. E. M. Ruede, chief engineer for the Nebraska Power Co., met Mr. Fred Swain of the C & S Radio-Electric Co. of Omaha. Mr. Swain, clothed in a pair of overalls and ready for radio work of any kind, asked Ruede just how to get on top of the power company building.

"We're planning a little radiophone demonstration from the Auto Show in the Auditorium to the Fontenelle Hotel", explained Swain.

"What are you going to use, a telephone line or a Victrola?" asked the interested Mr. Ruede.

Swain promptly found the top of the building and Ruede returned to his work.

Monday noon saw Ruede and some of his friends inspecting a newly stretched P.O.D. on the top of the building and, funny, but that darned P.O.D. ran the six blocks from the auditorium to the Fontenelle and jumped five trolley lines to do it. Gosh but wireless means a lot of work, doesn't it? Tuesday afternoon leads were run from the P.O.D. to a back room in the power company building and when a telephone receiver was shunted around these leads the darned diaphragm just naturally jingled and stuck tighter than ever.

And in the lobby of the Hotel Fontenelle sat a brand new coupe. Above this coupe ran a small flat top aerial while out of the hotel balcony ran a lampcord lead straight into the car. The contents of that car were doubtful. Was that some new fangled coffee grinder setting in the back seat or was it really one of the famous short wave regenerative receivers? At any rate two Magnavox horns adorned the top of this bus and that surely was all that was necessary, for from one of those wonderful horns spouted forth sweet, beautiful music, "wireless music from the municipal auditorium". Oh, what a wonderful age to live in—wireless music from the Auto Show six blocks away!

Wednesday morning a reporter from the Omaha World Herald traced the P.O.D. line for his own satisfaction and then with a sore neck adorned a chair in the lobby of the Fontenelle. He couldn't sleep so he gave the "Wireless Auto" the once over. What was all the funny noise coming from that crazy horn? Sounded like the tuning of some musical instrument combined with the scraping of feet and the low murmur of voices. Mr. Reporter lines out for the power company and hunts up Mr. Ruede. "Say there, fella, that darned horn up at the hotel's gone crazy" he explained.

"They're playing now," remarked Ruede, as he shunted a phone receiver and a condenser across his leads running from the P.O.D.

"Listen," pleaded Ruede, "you and I know this darn wireless business is a fake, but you shove over to the Herald and dig up another reporter and let him go over to the auditorium and yell into the transmitter over there and I'll bet you a quart of white mule to a quarter kilowatt power tube we'll hear him accompanying that two by four orchestra that's busy festering up a reputation for those two wizards. You sure got to give it to that guy when it comes to concocting a scheme like this. And another thing,—tell the reporter you send over to snoop around ham-like and cut their lead-in to that mistake of an aerial they've hoisted on the roof of the auditorium for a decoy. In the meantime, I'm going to connect up a phone magneto to this P.O.D. and about five minutes after your reporter makes his debut I'll kick one of those Magnavoxes off the top of the

coupe in the hotel or know the reason why. Now mozey along, Oswald, and let's climax this deal. No wonder that ham with the three tube set not three blocks from their aerial isn't hearing a peep out of them. They've got this P.O.D. loaded to the limit."

A news reporter of the Omaha World Herald walked briskly into the auditorium and yelled into the transmitter of the radiophone: "Hello Pat, do you get me? The next number will be 'Bright Eyes', played by Oleson's Orchestra?"

Having yelled into the transmitter as ordered and having accomplished his mission of separating that lead-in from its better half he made tracks for the hotel to find the music in full swing. Say gang, that's what I call efficiency,—a busted lead-in and sigs as loud as ever. Any one wishing to accomplish the same will please write the C & S Radio-Electric Company of Omaha. It's the chance of a lifetime fellows, grab it.

Forty minutes after the pot was opened every Omaha paper was represented in the form of a storm of reporters but the Herald had the dope, Ruede has accomplished his mission and the fight was over. But wait,—next day we had a come back something like this:

"The first two days we used real wireless but our bulbs all blew out at once and we had to resort to the P.O.D. It would take a long time to get new bulbs (they run a radio company) and we had to see it through."

That's about all, gang, but there's just one thing more,—that comeback was a wonderful show of genius in itself, fellows, for they seemed to know those bulbs were all going to "blow" out together. Why, say, they stretched that P.O.D. a week ahead of time!

Yours truly,

An Outraged Amateur.

Newspaper Clippings Re Above

"If Old Broadbrim could have peeped over the top of a downtown office building last night he would have looked upon his favorite dessert. Wiretappers were at work! Using a condenser in series with a telephone receiver, the whole clamped onto a wire with clips, E. M. Ruede, Kenneth Ross and a newspaper man heard over it sweet music coming from the Auditorium.

"Ruede and his friends are interested in radio work, and they have been particularly interested in the demonstration of Wilbur R. Cramer and Fred W. Swain of Omaha who, according to the Literary Digest, can catch wireless phone messages on apparatus which they have attached to their automobile.

"This week being auto week, guests at the Fontenelle have been marvelling at an

auto in the lobby equipped with the young men's apparatus, for over it they maintain that music from the auditorium is transported by ether to the Fontenelle where it is caught and released by the wireless phone to those who care to hear.

"Last night visitors at the auto show were surprised, so were members of the band, when a young fellow marched up on the stage and called into the apparatus "Hello Pat, do you get me?", then went away. The wiretappers on the roof nearby hear him call also, and heard the band play.....

"In leaving the auditorium the young man who had called into the receiving apparatus accidentally shut the door on the aerial of the wireless apparatus. But, according to another secret agent the music still waited from the wireless phone on the auto in the Hotel Fontenelle.

"'It's a blooming fake', cried Ruede, 'I think too much of the work to let anybody put a raw one like that across; that is why we tapped this wire to find out.'

"Ruede yesterday traced a loosely and newly hung wire from the auditorium north over the rooftops to the Rialto theater, thence west to a fire escape at the rear of the Fontenelle, where the wire went in thru a window. Last night the wire-tappers not only listened to the music that they tapped from the Auditorium but they called up several of their friends and by telephone let them hear it too."

—From the Evening World-Herald,
Omaha, March 17th.

"Wilbur Cramer, of Cramer & Swain, who have been giving auto show music by "wireless" at the Fontenelle, admitted today that their apparatus at the hotel is connected by wire with the Auditorium as charged by E. M. Ruede, who Wednesday night "tapped" their wire.

"But they really can transmit the music without the aid of wires and did so the first two days, they said. "Two of the bulbs on our transmitting instrument at the Auditorium burned out Tuesday night", Cramer said. "We sent to New York for others to replace them, so to keep the music going we connected the phone up by wire. Up to Tuesday night the music heard at the Fontenelle had been coming as claimed, by wireless..... It was unfortunate that our bulbs, each of which cost \$7.50, should blow out at once. It looks like someone, jealous of us or something, has tampered with them under the orchestra pit at the Auditorium. Someone surely cut the ground wire of the aerial, as it was not broken by having the door slammed on it. That wouldn't break it", Swain said.

"Mr. Ruede went just a little too far in his insinuations, both young men de-

clared. 'If our bulbs come in time we will yet prove to him and everyone else the music was wireless up to Tuesday night.'

—From the *Evening World-Herald*,
Omaha, March 18th.

(Of late we have had numerous complaints against the C & S Radio Electric Co. They make no response to our efforts to secure satisfactory treatment for A.R.R.L. members. We cannot recommend them to our readers.—Editor.)

IS SCOTLAND HEARING US?

130 Second Ave.,
Long Branch, N. J.

Editor, QST—

Several weeks ago I wrote to Mr. Miller of Aberdeen, Scotland (the man who says he heard 2QR), asking if it would be possible for him to listen for me, as I have a C.W. and get 2 amps. on about 240 meters. Well, the other day I received an answer and will give you a copy of part of it here:

"It must seem strange to you that I have only received 2QR and no other station, but as a matter of fact I've heard a large number of telephone and telegraph stations, but as I've got no directory of the addresses of the senders I can't write them and let them know. So I'm very glad to have had your letter. On looking over the list of the call letters of the ones I've taken, I find I've heard you and the one you work to (2AHL). You were quite strong and clear and when you said you had a low tone I quite clearly remembered you."

Now I'm going to write him and ask for a list of the calls he's heard and will shoot 'em to you as soon as I get an answer.

Hoping this may be of interest to QST readers, I remain,

Yours sincerely,
Harry J. McCollum, 2AXB.

(We also wrote Mr. Miller on April 8th and offered to swap him a new government call book for a list of the American stations he has heard, but to date we have no reply.—Ed.)

THE OLD UNANSWERED QUESTION

Stroh, Ind.

Editor, QST—

What is a ground lead? Where does it leave off and the actual ground begin?

For instance, supposing I have my transmitter located 20 feet above ground, and use a 25 foot lead to the ground. This 25 feet would be counted the same as that much lead on my aerial lead-in when I apply for a license. However, if I am using the well for a ground, my lead is only measured from my set to the well pipe. Why not simply extend a piece of 2 inch well pipe 20 feet above ground and then

make my ground lead short? You will probably say that this will not do, as the pipe is the same as the ground lead.

Granting that such is the case, then please explain to me how these fellows located on high buildings, with an aerial over a hundred feet above the ground, can simply place their transmitter close to the city water pipes and have a short ground lead—ON THE THIRD OR FOURTH FLOOR ABOVE GROUND?

Please explain to me how such stations keep their wave below 500 or 600 meters, when they use an aerial 50 or 60 feet long and are perhaps 100 feet above ground. If the ground lead oscillates the same as the aerial, it would seem to me that they would have a very long wave.

Being unable to get a satisfactory explanation I turn to you.

Yours truly,
F. B. Hanes.

FROM THE BUREAU OF STANDARDS

DEPARTMENT OF COMMERCE

Bureau of Standards
Washington

May 12, 1921.

Mr. H. P. Maxim, Pres.,
American Radio Relay League,
Hartford, Conn.

Subject: Co-operative Fading Tests.

Dear Sir:

1. The series of fading tests, extending over the past year conducted by the American Radio Relay League in co-operation with this Bureau, have been highly satisfactory. We believe that no such extensive and fruitful co-operative radio transmission tests have previously been held. The possibilities of such co-operative research for the future are very great. There is no question that there might be great extensions of similar work in the future. The A.R.R.L. is admirably adapted, through its form of organization and the facilities of its membership, for further very valuable work of this kind.

2. We desire to convey through you our appreciation of the organization of the tests by your National and District officers, of the excellent work done by the transmitting and recording operators, and, in addition, the fine spirit of co-operation shown by hundreds of stations that stood by patiently during the running of the tests. There has already been partial publication of results of the tests, and we expect to prepare a full account of the work, which will be submitted for publication in "QST".

3. The next project which we should like to take up with the A.R.R.L. is the study of direction of strays. We hope to transmit to you before many days some results of our preliminary experiments.

We appreciate that this project is probably one which will not be suitable for a very wide circle of the A.R.R.L. membership. The International Union of Scientific Radio Telegraphy is, however, making plans for co-operative radio experiments upon a large scale, and we are confident that other opportunities will arise for important contributions by the A.R.R.L.

Respectfully,

E. B. Rosa,
Acting Director.

OUR MOTTO: WE NEVER SLEEP

181 Waverly Place,
New York City,

Editor, QST—

Just noticed in the May number that I am a regular member of the Boiled Owl Club. I wish to nominate my side partner Mr. Intemann of 2ACX as another member, as he fully deserves that distinction.

On a recent nite abt a week ago we both stuck out the Saturday nite gang as per the O.M. and it sure was great sport art—every hour or so a new bunch got on and the rest went to bed. The sun came up and we still hrd 1XM, 8AIO, and others QSA. We stuck till abt 8 a.m. and then called it a nite and then went upstairs and ate abt a pint of ice cream. You see 2ACX is connected with the ice cream biz.

I wish to recommend a pint or two of ice cream to fellow B.O.'s after an all nite session of outsticking those whose stomachs never go bk on them, as it is very effective in obliterating that taste like a blacksmith's apron. If the ice cream alone is insufficient I wud advise a few pickles and bananas sliced in with it.

Well, on with the good wk, boys. QRU nw cul best 73s de

A. Rechert, 2TT, opr. 2ACX.

A SPLENDID IDEA

324 Tinkler Street,
La Fayette, Indiana.

Mon Cher Eddy:

When I reached my room yesterday afternoon I found "QST" waiting for me, so I devoured it in big chunks and let the rest of the world go by. I was particularly interested in 9ZN's article on the "Ideal Spark Transmitter". After having devoured about half of the number, I went over to a friend's station and tried to receive through all the static in the world. (The only thing from out of town that I got all evening was 9XM signing off on straight CW, QSA but still difficult to copy through the QRN.)

Having thus passed (up) an evening I went to bed. Suddenly a brilliant idea came to me. (It might be well to explain that I am a short-connection-fiend.) Why not cut about an inch out of the one-turn

primary (of 1-16" x 2" copper,) and arrange your rotary, of the straight-through type, so that it shall have electrodes of 1-16" x 2" aluminum? In other words, why have leads at all from your condenser to your gap and from your gap to your O.T.? Of course, the cut ends of the primary would be supported on efficient insulators and ground to a thin edge. I think that this must be the limit, so far, in means for the conservation of the amateur's invaluable, priceless inductance—and might be the means of bringing some of the wave-length-law-breakers down to 199 $\frac{1}{2}$ meters in stead of 400.

Truly yours, OM,
Wm. E. K. Middleton,
Canadian 4AQ.

WE STAND CORRECTED

15 Roseland Ave.,
Waterbury, Conn.

Editor, QST—

Permit me to call your attention to an error occurring in "Strays" of the April issue of QST.

The editor says, "You radiate energy which is measured in watts." This is not correct. Watts are a measure of *power* which is the *rate* at which energy is used. In order to obtain the energy the watts must therefore be multiplied by a time factor. For instance if energy is put into the primary of a transformer at a *rate* of 1 kilowatt and the transformer is operated for 2 hours there is used 1 x 2 *kilowatt* hours of energy.

The watt is not an electrical term entirely. In the so called C.G.S. (centimeter gram, second) system of measurement it is also the unit of power and represents the delivery of one C.G.S. unit of energy per second.

A clear understanding of the difference between power and energy will help a great deal in the understanding of our various sending and receiving problems.

For instance some of Mr. Wests' "whys" in his answer to Mr. Stones' communication become much easier to answer.

Donald O. Friend.

THE A.R.R.L. SPIRIT

Princeton, N. J.
April 16.

Editor, QST—

I am inclosing two dollars as my quota for the April A.R.R.L. Drive. My work keeps me from seeking new subscribers for our little magazine, but I owe it to the A.R.R.L. to help any time I can. Hence the cash. Put it to good use, with the best wishes of

An Amateur.

(Thanks heartily, O.M. But please give us your name so we can extend your own membership a year.—Editor.)

HERE IS A REAL IDEA!

1500 So. Ridgeway Ave.,
Chicago.

Dear Eddy:

After seeing Mr. Vermilya's letter in the March QST I decided to try it out but had too much trouble winding inductances so happened to think of another and better scheme. I brought every ground lead, insulated, up to the O.T. and tuned with ammeter for most radiation on each ground, all to the same wave length. Then I put them all on at once on their respective places and Oh Boy! the radiation jumped just as if u stuck it across your "A" battery. One good thing abt this idea is that the long ground leads could be used and they added to radiation but of course less O.T. was required on long ones than on the short ones.

W1 om nil nw, 73 cul.

9AOX.

WE MUSTABEEN WRONG

April 16th, 1921.

Dear Eddy:—

I am speaking at you in-re yours of April 1st., via QST, dictated by one Julius G. Aceves, by order of Dr. M. I. Pupin, I regret to advise that I do not agree with Julius.

Having had considerable experience with Bridges I feel qualified to hand you a cue.

Now Julius says that "if F is not known, a standard L. is substituted—", while I contend that if F is not known standard Loco is not substituted, for as the Bridge may be down, an Erie Loco will do, in which case the capacity will be about 2QTS (homebrewed). On the other hand, if the power factory is closed, more than 70% of the Henrys will be in use, by which token one will know that the vacuum can be determined only by the formula,

PHOTO-OTA2PLpg" QST 4-1921

_____ = MUD

2 I"

Moral: Don't sit on the table, use the Bridge.

Your for Beer & Light Wines,
Inocram.

I/me

CALLS HEARD

(Concluded from page 49)

WUBC, CAMP KNOX, KY. All C.W.

1DT, 1HB, 2XB, 2XX, 2CC, 2XK, 2DH, 2HTS?, 2AR, 2ZL, 3AC, 3AA, 3AB Canadian, 4AI, (4XB), 5XB, 5XA, 5VS, 8XB, 8XK, 8ZB, 8VS, 8OY, 8IB, 8IV, 8ZY, 8ZW, 8PJ, 8JM, 8OZ, (8AGZ), (8KM), (8ZG), (8YG), (8ZV), (8XI), (8XM), 9BY, 9YY, 9YK, 9YG?, 9ZN, XF1, XB1, VF1, WL2, NSF.

CLIFFORD J. GOETTE

(Concluded from page 43)

can border. To his surprise he found that about ninety percent of the M.I.B. men were amateurs, many of whom he had heard or worked before the war, which only proves once more what a factor we "hams" were in the war. Six months after the signing of the armistice he was discharged and was one of the first to open up after Uncle Sam lifted the ban on amateur operation, and from that day on he has done his share in burning up the air.

2JU was recently described in QST and it will be recalled has a "coffin" transformer and a Grebe synchronous gap. Goette is known for his very excellent fist and his courteous and diplomatic manner on the air, qualities all the more needful because of the range of his booming spark.

Recently Goette was chosen by Division Manager Chas. H. Stewart to become his assistant in charge of the Northern Section of the Atlantic Division, and under his management new life has been put into amateur affairs in that locality. The Northern Section is one of our most important territories, since it embraces New York City and all the traffic lanes leading into that center; it abounds with good stations and good operators; and with Mr. Goette as its able leader we expect to see it speedily gain that place in A.R.R.L. affairs which rightfully should be its own.

S. KRUSE

(Concluded from page 43)

hung up a 1320 mile record on a half kilowatt.

Kruse helped form the Lawrence Radio Club and the Central Radio Assn. ("From the Rockies to the Ohio"—Remember it, you old-time Valley men?), and from Kansas U. went to the Western Electric engineering department at New York on circuit analysis work and the development of sub-chaser radiophones. Whence, to the Bureau of Standards Radio Laboratory at Washington, where he is now an assistant engineer. To the Bureau he carried a keen appreciation of practical operating conditions on short waves that has stood him in good stead and makes him a connecting link between the amateur world and the activities of the Bureau relating to short wave radio. He was one of the originators of the idea of the B.S.-A.R.R.L. co-operative fading tests and to him is largely due the credit for the successful inauguration and performance of the tests. The collating and analyzing of the data gathered has been and is in his hands, and when the results from this vast effort are achieved, as they surely will be, the job will have been Kruse's, and to him belongs the credit.

At the convention in Philadelphia in March when the Third District Amateur Radio Council was organized, Kruse was elected president and there are very few men who could have been so wisely chosen. He was also recently elected a Director of our A.R.R.L.

With a sound technical training Kruse combines a hard-headed practical amateur's knowledge of practical operation, a noodle chock full of vital truths regarding 200 meters and thereabouts, and a gift for conveying ideas in a clear and clean-cut style all his own, and besides all this he can write funny stories. All of which makes him a good fellow to know.

SUMMER ARRIVES

(Concluded from page 50)

they are one-quarter the audibility of the strays. So it's far from hopeless! This contest, too, will show how the spark and

the C.W. compare in "static-puncturing"—we think we'd like to put it: "will show just how much better a static-puncturer the C.W. is than the spark."

Another thing, men: we mustn't forget our advertisers. They have to get results from their advertising or they can't afford to continue it, and that's the only thing that keeps QST going, for the printer alone gets more than you pay for your copy. We want to suggest that summer is a good time to do your over-hauling, assemble the results of the past winter's work into panels, build up new stuff for next winter, etc. You'll get prompter shipments at this time of the year and you'll have the knowledge that you're helping the game along by boosting business thru the hot months. One thing more: whatever you do, don't forget to mention QST when writing advertisers. It helps you and us—we both know why.

Now for that hash-house.



Mr. Manufacturer. Mr. Amateur

Stop! Look! Read!



Made Right

and let's settle

Stay Tight

YOUR BINDING POST TROUBLES



Corporal



Sergeant

The accompanying cuts illustrate two sizes of our Current Posts and the medium size of our slotted style Potential Posts. The bases of our Current Posts are tapped to take a #6, 8 or 10-32 machine screw and are knurled to prevent turning. The non-removable insulated cap and base of the Potential Post is made from a high grade indestructible material. We can supply the current post in any finish desired but unless otherwise ordered they will be furnished in a plain brass finish.

NINE REASONS WHY THESE UNIQUE POSTS SHOULD APPEAL TO YOU:

1—There are no parts to become lost	5—They permit a smaller sized post to be used.
2—They will not mar the finest of wires.	6—Extreme vibration will not loosen their lock grip.
3—They are built for a 24-hour service.	7—They are surprisingly low in price.
4—They are easily mounted on standard equipment.	8—They harmonize with other moving parts.
9—THEIR PARALLEL CONTACT SURFACES EXTEND THE FULL WIDTH OF THE POST.	



Commander
Opened

IMPORTANT NOTICE TO DEALERS: Here is a real money making proposition for you. We want responsible dealers in every city to carry these unique posts. The boys like them and will soon demand them on all their sets. Put your order in today. They are selling fast.

IMPORTANT NOTICE TO AMATEURS: If you want a real Binding Post that you can easily mount on your set—one that DON'T come apart and will easily clamp your wires—Demand "THE LEADER." Specify it in your next set or go to any leading radio dealer and ask for them. Do NOT order from us. Your dealer can supply them if you insist.

PAMPHLETS DESCRIBING THESE UNIQUE POSTS SENT UPON REQUEST

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1302 WALLACE STREET,
PHILADELPHIA, PA.

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